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# User Generated Content Contribution to Museum Experience Design

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# **The influence of museum user generated content to improve the experience design.**

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## **ABSTRACT**

The museums have shifted to a new hybrid cultural venue format, open to be enjoyed through multiple channels, multiple platforms, spreading the voice of art all around the world. Museums are challenged to draft new ways to interact with the potential visitors: The technology built a new framework of opportunities for museums to engage with clients and art and culture lovers, allowing these consumers to be part of the museum experience from any place. This chapter seeks to evaluate through a conceptual analysis of the use of #musetech, #musesocial, as a tool to define the new technological adoptions of the potential visitors, matching the digital needs, and measuring the level and depth of adoption of these museums' disruptive technologies. An initial exploratory analysis is offered (n=617 posts) to determine the current trending topics reframing service design.

**Keywords:** social media, Twitter, machine learning, sentiment analysis, text data mining, museums

## **Introduction.**

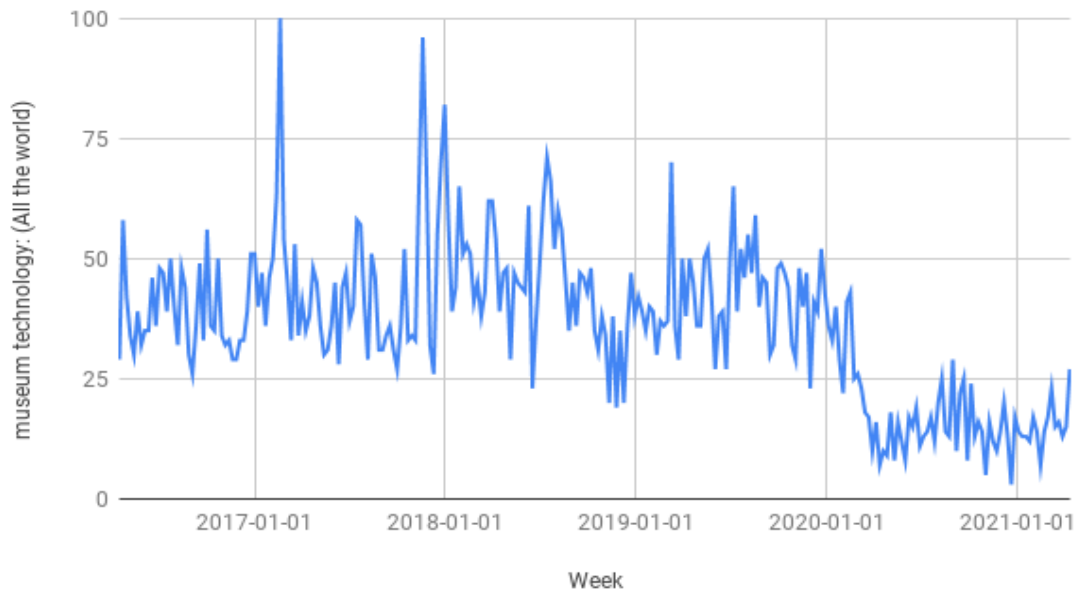
Museums provided an exceptional value and have been required to adapt to the new conditions moving from their typical presential activity to a non-explored endeavor (Verde & Valero, 2021).

During the last decade and more in the last two years, museums have increased their online content, as well as the importance given to their positioning in relation to their online engagement (Agostino., Arnaboldi., & Lampis. 2020). Precisely, during the Covid-19 pandemic, their cultural proposals have risen in online cultural activities and taking place through social media and multimedia channels. This online proof has inspired further suggestions on the future trend of digitally empowered styles of digital museology and its amusement.

Lot of social networks have been used to reach these interactions between online visitors and the museums, as a substantial increase of museums in Twitter, delivering cultural content, rather than sharing basic information or just marketing content. Social media opened new ways to interact becoming a strong channel to encourage the messages of the importance of heritage, its preservation, and appreciation (Rivero., Navarro-Neri., García-Ceballos., 2020).

In a bigger, more complex measure, some museums have already begun to research with the Big Data generated during these lockdown virtual cultural experiences as for example the keywords-based web search and analysis, and linked data as the tool to connect their databases (which might comprise million records) and making multi-layered and multimedia analysis, focusing on the data generated by these online visitors.

To date, much of this effort is in the early stages of technological progress but, in the long term, it comes to a likely framework for creating strong knowledge on how to take the most of these virtual tools, which would allow museums to become much more interactive in the real and digital world, interacting through 360° strategies with their audiences, no matter future disasters such as Covid-19 (Kahn. 2020).



**Figure 1.** Search trends on “museum technology” in Google Trends report (2017–2021).

In this regard, there were lot of museums visitors who began to earning interest to find which technologies were available to enjoy the museum's experience during the lockdown and the pandemic. as we can see in the Figure 1, gene time of the pandemic there were some pikes of interest to get the most and to learn as much as possible about the possibilities of enjoying the museum's experiences through their technology.

Based on the previous introductory explanations, the museums have to be aware about how important is to maintain insightful conversations with the visitors.

No matter the channel used in social media, in no matter the level of analyzes that the museums research to learn more about the visitors and potential visitors, it is especially important to analyze which are the consequences of this interaction researching on the user generated content (UGC) referring to the museum at online platforms reviewing the quality of the experience provided by the museum.

The role of the TripAdvisor and many other online reviewing platforms on learning, agreeing, or discussing the convenience whether to attend museum no matter digital or face to face museums experiences, show that there are much more to learn on UGC and on the presence of museums in these online platforms.

The analysis of user-generated Content (UGC) is a common practice in tourism during the last decade, but not at museum level yet.

Nevertheless, the online reputation of a museum and the height of visitor engagement are key relational considerations that affect museums visitor decision-making. (Fernández-Hernández., Vacas-Guerrero., & García-Muiña. 2020).

Due to the Covid-19 crisis, this study aims to answer to the recent call for improving visitors' physical experience in museums.

Furthermore, it will offer insights regarding the sentimental analysis which will propose useful information that will support collaborative learning.

## **2. Literature review.**

### ***2.1 Social networks importance in the museum sector***

When museums realized the importance of internally showcasing the positive impact of social media strategies to be implemented, museums' online curators should keep in mind when thinking about crowdsourcing museums on social media.

Since any social media initiatives were based on visual contributions. (Burke., Jørgensen., & Jørgensen, 2020).

These contributions became an active role for the museums to build opportunities that reply to these online interactions requests from the content shared in social media networks, as Snapchat, or Instagram. (Villaespesa., & Wowkowych. 2020).

In fact, museums have not seized the opportunity offered especially using Instagram. and their importance seems to be underestimated. (Amanatidis., Mylona., Mamalis., & Kamenidou., 2020).

With museums being asked to embrace the participatory potential of social media, no matter the channel, there are still significant differences in readiness to change across museum openness in social media. (Booth., Ogundipe., & Røyseng., 2020). Museum leaders' perspectives on social media.

But more and more museums use Twitter to attract visitors, engage effectively with them and facilitate the construction and strengthening of communities, where visitors are creating their own authentic, trustworthy content. (Kydrós., & Vrana., 2021).

An example of this content, there are numerous activities as the Twitter museum account takeover by any world-famous artist, to spread the voice and showcase the museum's collection. (Martín., & Aguirre., 2020).

In general, Twitter has been one of the main social networks used for museums to interact with fans and online visitors no matter the type of museum which provides interests. (Rivero., Navarro-Peri, I., García-Ceballos., 2020).

## ***2.2 Social media and the museum experience design.***

During the lockdown, museum fans appreciated the addition of a 'digital flavor' to exhibitions and art galleries. Improved experiences, better experience, and overall higher satisfaction result from the introduction of virtualization in museums. (Zollo., Rialti., Marrucci., & Ciappei., 2021).

Moreover, one of the causes of increasing use of social media is the engagement through current onsite experiences, since, despite the

level of online experience of them museum, the online experience design is increasing. (Romolini., Fissi., & Gori., 2020).

This museum experience design is expected to change rearranging how experiences will be offered, inevitably be led to more digital-real (Virtual Reality & Augmented Reality). (Kargas., Karitsioti., & Loumos., 2020).

Regarding the content used to design these experiences, a participatory environment of social media can help museums improve comprehension by providing new ways of seeing, as a particular potential in that digital context may relate to a humorous discourse showcasing real content. (Najda-Janoszka., & Sawczuk., 2020).

Prior to pandemic, while most museums maintain active Twitter accounts, few used the social media platform in a productive manner Increasing their own experience design, since museums just used Twitter to receive suggestions and changes these museums should make to improve their experience, rather than engage and communicate as It happens now. (Baker., 2017).

Nowadays, Twitter represents an opportunity for communication and experience management in museums. (Caerols-Mateo., 2017). In the end, Twitter is being used by museums in order to maintain contacts with existing customers and gain new clients. Increasing the online experiences production which has been adopted only recently. (Bertoldi., Giachino., Stupino., & Mosca., 2018).

### ***2.3 User generated content and sentimental analysis concerning museum experience design.***

But we should wonder how the museums were able to generate viewers who saw their UGC posts during lockdown. The sentiment and UGC analysis are useful to engage new audiences; re-purposing UGC for traditional media and their metrics. (Fernández-Hernández, Vacas-Guerrero, & García-Muiña, 2020). It is clear that the museums' visitors want to be educated and inspired, and the UGC metrics reveals how to do this more effectively. Putting visitors' experiences to drive the content strategy reflects the institution's "visitor-first" standard and extends it beyond the museums' UGC experience. (Naiditch, & Chamorro, 2017). UGC results affected museums in many ways, as for example User-generated reviews pose challenges to museums, and museum visitors pay attention to the usefulness of user-generated content as a source of data on museum visitors. (Alexander, Blank, & Hale, 2018). Museums UGC should contribute to sustaining value co-creation and service innovation, encouraging the participation of audience by enhancing experience and interactions, driving participants to create knowledge on cultural heritage. (Romanelli, 2020). We have to consider that museums are pieces of the destination experience as a whole, and how visitors would perceive UGC destination as a global atmosphere, leisure and recreation, social environment, culture, history, and art, is also affected by the Image of the museum experience design and their infrastructure. (Qi, & Chen, 2019).

**Table 1.** Main previous studies on UGC and museums.

<b>Authors</b>	<b>Description</b>
Colladon., Grippa., & Innarella., (2020).	Analysis of online conversations using Semantic Brand Score to measure brand importance of European museums.
Bailey-Ross., Ashby, J., Terras., Hudson-Smith., & Warwick., (2017)	QRator project. Exploring how mobile devices and interactive digital labels can create new models of UGC for visitors

Baldoni., Baroglio., Patti., & Schifanella., (2013).	ArsEmotica, an application software that combines an ontology of emotional UGC sentiment lexicons.
Hellin-Hobbs., (2010).	Constructivist Museum. Using UGC research how user-generated content is being incorporated into museums.

In the previous table, we can check one of the last previous studies on UGC based on analyzing how the online conversations are using the semantic analysis trying to track which is the importance of the brand of many different European museums. It was researched the different variations in the museum brand importance seems these variations were aligned with changes in the perceptions of the experience design from the visitors side. In this case the sentiment perceived was not relevant in order to be useful for predicting potential changes in the visitors side.

The second research was created few years before concretely in 2017, and it is a project to explore how the technology provided by mobile devices in any other interacted digital tools Kim showcase new kind of models to research the UGC in museums. It was about to try to interpretate how the culture could become innovative to provide good quality-based content from and for museums, trying to engage in a deeper way.

Another interesting study was created in 2013 designing a new software too much their emotions provided by the UGC analyzed through the research on sentiment lexicons. visitors from the most important museums bar beginning to provide valuable content as reviews, and it is important to check which activity are they shedding in what is the value that they provide. The sentiment analysis represents that the community of visitors and fans of the museums are usually moved by emotions once the experience has been lived.

The fourth study which has been include as one of the main previous studies on UGC refers to an early stage 10 years ago, when UGC was

beginning to be considered interesting to be incorporated in the research of museums to try to understand as best as possible the behavior of the visitors. In this research the aim was to discover how the UGC could be incorporated considering that there are official interpretations that, at that time, were difficult to be reshaped do today's traditionality of the museums.

We can see a clear evolution from the moment where the UGC was not really considered as useful too until nowadays worthy UGC is not enough seems there is also analysis of semantics and brand sentiments as well.

### **3. Research questions.**

This study followed an approach based on Research Questions (RQs), which is particularly interesting to motivate learning processes (Schumaker et al., 2016) and stimulate the generation of new ideas.

Table 1 details studies that have confirmed that the most trendy and latest topics can be recognized by investigating UGC on social media channels. Thus, the next RQ is proposed:

- **RQ1:** *Is it feasible to recognize the most popular museum technology topics conducting an analysis of UGC on Twitter?*

Sentiment analysis has been widely used to distinguish the feelings expressed and categorized into positive, neutral, and negative sentiments (Saura et al., 2020). Accordingly, the following question is:

- **RQ2:** *Will the recognized museum technology topics in UGC on Twitter be related to different feelings?*

It has been affirmed that the UGC from Twitter advances collective learning (Stephansen & Couldry, 2014; Tang & Hew, 2017). Therefore, all

the conclusions from this study can offer pertinent information, for instance, to advance museum experience design.

- **RQ3:** *Is it feasible to motivate collective learning of how to improve museum experience design by grouping the identified museum technology topics in relation to positive, neutral, and negative feelings?*

#### **4. Research method.**

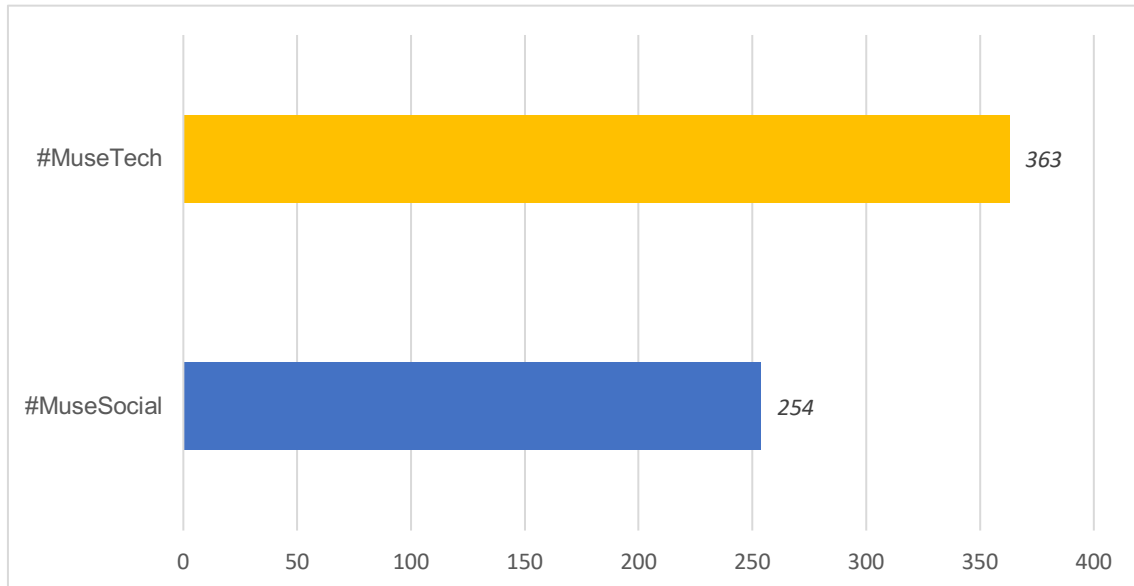
This study implements the three-stage methodology for data text mining employed in Saura and Bennett's study (2019). In the first stage the Latent Dirichlet allocation (LDA) is employed. Python was used to evaluate the large dataset and identify datasets that were associated. Before, 617 tweets were extracted and cleaned within the hashtags #edchat and #edtech. LDA was employed to categorize these tweets. Thus, it was employed to classify the museum topics most discussed on Twitter based on the above-mentioned dataset extracted of Tweets (i.e. 617).

In the second stage, the Support Vector Machine (SVM) type algorithm was implemented in order to operate sentiment analysis. This phase permitted the detection of the feelings for each topic by labeling these sentiments as positive, negative and neutral. Finally, Atlas.ti was implemented for text data mining within the results to order them concerning the weight of repetition of words and the system of measurement acknowledged as weighted percentage (WP), which distinguishes the words that are repeated the most.

##### **4.1 Data collection**

The data extraction was accomplished using Python software 3.9.2 for Mac OS X linked to the public Twitter Application Programming Interface (API). The collected UGC was in English and Spanish and

contained as keyword any of the following hashtags: #edchat and #edtech (Figure 2 and Table 2).



**Figure 2.** Tweets collected using the popular hashtags used in Twitter #musetech and #musesocial.

**Table 2.** Tweet collection concerning the hashtags employed.

Tag	N° of tweets
#MuseSocial	254
#MuseTech	363

The dataset was cleaned by eliminating repeated tweets, retweets, and not readable tweets, which left a final sample of  $n= 617$  tweets. The data collection was realized from 15 December 2020 to 1 February 2021; it comprised the Christmas holiday period, and the pre- and post-vacation phases. The museum tags #musesocial and #musetech in Twitter were chosen as these are the most used hashtags for museum related tweets.

#### **4.2 Topic detection.**

The LDA model employed in this study is based on Jia's (2018) study and takes into account a two-step mathematical and probabilistic approach. The first phase classifies the keywords within a database, where each word is encoded in an independent file. During the second stage, the topics are randomly acknowledged, and the themes are identified (Equation 1).

- Equation 1

$$p(\beta_{1:k}, \theta_{1:D}, Z_{1:D}, \omega_{1:D}) = \prod_{i=1}^K (\beta_i)(\beta_1) \times \prod_{d=1}^D \rho(\theta_d) \times \sum_{n=1}^N \rho(Z_{d,n} | \theta_d) p(W_{d,n} | \beta_{1:k}, Z_{d,n})$$

- $\beta_i$  distribution of word in topic i, altogether K topics
- $\theta_d$  proportions of topics in document d, in all D documents
- $Z_d$  topic designation in document d
- $Z_{d,n}$  topic designation for the nth word in document d, in all N words
- $W_d$  spotted words for document d
- $W_{d,n}$  the nth word for document d

Then, the identification of the topics and words is prearranged following Equation 2, using Gibbs sampling (Jia, 2018).

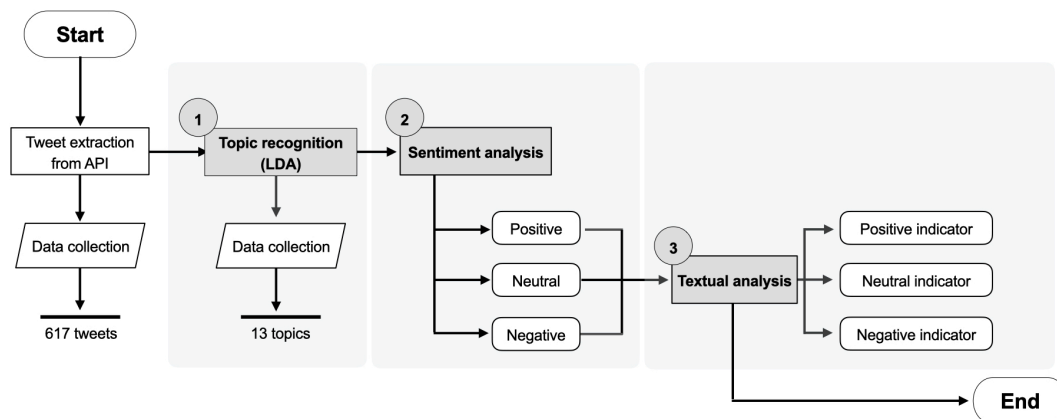
$$\rho(\beta_{1:k}, \theta_{1:D}, Z_{1:D} | \omega_{1:D}) = \frac{\rho(\beta_{1:k}, \theta_{1:D}, Z_{1:D}, \omega_{1:D})}{\rho(\omega_{1:D})}$$

### **4.3 Sentiment analysis.**

Once the most popular museum topics in Twitter were identified, a Python algorithm based on machine learning was performed. This stage included using the algorithm for text data mining to classify the feelings into positive, neutral and negative. Finally, Krippendorff's Alpha Value (KAV) was used to determine the precision of sentiment analysis. The reliability of the results was established in the three sentiments, as it concludes that when  $\alpha \geq 0.800$  the reliability of the results is high, when  $\alpha < 0.667$  the results are low and the limit for tentative results is  $\alpha \geq 0.667$  (Krippendorff, 2004).

#### 4.4 Textual data analysis.

This stage was implemented using Atlas.ti software. Text data mining was accomplished and labelled into the three sentiments (i.e., positive, neutral, negative). The dataset was structured following three processes: (1) recognizing the frequency of repetition of the words; (2) establishing the keywords' total weight measured as a weighted percentage (WP); and (3) filtering the words that are not appropriate for the research objectives (Newton-John, 2018). WP labels the weight of the indicators gathered into nodes which is reliable with the number of times they are repeated (Newton-John, 2018). Figure 3 clarifies the three stages fulfilled in this research.



**Figure 3.** Stages of the research methodology.

#### 5. Results analysis.

The results of LDA estimation revealed 13 museum-related topics, which are showed in Table 3. Throughout this procedure, LDA categorizes the words into topics, that were cautiously controlled and named after examining the group of words (Büschken & Allenby, 2016; Jia, 2018; Miller et al., 2017; Saura & Bennett 2019). The name of the topic was given considering the 10 to 20 most repeated words, and the meticulous descriptions of the topics were established bearing in mind the content of the topics.

**Table 3.** Recognized topics related to #musetech and #musesocial in UGC.

Topic name	Topic description	WP	Sentiment
Avarice	Comments in relation to museum technology where these are perceived as greedy.	0.76	negative
Wired	Observations concerning the online dimension of these innovations.	0.66	positive
Experiential marketing	Mentions regarding the significance of creative experiences for the engagement.	0.49	positive
HR updating	References of the employee requirements to update, look for innovations and learn their use.	0.45	negative
Great	Mentions concerning the impacts of these technology to get immersive experiences that are perceived as cool and relaxed.	0.41	positive
Missed opportunities	Annotations regarding the lack of adaptation to many of these advancements.	0.32	negative
Managament supervision	Remarks relative to the team supervision of these innovations.	0.32	neutral
Digital	Recognition of the lack of adaptation concerning digital improvements that can be implemented in museums.	0.31	negative
Time	References to all the technological advances that have been historically adopted.	0.22	neutral
Free	Recognition of the economic benefits from all these technonological devices.	0.18	positive

Jobs	Discussion of the advantages for the creation of employment.	0.16	positive
Recent	Recognition of the fastness of these advancements.	0.16	positive
Demand	Comments and opinions regarding that visitors are asking for technological innovations.	0.15	negative

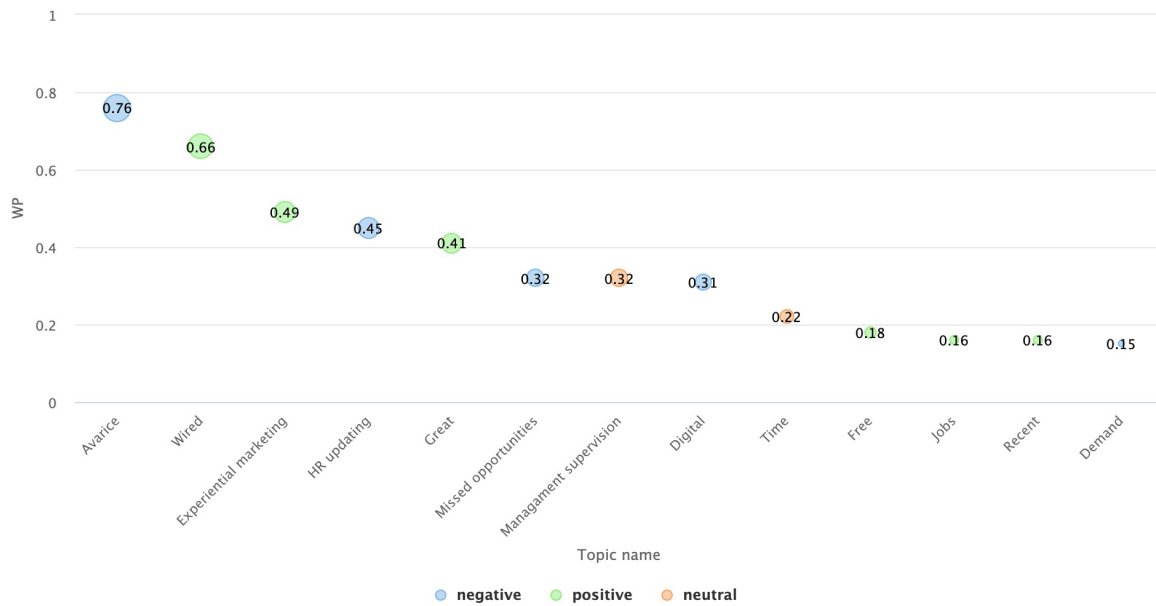
Sentiment analysis was fulfilled following Saura et al.'s (2020) recommendations, where the tweets of each topic were individually studied. The sentiment analysis algorithm was trained to achieve the endorsed probability of success (Saura et al., 2020).

Consequently, a sample of 160 posts was managed with data mining techniques to train the algorithm. Hence, Krippendorff's alpha values were estimated and the results are above the thresholds (KAV). Table 4 details the sentiment analysis reliability.

**Table 4.** Sentiment Analysis conclusions' reliability (Krippendorff's alpha).

Conclusions reliability	Krippendorff's alpha value	Sentiment	Average KAV
High	$\alpha \geq 0.800$	Positive	0.875
Tentative	$\alpha \geq 0.667$	Negative	0.775
Low	$\alpha < 0.667$	Neutral	0.685

The results of the textual analysis phase are presented in Figure 4, where the WP of each topic is identified in relation to the feeling expressed (Krippendorff, 2004).



**Figure 4.** Recognized museums topics in relation to the sentiment expressed and WP.

## 6. Discussion.

After analyzing all the results collected in this chapter, we are about to discuss the research questions results compared with the insights achieved. Regarding the RQ 1, the main technology-based comments are those which are perceived as greedy, and also some comments related with the online dimension of this innovations. The analysis reveals differences between UGC attributes and UGC feelings according to the UGC types. In fact, UGC attributes have positive effects on eWOM, brand attitude, and visit intention. (Yu., & Ko., 2021).

Hence, we cannot perceive, and we cannot recognize popular museum topics on these technology-based concept analyses in Twitter. A positive concept that we can perceive is regarding how the technological innovations are created to engage with the visitors in the distance. In relation to RQ2, it has been affirmed that the UGC from Twitter advances collective learning (Stephansen & Couldry, 2014;

Tang & Hew, 2017). Therefore, all the conclusions from this study can offer pertinent information, for instance, to advance museum experience design. In this regard we can discuss what happened with the research question number three:

Is it feasible to motivate collective learning of how to improve museum technology experience design by grouping the identified education topics in relation to positive, neutral, and negative feelings?

We can find positive negative and neutral feelings which brings us to the status of reaching topics on museum technology experience design through motivate the collective learning. UGC is a valid source for the study of tourism destination image, (including museums) confirming the need to adopt a holistic and attribute-based approach to this concept. (Alarcón-Urbistondo., Rojas-de-Gracia., & Casado-Molina., 2021). We cannot forget that not all attributes, both positive or negative, influence the overall idea of a museum and its technologies.

## **Conclusions.**

Latest analysis and visualization methods on UGC are required to gather useful insights from the massive volumes of data generated by new technologies and data sharing stages. We tried to find a groundwork for such practices so that the time of big data may also be the stage of experience, vision, and understanding. Museums and technology built a deep relationship in these times and reflects that is the future and is the grounding extent used, because it is extremely affected by digital platforms as the way to learn from museums in the distance.

Visitors and museums are sharing a plentiful supply of user generated content (UGC) on social networks and digital platforms. We checked how useful technological interactions can be obtained and envisaged from examples of easily accessible UGC, in this case, the

topics analyzed in tweets from the social network Twitter. As a conclusion, we have to considered based on the results obtained, that insights related to innovative encounters between museums and visitors can be fruitful to improve strategies and technological developments and involvements in the museums in a short-term future.

### ***6.1 Theoretical implications***

This research provides three main contributions. Firstly, it provides knowledge regarding UGC sentimental analysis influence on museum technology management. Secondly, it offers 13 topics that can be employed to improve collective learning in Twitter. Thirdly, it identifies the feelings that arouse from each of the topics. This study can be improved by using other social media channels and rising the time lapse of the data collection (Tang & Hew, 2017).

### ***6.2 Managerial contributions***

This research can assist decision-making processes as it improves the knowledge of some of the trendiest issues regarding museum technology implementations discussed on Twitter.

The three most popular topics were avarice, wired and experiential marketing, where avarice is related to negative emotions and wired and experiential marketing to positive feelings. This finding is useful for museum managers as they get to know that many museums technology is perceived as greedy, which denotes the importance of promoting positive experience among users, visitors and employees regarding these devices. Besides, online and creative experiences are well perceived which is significant as these initiatives can be increased.

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