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Analyzing Museums and Key Influential Users on Twitter during the European Night of Museums 2016

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Abstract. In this paper, we first present a representation of message flows and their lexical and topic contents on Twitter, then an instrumented methodology to describe and analyze these flows and their distribution among the various stakeholders. The aim is to explore the engagement and interactions between different types of stakeholders and to identify key influential users. We apply our methodology and tools to the 12th edition of the cultural event "European Night of Museums" (NDM16).

Keywords: circulation of information, influence, instrumented methodology, social network, Twitter, European Night of Museums

1 Introduction

It is a fact that in France and in Europe, over the last decade, temporary cultural events have multiplied, in the form of public events or festivals - such as the 'Journées Européennes du Patrimoine', 'la Nuit des Musées', 'La Nuit de l'Archéologie', 'Passeurs dimages'. These events have now become recurrent, generating initiatives that contribute to cultural outreach in society as well as to the development of cultural tourism. Lastly, the 'eventualization' of culture, following the explosion of temporary exhibitions, has amplified a shift of patrimonial institutions to the logic of working like streaming media.

We consider that these profound ongoing changes in the museum context [1] are a necessary framework to understand the relationship between museums and digital media and more specifically the presence of museums on social networks. Therefore, we do not attempt to assess the 'impact' of these digital media on museum practices, but rather to apprehend the place and the role they play in the evolution of these practices. In this perspective, this article focuses on the representation and analysis of message flows on Twitter during a cultural event and on the instrumented method designed to analyze these flows. The purpose is twofold: first, to devise a representation of message flows and their contents on this platform; second, to develop an instrumented methodology to describe

and analyze these flows and their distribution among stakeholders in order to reflect the engagement and interactions between different types of stakeholders.

Our study is based on the 12th edition of the cultural event 'European Night of Museums' (NDM16). This event took place in the heritage institutions that were partners in the event and was extended to digital media on the website dedicated to the operation as well as on social networks (Twitter, Facebook, Instagram). The outline of this paper is the following. First, in Section 2, we will present the specificities and the contribution of our approach and our methodology to collect and analyze flows of tweets. In Section 3, the results from quantitative and lexical analysis are discussed. Finally, we conclude in Section 4.

2 Related Work and Contribution

The concept of participatory museums proposed by Nina Simon in her book [2] departs from the vision of museology; her proposal is built on the articulation between the audiences who contribute to the activities of the institution and the museums that supervise encourage and evaluate collaborative projects and co-creation activities with visitors. In this section, we begin with a review of the literature in order to present and situate the contribution of our approach, and then to present the interdisciplinary approach and methodology we developed to conduct the analysis of messages.

2.1 Related Work

A number of scientific studies have investigated how museums use social media, focusing on the communication and mediation policies and practices of museums and their uses of platforms (including Facebook, Twitter) for various purposes [3] [4]. The aim is to move from a vertical logic of diffusion to the establishment of closer relationships based on audience interaction and participation. Nowadays, museums and cultural institutions use social media as a means to communicate and promote their cultural activities, as well as to interact and engage with their visitors, the main use of social media by museums remaining information and promotion of activities such as exhibition openings or events [4]. Some museums choose to adopt social media for audience development and engagement in order to maintain their position of cultural and educational leaders. A qualitative study on the ways that museums use Twitter in this perspective shows that they choose to link resources, engage the public with new social media tools and favor a two-way form of communication [3]. In their commitment to a digital policy of mediation of cultural resources, institutional communication strategies and marketing strategies are also a common concern. Indeed, the image of the institution is affected by its capacity to ensure visibility on media considered as innovative in their modes of public involvement and in the sharing of their cultural resources.

Villaespesa Cantalapiedra [5] carried out fieldwork including a series of interviews with museum professionals which showed that the term engagement, 'can

be interpreted in a variety of ways (...): From fostering inspiration and creativity in the user, originating a change of behavior, increasing the user's knowledge, receiving interaction from the user in the form of a like or a comment,' [5]. In particular, when Langa [6] studied the building of a relationship that forty-eight museums engaged on Twitter with online users, she showed that its primary use was as a marketing tool (public relations, events announcements, fact of the day, etc.) and that it led to a lesser engagement and a low audience participation. However, when museums led a more engaging and interactive communication (including games, live tweeting events and co-curating projects), this greater engagement was related to a higher level of participation [6]. In this study, it therefore appears that the kinds of communication museums are conducting with online users have a meaningful influence on user participation.

2.2 Studying the Relationships between Stakeholders

So far, scientific studies on the forms of digital communication engaged in by cultural institutions and audiences have analyzed the practices of institutions and audiences as well as their uses of digital platforms. Our contribution aims to design, in an inter-institutional cultural space, a model for the circulation of message flows on a social network platform, taking the case of Twitter. We chose an inter-institution space that corresponds both to a social network platform widely used by institutions and to a growing communication situation in the cultural field at the present time. This choice led us to focus on the category of cultural event programmed on a national scale. This enables us to explore how information circulates and is exchanged as well as the communication relations established between the different stakeholders present in an inter-institution space. It also avoids making any presuppositions about the various categories of stakeholders taking part in cultural events, as well as their statuses and roles. We focus particularly on the configurations of the authority and legitimacy relations that institutions maintain with the public through the processes of communication and mediation that they implement. Such an approach emphasizes the socio-political aspects of museums' editorial practices, in particular the relations of legitimacy between different categories of actors. Based on the analysis of message flows on the scale of the cultural event studied, we attempt to answer questions concerning the communicative practices of the stakeholders, such as for example, what is the current strategic usage of social media conducted by different types of stakeholders (not only museums or cultural institutions) during cultural events? We expect marketing and promotional messages to be present but we also inquire into initiatives fostering audience participation, providing cultural contents and favoring interaction with users. We will specifically examine the communication policies of cultural institutions during a cultural event on Twitter in order to assess whether they are part of their mission to democratize culture for a wide audience on this platform or whether it is rather a marketing campaign to promote a place or an event. More broadly, do stakeholders focus on marketing, advertising, education, cultural information or institutional communication?

2.3 An Instrumented Methodology

In order to build a representation of the modes of circulation of message flows, we developed an instrumented and interdisciplinary methodology that calls on Communication Sciences, Natural Language Processing (NLP) and Computer Science. Our methodology is based on statistical analyses of all the Twitter messages sent during the period of a cultural event as well as a content analysis of the messages. As mentioned in [8], tweet analysis has led to a large number of studies in many do-mains such as ideology prediction in Information Sciences [9], spam detection [10], natural disaster anticipation in Emergency [11] and tracking epidemic [12] while work in Social Sciences and Digital Humanities has developed tweet classifications [13]. However, few studies aim at classifying tweets according to communication classes. They mostly rely on small reference sets analyzed by experts in Information Communication (InfoCom) rather than by Twitter users. An exception worth mentioning is the work presented in Lovejoy and Saxton [14] in which the authors (Twitter users) analyze the global behavior of nonprofit organizations on Twitter based on three communication classes: Information, Community and Action classes. Recently, several studies on tweet classification have been carried out in NLP [12, 15, 16] but to the best of our knowledge, only [17] has classified cultural institutional tweets in communication categories based on NLP techniques. The advantage of NLP approaches is that they can automatically classify large corpora of tweets. The most commonly used models are supervised learning, Support Vector Machine (SVM) and Naive Bayes (NB) [12, 18–20]. In supervised learning, features are extracted from tweets and metadata and then vectorized as training examples to build models. Our analysis focuses on Twitter messages (called tweets) sent by accounts of cultural institutions and by other institutional or non-institutional stakeholders who participated in a cultural event. A first step was to build a terminology to describe the objects studied according to three dimensions: the message, the stakeholders, and the forms of stakeholder participation. Concerning messages, we will call a message sent by a twitter account an "original tweet" and an original message sent by an account different from the issuing account a "retweet". The current Twitter API gives access to the original tweet (and its sending account) of a retweet. The generic term tweet includes original tweet and retweet. Regarding stakeholder qualification, we distinguished Twitter accounts, accounts managed by institutions (called organizational account, OA), and accounts managed by individuals (called private account, PA). This distinction is based both on the official list of museums in France provided by the French open data website, and the description on the Twitter account provided by the Twitter API. The analysis of the description field is necessary because non-museum institutions such as the City of Paris (@Paris) participated in the Night of Museums. Analysis of the flows during the MuseumWeek 2014 and 2015, European Night of Museums 2016, Europeans Days Heritage 2016 events, led us to identify six attributes used to qualify accounts according to their modes of participation and one computed score was associated at each attribute (cf. Table 1). We used the terms participant, producer, relayed, relaying, mentioned and

passing. The attribute "participant" was assigned to an account if it produced at least one original tweet or retweet during of of the the two temporal periods of the event (before and during the event). The attribute "producer" was assigned to an account if it produced at least one original tweet. The attribute "relayed" was assigned to an account if at least one of its tweets was retweeted. The "relaying" attribute was assigned to an account if the account retweeted at least one tweet. The "mentioned" attribute was assigned to an account if its Twitter account name was mentioned at least once in a tweet. The attribute "passing" was assigned to an account if it was both relayed and relaying. Our hypothesis is that an account with a high passing score is a key influential user (see section 3.2). Note that these attributes were calculated irrespective of the number of followers. From these six attributes, it is possible, on the one hand, to compare the behavior of several accounts and, on the other hand, to calculate an overall score to classify them (see 3.2).

Table 1. Score calculation method

Attribute	Method
Participant	0 (no participation in the considered period of time) or 1
Producer	Total amount of tweets and retweets
Relayed	Total number of accounts which relayed his/her original tweets
Relaying	Total number of accounts she/he relayed
Mentioned	Total number of mention of the account in text tweets
Passing	Product of relayed score by relaying score

Both quantitative and lexical analyses were carried out. Quantitative analyses focused on the observation of flows and aimed to identify accounts that contributed to the circulation of information during the cultural event. For each attribute (see above) a ranking of the accounts was computed, keeping only the first 10 or 15 accounts in this ranking. This made it possible to order the accounts that produced the largest number of original tweets, which were the most retweeted, and so on. In order to rank passing accounts, we computed for each account a score that is the product between the number of accounts that this account retweeted and the number of accounts that retweeted it. The value of this index is not significant in itself; it simply provides a means of comparing accounts. The lexical analysis focused on the contents of the messages. Lexical analysis of tweets was carried out as well as an automatic classification of tweets, in three stages. First, a team composed of two linguists and 10 community managers of cultural institutions designed a model, that is to say, determined the classes in which to categorize the tweets, and the features used to assign a tweet to a class. Four classes were identified (Encouraging participation, Interacting with the community, Promoting the event and informing about it, Sharing experience). The features selected were semio-linguistic (mostly lexical, but also

including punctuation marks, emoticons), tweet-specific features (for example, the presence / absence of hashtags in tweets) as well as metadata such as the identity of the account. In the second stage, a classifier was built based on a corpus of sample tweets drawn from two cultural events, MuseumWeek2014 and MuseumWeek 2015 [17]. In our case, these examples take the form of 1000 tweets annotated by hand by cultural experts according to the categories defined in the previous step. The classifier is based on the Naive Bayes and SVM models, with unanimous vote. This means that both models had to predict the same category for a tweet; otherwise, the tweet was not classified. In a third stage, the classifier was applied to the corpus of tweets to categorize all the tweets. Results of the thorough evaluation of the quality of the classifier carried out on the MuseumWeek 2015 campaign are detailed in [8]; the F-measure $F_{0.5}$ coefficient is 0.696.

3 Applying our methodology at the European Night of Museums (#NDM16) on Twitter

The analyses of the European Night of Museums (NDM16) were carried in the structuring content of the organizational and media framework in order to understand what happened during this cultural event, going beyond the display of quantitative data communicated at the time of its closure, i.e. 3000 events organized in France and in Europe, more than 2 million visitors who participated in the European Night of Museums in France.

3.1 The Sociocultural and Media Context

The European Night of Museums in 2016 had a European and international dimension thanks to the patronage of the Council of Europe, the French National Commission for UNESCO and the International Council of Museums (ICOM). It included both public and private partnerships. The event therefore had a political dimension of cultural outreach and democratization, an international dimension (although the event was mainly French) and a media dimension through the support of major media. The press release issued by the Ministry of Culture highlighted the characteristics underpinning the Night of Museums event - marketing, cultural mediation and pedagogy. They form the basis of the constituent dimensions of the event, which are reflected in its organizational structure and in the program of activities. The event was free of charge. NDM 2016 can be considered a hybrid cultural event in its purposes of marketing, cultural mediation and pedagogy. It welds together events communication and cultural marketing devices, an educational system and cultural mediation operations. The latter, supervised by the Ministry of Culture, gave rise to forms of engagement which associate the participating institutions with the public. We will now examine the forms of communication on the Twitter platform.

3.2 Key Influential Users

Data Acquisition. The data acquisition stage consisted in harvesting tweets with only one hashtag, the official event hashtag #NDM16. We developed a script Python, based on Twarc(<http://github.com/docnow/twarc>) module proposed by Ed Summers using the streaming option of Twitter Application Programming Interface (API) . However, Twitter data collection poses a number of challenges which introduce biases and problematic assumptions [21]. We followed best practice in terms of data collection and outline our data model and framework (see section 2.3). In this paper, we limit the analysis to tweets in French sent during the week preceding the event and the day of the event, that is to say from 14 May to 21 May 2016 midnight. Some flows were analyzed over the time period of the day of the event, from May 21 at 6pm to May 21 at midnight. The main figures are the following: 11 264 tweets of which 3 301 original tweets (29%), 7 963 retweets (71%) sent by 4 012 participants.

Table 2 shows some specific figures : more than half (56%) of organizational accounts and only 25% of private accounts produced original tweets. Participation in this event was largely limited to the action of retweeting (75% of tweets) the messages sent by the institutional partners.

Table 2. Specific figures

Type of account	Number	Percentage of original tweets	Percentage of retweets
Institutional accounts	411	56%	44%
Private accounts	3601	25%	75%

Table 3. Passing accounts

Name	Type of accounts retweeted	Retweeted by	Followers
NuitdesMusées	Mainly organizational	Mainly private	22 422
MarietteEscalier	Organizational	Mainly private	1 842
MuséeCluny	Half organizational, half private	Mainly private	44 839
MinistèreCultureCom	Organizational	Private	184 521
AlainJuppé	Two Organizational	Private	352 837
MuséeOrsay	MuséeOrangerie	Private	463 184
LeCMN	Organizational	Mainly Private	27 856
MuséesAugustins	Private	Mainly Private	4 774
MuséGuimet	Half organizational, half private	Private	29 500
MuséBretagne	Half private	Private	7 708

Passing Accounts . Table 3 shows, in descending order, the 10 passing accounts that had a significant score (see 2.3). These accounts that are both relayed and relaying played a central role in the flow of information on the platform. We have indicated for each of them the number of followers as they appeared on their Twitter account on May 28, 2016. A remarkable point is the non-correlation between the passing score and the number of followers. The Pearson-correlation computed on the first fifteen passing accounts (NuitdesMusées excluded) is equal to 0.15875, that is very low. Consequently, while the growth of followers of museums Twitter accounts is considered as a marketing target, the circulation of information during a cultural event is depending of key influential accounts which are not necessarily what is called 'big players' [22].

Some characteristics of these passing accounts must be pointed out. They are all organizational accounts with the exception of the account '@Marianne Escalier'. The owner of this private account is a professional in the field of cultural mediation. She holds the position of 'Mediation Coordinator' for the 'Quai in Toulouse', which is an institution that supports Scientific, Technical and Industrial Culture (CSTI), but she tweets on her own behalf. Ranked second after the organizational account of the event but with less than 2 000 followers, she can be considered as an key influential user. The first account, 'NuitdesMusées', is the institutional account dedicated to the event. It thus fulfills its role of dissemination account of NDM 2016, as does the account of the Ministry of Culture and Communication (@MinistèreCultureCom). Other accounts include museums located in Paris, as well as a regional museum (in Brittany) that reaches the same level of visibility as the Paris museums. In 5th place, the presence of the account of Alain Juppé, a French politician, mayor of the city of Bordeaux and former prime minister, shows that culture has become a political issue (he built an ambitious cultural policy program during his candidacy for the right-wing primary of the 2017 presidential elections) and plays an important role in marketing Cities and territories. The circulation of cultural information appears to be a dynamic process that goes beyond the cultural sphere and achieves wider political and social appropriation. Great diversity was observed in the communicative practices of museum accounts. Some museums relay exclusively organizational accounts, while others relay only private accounts. We also noted that the passing accounts during the event are not the same as the passing accounts of the period preceding the event. Only the 'NuitdesMusées' and 'MinistèreCultureCom' accounts are common to both these periods.

Lexical Analysis and Supervised Classification. The 10 most frequent terms in the text of the tweets (after deleting prepositions, conjunctions and terms related to the event) sent before the event are presented in table 4. Before the event, organizations used 'vous' (you) and 'votre' (your) to address the public and 'nous' (us) and 'notre' (our) to present their offer. They stressed that the event was free of charge 'gratuit' and the notion of discovery 'découvrir, découvrez' (to discover). During the event, organizational accounts used 'vous' and 'tous' (all), 'notre', an invitation to discover 'découvrez' emphasizing participation. They also reported on specific events such as 'concert'.

Table 4. Most frequent terms

Before the Event	Number	During the event	Number
Vous (you)	160	Vous (you)	49
On(one)	78	Tous(all)	28
Votre (your)	78	Nous (we)	18
Notre (our)	76	Découvrir (to discover)	18
Merci (thanks)	55	Notre (our)	18
Nos(ours)	53	Monde(world)	18
Gratuit(free of charge)	45	Nos(ours)	18
Découvrir (to discover)	40	Concert	18
Venez(come)	40	Belle(Beautiful)	17
Découvrez (discover)	40	Voir (to see)	15

The findings of the supervised classification of original tweets sent during the event (see section 2.3) are shown in table 5. It should be noted that some tweets have been categorized twice (that is why the sum of the total percentages is greater than 100%). This table shows that the organizational accounts tweets mainly (93%) serve to promote and inform about local events planned for the occasion. This result is consistent with the organizational framework of the cultural event, the success of which is partly linked to its attendance. There is also some interaction with the public but messages of engagement are very sparse.

Table 5. Supervised classification

Classes	Percentage
Encouraging participation	4%
Interacting with the community	19%
Promoting the event and informing about it	93%
Sharing experience	0%
Not classified	93%

Comparing practices . In order to compare the 15 most active accounts, we performed a principal component analysis with 4 variables for each account: number of original tweets, mentioned score, relayed score and passing score (see section 2.3). We did not take into account the official account of the event (@NuitdesMusees) which due to its official position, presents specific characteristics. This analysis shows the positions occupied by the 15 most active stakeholders in the 2016 NDM (Figure 1). Among them, the Musée d'Orsay is in a remarkable position, far on the right; it was mentioned and relayed many times because it organized an event (a jazz concert in the museum) which was very well at-

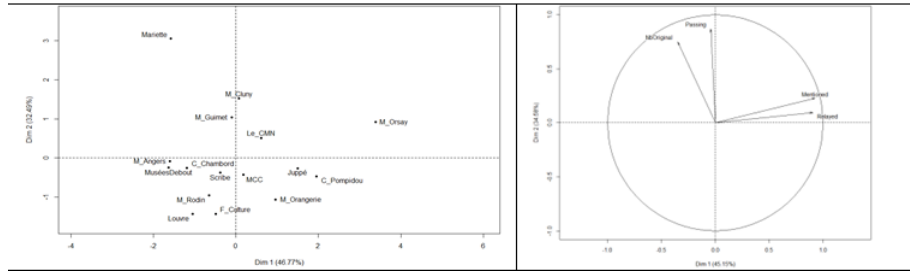


Fig. 1. Principal component analysis

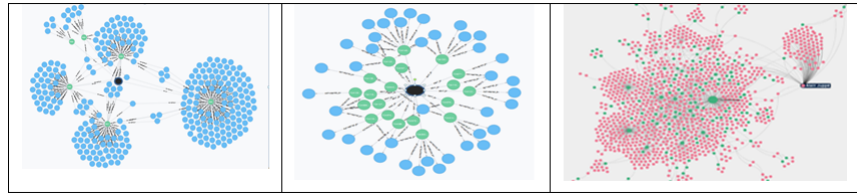


Fig. 2. Networks of the Musée d'Orsay, Mariette Escalier and Alain Juppé

tended. The success of this in situ event was relayed on Twitter which worked in this respect as a soundboard whereas the Louvre Museum, which organized conferences, was seldom mentioned or relayed despite its reputation. The Cluny Museum, the Guimet Museum and the CMN occupy positions that place them more as passing accounts. There are also several stakeholders who were not partners in the events and who took the opportunity of NDM 2016 to enhance their visibility in the cultural field. Similarly, the position of the private account Mariette Escalier (cultural mediator) occupies another remarkable position, in the left top corner; she is a passing account and she sent a lot of tweets, unlike most private accounts. Another private account, 'Scribe', in the center, occupies a position closer to that of the organizational accounts, that is to say, rather well retweeted. One can also see an activist account 'Musées Debout' (Standing Museums), a collective in line with the political movement 'Nuit Debout' (Standing Night), launched by a curator at the Louvre Museum with a program 'to put the museum at the heart of public debate, and public debate at the heart of the museum', whose tweets were quite well retweeted but he was not a passing account. The private account of the politician Alain Juppé (see 3.2.3) who sought to enhance his cultural program was largely relayed by the collective who supports him (fig.2). France Culture, the only media, occupies an average position of relayed account.

The topological representation of the networks of the two most active accounts, one organizational, @Ministry of Culture and one private, @Mariette Escalier reveals very different forms of information flows. There is a spin-off in clusters for the organizational account of the Musée d'Orsay (Figure 2), in dark

blue in the center (accounts are in blue and tweets are in green). This account sent information to other accounts which play the role of broadcaster towards the collectives to which they are connected. In contrast, the network of the private account of Mariette Escalier in dark blue in the center, shows a circulation of information that is more fragmented and more diffuse. The third picture shows clearly that the supporters of Alain Juppé (black label on the far right) network is not connected with others networks like for instance the NuitdesMusées (green label) network.

4 Conclusion

In this study, we described how to design an interdisciplinary and instrumented methodology in an inter-institutional cultural space. We proposed a model based on six attributes to qualify accounts according to their modes of participation and a machine learning classifier to categorize all the accounts. We applied the methodology and the tools to the cultural event European Night of Museums 2016. We pointed out that one private account played a major role in disseminating information and that culture has become a political issue in France. We performed a correspondence analysis that shows the specificity of this private account and the role of two museums in Paris, the Musée d'Orsay and the Centre Pompidou. We are working on the extension of our method in order to take into account the incremental analysis of graphs.

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