Article

Languages and Context Issues of ICTs for a New Role of Museums in the COVID-19 Era

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Abstract: The rapid spread of the COVID pandemic is deeply changing people's lives and upsetting consolidated models and lifestyles. The social distancing measures for the reduction of contagion have been heavily affecting people's daily experiences, such as for example the public's relationship with cultural resources. Museums, in particular, are paying the highest price for that, forced to find new forms for heritage fruition, thus representing an emblematic case. Taking its steps from the analysis of the pandemic's effects on global museum heritage and of museums' response, the article focuses then on ICTs' role as communication languages between heritage and its audiences in the solutions adopted, and on their suitability to the changed context. Finally, reflections on structural and contextual aspects of the dialogue between cultural resources and their public, beyond strictly technological matters, are proposed, to highlight the real extent of the challenges facing the museum sector.

Keywords: cultural heritage; museums; ICTs; heritage fruition; COVID pandemic

1. Introduction

The COVID pandemic and the consequent safety measures for the reduction of contagion have been inducing a striking impact on the public's relationship with cultural resources, especially those whose consumption implies people's gathering. Museums in particular, as delimited physical places, are among the institutions most affected by the implications of COVID spreading, whose most tangible indicator is the shrinkage of revenues from ticket sales, merchandising, and government subsidies.

However, although not as evidently, the pandemic represents a huge risk factor for not only the financial sustainability of managing institutions, but also for the very existence of cultural heritage, whose physical integrity is already jeopardized through deterioration, poor or lacking maintenance, extreme events, and anthropic pressure. To that, also the sudden interruption of physical frequentation in the absence of alternative fruition modes must be added. Indeed, it must be considered that cultural resources can be defined "at risk" even maintaining their physical integrity, if they drop away from communities' life losing contact with them and consequently their acknowledged significance. In fact, UNESCO expressly included communities' abandonment in its List of primary risk factors (Section "Social/cultural uses of heritage—Society's valuing of heritage") [1]. In this process, omitted frequentation and consumption of resources from the part of the public play a key role. If communities keep their relationship to and knowledge of heritage alive, cultural resources maintain their essence and significance as inheritance, testimony and identity value; the transfer of knowledge of cultural resources can only occur at its highest through the fruition experience, on site or in remote mode.

Due to the COVID pandemic, the whole museum heritage has become, then, suddenly fragile and vulnerable—as its relationship with communities has thinned out—and apparently silent in respect to it, since it is physically distanced from the public. To identify directions in the process of re-approaching of museum resources and communities, current practices and approaches needs to be considered. In this frame, one main research question

pertains to ICTs' role in museum institutions: the article aims to assess the adequateness of the usual exploitation of ICTs as museums' communication means (i.e., as a 'language') for the present challenges posed by the COVID and post-COVID scenarios.

The work takes its steps from the analysis of the pandemic's effects on global museum heritage, through an overview of the most authoritative reports from the field, and analyses the response of institutions to the current crisis through concrete initiatives. The investigation method is based on the analysis of quantitative and qualitative data obtained by documents and artifacts, official reports in particular, and facts gathered among museums' direct experiences. Taking into consideration the different technological solutions adopted, it focuses then on ICTs' role as communication languages between heritage and its audiences, and on their suitability to the new context. From a wider-scale perspective, it finally proposes reflections on structural and contextual aspects of the dialogue between cultural resources and their public, beyond strictly technological matters, in order to highlight the real extent of challenges facing the museum sector.

2. Effects of COVID Pandemic on Museum Institutions

The spreading of the COVID pandemic in the world has been causing a deep unsettling in all aspects of people's everyday lives, interrupting any appearance of normality, depriving individuals of references and upsetting organizational models in all sectors, above all for activities with marked social component or based on individuals and groups' movements.

Undoubtedly, museums are among the institutions most affected by the COVID emergency. Given the multifaceted value that they assume within communities and the diverse implications of cultural consumption (cultural, social, economic, productive, occupational), it is not easy to abridge the extent of the overall impact of the Coronavirus and of the violent suspension of museum activities on the whole of satellite activities also due to the absence of precedents. Such a sharp break of an activity deemed (unjustly) "not essential" by many governments was probably experienced only during wartimes. Studies carried out by many international institutions can anyway give us the idea of that impact through the dramatic objectiveness of figures. A first report by ICOM (May 2020) [2] analyzed the impact of lockdown on a sample of 1600 respondents in 107 countries across five continents from 7 April to 7 May 2020. The results indicate the closure of about 95% of the museums studied and a downsizing of activities for all of them, with serious economic, social and psychologic repercussions for operators. The study reports also a probable permanent closing for 12.8% of structures, 30% forced to reduce staff by one third and almost half museums forced to suspend salary for external collaborators. The budget situation varies considerably between public and private museums, as, while the former can rely on government subsidies, the latter are strongly dependent from ticket sale and, to a lesser extent, from donations. Closures have mainly affected those regions where museums are few and recent, with a still fragile and unconsolidated establishment, ranging from 8% in Europe to 39% in the Arab countries. The ICOM follow-up report (November 2020) for the period 7 September–18 October 2020 [3] showed only a slight improvement, with greater diversification depending on geographical areas, with most museums closed in Latin America and most museums open in Asia and Europe, right before the second lockdown wave hitting the latter. The UNESCO report (May 2020), also started in March 2020 on 95,000 institutions across the world, returns accordant data, with around 90% of museum closed [4]. Switching to the regional level, the American Alliance of Museums (2020) estimates the 30% of museums doubting reopening [5], and the Final Report by the Network of European Museum Organizations on the period 24 March–30 April (NEMO, May 2020) [6] indicates the same value for European museums forced to suspend freelancers' payments.

This situation, though captured several months ago, appears anyway critical, despite partial re-openings, due to the recurring lockdown periods according to the virus waves. The reoccurring of contagion peaks leads to foresee a considerable impact of the pandemic

on museum institutions also in the medium-to-long term, with repercussions on all aspects of cultural activities. Then, not only closures in themselves, but above all the unpredictable nature of the crisis duration makes museums vulnerable and fragile against the current scenario, due to impossibility to plan a reorganization of activities and of the necessary resources.

3. Museums' Response

In the complex scenario described above, several reports and news demonstrate the rapid and proacting response of many museum institutions to the crisis, formulating variegated approaches according to the contexts.

It must be premised that as Vayanou, Katifori, Chrysanthi, and Antoniou underline [7], many museums have found themselves unprepared to manage this real emergency, and the radical change in the modes of service delivery it has been imposing, lacking an effective and well-defined virtual presence in the net, beyond the plain communication and information on on-site activities. Indeed, the COVID epidemic, and the willingness to respond to it, has brought to light dramatically not only long-lasting structural weaknesses (first the limitations in staff and financial resources for digitalization) but also heavy disparities across different regions of the world with reference, for example, to the access to the Internet. The digital divide has emerged more than ever, as only 5% of museums of those impaired countries, accounting for only 1.5% of museums in the world, have been able to share content online. Moreover, half of the world population has no access to digital technologies at all.

In many other contexts, on the contrary, initiatives demonstrate the rapid and proacting response of many museum institutions to the crisis, formulating variegated approaches according to the contexts. Undoubtedly, the push to maintain and amplify remote relationships with the public with digital technologies has been a compelling response, for the need to assure safety conditions by reducing the risks of contagion for visitors and staff, grant the very existence of museums and allow them to continue playing their social role. Indeed, the initiatives launched show a manifold creativity in their different declinations.

In particular, the museum sector has proved rapid and effective in reacting, amplifying their presence online. Many institutions have been offering hundreds digital/digitized contents generally through their own website, in theory opening the doors to new user groups. In practice, even if an increase of 80% has been registered in the online presence of museums and the number of online visitors has raised by 40%, the remote cultural experience apparently fails, in general, to establish itself as an adequate substitute for on-site visits. Indeed, as Vayanou et al. underline [7], users frequently stop navigation after a few seconds, limiting the exploration to one or two pages.

The follow-up report by ICOM [3] has highlighted how the digital activity, meant as a whole of communication strategies, has started or has intensified after the lockdown for at least 15% of the sample, while the sole communication via social networks has involved at least 50% of museums. In this respect, it can be observed that the disparities in the use of remote technologies across different geographic regions lessen in the case of social media.

In Italy, the creativity of museums is giving life to experimentations, often prioritizing the educational value of institutions, as in the case of the Galleria degli Uffizi in Florence with its 21 virtual exhibits and a specific section of the site with stories and videos divided by themes and dedicated to curiosities, secrets, and marvels [8]. This is also the case with the Museum of Science and Technology Leonardo Da Vinci in Milan [9] and its #storieaportechiuse format narrating the museum in the closing days. The 'Maison Petit' educational initiative [10] is dedicated to children, based on Jitsi platform to facilitate co-presence, participated construction of narratives and sensorial interaction with home objects, selected for their resemblance with the museum's sculptures. The Museum of Modern Art in Bologna (MAMBo) has made available, since the early days of lockdown, environmental performances in streaming, a digital engagement format through social media and YouTube, and several kits [11]. These are downloadable free, to approach

masterpieces and prepare to future visits on site, but above all to support teachers who have been unable to carry out the planned visits [12]. The Triennale in Milan has launched the "Decameron: stories in streaming" initiative, while the Civic Museum Foundation of Ven-ice has started its "Every day a story, a game, a masterpiece" cycle [13].

Across the world, initiatives are too many to mention; some examples are the J. Paul Getty Museum in Los Angeles, which launched a challenge to re-create art masterpieces with common home objects, soon become viral across the world. The Rijksmuseum in Amsterdam has kept on performing its ordinary digital activities, already articulated and stimulating, such as the high-resolution of paintings with different narration levels through its own website and social media. Moreover, it started coupling it with civic engagement, by organizing a collection of gloves and respiration masks to be donated to hospital staff, mobilizing also other museums [12].

In the wider awareness of their social function, many museums in the world have also acted as resilience activators for communities, giving life, beside digital exhibits, to initiatives focusing on the concept of empathy, help and solidarity, in the effort to give solutions to the sense of isolation spread by the COVID pandemic. Some of these have been surveyed and published in another study by NEMO [14]:

- Digital exhibitions;
  - Online tours
  - Blogs, stories posted on Instagram and Facebook
  - Tours via live stream
  - Art education apps
  - YouTube channels with artist talks, lectures, fun videos, etc.
- Downloadable objects/materials for creative use;
- Documenting the COVID pandemic for future generations;
- Collection/donation of sanitation materials to hospitals.

4. ICTs for Museums: Language-Related Issues

As mentioned above, museums have increased their online presence during the lockdown by 80%, offering more interactions on social media, virtual tours and online exhibits, and a rise of 40% in online visits has been reported. More generally, the online presence of museums can take on different forms and accordingly adopt different communication languages: websites, social media, digital galleries, VR/AR applications for virtual tours and games, podcasting for audio content sharing, 3D materials for engagement and creativity development (especially for learning purpose), quizzes and contests, Pinterest exhibitions, Twitter threads. In this landscape, several limitations are nonetheless evident in many of the strategies adopted:

- many museums limit themselves to simply transferring online their collections and/or disseminating their ordinary on-site activities, leaving little space for interaction and generally paying little importance to establishing a direct relation with the public. For a more and more skilled, informed and exigent audience, seeking for captivating and engaging experiences, such kind of online experience does not represent an attractive option;
- despite the wealth of cultural resources that are currently accessible online and the marked variety of approaches in the design of cultural experiences, online visits are generally conceived as private experiences, focused on individual users. However, studies from the museum fields have been underlining the importance of the social context, suggesting that social interactions are key elements in the design of engaging visits [15,16];
- despite the gradual integration in cultural offers of more information contents, new fruition and engagement modalities and greater autonomy in determining the characters and values of the visit experience (especially for "enlarged" publics), many museums show little openness towards new digital technologies and the changes

triggered by them, a marked delay in the development of effective strategies for online communication and in welcoming the full potential of technologies to support innovative cultural offers, visitors loyalty building, and intercepting new users' segments [17];

- the sudden isolation and the objective impossibility to choose the on-site, physical relation with cultural resources has been transforming what was once a "desired" possibility into a forced option, perceived as a limitation in choice faculty. As Galani and Kidd observe [18], the pandemic has been imposing a de-prioritization of touch and physicality, since individuals have been compelled to isolate or distance from each other and institutions have shifted towards digital formats.

In general, many countries are witnessing a "macro-challenge", of structural nature, in the digitization work progress of museum contents. The recent NEMO report on the digitization of a sample of European institutions of July 2020 [19] highlighted some points:

- 3 of 4 museums reported as main obstacle the restraints in the budget and limited time resource of staff, beside Intellectual Property Rights problems (30%) and limitations in the equipment (30%);
- overall, 43.6% of collections is digitized, but there exist some discrepancies according to the museum category. Although art and design museums have already 65% of their collection in digital format, for natural history museums the percentage drops to 15% due to the dimension and type of objects (complex 3D objects, such as those typically to be found in the second category of sites generally require adequate technologies and resources);
- more than 88% of interviewed museums reported visibility as main goal for digitization, followed by access increase (76%) and educational purpose (76%); interaction is absent among motivations mentioned;
- the awareness or knowledge about the existence of organizations that can support this task, as well as a map of involved players, are missing, and this hinders the triggering of a virtuous knowledge exchange.

It must be said also that the contexts with a renowned cultural identity and a wealthy and extended heritage are those that most hold out against innovation trends in communication means and the democratization of cultural offers, due to a sort of inertia that is rooted in a century-old role of "culture cradle" and in a consequent conservative to jealous approach to the held heritage [20], to which an elitist character is often ascribed.

Thus far, structural challenges are concerned, which are unlikely to be fully solved from within museum institutions. In correspondence with the limitations cited above, the specific challenges facing museums can rather be identified:

- greater interaction of offers with respect to contents

Overall, solutions for virtual visits are still marked by low interactivity; many virtual tours are still little more than plain 360° photos, and offer limited possibilities for the selection of content and visit paths; gaming applications are often little appropriate for home use due to technical requirements when one does not refer to mobile versions. More often, interactivity translates into textual communication on social web pages or in the use of platforms during events organized by museum managers, putting user and staff in contact. The main challenge lies in delivering solutions allowing users to interact with the cultural offer as a whole (objects, spaces, paths, staff, information material), for really engaging experiences; in this sense, making the most of UGC (User Generated Content) can greatly contribute to the definition of really enabling offers based on continuous improvement.

Some institutions have been adopted broadcasting technologies to support interaction between users and collections, which anyway does not offer visitors the perception of their co-presence or simultaneous activity and the possibility to interact.

- greater interactivity across users

In general, social interaction in museums and heritage sites can be said to improve learning also in the absence of specific intentions in this sense [21]; in critical circumstances such as the current one, experimenting collective cultural experiences becomes a response to the forced isolation of the relation with heritage, overthrowing the value of an autonomy of choice (objects, semantic associations, exploration modalities) suddenly turned from possibility into obligation. In this sense, autonomy and self-determination of the visit risk to lose their value in an experience that fails in relieving the ultimate problem of the pandemic (i.e., isolation) and potentially lead to give the relation with heritage up, in favor of more interactive and "social" activities. Social media, in this sense, will represent an essential and more usable component, against more complex and costly solutions. Awareness-supporting technologies, typical of collaborative systems can reveal very useful, both in space (co-located/distributed) and time synchronous/asynchronous) dimensions [7,22], but despite the significant progress in hardware/software components, the promotion of social interactions keeps on posing puzzling challenges.

-   new focuses (from object-centered to people-centered offers)

Even before the COVID diffusion, the need for a shift from objects to users has been gradually becoming a key point in debates and practical experimentations [23–29], due to the exigence to define more stimulating proposals, close to the needs of the "non-publics" to facilitate an increase in visit flows and in museums revenues. With the spreading of the Coronavirus, such opportunity has gained a specific urgency, due to the need to respond to the sense of loneliness and isolation perceived above all by young people, forced to remote learning and deprived of the social dimension of education. The feeling of uncertainty and unhearing of their sensations, downsized against a bigger and common danger, demands customizable solutions for approaching cultural resources.

-   need to recover the material and physical dimension in the relation with cultural objects and contents

The "virtualization" of cultural contents and experiences is not, in absolute, fit for everyone; on one hand, the need for adequate skills and means must be considered, to make the most of digital content. On the other hand, it can be observed how, for example for younger generations, the material and physical dimension is strictly functional to the effectiveness of the cognitive experience. In children's education in particular, for the development of manual creativity, but also for specific user categories (e.g., people with visual impairment), the relation with physical objects or their replicas is essential [30–32].

More generally, the innovation of languages must do not so much with ICTs as communication means but rather with their re-finalization for new missions, new objectives, and new contents and messages, in other words: with the new role of museum institutions in front of the crisis. Under these respects, then, the museum should try to recount itself again to communities, and in this task, storytelling technologies and techniques can prove very useful. The importance of cultural objects' narrative, which goes beyond the plain description and communicates their meaning and unique story, is a long-acquired concept in museum policies [33–35]. Supporting technologies must now measure themselves against new, different "tales" that do not leave visitors alone with their feelings but allow them to discover other visitors' emotions and confront with them. The possibility of storytelling can then range, moving from objects and widening their gaze to emotions felt, for example, also by museum staff and managers, asking them to abandon their institutional guise and share their cognitive experience and emotions in front of collections.

Moreover, also the possibility emerges to share the knowledge of the museum context, especially the part not accessible to the public during on-site visits for logistic or safety reasons (the so-called "behind the scenes"), e.g., restoration activities, conservation modalities, treatments and handling of artworks, or the organizational phase of exhibits.

Ultimately, storytelling technologies can allow to recounting not only of objects, but also of "the museum", with modalities the necessarily require that operators change also "their" own language to tell stories linked to objects that they see in a different guise, while

being seen themselves in a different role. This implies changing the languages through which the museum presents itself to the public that will need to be less authoritative and specialized, more connected to daily experiences and contexts, just because it enters people's homes.

Then, not only language, but also technical means will have to be more accessible, based on more affordable, open-source, and user-friendly solutions, also in relation to the ultimate goals of cultural communication. The latter will necessarily need to look less to tourists—culturally prepared and motivated—that focus on knowing what is "other than us", and more to local communities' re-appropriation, in order to establish an ongoing relation with people "close" to heritage.

An interesting area to develop that can be reasonably expected to spread in the medium-to-long term, appears to be the construction of hybrid contexts for cultural experiences, able to combine on-site controlled flows of visitors with remote experiences and support real time communication and information sharing [36,37]. Currently, applications in this sense are not very frequent. Indeed, just because the pandemic has put us in front of deep and unavoidable modifications in lifestyles, also changes in language and expression means cannot be considered a temporary occurrence, thus making the recovery of traditional modes and the traditional duality between physical and virtual visit a remote hypothesis for the future.

5. Challenges to Museums: ICT Languages and Beyond

From the above, it can be observed that the technologies that can support a recovery from the crisis are widely available; technological solutions that can guide museums to the post-COVID phase and to a full restart of activities are the same to which institutions were turning to enlarge the user-base short before the pandemic changed their perspectives. The first big challenge facing museums is anyway a deep change in the contents and in the ways to propose them; a challenge that many of them have already taken up, highlighting the fact that what must be considered to be "languages" is not only technical means (i.e., technologies) but also actions (i.e., concrete examples).

Widening the look from 'languages' represented by ICTS' expression means to other contextual elements, some reflections can be made. Before the COVID pandemic, visitors went to museums in a peaceful mood, well disposed to learning and entertainment; now, the role of a museum is also helping the public to metabolize and interpret the current crisis experience by integrating it in a healthy way in their everyday life and give a sense to it. For such reason, when talking about museum "languages", we can no more just focus attention only on technologies, i.e., technical means of expressions, but also on their contents: the mission influences the goals, and these in turn influence contents and languages.

In general, the negative effects of the COVID-19 pandemic and of safety measures (lockdown, social distancing, closures or suspension of many daily activities) on people's overall wellbeing is acknowledged, on an intuitive basis and due to the wide commonality of the problem. A field survey on the socio-economic effects of the pandemic in Thailand, Malaysia, UK, Italy and Slovenia [38] reports, although with differences across single countries, shared general concerns among people with different ages and status about social life (64%), physical health (59%) and mental wellbeing (58%). In his theorizing on the mechanisms underlying those processes, Schwinger [39] identifies as the pandemic's major upsetting and damaging factors, for mental wellbeing, its sharp annihilation of people's basic need for autonomy and connection. The virus spreading and the subsequent safety measures also tend to amplify pre-existing differences in terms of access to social resources, thus producing heterogeneity in impacts' extent [40].

Compared to the adults' one, young people's mental wellbeing is often disproportionately affected by catastrophes [41]; moreover, social isolation and loneliness intensify depression and anxiety among children and adolescents [42]. For its peculiarly vulnerable nature, adolescence has been extensively investigated with reference to the pandemic effects [40]. Indeed, adolescence is a very fragile life period, as it represents a crucial

transition from family to social life through the increase of "outdoor" experience and of time spent outside the family unit: through social life and relations, youngsters acquire autonomy and become aware of themselves as social—beside human—beings [43,44]. Gruber [45] identifies three channels through which the pandemic affects their mental health and wellbeing:

- stress through a sense of uncertainty;
- multi-systemic nature of impacts (destruction of connections in the family, community, state and economy spheres simultaneously) and the resulting sense of loneliness;
- annihilation of supportive interactions able to act as stabilizing factor for addressing the first two issues.

Many studies [39,46–52] carried out in different regions of the world (Australia, Italy, Germany, Norway, Canada) report the onset of depression symptoms, anxiety, dissatisfaction, somatic diseases, mental wellbeing decrease among adolescents. The 2020 Survey from the UK's National Statistic Office [53] on the social impacts of COVID-19 on national youth shows that people aged 16 to 29 expressed the highest concerns about the virus' impact on their social relations, compared to other age groups; respondents from the 16–19 age-group, in particular, reported sense of boredom (87%), loneliness (51%) and general negative feelings (42%). A large number (75%) of people aged 16–24 among those who were unable to engage in educational activities reported a strong negative concern about their future life plans for such reason, thus showing a clear perception of the link between education and future life opportunities among young generations. Half of them expressed a negative evaluation of the effects of home study on their wellbeing, one third reported consequences on family relations and 20% insufficient access to resources necessary for home study. Respondents aged 16 to 29 expressed a low level of life satisfaction compared to other age groups in the survey. They also mentioned the Internet as one of main support instrument to cope with lockdown measure effects.

Across Europe, two thirds of students interviewed by the European Youth Forum [54] declared to be unsatisfied with digital learning in qualitative and quantitative terms.

Other research also highlighted the existence of factors able to trigger response ability and innate resilience at different degrees among people, and particularly among younger generations. Indeed, one interesting outcome has emerged from a study on Hong Kong population [55], showing a direct and positive relation between a high level of understanding of the COVID-19 form the part of respondents and their ability to adopt distancing safety measures and/or generally adapt their behavior in response to the emergency. This seems to suggest us that the Internet, as main information channel particularly for young people, can play a further beneficial role, especially in view of museums' re-openings and the recovery of the related on-site activities, through the communication of knowledge of the pandemic and then by facilitating and stimulating positive behaviors that will become crucial for on-site visits. Another study on the Italian adolescents [56] revealed that despite the understanding of the pandemic gravity, youngsters showed a remarkable balance and outstanding ability to manage uncertainty by adapting to new routines and finding alternative ways to nourish their social and psychological needs. The work of Waters [57] proved that the more students were taught about the COVID-19 and how to face it, the more they proved able to adopt strategies and positively reacted to stress. Masten [58] highlights the importance of the sense of belonging as psychological resource, while Magson [45] emphasizes the direct negative relation between social connection and changes in mental health during the breakdown.

Actually, we should also consider that intensifying social contacts could prove insufficient for a beneficial effect on young people's wellbeing. Exactly for the fact that youngsters turn to the connection and communication tools they have at their disposal, it is crucial that those do not turn into additional stress sources by reducing to a fruitless and detrimental exchange of negative feelings among them. The use of social media to convey positive messages and contents able to engage young people by feeding and reconstructing their sense of belonging to a community, symbolized through cultural identity resources, is

then paramount. Moreover, based on the findings of the mentioned studies, the use of the Internet to transmit, along with those content, also specific information on the pandemic and ways to cope with it, can greatly contribute also to activate reaction abilities and resilience of young generations.

The close relationship between education and cultural function, or between school and heritage institutions, forces us to reflect on the immeasurable role that museums can lay in those processes. On the other hand, such role already appears somehow legitimated among communities. In an online survey of 2020, ICCROM asked people of all ages and occupation from all over the world how big a difference would the disappearance of cultural heritage collection, sites, institutions and communities, make in their lives [59]. Two thirds of the 2400 respondents ranked it a "huge" difference, while 90% ranked it "large" or more, motivating that with heritage being a source of wellbeing, identity and belonging, of knowledge and understanding of other people, the past and humanity's existence, but also a reference and an inspiration for the future, showing a perceived connection between heritage and the human nature.

One first consideration, after all that has been said, is, then, that museums do not need so much to find new languages to overcome the crisis; rather, they become language themselves, for example towards the educational sector: the cultural experience as 'language' in learning practices, and vice versa, didactic as a new language—one of the many possible ones—of the museum experience. The difference between what is 'content', what is 'language' and what is 'objective' (i.e., the 'what', 'how' and 'why') faints. In definitive, for museum systems, the innovation challenge has become, at the same time, much more complex compared to little more than one year ago (we might say that it has levelled up), but also much more approachable with the available technologies. Before the pandemic, the main challenge for museums was the acquisition of new differentiated publics and an innovation in the use of technologies [60–62], a challenge that without debating their role, aimed at a more mature and less spectacular use of technologies. Now the challenge for museums is to reinvent themselves and find new justifications for their existence and a redefinition of their mission. In this much more demanding task, there seems to be a wider space for already reliable technologies to come to their aid, since there is no new means to invent.

Already in 2015, UNESCO emphasized in the Paris Recommendation [63] the social—even more than cultural—function of museums; for such reason, it is evident that the role they are today called upon to, in supporting communities to cope with the crisis, shall be an active, concrete one and use an equally concrete language, made of wide-ranging actions. What they can do for the most fragile generations, i.e., young people are of utmost importance. Indeed, the pandemic has first deprived them of the social dimension of learning, then transferred them a strong sense of uncertainty and finally conveyed the feeling of returning to schools as a regression to 'assisted' learning models, after a pained development of some autonomy in study. Undoubtedly, the re-creation of the social dimension of young people's experience can and should be supported by museums that have the unquestioned advantage to be places with validated visit protocols and are appropriate to support the partial recovery of physical relation in the post-COVID phase. In this sense, the museum faces the two-fold challenge of being, at the same time, context and stimulus for socialization, a challenge that makes the co-design of museum learning experiences, involving museums and schools, more important than it was in the past. In particular, it can be expected that ICTs supporting semantic connections among resources located at different institutions and immersive solutions will play a strategic role. Museums will have to leverage their use to define their offer in a way that is 'open' to the stimuli coming from schools' needs, no more exploiting them for plain marketing reasons or to transmit academic, top-down visions of heritage, but with a participative approach.

It can also be observed that the pandemic is changing the playground of heritage communication more than its means of expression. Traditionally, the museum has always been the place where the "cultural content" was located and enclosed; now the pandemic

is 'imposing' virtual fruition; the "enabling" effect produced on users by remote fruition technologies, especially when customizable, is more than evident; but un-negligible impacts are induced also on the museum institution. Cultural consumption moves from the physical place of museums to the physical place of consumers, in a different scenario and in close contact with their personal "surroundings", made of other activities and the related spaces and times. This poses much wider demands on museums, for example to coin languages that are not just easier and more enabling, but also able to support semantic relationships with the users' everyday life and the other urban places where it unfolds. Before the pandemic, visitors entered museums leaving at home other commitments, interests, hurries and personal to-do lists, to enjoy the cultural experience in that confined space as if in a sealed-off compartment in respect to the rest of the day. Now, the museum enters their homes and must "compete" with all their daily activities the time for the virtual visit, which can be extremely variable, more or less repeated and/or frequent. This can have a two-fold reading. To a basic level, it can simply be interpreted as the "objects" or collections "entering" homes, without acknowledging the museum a specific identity; to a higher level, this leads us to consider with a more attentive look museums entering homes with their proposals, policies, offers and peculiar way to inform the relation between heritage and publics. This consideration has obvious and considerable effects in orientating the adoption of languages, whether technological or not, in the design of cultural offers in view of the competitiveness of single institutions.

In such dynamics, museums are not the only ones to benefit from taking part in the relation of users with the other places of their everyday lives and connect to urban places through visitors. Symmetrically, also cities, to be competitive, should integrate explicitly in their organizational system also the cultural system's elements. The need for a connection between museums and urban contexts, in other words, is inherent in both.

The emerging concept of "new economy", or "knowledge economy" [64], which is gradually informing our times, assigns an utmost value to cultural capital and experience. A framework allowing relying on a reference conceptual map to identify points of strengths and criticalities in urban cultural systems is still missing; indeed, a recent study by Díez-Pisonero et al. [65] aimed at the definition of a Synthetic Index of Cultural Components, but literature on the topic is very limited by now. However, if cities aim at maintaining highly competitive levels, they will have to devote specific attention, in planning activities, to their own cultural system and to the way it operates within the whole urban one. Where such "cultural system" does not exist, or is not adequately readable, the risk of being left out of a competitiveness area is—and it will increasingly be in the next years —more than real.

In this sense, the pandemic offers museums a "gateway" to reconnect to urban places through the everyday experience of online publics. Technologies that can support the dialogue with networked visitors will deserve, then, a special attention, to know more about them and the space that the cultural experience has in their lives, what time is dedicated to cultural experience and what other urban and cultural markers it can semantically connect to, or, on the contrary, compete with to gain users' available time within a typical day. It can be important to identify possible connections and new cultural services to offer in a "cultural system" logic, and can represent the opportunity to define new profiling and tracking modalities for preferences and fruition patterns, less susceptible of the "resistance to the system" [66] that is typical, for example, of wearable devices, but anyway shared and accepted. In this sense, a change in attitude among institutions, and their ability to consider other museums no more as "competitors" but as "colleagues" committed in a common endeavor, will be anyway decisive.

With reference to urban contexts, in general, the role of museums in cities as tourist attractors is well established, but less is known about their role in urban systems, which is also more important for modelling issues. Indeed, studies have been carried out on the spatial outreach of museums and cultural institutions with relevant social implications, also taking into consideration their role in urban development and regeneration [67–69]. Still, a

methodology and tools for a clear definition of the urban cultural system, of its components and of its relation to the whole urban system, are missing. This could usefully trigger reflections on the new role of museums in the urban scenario of heritage cities, in particular, on how digital technologies change urban context and on the transformation of museums from "containers" of cultural resources into open places, dynamically talking with the city (semantics in urban space use, movement patterns, transports, resource consumption). An approach to urban implications of users' daily life through a direct dialogue enabled through online visits can represent a first step towards the definition of the connections among cities' cultural components and, then, the integration of the cultural system into the urban one.

Such knowledge gap results consequently on the strict technological level, readable for example in the absence of heritage and cultural sites in the digital modelling of urban systems in the field of Digital Twins (i.e., dynamic digital representations of a real-world entity or system for simulation and predicting purposes, analyzed by [70]). A very demanding challenge will possibly consist, for example, in the match between the most appropriate technologies for sustainable heritage communication and fruition and those for urban system management, to identify overlap areas that can make museums an integral part of it, and best support a digital sub-model of museum system and its dynamics.

The IoT (Internet of Things) could greatly contribute to the concrete realization of the connection among local cultural resources and their transformation into a real 'system'. A change of approach is needed that allows an understanding of how the connection of possible experiences according to proximity or to semantic relation is, in fact, an effective way to establish a more intense and ongoing relation between heritage and communities. From this perspective, each visited site can inspire visitors to continue the exploration elsewhere and discover new resources. In this sense, the IoT can also operate a significant shift in the observation perspective of cultural experiences, no more perceived as single episodes but rather as moments within a wider "sentimental" connection between heritage and its publics.

There are, then, two important implications that may derive from the encounter of ICTs for the fruition of museum collections and the IoT for the networking of cultural resources. On one hand, a more stable and autonomous relation of the public with heritage; on the other hand, a greater completeness of tools for the modelling and management of urban contexts, doomed to become, in time, the primary playground of challenges related to the sustainability of development processes.

A further impact can affect the museum itself, meant as "cultural offer". Museums are already able to transform their collections from 'objects' into 'subjects' of communication, giving new life to cultural resources in users' perception. Thanks to the IoT, they have now the opportunity, themselves, to turn from plain "neutral" locations of resources into communication subjects with unique features. Thanks to the high connectivity of the IoT and to the possibility to make the semantic relations among resources more explicit, museum buildings lose their neutrality with respect to their hosted content. The displayed resources being equal, different museums—or the same museum in different occurrences —can emphasize different messages, facilitate different cognitive paths and realize different settings with the surrounding urban systems. Then, the use of technologies can significantly modify the overall meaning of the heritage that they enshrine, according to the target public and to local communities.

Ultimately, the technologies that can support museum institutions through the change are largely available and reliable. Museums must, on one hand, understand how to make them remunerative. On the other hand, they will also need to "re-think" them as communication languages, reorienting them towards deeply and suddenly changed social missions and to the reconnection to urban places, to pursuit a greater hybridity of fruition models, fit to support the relation with heritage in a context that has been irreversibly transformed by the pandemic.

6. Conclusions

The COVID pandemic has brought to light the extreme vulnerability of heritage; cultural resources are fragile, as they are exposed to material decay but above all because their relationship with communities has been thinning out. At the same time, they appear as silent, since, on one hand, they communicate much less with their audience, forced at home, and, on the other hand, they do not interact with the urban scenario. However, this does not mean that they have nothing to tell.

Museum institutions in particular, as mediators of the relationship between heritage and the public, absorb that fragility themselves, as their very existence depends on heritage subsistence. In their management, preservation and promotion activities they have, then, the task to listen to heritage as well as to its audiences, and identify the most appropriate languages and expression means to establish a lively and talking relation, by connecting values, needs, problems and potentials of both in creative ways.

ICTs have been making a variety of reliable and tested solutions available, for engaging and stimulating experiences in cultural resource communication and fruition, for education and entertainment purposes. In the occurrence of the COVID pandemic, the social role of museums needs however to be fully interpreted, by coupling those functions with the task of supporting and guiding communities through the crisis, addressing their sense of isolation and their need to understand and face the deep changes we all are experiencing. The pandemic demands that museum institutions work for the innovation, not only of languages, but also of messages to convey, in a context deeply and rapidly changed, where languages, contents and missions merge with each other. This implies, on one hand, reorienting technological means according to objectives, and, on the other hand, widening the playground of communication, up to now confined in the physical "place" of the museum, in a larger contest.

The movement of the relation with heritage towards people's homes, forced and accelerated by the pandemic, represents then an opportunity for a daily and pervasive dialogue with communities, and, through that, for reconnecting the museum presence to the urban context, its places and its dynamics. This means laying the foundation for the museum to evolve in cultural system, integrating in urban metabolism, and convert itself from physical space into a "service" through the definition of more articulated offers, thus achieving adequate competitive levels in the new economy models.

The main limitation of this study lies in the impossibility to cover the wealth of museum cases and experiences as well as the variegated nature of initiatives carried out across the world and, at the same time, their rapid development in respect to the temporary nature of exhibition events and to the quick feasibility in some contexts. This makes it very difficult to have a quite exhaustive picture of all possible declinations, compared to the static nature of writing. Indeed, the scene evolves and transforms continuously and with uneven pace across the world, between more skilled contexts and less developed ones, hindering the tracing of general or regional trends in respect to the leveraging of ICTs' potentials.

Future research directions in this field, from the strict point of view of ICTs as a language, could positively focus on the specific tasks of greater interaction of offers with respect to contents; greater interactivity across users; new focuses (from object-centered to people-centered offers); ways to recover the material and physical dimension in the relation with cultural objects and contents. At a higher level, investigation on the new role of museums in the urban scenario to facilitate the transformation of museums into open places, dynamically talking with the city, could prove beneficial. From a wider perspective, research efforts should also positively investigate the space available for ICTs to connect museum contexts into network schemes, to incorporate cultural resource systems in the general frame of urban systems, thus making it integrant part of urban communities' sustainable development process.

In the face of the COVID-19 crisis, museums are now required a new ability to "listen", no more just to "talk" to publics to deliver knowledge or ask for co-created contents; i.e., ability to listen to needs and answer to them. In this sense, the intent of the work was to throw a light on the huge extent to which available ICTs, against those new challenges facing museums, are enormously underused.

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