HOW TO BENEFIT FROM DIGITISATION

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INTRODUCTION

Digital networks of information have become an essential enabler in contemporary life, including all aspects of social, economic, and political activities. It is hard to imagine a day without the use of email, the Web, and increasingly the Internet of Things. Accordingly, digital access to cultural content for leisure or learning continues to grow, including the streaming of music, television, and film or the use of digital libraries for higher education. The presence of museums online, and their vast collections, appears to be limited by the low availability of content, estimated to amount to less than 10% in Europe[1] and in the USA[2].

The digitisation of collections has a long history, as has the informatisation of our society. The International Telecommunications Union (ITU) publishes yearly reports on the state of the Information Society, including country reports. In Croatia, there are more mobile subscriptions than inhabitants (106%) with access to the Internet (80%), while only a third of the population has a fixed phone. This is in strike contrast to 80 years ago when only 0.36% of the population had a telephone line connection (20 thousand individuals made 41.3 million calls in 1943).[3] Overall, 72.7% of the population has access to the Internet in 2018, compared to 6.6% in 2000.[4]

An Information Society is characteristic by the significant role of information creation, distribution, diffusion, use, integration, and manipulation in the economic, political and cultural activity of a country. Such information society relies heavily in a sound telecommunications infrastructure, which is often publicly financed because it is meant to be beneficial for the entire population. In Croatia, the Strategy for Broadband Development (2016-2020) is partially financed by the Ministry of the Sea, Transport and Infrastructure and regulated by the Croatian Regulatory Authority for Network Industries. The average annual budget of the broadband program is estimated at €31.5 million while the budget for the implementation of the strategy has been estimated to reach €770 million. Further financing is expected from the European Regional Development Fund and from the European Investment Bank in the form of loans. The strategy is meant to increase speed and coverage of broadband Internet access infrastructure, and to develop the infrastructure in areas lacking commercial interest for investment or where network development would not be profitable. Private operators are important investors, which respond to a growing mobile market, and who will have access to the publicly financed infrastructure.[5]

At European level, the Digital Agenda for Europe is meant to support the Europe

2020 strategy which intends to increase employment rate, increase investment in research and development (to reach 3% of GDP), reduce greenhouse gas emissions, reduce school dropout, and reduce the number of Europeans living in poverty. Its main tool to achieve this is the Digital Single Market strategy, which aims at enabling online access to products and services, improve conditions for the information network to thrive, and to stimulate growth of the European digital economy. Key to this information market is content. For this reason, the Digital Agenda for Europe addresses reforming European copyright law, geo-blocking, return of investment practices across borders, and the handling of sensitive data (including personal data). The recently approved European Commission's Council Directive 2019/1024 of 20 June 2019 on open data and the re-use of public sector information[6] supports the publication of museum collections in order to promote the use of open data and stimulate innovation in products and services.

Open data is defined as "data in an open format that can be freely used, re-used and shared by anyone for any purpose"[7]. Public sector institutions and public undertakings are called to make "documents available in any pre-existing format or language and, where possible and appropriate, by electronic means, in formats that are open, machine-readable, accessible, findable and re-usable, together with their metadata [at the best level of precision and granularity, in a format that ensures interoperability, as well as] dynamic data available for re-use immediately after collection, via suitable APIs and, where relevant, as a bulk download"[8].

The argument to support open data is to comply with the Charter of Fundamental Rights of the European Union that recognises access to information as a fundamental right. Access to digital information plays an important role in enabling every citizen to "gain new ways of accessing and acquiring knowledge" in the current data-based society.[9] However, digitisation requires significant investment and not every institution is able to finance accessibility from current funds. For this, the directive accepts that museums, libraries and archives, are able to "charge for the re-use of documents in order not to hinder their normal running" not to exceed "the cost of collection, production, reproduction, dissemination, preservation and rights clearance, together with a reasonable return on investment"[10]. Because of public-private collaborations, a certain period of exclusivity may be necessary in order to give the private partner the possibility to recoup its investment. This period should not exceed 10 years. Further, museums, libraries and archives, may issue a temporary license imposing conditions on the re-use of their content in order to deal "with issues such as liability, the protection of personal data, the proper use of documents, guaranteeing non-alteration and the acknowledgement of source".[11]

The current directive leaves institutions, and Member States, the discretionary decision of harmonising (or not) online publication of museum collections. There are currently no specific goals or performance indicators related to the accessibility of heritage content for the Digital Agenda for Europe and available data on accessibility is scarce.

Museums are unique institutions with an important social function, that of knowledge transfer across generations. The vast collections of material, immaterial, and natural heritage wonders are rich sources of inspiration to feed the information society. Digitisation of collections hence can be an important enabler to position museums as important contributors of diverse, complex, authentic, and organised information for the benefit of society. This paper will argue that benefits of digitisation can be found in the society at large, in museums taking part the information network, and in future generations, when three conditions are satisfied: first, digital technology is embraced as a tool to advance all objectives of the museum; second, digitisation of collections follows international standards to facilitate integration across systems; and third, accountability is improved to reflect the contribution of available museum collections in the information society.

The remaining of the paper is organised as follows. Section two will present the current state of digitisation in museums based on the latest European survey Enumerate. Section three will present a view of digital museums defined by the provision of access to the digital collections followed by section four which presents potential future scenarios based on some current innovations in the field of digitisation in museums. Section five will close with some questions and proposed conclusions.

STATE OF DIGITISATION OF MUSEUM COLLECTIONS

The digitisation of collections can be said to have started with the adoption of a digital work practice, mostly for the registration of collections, which has taken a new dimension with the broad use of the Internet. Museums serve to diversify and enrich the information society by providing access to their collections increasingly online. In 2008, the European Commission funded a first project to develop a coherent and comparable framework to monitor progress of digitisation in museums, libraries and archives. Some challenges were encountered, such as the lack of a centralised, standard registration system to identify institutions and objects. Libraries' collections may be identified with an ISBN number, which has been considered for museum collections. Further, measuring units resulted highly heterogeneous, where paintings and books were accounted in numbers, three-dimensional art and natural specimens in objects, film in hours, newspapers in issues, and archives in meters. Monument sites were not included in the survey. Museums in the 27 responding Member States reported 30% of their collections to have been digitised.[12] Less than half of participating museums had a budget specific for digitisation activities, representing less than 1% of their total budgets.[13]

A second survey was conducted in 2012 among the 27 Member States and 87% of museums reported being involved in the digitisation of 28% of collections (a slight lower percentage due to the changing pool of participants), with an expenditure of 1% of the total budget.[14] In 2014, museums reported 24% of their collections to have a digital image as part of the digitisation process, reflecting an improvement in the methodology, recognising digital cataloguing and digital

imaging as two distinct processes. Further, participating museums reported investing €45,300 of their internal budget in the annual creating/acquiring, maintaining, enhancing and preserving of the digital collection.[15] There is no indication on the percentage of the annual budget this represents, and so the amount is not comparable to the previous surveys.

From the latest European survey on the digitisation of heritage collections, 45% of museums reported having a written strategy for digitisation (yet 77% of museums reported being involved in digitisation activities). The strategy generally includes the digitisation of the analogue collection (90%) and the publication of the digital collections (77%). Some museums discussed long-term digital preservation (51%) and few the selection and acquisition of the materials (33%).[16]

Museums reported having a mixed collection including text (42% of museums), 2D objects (64%), archival records (35%), 3D man-made objects (45%), natural resources (17%), geography-based resources (20%), time-based resources (60%), and born digital interactive resources (46%). In general, 58% of the collections are catalogued digitally while 31% have a digital reproduction, of which 33% and 28% are available online respectively.[17] Figure 1 represents the state of digitisation and online accessibility of collections. It is important to note that the percentages are an indication of the share of available collections, yet actual number of objects remains obscure in national statistics.[18]

Further, the report suggests that institutions are reluctant of publishing their data because of copyright restrictions, yet results would suggest otherwise. Museums reported an estimated 37% of the metadata and 33% of images in the collections to be in public domain, 46% of metadata and 43% of images to be the owner of the copyright, while the copyright of 6% of
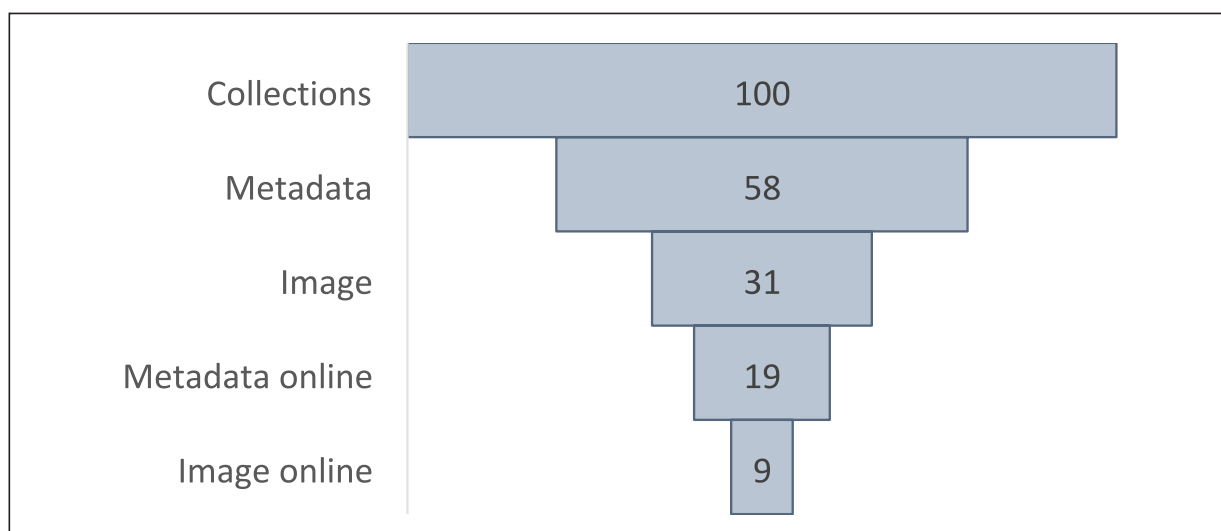

Figure 1. Museum collections digitisation and online availability in percentage (not weighted). Source: Gerhard Jan Nauta, Wietske van den Heuvel and Stephanie Teunisse, **Europeana DSI 2 – Access to Digital Resources of European Heritage: D4.4. Report on ENUMERATE Core Survey 4** *(The Hague: DEN Foundation, 2017).*

the metadata and 12% of images is held by a third party, and 10% of metadata and 13% of images are unclear regarding copyright status. That would mean that 83% of metadata and 76% of the images in the collection could be potentially made available by the museum. Figure 2 shows the copyright status of museum collections in percentage.

As the previous section confirms, the methodology to account for digital activities in museums continues to develop as museums adopt the digital technology and understanding of activities refines. Two things are clear: first, digital technologies have seeped into all activities of museums, and so accounting for a "digitisation budget" is practically impossible. IT related expenses, such as data storage and maintenance, hardware acquisition, and launch of a new website may be easily accounted but many other activities, such as researching the collections for digital documentation, remains a chal-

lenge. Second, accounting for a "percentage of digitised collections" to include basic registration and imaging may result superficial. Adopting a digital work practice requires institutions to develop networked dynamic systems that enable continuous enhancing and updating of collection's information. Having 100% of the collection digitized does not free museums from improving documentation, findability, interoperability, and further related services. Methodologically, accounting for an ever-changing system is not simple.

DIGITAL MUSEUMS

A *museum* would generally bring to mind a large building and an exhibition of a famous artist to the general public. However, those more familiar with museums know that museum organisations exist in many forms, house all sort of collections, and have multiple goals, one of which is exhibitions. Museums also collect, pre-
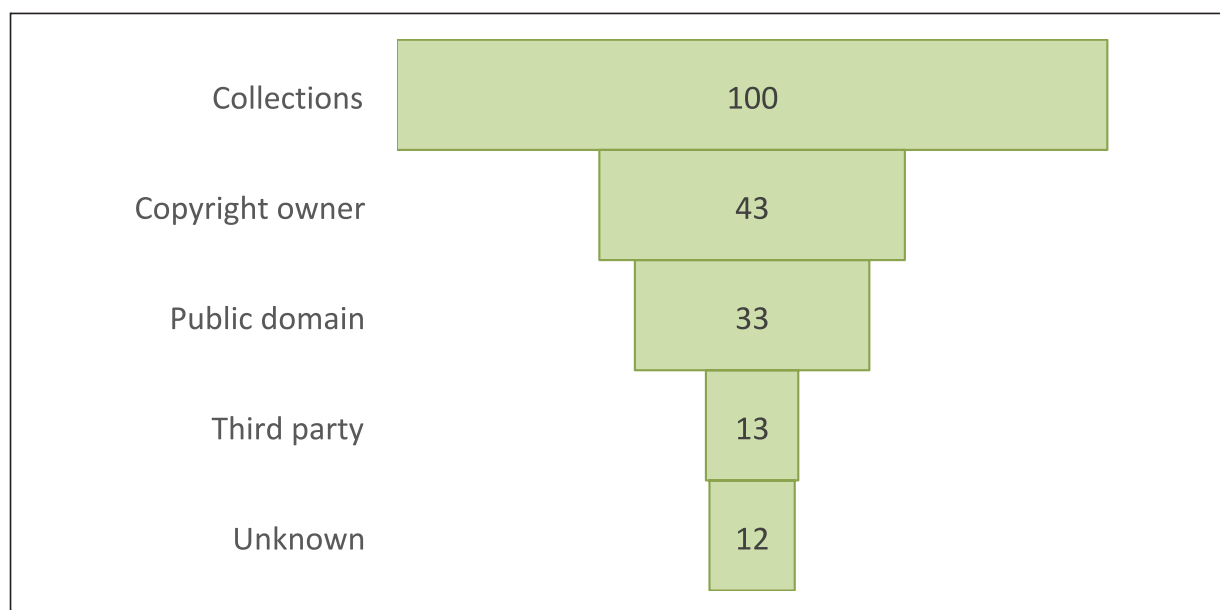

Figure 2. Copyright status on museum collections' images in percentage (not weighted). Source: Nauta, van den Heuvel and Teunisse, **Europeana DSI 2.**

serve, research, and communicate about the world at large. They may even have a shop. Socially, museums have an important role in informal education, and supply the information society with unique, diverse, and quality information like no other institution of the world.

A digital museum can only be imagined having such a great variety of looks. Though there is no harmonised definition of a digital museum, the international community has developed a working definition on the virtual museum to denote an entity that can "perform as the digital footprint of a physical museum, or can act independently […] in order to complement, enhance, or augment the museum experience through personalisation, interactivity and richness of content."[19]

Most museums can be found on the Internet, either through their own website or through a social media profile. Generally, publication online is envisioned as marketing and directed to attracting physical visitors. However, some museums provide access to their collections and their various activities.

The Yale Center for British Art, for example, presents the expected calendar of activities with current exhibitions, gives information about their building and general activities, including a comprehensive research and education sections, but also gives access to their publications, a guide to the galleries for download as document and as APP, the multimedia library (including lectures, behind the scenes, and interviews), and the museum shop (with links to their social media
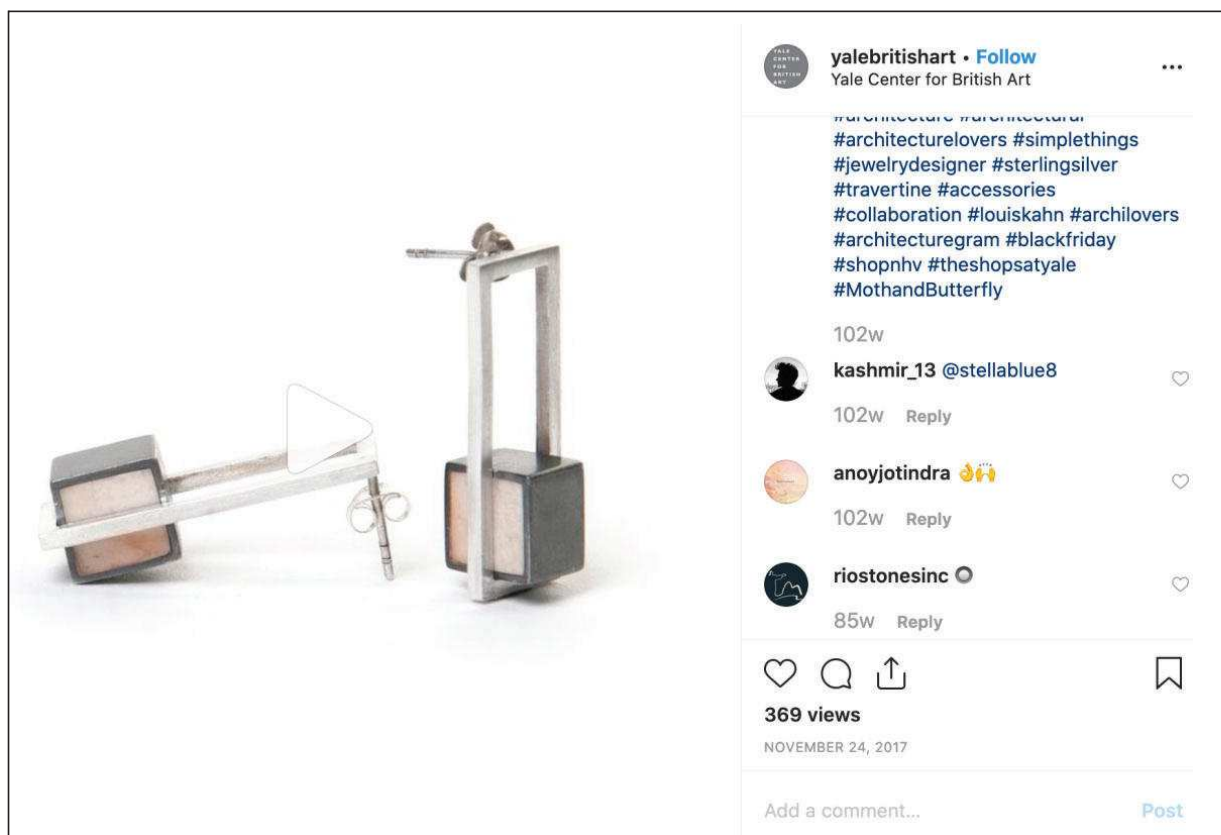

Figure 3. Post of an object for sale at the shop. Source: Yale Center for British Art Instagram account, posted November 24, 2017, https://www.instagram.com/p/Bb4epMnFVbj (accessed November 5, 2019).

accounts). Figure 3 depicts an Instagram image from an object for sale at the museum shop, which is accessible through the museum's website. Most impressively perhaps, the website gives full online access to the entire collection of paintings, sculptures, prints, drawings, rare books, manuscripts, and library books (the archive is saved for a future digitisation project).[20]

The Yale Center for British Art may be a unique digital museum example in that it is part of a higher education centre, Yale University, and it clearly holds scholarship and education as core activities. For this, their commitment to grant open access to the collections is paramount and visible.

For a general user, an Internet search engine would require a starting key term to perform a search. Searching for *museum* would lead to a list of institutions in the near geographical region, provided either by Google, TripAdvisor, or Wikipedia. Looking at each case in particular, they all point at interesting developments in the possible perception of what a digital museum may be. The Google Art Project, renamed Google Arts and Culture, was first launched in 2011 with a selection of 17 well known museums from across the world. The project provided giga pixel imagery of a selected piece, which at the time was a great innovation. Eventually, all Google products were made available and currently one can start from Google Earth, zooming into the desired city using Google Maps, to enter the museum walking virtually using Street View (in some sites at various levels, such as the Grand Palais in Paris, or via the canals, as in Venice). Images of artworks in Picasa can be complemented with documents from Google Scholar and videos from YouTube. In the Google Arts and Culture site, there are further exhibitions
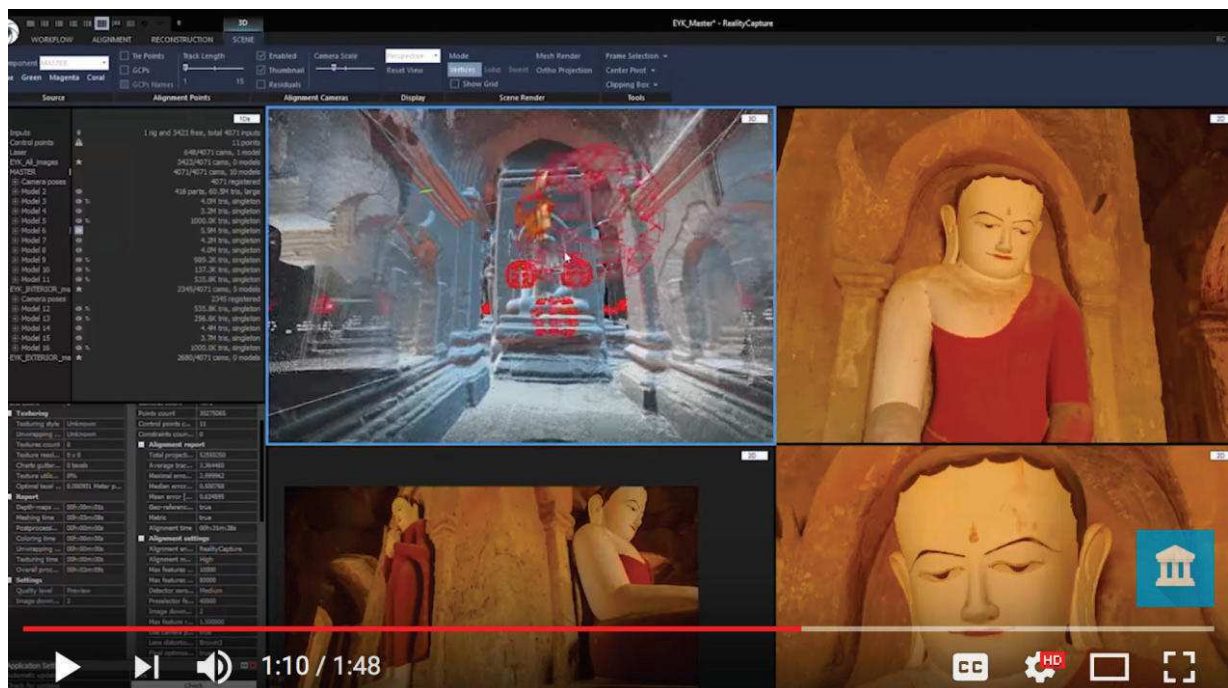

Figure 4. Still from "Digitally Preserving World Heritage with CyArk." Source: Google Arts & Culture YouTube channel, uploaded April 16, 2018, video, 01:48, https://youtu.be/ryaWVQM53gQ (accessed November 5, 2019).

available, stories, highlights, and one can create a personalised exhibit that can be shared online.

Eventually, the project grew to include many more museums, and several partners (which amount to over 1,500 museums). Besides museums, Google has partnered with CyArk in the Open Heritage project which creates VR reconstructions of heritage sites using 3D laser scanning and photogrammetry. The project has mapped 25 sites across the world and Google announced providing the open data through the Google Cloud Platform.[21] The project argues that data can help the preservation of sites for future generations in at risk locations due to environmental, natural, or human conflict disasters. Figure 4 depicts an impression from the promotional video.

Going to the second example, TripAdvisor is a social travel site that functions as digital word of mouth recommendation system (e-WOF) by allowing consumers to review restaurants, hotels, but also any other touristic attraction sites including museums. They rank prominently in Google search results, particularly with their list of "ten best". A recent study on the effect of positive or negative reviews of museums shows that TripAdvisor can indeed be used to inform a potential museum visitor, and can greatly influence perception of the museum for younger individuals or those with less experience of visiting museums, particularly regarding the lesser known museums or collections.[22] Online review platforms have increased their coverage to also include museums, as part of the myriad of Web 2.0 platforms.

One of the best known of such participatory platforms is Wikipedia, the Online Encyclopaedia launched in 2001 using the wiki software where content is created collaboratively. It remains one of the most popular online websites across the world for years, ranking among the top 10 in spite of being a charitable Foundation (receiving 41% of its revenue from users responding to online banners).[23] The use of museum collections to illustrate articles is particularly noticeable for historical figures, geographic locations, or endangered animals, in addition to the expected art related articles about the artist, painting, art movement or housing museum.[24] A study of the use of paintings in Wikipedia identified paintings used receive a significant amount of views as part of the encyclopaedic articles, particularly when compared to online views via the museum's website. Also, while the English Wikipedia is the largest used (with nearly 6 million articles and receiving over 100 billion monthly views),[25] other languages appear to be quickly growing when multimedia content is available.[26] An example of the use of paintings for non-art related articles can be found in Figure 5, where a painting by Laura Knight depicting Ruby Loftus screwing a Breech ring from 1943, housed at the Imperial War Museum in London, is used prominently in the online encyclopaedia. Still, from the nearly 400,000 paintings identified using WikiData, less than 3% are used to illustrate articles, pointing to the potential for further collaboration.[27]

In the museum field, government supported heritage portals may be a more natural partner to collaborate with, such as the Europeana portal launched in 2009. The portal gives access to over 57.7 million objects from over 3,000 institu-

Figure 5. Painting from the Imperial War Museum London illustrating a Wikipedia article. Source: "Occupational safety and health," Wikipedia, last modified December 3, 2019, https://en.wikipedia. org/wiki/Occupational_safety_and_health (accessed December 3, 2019).

tions in Europe mostly. Visitors to Europeana are a surprisingly large group of museum professionals (20.8%), teachers (7.9%), and academics (30.4%) searching for work, with cultural enthusiasts (27.5%) being mostly interest in genealogical resources.[28] Still, the number of users does not compare to the well-known examples described above. The portal also provides online exhibitions unifying collections from across institutions, where fashion is one of the most particularly popular topics.

Another form of digital museums, increasingly popular, are the physical exhibition halls projecting digital art images. One example is the Atelier des Lumières, project of the private firm Culturespaces, which has specialised in immersive temporary exhibits. The Culturespaces Foundation is driven by the mission of providing access to heritage content to the youth, particularly those in disadvantageous conditions due to poverty or sickness. Their Paris exhibit presented the work of Gustav Klimt using 140 laser video projectors covering a surface of 2,000 m2 accompanied by a classical music soundtrack, which received over 1.2 million visitors in 8 months. The Belvedere museum in Vienna, where the paintings are housed, has an open-content policy which are available for anybody to use so that Culturespaces did not have to contact the museum for a collaboration.[29]

Immersive art spaces are being explored by various private firms, some of which in collaboration with museum institutions, across the world. The apparent popularity has attracted a segment of the population often missed among the

regular museum visitors, such as those with lower educational attainment and economic means.[30] The potential to attract a wider audience, particularly those unable to travel across the world to visit the actual museums, is notable across all digital museum variants.

AN ENVISIONED FUTURE

Besides the work of museums publishing their collections online, with various degrees of collaboration with third parties, there are a few notable examples that point to potential new applications of digitisation in museums. One is the creation of robots that publish content online automatically. An active art enthusiast is Andrei Taraschuk (@andreitr), who has created a series of artists and collections profiles in social media (Tumblr, Facebook and Twitter) to publish art images, so far responsible for posting over 2.7 million artworks. His robots have learnt to identify each other and repost related content, creating a network of over 800 art robots with nearly 5.6 million followers.[31] Worth noting is that a significant number of images publish by his bots originate from the image repository of Wikimedia, which are properly identified in machine readable format.

Another example is the smart campaign to reuse content in the collection of the Rijksmuseum in Amsterdam. Their strong brand allows them to reach a wide audience for the bi-yearly Rijksstudio Award, which received 2,600 entries from 62 countries in 2017, 892 entries in 2015, and 820 entries in 2014. The first prize received €10,000, the second prize €2,500, and the third prize €1,000. In 2020, the first prize will receive €7,500,

the second prize €5,000, and the third prize €2,500 for two categories, including a Design Award and a Young Talent Award (for designers under 21 years old). Winning designs are incorporated into the museum shop collection.[32] This award allows the museum to have an idea of the reuse of the open collection and increase the visibility of its branding. Figure 6 shows a selection of entries.

The Rijksmuseum has further explored the use of artificial intelligence for the exploration of their collections, mostly surrounding Rembrandt. The Next Rembrandt[33] is a project that studies the portrait characteristics of Rembrandt to create an automated painting, in a sort of visual average, by an algorithm. The Rembrandt Tutorials used the self-portraits to estimate the voice of the painter, which supported by his letters and texts from the period result in the painting lessons available on YouTube.[34] Both projects are largely financed by the main sponsor of the museum, the ING bank.

Video games using museum content appear promising to enlarge the visibility of collections and to reach a younger, broader audience. One example can be found in *Father and Son* (http://www.fatherandsongame.com/), a game narrative by a son who never met his archaeologist father, based on the Naples National Archaeological Museum collection. The game was developed by TuoMuseum, an Italian firm collaboration made up of game designers, developers and artists, and launched in 2017. Other games include A Life in Music, story of two young musicians and Giuseppe Verdi, Beyond Our Lives, a touristic promotional video, and the Medici Game, a murder at Pitti Palace. All these projects are financed by

sub-national government bodies in collaboration with the museum institutions. A different type of video game can be found in Assassin's Creed, which has a team of over 200 people and a budget of over €20 mil (for Assassin's Creed II). The game series was first launched in 2007, and has become greatly popular because of its impressive visualisations of ancient Greece and ancient Egypt, Italy during the Renaissance, the French Revolution, and the Ming Dynasty among others. Its *Origins* series is set in ancient Egypt, with an additional update that adds 75 interactive tours without the combat. The Brotherhood episode presents da Vinci's engineering projects

and allows the player to immerse in a "time-travel yarn for the quantum era."[35] The implications of such availability of museum object images and general content has not been really monitored, measured, or widely discussed. Improved metrics of access to the collections online may give a better sense of the future potential of digitisation of museum collections.

CLOSING

Remote federated access across collections has been the dream of many,[36] and digital technology and the Internet appear to enable a great first step. As with all new technological changes, funda-
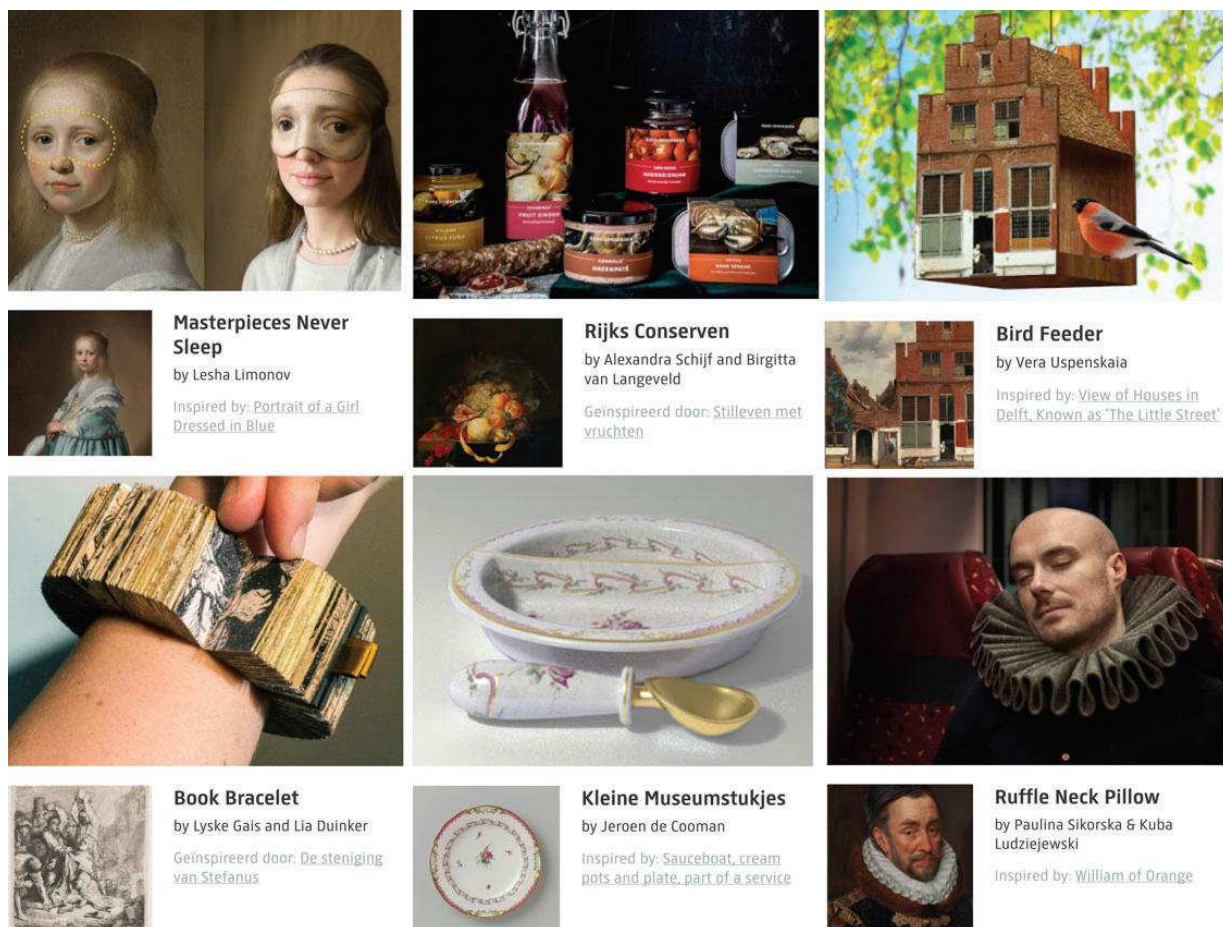

Figure 6. Rijksstudio Awards examples. Source: "Rijksstudio Award 2020: International design competition," Rijksstudio, Rijksmuseum, https://www.rijksmuseum.nl/nl/rijksstudioaward (accessed November 6, 2019).

mental shifts can be expected. One important question is the definition of the museum space online, which becomes increasingly difficult to define through the Internet's network of hyperlinks. Does it matter if collections are not associated with the museum?

Education is one important goal of museums, through intergenerational knowledge transfer, to communicate about the wonders of our world and our history. The size of the object or the museum housing it result of lesser importance when compared with the *why* of who we are. Digital technology hence appears to be a magnificent tool to broaden the reach of museums beyond the actual physical visitor to communicate the vast knowledge through what museums know to do well: storytelling. Each object can be positioned in an infinite of contexts to serve the desired curatorial perspective and communicate efficiently. Should museum content be made available in any form to broaden user base?

Museums are responsible for caring for the objects in their collections and can become protective of moral rights. The appropriation of content can be valued different depending on the context, as morals are strongly subjective of changing social norms. As society becomes more aware, and due to technological changes, new moral agreements will be made to best reflect the ideals of the time increasingly to reach universal agreement. As access to content becomes global, wo should then finance the digitisation of museum collections?

Public museums are financed by their geographical user base, through taxes, and by international users through ticket entrance. However, online, not all content is equally valued and museum collections are seldomly paid for (except for licensing agreements). As the case of Wikipedia illustrates, new financing models could develop to tap global donations. Alternatively, museums could develop their online shops to profit from the reuse of the digitised collections. 3D printed images on canvases, or any other object of the collection, can be issued with a certificate of authenticity (as the Rodin museum does with cast bronzes) on demand. This requires of course a sound information system to track the production process. What metrics would best reflect success and benefits of digitisation of museum collections?

Sales are an easy measure, and the Art Newspaper publishes yearly the most visited museums of the world based on ticket sales. This does not include the number of paintings viewed per individual, the repeat visitors, or the quality of the experience. The core of the museum activities may not have a sale transfer to reflect, for instance, research, education, or preservation of invaluable materials.

In this contribution, I have tried to argue that the greatest benefits of digitisation of museums are many and can reach across generations. However, digitisation cannot be conceived as a digital inventory or as digital imagery alone, nor a social media marketing campaign. Instead, the technology offers a tool to advance the multiple museum goals at the same time. The medium is, by nature, a networked, fluid, and collaborative process that benefits from integration beyond the museum and into existing larger networks. Ideally, new efforts and emerging players will embed policy and metrics from the start, in order to capture change. What is

the goal of the effort? How to measure its progress? Tracking the effects of the increasing availability of museum content require harmonised documentation for a period of time, with clear understanding of what is expected. The museum field is at the verge of a significant change, where its rich collections information may just become the most valuable source of future inspiration.

NOTES

[1] Gerhard Jan Nauta, Wietske van den Heuvel and Stephanie Teunisse, *Europeana DSI 2 – Access to Digital Resources of European Heritage: D4.4. Report on ENUMERATE Core Survey 4* (The Hague: DEN Foundation, 2017).

[2] Axiell, *Digitising Collections: Leveraging Volunteers and Crowdsourcing to Accelerate Digitisation*, report (Axiell, 2017), https://alm.axiell.com/wp-content/uploads/2017/04/DigitisingReport-1.pdf (accessed November 5, 2019).

[3] The choice of the year was selected because of ability to isolate the data from the Independent State of Croatia, as reported in: International Telecommunications Union, *Statistique generale de la Telephonie* (ITU: Berne, 1946), 10.

[4] International Telecommunications Union, *Measuring the Information Society Report. Volume 2. ICT Country Profiles* (ITU: Geneva, 2018), 45.

[5] See country information at: European Commission, "Digital Single Market Policy: Country information – Croatia," https://ec.europa.eu/digital-single-market/en/country-information-croatia (accessed September 27, 2019).

[6] European Parliament and Council of the European Union, "Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information," June 26, 2019, *Official Journal of the European Union* L 172/56 (2019), https://eur-lex.europa.eu/eli/dir/2019/1024/oj (accessed November 5, 2019).

[7] Ibid, p. 3.

[8] Ibid, p. 17.

[9] Ibid, p. 2.

[10] Ibid, p. 8.

[11] Ibid, p. 9. The Open data policy dossier is available at https://ec.europa.eu/digital-single-market/en/open-data, where the directive can be downloaded in several languages.

[12] Institute of Public Finance and Accountancy, *NUMERIC Study Report* (IPF: Croydon, 2009), 36.

[13] Ibid, p. 47.

[14] Natasha Stroeker and René Vogels, *Survey Report on Digitisation in European Cultural Heritage Institutions 2012* (Zoetermeer: Panteia, 2012).

[15] Natasha Stroeker and René Vogels, *Survey Report on Digitisation in European Cultural Heritage Institutions 2014* (Zoetermeer: Panteia, 2014), 36.

[16] Nauta, van den Heuvel and Teunisse, *Europeana DSI 2*.

[17] Ibid.

[18] Trilce Navarrete, "A history of digitisation: Dutch Museums" (PhD diss., University of Amsterdam, 2014), https://hdl.handle.net/11245/1.433221 (accessed November 5, 2019). After a 20-year intense inventory project in the Netherlands, an estimate has been made that museums house over 80 million objects, 90% of which are managed by 10% of museums. The estimate may change as many collections have yet to be accounted for at object level. Few countries are able, if any, to give an actual account of museum collections at object level.

[19] Wikipedia, s. v. "Virtual museum," https://en.wikipedia.org/wiki/Virtual_museum (accessed November 5, 2019).

[20] The Yale Center for British Art is fully searchable via https://britishart.yale.edu/collections/search. Filters include sorting by title, date, creator's genre, and relevance, with a long list of additional filters including subject terms, places, size, object type, frame quality, and credit line.

[21] The Open Heritage project website: https://artsandculture.google.com/project/cyark.

22 Hanna Pijpers, "Museums and Web 2.0. The role of online reviews in museum visiting decisions" (BA thesis, International Bachelor Arts and Culture Studies, Erasmus University Rotterdam, 2018).

23 In 2017, the Wikimedia Foundation received about €35.6 million from the desktop and mobile banners campaign. Wikimedia, "Fundraising/2017-18 Report," last modified October 16, 2019, https://meta.wikimedia.org/wiki/Fundraising/2017-18_Report (accessed November 5, 2019).

24 Elena Villaespesa and Trilce Navarrete, "Museum Collections on Wikipedia: Opening Up to Open Data Initiatives," *MW19: MW 2019*, published January 14, 2019, https://mw19.mwconf.org/paper/museum-collections-on-wikipedia-opening-up-to-open-data-initiatives/ (accessed November 5, 2019).

25 Data from: Wikimedia Statistics, "Monthly overview," https://stats.wikimedia.org/v2/#/en.wikipedia.org (accessed November 5, 2019). All Wikimedia Foundation statistics on page views, edits, and content are available at https://stats.wikimedia.org/.

26 Trilce Navarrete and Karol J. Borowiecki, "Changes in cultural consumption: ethnographic collections in Wikipedia," *Cultural Trends* 24, no. 4 (2016): 233–248, https://doi.org/10.1080/09548963.2016.1241342 (accessed November 5, 2019).

27 Wikidata was used to identified all the instances (P31) of Painting (Q3305213) using the Wikidata Query Service (https://query.wikidata.org).

28 Paul Clough et al., "Europeana: What Users Search for an Why," in *Research and Advanced Technology for Digital Libraries: 21st International Conference on Theory and Practice of Digital Libraries, TPDL 2017, Thessaloniki, Greece, September 18-21, 2017, Proceedings*, ed. Jaap Kamps et al. (Springer, Cham, 2017), 207–219, https://doi.org/10.1007/978-3-319-67008-9_17 (accessed November 5, 2019).

29 Anna Sansom, "Paris digital art venue Atelier des Lumières is a hit, and expanding abroad," *Art Newspaper*, February 22, 2019, https://www.theartnewspaper.com/news/paris-digital-art-venue-is-a-hit-and-expanding-abroad (accessed November 5, 2019). For comparison purposes, the adult ticket of the Atelier des Lumières in Paris cost €14.50 versus €16 at the Upper Belvedere museum.

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31 Milly Burroughs, "The Hacker Flooding the Internet with Art via Bots," *Another*, May 22, 2019, https://www.anothermag.com/art-photography/11726/the-man-using-bots-to-share-artworks-on-social-media-andrei-taraschuk (accessed November 6, 2019). Andrei Taraschuk explains briefly his motivation to create the collection of art robots: Ignite Boulder, "Andrei Taraschuk 'Enriching Social Media Through the Power of Art, Bots and AI' at Ignite Boulder 37," YouTube, uploaded December 20, 2018, video, 05:16, https://youtu.be/Z1p7p9vLCno (accessed November 6, 2019).

32 The Rijksstudio Award 2020 international design competition call for entries is available at: Rijksstudio, "Rijksstudio Award 2020: International design competition," Rijksmuseum, https://www.rijksmuseum.nl/nl/rijksstudioaward (accessed November 6, 2019).

33 ING, "The Next Rembrandt," https://www.nextrembrandt.com/ (accessed November 6, 2019).

34 The Rembrandt Tutorials Playlist is available at: ING Nederland, "The Rembrandt Tutorials," YouTube, uploaded February 28, 2019, video, 05:46, https://youtu.be/q93P8Y5Daso (accessed November 6, 2019).

35 Keith Stuart, "Assassin's Creed and the appropriation of history," *Guardian*, November 19, 2010, https://www.theguardian.com/technology/gamesblog/2010/nov/19/assassin-s-creeed-brotherhood-history (accessed November 6, 2019).

36 Paul Otlet envisioned a Mundaneum in the start of the 1900s, where any individual could access all the information housed in museums, libraries, and archives via a centralized bibliographic repository to include universal information (in all formats including paintings, documents, maps, and recordings). He wrote the Treaty of Documentation advocating for a harmonized clas-

sification system to assist access. For a general description see: Wikipedia, s. v. "Paul Otlet," last modified September 25, 2019, https://en.wikipedia.org/wiki/Paul_Otlet (accessed November 6, 2019).

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KOJA JE KORIST DIGITALIZACIJE

Ovim radom autorica tumači da se korist digitalizacije za društvo u cjelini kao i za muzeje koji su dio informacijske mreže postiže kada su ispunjena tri uvjeta: digitalna tehnologija primjenjuje se kao alat za unapređenje svih muzejskih djelatnosti, digitalizacija zbirki poštuje međunarodne standarde kako bi se omogućila interoperabilnost među različitim sustavima te društvena odgovornost muzeja raste doprinosom dostupnih zbirki informacijskom društvu. Rad pruža širok pregled digitalne preobrazbe europskog društva, prikazuje mjesto muzeja u tim procesima, ulogu telekomunikacijske infrastrukture u razvoju informacijskog društva, daje pregled najnovijih europskih direktiva povezanih s digitalizacijom, kao i pregled trenutačnog stanja digitalizacije u europskim muzejima prema posljednjim podatcima Enumerateova istraživanja. Uz opažanje mnogoznačnosti naziva digitalnog muzeja navode se zapaženi primjeri koji upućuju na potencijalne nove načine primjene i korištenja digitalizacijom u muzejima, od kreativnih rješenja za povećanje vidljivosti muzeja i upotrebe umjetne inteligencije do videoigara koje se koriste muzejskim sadržajima. Zaključno se u radu razmatraju izazovi koje donosi primjena novih tehnologija, poput sve težeg određivanja onoga što je to virtualni muzejski prostor u mreži internetskih poveznica, te pitanja treba li muzejski sadržaj učiniti dostupnim u bilo kojem obliku kako bi se proširilo korisničku bazu, kako financirati digitalizaciju ako je korištenje svjetsko, a trošak digitalizacije lokalan, te kojim pokazateljima mjeriti uspjeh digitalizacije. Premda su koristi digitalizacije mnogobrojne, ona se ne smije doživljavati samo kao digitalna inventarna knjiga ili niz digitalnih zapisa kojima se koristimo na društvenim mrežama, već kao alat kojim možemo istodobno unaprijediti cijeli niz segmenata rada u muzeju.