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Digital heritage tourism: innovations in museums

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ABSTRACT

Heritage tourism is one of the oldest forms of travel for leisure, and more recently an important resource for the tourism industry. Museums benefit from ticket sales but also from recognition. Digital technology has served as an important tool to innovate in all areas of the museum institution, repositioning firms within the heritage tourism market, leading to emerging forms of consumption. Museums may not be fully ready to accept the visit of a digital heritage tourist, yet acknowledging the value of the new consumer can free museums from the limits of their physical walls to explore new horizons in the digital information market space. We define the digital heritage tourist and argue that the large banks of objects and knowledge about our past held in museums are an extraordinary source of discovery, leisure and life-long learning for the emerging digital heritage tourist.

Turismo digital cultural

El turismo cultural es una de las formas mas antiguas de viajar con fines de ocio, que se ha convertido en una importante fuente de recursos para la industria del turismo. Los museos se benefician de la venta de boletos adiciones pero también del reconocimiento. La tecnología digital ha servido como una herramienta importante para innovar en todas las áreas del museo, quienes consiguen una nueva posición en el mercado de turismo, resultando en nuevas formas de consumo. Los museos pueden no estar completamente preparados para aceptar la visita del turista digital cultural, aunque el reconocer el valor del nuevo consumidor puede liberar a los museos de los límites impuestos por sus muros físicos para poder explorar nuevos horizontes en el mercado digital de información. Aquí definimos al turista digital cultural y argumentamos que las grandes colecciones de objetos y conocimiento sobre nuestro pasado contenido en museos son una fuente extraordinaria para el descubrimiento, para el ocio, y para el aprendizaje del nuevo turista digital cultural.

1. Introduction

The Rijksmuseum recently presented the recreated voice of Rembrandt, resulting from an international biometrics research project that used Rembrandt's self-portraits to estimate

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the physiognomy of the painter and deduce his voice, informed by a team of artificial intelligence scientists, linguists, and historians (Steenhuis, 2019). The application of results is already visible in a series of painting lessons available on YouTube, given *by* Rembrandt (www.ing.nl/rembrandt). A previous investigation involved *adding* all portrait paintings by Rembrandt, resulting in a computer-generated portrait that summarized Rembrandt's portraits (see https://www.nextrembrandt.com/). Both projects were financed by a prominent sponsor, ING Bank.

The use of the available state-of-the-art digital technologies to advance the understanding of a major painter from the Dutch Golden Age is not new. A decade ago, the Rijksmuseum made its collection available to semantic web experts to link and contextualize the objects using digital hermeneutics (Agora project) and to develop a recommendation system based on the collection thesauri (CHIP project) (Aroyo, Stash, Wang, Gorgels, & Rutledge, 2007; Van den Akker et al., 2011). Both projects were financed by a special programme to advance innovation by the Ministry of Culture. While results remained within the academic circles, the experience served to inform the development of the Rijks Studio, where users can curate the digital collection online (https://www.rijksmuseum.nl/en/rijksstudio). The Rijks Studio was financed by a second sponsor, the BankGiro Lotterij.

Curiously, both the YouTube painting lessons by Rembrandt and the Rijks Studio website exist independently of the physical exhibitions at the Rijksmuseum, reflecting an interest to serve online visitors as much as physical visitors. While the Rijksmuseum received over two million visitors in 2017, of which 63% were international visitors (Rijksmuseum, 2018), it excludes a significant part of the global population, estimated to reach eight billion in the next decade (UN, 2017). Welcoming online visitors emerges in part from the vision to be "The museum of The Netherlands for the world", drafted in 2013, where the collections serve as a converging point for multiple perspectives about the past and the present, and where digital environments facilitate meetings, conversations, and discovery beyond the museum walls (Rijksmuseum, 2018).

The web, particularly social media, represent a new communication channel where museums can reach a greater number of digital visitors. In the Netherlands, there are more museums with a Facebook account than with their own website (Wapenaar, 2017). Online communication has largely been adopted to replicate traditional media communication, advertising the products available onsite, and as a marketing tool to sell entrance tickets to an exhibition (Padilla-Meléndez & del Águila-Obra, 2013). The availability of information freely available online is expected to influence leisure activities (Han, Tom, & Jung, 2019), including visits to the museum, and to contribute to the destabilization of leisure activities in relation to place and time (López-Sintas & García-Álvarez, 2015). Digital technologies make it increasingly possible to *visit* the museum from anywhere, at any time.

Museums have been important leisure destinations and touristic attractions, largely because of their authentic holdings representing the past. The conception of authenticity and heritage are largely dependent on individual perceptions informed by cultural capital (Poria, Butler, & Airey, 2003; Timothy & Boyd, 2003). The digitization of activities in society contributes to the expansion of both concepts, authenticity and heritage, to include a digital variant. This article focusses on the remote access to museum collections by an emerging user, the digital heritage tourist.

We argue that the museum can take a digital form, ranging from clearly defined spaces at the museum website to accidental mentions in third-party portals, to serve a digital visit from a tourist seeking leisure activities online. Leisure activities have expanded to incorporate online texting, surfing, and socializing, within new defined places (Henderson, 2008), which may include a *digital museum*. Acknowledging the value of a digital visitor can be expected to unleash a series of further innovations in the museum organization, independently from the flow of onsite visitors, to further strengthen the position of heritage institutions in the expanding online market.

The remainder of this paper is organized as follows. This paper starts in Section 2, by proposing the definition of a digital heritage tourist. The argument will be substantiated in Sections 3 and 4 by a revision of literature, first on innovation in museums related to the collections, and second on tourism and leisure related to museums and digital activities. These two perspectives are brought together in Section 5 to present digital innovations in museums online directly responding to the digital heritage tourist. Section 6 proposes some conclusions.

2. The digital heritage tourist

Henderson (2008) has claimed that the scope of leisure activities has expanded in response to changes in social practices, use of time, and conceptualization of place where leisure activities can take place. Tourism is one important type of activity identified that often includes a visit to a museum. Falk and Dierking (2012) conceptualize the museum visit to include the idea of visiting the museum, the actual visit, and the future recollection of the visit as the entire museum experience. In this sense, the *time* of the museum visit expands to include a period before and after the actual visit. Similarly, the *place* of the visit incorporates finding information about the museum on the Internet as much as sharing images of the visit in social media beyond the museum building. Lastly, the *activity* of visiting a museum is encompassing of walking through the gallery halls as much as planning the visit, getting there, and remembering the event.

This expansive conceptualization can be contrasted to the limiting statistical tourist definition that requires an individual to travel beyond the space of residence and to overnight. Building upon the heritage tourist definition by Bonet (2013), we propose the conceptualization of a digital heritage tourist that exists independently of the physical location to explicit and voluntary come in contact with the museum's goods and services online, not necessarily involving direct payment. In this way, the tourist *visits* the museum remotely to enjoy the vast information services related to the collection, which can include viewing an online catalogue on the museum's website, watching videos on the museum's YouTube channel, or sharing images from the museum's Instagram profile. For some, access to specialized content may involve payment as would the purchase through the online shop.

Anticipating methodological challenges to quantify these digital tourists, limitations of time, place and activity may be proposed, in line with the defining characteristics of leisure (Henderson, 2008). For example, a digital tourist will not intent to visit or actually visit the actual physical museum within the year of visiting the museum online. This of course does not limit individuals from physically visiting other museums, so that they may be both physical and online tourists. The digital visit will only apply to those products and services

originating from the museum, which may involve collaborative ventures but not all services that make use of the museum content. In this way, an individual can be considered a digital tourist when consumption takes place within the museum website, social media profiles and joint collaborations including the portals such as Europena, Google Art Project, or Wikipedia. The independent use of collections information for new products which involve no cooperation with the museum institution represent a great challenge to the quantification of consumption with the current practice and technology. Regarding a limitation of activity, it would make sense to limit the tourist's interaction with the actual collection-related services of the museum, excluding information online on parking facilities or opening hours since these are associated to the physical museum visit.

This definition is proposed to fill the apparent gap in the literature, which associates a digital tourist with digital technology to enhance the physical tourist experience (Benyon, Quigley, O'Keefe, & Riva, 2013; Munar, Gyimóthy, & Cai, 2013), or with the use of digital technology and the Internet for marketing and business models (Baggio & del Chiappa, 2014). The current contribution draws attention to the role of museum content beyond the use of images to attract future physical tourists, and instead acknowledge the potential of the medium to reach greater audiences who will come in contact with the museum collections in new ways.

Some questions may be raised. Why should the museum allocate resources for an online service that is not linked to the physical collection, for a consumer seeking entertainment instead of learning, who is most probably not willing to pay? And what is the value of such consumer to the museum and the further society? The following sections will discuss the literature on innovation in museums and on tourism and leisure relevant to answer these questions in Section 5.

3. Innovation in museums

Digital technology has unleashed the repositioning of collections into what has been referred to as The New Renaissance (Niggermann, de Decker, & Lévy, 2011) because it allows the rediscovery of collections for new uses by new users (e.g. Villaespesa & Navarrete, 2019). While the application of digital technologies is much more advanced in other areas of the economy, a number of museums have been implementing digital applications to develop new products and services such as online exhibitions, new processes to research, display and manage collections, new organizational structures to accommodate an increasingly digital environment, reaching new markets, and tapping into existing resources to generate new capital.

Innovation of product, process, organization, markets, and resources, is enabled by the novel combination of existing knowledge, capabilities, skills, and resources. Each form of innovation represents a different challenge for the firm, and may lead to different social and economic impacts (Fagerberg, 2003). Product innovation, for instance, is generally expected to lead to greater income while process innovation may have an ambiguous effect (Edquist, Hommen, & McKelvey, 2001). As an example, we can compare an innovative website to generate greater online visitors and the implementation of a digitization strategy to reflect an innovative conceptualization of the museum's information capital.

Some innovations are marginal, referred to as incremental innovations, while others can be considered radical innovations (Schumpeter, 1942), involving the adoption of a

totally new technology or resulting from a series of smaller changes that eventually add up to major changes. Innovation is in fact a continuous process, supported often by complementary innovations (Fagerberg, 2003). This complementarity is evidenced in a study on the digitization of museums which showed a relation between the level of digitization and the presence of a digital strategy (Borowiecki & Navarrete, 2016).

Innovation requires resources. However, while larger organizations may have access to greater resources, a stronger inertia of work practice may slow down change, while smaller organizations may be more agile to change and have the greater absorptive capacity to capture and exploit external sources of knowledge to innovate (Cohen & Levinthal, 1990). For this, a smaller museum may innovate in the use of social media or in its website presentation with greater frequency than a larger museum, involved in the development of an innovative digital storage infrastructure, representing a larger investment which may take a decade to complete. It is not surprising that the first Dutch museum to publish a website (in 1994) and to join Twitter (in 2009) was a medium-size museum, the Teylers Museum, with enough resources and organizational flexibility to adopt an innovating technology, curiously also the oldest museum in the country dating from 1778 (Navarrete, 2014).

Innovations can be adopted at a different rate, which has been referred to as diffusion of an innovation (Rogers, 2003). Following Rogers (2003), the theory of the diffusion of an innovation can be applied to the digital registration of collections in Dutch museums. In the 1970s, a handful institutions adopted a computer for the registration of collections, representing the early adopters of the new system. This group is characterized by a strong drive to try new things and improve their current work practice. As the novelty of the digital work practice was communicated through conferences and publications (and word-of-mouth), the early majority followed in the period 1985 to 1995. Notable of this period is the financial support from the government as incentive for museums to adopt computers. The late majority of museums adopted the innovation by the 2000s, following the formation of a new "museum registrar" position further popularizing digital registration. This group adopted a digital registration work form as the Internet emerged to clearly disseminate collections information. The laggards, representing smaller institutions with limited resources, continue to adopt a digital work practice. The last group remains unsure on the benefits of online publication of collections information (DEN, 2009; Navarrete, 2014). The adoption of a digital information management systems in Dutch museums appears to be indeed dependent on communication systems, but also on financial incentives and the ability of the museum to change (Cohen & Levinthal, 1990).

The process to adopt an innovation is referred to as diffusion, which depends on (1) the innovation itself, (2) the channels through which the ideas are communicated, (3) over time, (4) within a social system (Rogers, 2003). Lack of knowledge, skills, available resources, and understanding of the benefits afforded by the new innovation, in combination with the laws and regulations affecting institutions, are some of the main challenges identified limiting firms to innovate (Fagerberg, 2016). In the case of museums, copyright has been criticized to limit the ability of museums to serve online users (Bertacchini & Morando, 2013).

In spite of limitations, museums have adopted digital technologies to innovate across the institution, involving all staff and activities, from human resources, the education

department, preservation efforts, tracking object mobility, and remote display of collections. Schumpeter (1942) argued that firms are driven to innovate in order to improve their place in the market, differentiating their products and services against competitors, while seeking to improve efficiency. Indeed, publication of collections has been noticed by consumers, as we argue, to stimulate the development of a digital heritage tourist.

4. Tourism

Positioning heritage as economic resource has led to a thriving heritage tourism industry becoming "one of the most powerful economic, social, cultural, ecological and political forces in the world today" (Timothy & Boyd, 2006, p. 1). The argument is that tourism generates revenue from ticket sales, special events, retailing, donations and interpretation fees as well as from public funds, grants, and sponsorship (Timothy & Boyd, 2006). The greater the number of visitors, the greater the economic externalities in the form of job creation, visitor travel, food and lodging expenses, regional development, and inner-city renewal (Duffy, 1992).

Tourism, as defined by the World Tourism Organization, is "a trip to a main destination outside of [a traveler's] usual environment, for less than a year, for any main purpose (business, leisure or other personal purpose) […]. Tourism is a subset of travel and visitors are a subset of travels" (UNWTO, 2008, p. 10). A tourist (or overnight visitor) is defined as a visitor (domestic, inbound or outbound) and "if his/her trip includes an overnight stay, or as a same-day visitor (or excursionist) otherwise" (UNWTO, 2010, p. 9).

Under this definition, a visitor becomes a tourist only when staying overnight. Bonet (2013) defines heritage tourism as "the explicit and voluntary contact that tourists have, away from their normal place of residence, with cultural heritage through the visit or consumption of heritage goods and services" (p. 388). That is, consumption includes visiting sites, such as museums, as well as related goods, for instance, in the museum shop. If consumption must be paid or can be unpaid is not specified, even though the out-of-pocket expense related to the economic externalities is what generally defines the "tourist" from the local consumer. Key point to construct our working definition of a digital heritage tourist is the "explicit and voluntary" choice to consume heritage products and services.

Heritage tourism is one of the oldest forms of travel for leisure. Museums are a particular leisure destination and tourist attraction, with the superstar museums at the top of the most-see list. Frey and Meier (2006) define the superstar museum by five distinguishing characteristics: (1) museums are a "must see" destination of tourists, which lead to (2) large number of visitors, who see (3) world-famous painters and paintings, generally housed in (4) a world-famous building, supported through (5) large budgets, often self-generated. The superstar status is visible also online as visitors of Paris will most likely post a selfie in front of the *Mona Lisa* on social media, or at least in front of the Louvre glass pyramids (Iqani & Schroeder, 2016). The Louvre was the most visited museum in 2017, as well as the most Instagrammed according to The Art Newspaper.

Heritage tourism generally encompassed the special and extraordinary objects and places, with royalty or elite associations generating greater attraction. The concept has been expanding to include ordinary expressions of the past driven by a desire to preserve a more diverse notion of identity (Timothy & Boyd, 2006). We believe this trend is expanding to include a digital variant, where consumption of digital heritage content

assumes the greater value to content where authenticity of origin is guaranteed (Timothy & Boyd, 2006), for instance, through a museum's YouTube channel. This is because the notion of leisure has expanded to include a digital variant (López-Sintas & García-Álvarez, 2015).

Online and onsite, museums are recognized centres of authentic heritage content with vast collections of unique objects. While some authors argue that authenticity is an important element for selecting destinations and activities (Domínguez-Quintero, González-Rodríguez, & Luis Roldán, 2019), others argue tourists seek entertaining, enjoyable, transformational, meaningful, memorable, and extraordinary experiences (Duerden et al., 2018), perhaps believing that replicas are sufficient for a good experience (Timothy & Boyd, 2003). In fact, authenticity is relative to time and place, more dependent of the cultural capital of the viewer than on the object or site (Timothy & Boyd, 2006).

Besides authenticity, museum visitors' utility is in direct relation to the level of recognition or familiarity with the objects (Capstick, 1985), where viewing the *Mona Lisa* may result in greater enjoyment of the Louvre experience than only viewing Veronese's *Wedding at Cana*, hanging on the opposite wall (Latour & Lowe, 2010). Understanding the objects leads further to greater utility, which has been associated with consumer's capital (Gazeboom, 1982). Supporting the understanding of collections through the availability of contextual information in museums has increasingly taken advantage of digital technologies, including digital guided tours through museums' Apps, touch-screens panels, wearable technology, or the more personalized indoor-location-aware projects enabled by Bluethooth technology (Han et al., 2019; Jaebker & Bowman, 2015). Such technological aids can improve the visitor's satisfaction (Antón, Camarero, & Garrido, 2018) but can also become an obstacle, rather than a facilitator, in the enjoyment of the experience (Di Pietro, Guglielmetti Mugion, Mattia, & Renzi, 2015, p. 76).

Museums attract visitors for different reasons. Only 20% to 30% of urban tourists in Europe choose heritage destinations for cultural motives; the majority visit those destinations because of a combination of reasons, including visiting relatives, going to conferences, doing business, having a break, or even to stay warm and dry during a rainy day (Bonet, 2013; Cuffe, 2017). Besides the individual motivations connected to a heritage visit, there are also the location attributes, including physical context, features, popularity and perceived quality. Combined, Di Pietro et al. (2015) arrived at learning, connecting with personal heritage, leisure pursuit, bequeathing for children, and emotional involvement as the main motives driving heritage tourism.

Greater visitor numbers are associated with greater prestige (O'Hagan, 1998a), as visitors are indeed an important source of income, often willing to pay regardless of price (O'Hagan 1998b; Prieto-Rodríguez & Fernández-Blanco, 2006). To put things in perspective, the Netherlands received 17.9 million international tourists while museums reported 10 million visits from international guests in 2017 (StatLine). Nearly half of the museums visited are located in and around Amsterdam (NMV, 2016). Table 1 shows the number of tourists, defined as individuals who overnight based on their country of residence, and the number of museum visits. Number of visitors, or repeated visits, are not reported, which seems particularly important to interpret the choice of leisure activities for national tourists.

From the 2016 report of the Dutch Museum Association, nearly a quarter (22.5%) of museums' revenues was generated from ticket sales, followed by the restaurant and shop (7%) (NMV, 2016). As governments stimulate private sources of revenue, it is

Table 1. National and international tourists and visits to museums in the Netherlands (in millions).

	2015	2016	2017
Total tourists	37.3	38.5	42.2
National tourists	22.3	23	24.3
International tourists	15	15.8	17.9
Total museum visits	31.4	33.4	33.2
National museum visits	22.9	23.6	23.2
International museum visits	8.5	9.8	10

Source: Composed from StatLine (https://opendata.cbs.nl). Tourists spent at least one night (CBS, Logiesaccommodaties, overnachtigen), Museum visits include paid and not paid visits (CBS, Musea bezoeken).

understandable that museums want to attract more visitors, of which tourists are an important market opportunity.

Payment for entering museums is a general world-wide practice though some sites request a symbolic fee, while others are free of charge and offer a voluntary donation scheme (Frey & Steiner, 2012). Free entrance is supported by an equity argument, though not without criticism. Frey and Steiner (2012) argue that free entrance cannot serve an equity argument because it actually benefits those who already have a higher socioeconomic capital, who remain the greater share of museum visitors even if visitor numbers grow. In the online world, museums hardly ever charge an access fee. Equity of access is one of the main arguments feeding the open data movement and the free online access to museum collections. It can be expected that as museums develop further online services to receive greater online visitors, additional sources of income may be welcomed to finance innovative activities. Museums can learn from other similar non-profit, educational, international ventures that offer free access to services such as Wikipedia. The Wikimedia Foundation, for example, received $26.9 and $13.5 million (about €23.7 and €11.9 million respectively) through desktop and mobile banners in 2017, representing 41% of all donations received (https://meta.wikimedia. org/wiki/Fundraising/2017-18_Report). A system of name recognition or similar schemes to stimulate donations to support online activities in museums is practically non-existent.

While museums have increasingly sought to accommodate tourists and consumers of the leisure market onsite (Foley & McPherson, 2000), the online leisure and tourists' market has yet to develop. In the following section we review the adoption of digital technology by museums relevant to the digital heritage tourist.

5. Museum collections online

Museums have started to populate the Internet since the 1990s. Since then, only a fraction of the collections have been made available on the Internet. While the public increasingly expects to find all images online, museums struggle to develop their digital collections due to a combination of reasons, including lack of resources and know-how, decisions on what and how to digitize, availability of technical infrastructure, and legal constraints. "Copyright considerations, contracts, or donor restrictions" are an inescapable administration costs that museums must face sooner or later (Wallace & Deazley, 2016, p. 1).

Licensing of images of museum collections has been made more efficient, yet more complicated, as images can be viewed on and downloaded from the Internet without

requiring institutional approval. Museums' online "terms of use" lacks standardization, as these respond to institutional goals and national legal frameworks, while users lack understanding of the contract, copyright, and private international law to properly use these "terms of use" (Wallace & Deazley, 2016). The Creative Commons (CC) license provide a relatively easy and straightforward series of options with various degrees of conditions for use. These range from identifying objects as being in the public domain (PD), allowing full use (CC0), to require attribution (BY), share-alike (SA), non-commercial (NC), and no-derivatives (ND) requirements (https://creativecommons.org/share-your-work/licensing-considerations/). The open data movement has been gaining attention since large institutions have made their collections available online (Halperin, 2019), of which a selection can be seen in Table 2, though several smaller institutions have also taken an active part in the process of open online publication of collections. According to the Open Knowledge Foundation, "Open means anyone can freely access, use, modify, and share for any purpose (subject, at most, to requirements that preserve provenance and openness)" (Open Definition 2.1, http://opendefinition.org/).

How are these online collections viewed? It is often the catalogue of the collection that is published online with various degrees of keywords, filters, navigation and search possibilities. However, providing online access to a collection's catalogue is not more interesting than providing a version of the phone book online. That is, a list of names, years, and titles with an image assumes the consumer knows what to look for, which is rarely the case (Stiller, 2012). Arguably, the prominence of quality information available free for reuse would lead to the creation of new products and services by third parties, not necessarily in collaboration with the originating museum institution. One example of this can be found in the Heritage version of the *Assassin's Creed Origins* video game which contains 75 interactive tours that display a series of museum pieces (MacDonald, 2018). A link is

Table 2. Museum collections available as open data (selection).

Museum	Year	Open data action	License
Amsterdam Museum[a]	2009	70,000 images published online	PD where possible
Statens Museum for Kunst in Copenhagen[b]	2011	160 highlights from the collection	CC0
Walters Art Museum in Baltimore[c]	2012	Released 18,000 images	CC BY SA
Rijksmuseum in Amsterdam[d]	2013	Published collection online	CC0
	2016	Launched a live API	
Los Angeles Museum of Art[e]	2013	Released 20,000 high-quality images	PD where possible
Smithsonian American Art Museum in Washington DC[f]	2014	Published information as Linked Open Data	CC0 (only metadata)
Metropolitan Museum of Art in New York[g]	2017	Published 375,000 images	CC0
Cleveland Museum of Art[h]	2017	Published 30,000 high quality, free and open digital images	CC0
		Published API	

Source: compilation of author.
[a]https://open-collections.okfn.org/items/show/1.
[b]https://medium.com/@MSanderhoff/your-imagination-is-the-only-limit-67cc98ebaab1
[c]https://openglam.org/2015/07/30/walter-art-museum-goes-cc0/.
[d]https://www.slideshare.net/saschel/quo-vadis-het-belang-van-een-digitale-strategie-voor-een-museum-123969845
[e]https://lucian.uchicago.edu/blogs/vrc/2013/03/21/new-lacma-collections-website-20000-images-to-download/.
[f]https://americanart.si.edu/about/lod.
[g]https://www.metmuseum.org/blogs/now-at-the-met/2018/open-access-at-the-met-year-one
[h]https://expo.cleveland.com/life-and-culture/g66l-2019/01/fe82a74cbf1054/cleveland-museum-of-art-launches-nextgeneration-open-access-to-artworks-and-data-online-.html

provided so that the consumer is able to navigate to the originating museum source. Another example is the specialized list of images depicting musical iconography which lacks proper referencing regarding the location of the original (often museum institutions) and instead identifies the instruments and musical actions depicted with great detail (https://www.earlymusicsources.com/Iconography-database).

Museums have also explored collaborations to develop new services in response to emerging forms of consumption afforded by digital technology and the Internet. One example is the 3D visualization of *Archaeological Reminiscence of Millet's "Angelus"*, a painting by Salvador Dali from 1935, based on Francois Millet's *The Angelus* from 1859 hanging at the Musée d'Orsay in Paris. In 2016, the Salvador Dali Museum in St. Petersburg Florida (U.S.A.) embarked in a collaboration with Walt Disney to create an exhibition about the two innovators and commissioned a virtual-reality environment of the painting. The makers took enough artistic liberties to imagine the back of the figures and endless landscape, inspired by other works by Dali. The 3D product is available at the museum as well as a five-minute version online (http://www.dreamsofdali.net/). The museum dropped the $2.99 charge to download the 360-degree experience application when it proved unpopular and instead focused on expanding its online fans: the museum reported international visitors represent 50% of its social media followers, compared to 15–20% of physical visitors (Elliott, 2014).

Relating the digital and the physical museum is not always necessary. There are a number of projects that exist independently from the museum exhibitions. Some collections are available for browsing within the institutional website, such as the Rijks Studio, or are accessible through third-party portals, such as Wikimedia Commons, Google Art Project, Github, or social media. Digital consumption of museum collections was initially fed by Google (Sood, 2016), allowing the visitor to enter the museum via Google Earth, to walk through the galleries using street view, and to jump into a painting with mega pixel zoom technology (https://artsandculture.google.com/). The extent to which people follow such path has not been documented but has been taken a step further by Weng, Curless, and Kemerlmacher-Shlizerman (2018) who developed an application to make a 3D form from a 2D image, in collaboration with Google. The result is the animation of figures within paintings.

The way collections are made available in each site depend on the nature of the medium, so that YouTube allows for interviews with artists and curators, giving a behind-the-scenes view to the museum, as well as guided tours, and other video content. Use of social media highly reflects the identity of the institution, dependent on individual staff feeding the account (Vorasutharosoth, 2018). Some museums choose to give little access to the collections online, restraining their presence to the marketing of current exhibits.

One curious collaboration can be highlighted between the Solomon R. Guggenheim Foundation and Google, the "YouTube Play, a Biennial of Creative Video", an online participatory project launched to celebrate the museum's YouTube five-year anniversary. The museum launched an international contest to "unearth and showcase the very best creative video from around the world" (Dobrzynski, 2010), and received 23,358 submissions from 91 countries. Curators preselected 125 after which a jury selected the top 25 videos, made in the last two years and not exceeding ten minutes, to be displayed on the façade of the building during the opening, live broadcasted on YouTube. The 100 short-listed videos

were on display inside the Guggenheim in New York, Bilbao, Berlin, and Venice the four consecutive days (Semel & Merlino, 2010; Smith, 2010). A blog was launched to showcase experts, scholars, and artists discussing the topic of video art.[1] The relation between the project online and the physical museum, in any of its branches, remains unclear (Grincheva, 2018).

Availability of collections online allows consumers to experience *a museum visit* in greater numbers, including those not able to physically visit during the physical event, and with greater personalization of the service. A recent study on digital home leisure found consumer behaviour changing as books, movies, music, and heritage content can be easily available for free online (López-Sintas, Rojas de Francisco, & García-Álvarez, 2017). Respondents noted the ease of browsing content online, moving through hyperlinks, with the freedom of individual choice. In contrast, watching television or visiting places requires a certain amount of negotiation. Online consumers can be expected to experience a similar perception of freedom to see as many paintings or exhibits as desired, to avoid unpleasant satiation often associated to a physical visit (Antón et al., 2018). In the next section, we discuss the implications of museums adopting the Internet.

It is clear that the adoption of digital technology by museums to manage the collection information (an incremental process innovation) led to museums repositioning their services in the market through online publication of digital content (an incremental service innovation). Resource allocation for digitization is hence primordially for the support of internal purposes as much as research and education. This practice has been slowly diffusing but can be expected to accelerate as major institutions embrace open access policies and the online visitor is recognized as a valued consumer. Perhaps inadvertently, museums contributed to the creation of a new consumer, a digital heritage tourist. The consideration of an online remote service for individuals seeking leisure activities online can only gain value as museums understand their role as key providers of monopolistic quality information within a global information economy (a radical innovation).

While tourists are valued for their economic contribution, digital heritage tourists remain neglected mostly due to their apparent lack of value generation. However, taking a welfare perspective, most museums are driven by missions with education and access to knowledge provision at their core (Frey & Meier, 2006). It is nonsensical to want to exclude a digital consumer. Museums that provide free physical entrance have developed alternative financing models, while regular online crowdfunding projects beyond the museum sector have proven successful. Online, museums can easily reach millions without fearing congestion (Villaespesa & Navarrete, 2019). It appears that the social welfare of quality authentic heritage content provision on the Internet reaching millions outweighs any counter-argument. This paper argues that the understanding of consumption by digital heritage tourists can provide the needed evidence to understand the reach of museum services online.

6. Conclusions

Museums have been traditional touristic destinations to learn about the past and to have a good time. The adoption of digital technologies for the improvement of all museum activities has led to unexpected results, including, as we have argued, the rise of a digital heritage tourist. Digital technologies enable the presence of museums in innovative ways for

consumers not physically present, yet potentially willing to support the institution. Business models to support online museum activities are expected to emerge as museums mature in their conception of a presence online. Voluntary payments have a long tradition in the physical museum, for instance, and allow museums to capture income based on willingness and ability to pay (Frey & Steiner, 2012).

Innovating in product and process using digital technologies has led museums to tap into old resources to make new ones, reaching new markets, but requiring a new organization form, one that recognizes the value of the digital heritage tourist. Other firms have recognized the market value of collections online, such as the Google Art Project or the recently launched Preservation Robot.[2]

Authenticity of a digital presence has been achieved by museums developing a strong brand online, as well as by museums enabling access and reuse of quality images online. The consumption of digital images, and other museum content online, has yet to be properly accounted for but already point to new consumption practices, for instance enabled by the infinite scroll technology. As Timothy and Boyd (2003) agued, heritage and authenticity are defined socially and depend on an individual's cultural capital.

Museums will benefit from supporting innovations in line with the emerging circular sustainable economy, increasing services and intangibles in the economy, where sharing and renting substitute ownership, all supported by ICT (Perez, 2016). The large banks of objects and knowledge about our past held in museums are an extraordinary source of discovery, leisure and life-long learning for the emerging digital heritage tourist.

Future lines of research may include the extent to which digital heritage tourism can contribute to social progress and greater wellbeing, as well as investigating the visitor's conceptualization of the museum space online. Giving the large investment by museums to develop online services for the emerging digital heritage tourist, a future welcomed line of research will shed light on the individual and social meaning of having unrestricted, sustainable and reliable access to heritage collections across the globe.

Notes

1. https://www.guggenheim.org/youtube-play.
2. The Preservation Robot is designed to disseminate images of traditional heritage communities to support the preservation of diversity through the Internet. It was launched in 2019 (https://jwt-amsterdam.pr.co/171758-a-robot-to-defend-cultural-diversity).

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