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Visuality peaks, function lasts: an empirical investigation into the performance of iconic architecture on Instagram

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Abstract

Purpose – The purpose of this paper is twofold: first, to propose a methodology to empirically investigate the longitudinal development of social media content concerning buildings characterized by iconic architecture and second, to report on the application of this methodology.

Design/methodology/approach – We collected and analyzed empirical data of social media content shared via Instagram between 2011 and 2019 on 16 buildings that can be considered iconic architecture projects. Using an automated pipeline, we collected and processed 264,000 posts and 140,000 images from Instagram for the selected case studies. By studying the posting activity of Instagram users through time series analysis and conducting content analysis of the social media posts by means of both image classification and topic modeling, we report on the development of users' capturing and reception of the selected case studies on Instagram over time.

Findings – First, we identify two distinct time patterns of social media content: instantly popular buildings whose popularity fades over time and buildings that gradually gain popularity over time. Second, we distinguish differences in the content of social media posts: some buildings are primarily covered for their architectural features and others for their cultural function and facilities.

Originality/value – Using empirical investigation of Instagram data on iconic architectural projects, we have identified a correlation: buildings primarily posted for their architecture are generally also the ones to gain

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instant online popularity that subsequently faded over time. In contrast, buildings primarily posted for their function and facilities slowly gained popularity on the social media platform over time.

Keywords Iconic architecture, Star architecture, Social media, Instagram, Image classification, Topic modeling
Paper type Research paper

1. Introduction

The rise of photography, film and television as modern mass media throughout the 20th century played pivotal roles in what art historian Mitchell (1995) called the "pictorial turn" (Mitchell, 1995, 11), that is, the departure from the dominance of written or linguistic modes of communication towards a heightened emphasis on the visual. A "pictorial turn" can also be identified in architecture. In her book *Privacy and Publicity*, Beatriz Colomina (1994) notes that the emergence of photography at the beginning of the 20th century shifted the production of architecture from the physical building site to immaterial media sites such as magazines and journals. In the article "A Note on Photography and Its Influence on Architecture," Frampton (1986) more specifically suggested that photography has reduced the perception of architecture, "to the status of passing images seen from a car traveling at sixty miles per hour" (Frampton, 1986, 40), and that architectural magazines at the time "compete with each other by publishing not only the same buildings in the same visually cursory way, but even the same photographic images" (Frampton, 1986, 41).

Did such practices mark the start of architectural iconization processes through modern media, in the sense that buildings' increasing visual representations would stimulate their recognizability and popularity among audiences? In an article that further traces the historical practices and performance of architecture through mass media, Thomas Elsaesser (2018) describes a growing reversal between the object and image of architecture, positing that increasingly "buildings are conceived with the image they want to produce of themselves already in mind. They are thus as much built to be seen with the photographer's eye as they are built to be used or inhabited, since the manipulations of scale and size entered into their construction at the drawing stage" (Elsaesser, 2018, 95). While this statement alludes to a growing professional dynamic between architects and photographers throughout history, it also raises questions about how certain tendencies of media representation underlying the conception of architectural projects are potentially further exacerbated in contemporary contexts, where the ubiquity of image-taking and sharing has come to dominate media landscapes.

Other authors such as Kester Rattenbury (2002) have further posited the idea that the ways in which architecture is being conceived have increasingly become linked to how architecture is represented. A substantial body of literature in the last two decades (see among others Plaza (2006), Gravari-Barbas and Renard-Delautre (2015), Nastasi and Ponzini (2018)) has in particular linked the phenomena of star architecture and iconic architecture to the emergence and development of digital communication technologies and the new possibilities afforded by handheld phones and social media in the 21st century. In doing so, these scholars have been building on the insight that media representations and renderings of architectural projects have historically played an important role in the cultural ideology of iconic architecture (Sklair, 2006). There is no "minimizing the centrality of the image in the production and iteration of iconicity" (Sklair, 2017, 17). In this respect, Beatriz Plaza and Silke Haarich have for instance argued that the success of the so often highlighted Guggenheim Museum Bilbao in attracting media attention could mostly be attributed to the coinciding of the building's opening in 1997 with the establishment of public access to the World Wide Web in the same decade, providing "social media channels and digital branding [that] opened up the processes of image accumulation" (Plaza and Haarich, 2015, 1472), i.e. the capacity to circulate images of the building more widely and quickly online. Simone Brott (2019, 10) in her book *Digital Monuments: The Dreams and Abuses of Iconic Architecture*, argues that this

"radical, digital paradigm of the architectural image since the end of the 1990s" has played a central role in geopolitics and the "worlding" of cities.

However, it has often remained unclear how circulations of images and content on social media actually unfold (Gries, 2013; van Noord, 2022) and whether, and if so, how iconic architecture specifically influences such processes. This paper is therefore concerned with investigating the dissemination of social media content of buildings that feature iconic architecture, and architecture's potential role in establishing iconic status for these buildings. We introduce an empirical methodology to analyze the development of social media content and apply this to capture and analyze content posted by users on Instagram between 2011 and 2019 regarding 16 selected case studies. The findings of this study reveal two distinct patterns in the evolution of social media posts over time and related to their content distribution. Additionally, a correlation emerges, signaling how buildings emphasized for their iconic architecture generally experience instant online popularity that fades over time, while those buildings that are rather captured and emphasized for their cultural functions slowly gain popularity.

2. Instagram, architecture and iconicity

Digital media have not only further fostered the centrality and dominance of images and the visual in contemporary life but have also helped shift the focus from capturing and documenting reality to its instantaneous sharing (van Dijck, 2008; Jurgenson, 2019). Analyzing the socio-visual interactions of a self-organized group of Flickr users Cristina Garduño Freeman (2010, 353) shows how "photosharing is a public visual discourse". In addition, photographs that are being shared on social media, and that for instance have a specific building as their focus, may cumulatively generate a certain online omnipresence for the object they depict. While diverging from strict visual reproduction (Serafinelli, 2018), as was for instance the case with architectural magazine practices, a corpus of social media images likely helps intensify a building's "simultaneous reception by large numbers of people" (Benjamin, 2008 [1936], 27), a characteristic that Walter Benjamin ascribed as inherent to architecture. In this regard, the posting and sharing of images through digital means potentially marks an unprecedented new influence on architecture in gaining online traction and garnering substantial public attention. Indeed, specific demands for and growth of so-called "instagrammability" in architecture have been recognized in recent professional and academic debates (Fiocco and Pistone, 2020; Akyol and Yurttaş, 2023).

The social media platform Instagram was launched in 2010, first enabling the instantaneous sharing of picture-only posts, particularly solidifying its appeal among relatively young users, and then in 2015 also text. Over time, Instagram has become increasingly popular for sharing images of architecture as well. Being primarily a platform to share visual content, Instagram has arguably not only transformed the way architects, users and stakeholders document and appreciate architecture, but also how the public at large interacts with the built environment. Instagram embodies a "new cultural logic of the networked image" (MacDowall and Budge, 2022, 1). As Instagram experienced a broader demographic as well as corporate uptake over the past few decades, it has also become an essential platform for teasing and showcasing architectural projects, even with the additional potential of turning popular buildings into tourist destinations (Iglesias-Sánchez *et al.*, 2020; Purwani *et al.*, 2022). Acknowledging that social media should be considered not only as a communication tool, but also as an active component in a destination's image (Iglesias-Sánchez *et al.*, 2020), scholars of tourism studies (e.g. Paül i Agustí (2021), Egger *et al.* (2022), Marine-Roig and Ferrer-Rosell (2018)) and architecture (e.g. Sawyer and Lindsay, 2022) have investigated "mediatized tourism" (Månsson, 2011), and how the search for imitating of images seen elsewhere supports the "circle of representations" (Jenkins, 2003, 307). To further understand Instagram's role in architectural discourse and practice, research needs to

empirically capture and quantify Instagram's specific impact by analyzing the number of platform users engaging with particular types of content that can potentially be linked to the so-called "instagrammability" of architecture. Previous studies have already shown that image aesthetics can for instance predict the numbers of social media likes, making visual appeal one crucial success factor in the potential online popularity of architectural projects (Thömmes and Hübner, 2018, 2022).

In our empirical investigation of the performance of iconic architecture on Instagram, understanding and defining iconicity becomes a crucial starting point. As such, we differentiate between iconic buildings and iconic architecture in this article. We define iconic buildings as built artefacts that have acquired iconic status. In other words, iconic buildings are buildings that are recognized as icons of something, for example of the institutions they house, or the cities they are located in (Ethington and Schwartz, 2006). Iconicity in this sense is not reduced to architecture, but rather extends beyond it. Indeed, buildings that are not architecturally iconic can still be or become icons, owing, for example, to historical events, institutional context, or their strategic location in a city. On the other hand, we understand iconic architecture as architecture that can be defined by one or both of the following tropes. The first trope is that of spectacularity, emphasizing the visual impact and uniqueness of architecture. Iconic architecture is distinguished by striking and captivating appearances, which set it apart from its surroundings. Unique design elements and architectural features contribute to the spectacularity of iconic architecture, turning a building into an eye-catching landmark that commands attention. The second trope is that of symbolism. This trope suggests that iconic architecture often carries symbolic meaning beyond its physical properties. Charles Jencks (2006, 4) coined the term "enigmatic signifiers" to denote how distinct architectural features allow for multiple interpretations. They can represent ideas, values or cultural significance. Iconic architecture can make a building become a symbol of something more encompassing or profound. Visual reductions and nicknames created for buildings through time are particularly indicative of such processes (Uluğ, 2022). In this respect, architectural iconicity is not merely related to aesthetics, but also to the meaning(s) this conveys. This semiotically charged connection highlights how iconic architecture can enable buildings to serve as symbols of cities or other, broader concepts (Uluğ, 2022; Ethington and Schwartz, 2006). Both tropes of spectacularity and symbolism also relate to tendencies of emphasizing the value of architecture's visuality. As pointed out before, such trends have been accentuated with the rise of digital communication media to the point that the digital image not only precedes the material building, but that its reproduction and circulation have started to become as valuable as the building itself.

It should be noted that media exposure, attention and popularity that a building can receive might not only stem from its iconic architecture but also from the accompanying symbolic capital, in the Bourdieusian sense, attached to the star architect who designed it or the star foundation that is housed in it. Popularity, in this case, is therefore not limited to the building alone, but encompasses all other aspects that contribute to its allure (Thierstein *et al.*, 2020). As such, defining iconic architecture through the previously discussed tropes of spectacularity and symbolism presents itself as only one option to operationalize in research. Several other attributes remain that could enable buildings to become iconic as well, some of which also still come into play in the methodological setup of our study (the commissioning of star architects in particular), as explained later.

How then does iconic architecture perform on social media? Assuming that iconic architecture stimulates a desire to be captured in images and shared by users online, the question arises as to how exactly such processes and dynamics play out on a social media platform. So far, spaces of social media have perhaps evaded the scrutiny of architectural scholarship, because they do not address any specialized field, but rather media users and behavior at large. Along the crossroads of cultural studies, media theory and computer science, Lev Manovich (2020) has helped pioneer cultural analytics research over the past decades,

taking as its focus of study the myriad objects and interactions of popular culture as they unfold and are disseminated through contemporary digital media. The sheer scale of research observations has become essential in this respect, illustrative of what Manovich (2009) has termed an era of *more* media instead of simply *new* media. Social media platforms have become focal points for research in this respect, as they enable data collection and analysis that cover large samples of user content and behavior. They offer glimpses of popular culture on unprecedented scales, with possibilities to both quantify user content and interactions and, following Manovich (2020), also get an empirical grip on more ephemeral concepts that relate to the tastes, emotions, experiences and perceptions of mass online audiences. These aspects inform the methodology laid out in this paper as well, in trying to empirically identify and measure architectural iconicity, through user content and activities on the social media platform Instagram. Building on earlier studies on iconic architecture that applied computational analysis techniques (see for example Alaily-Mattar *et al.*, 2022a; Jacquot and Chareyron, 2020; Alaily-Mattar *et al.*, 2023), this paper applies and expands research methods such as metadata analysis, textual and visual content analysis.

The research questions guiding our inquiry can be further specified as follows: what visual and textual content is generated and shared by Instagram users concerning buildings that can be considered as iconic architecture projects? How does this media content develop over time? And what role does iconic architecture additionally play in boosting this media content? Our hypothesis posits that the accentuated visuality of iconic architecture attracts and sustains the attention of social media users. By adopting computational analysis techniques similar to methodological approaches taken up in cultural analytics and related fields, as discussed further, we aim to describe how iconic architecture performs within the particular social media context of Instagram. Such descriptions can support further investigations about whether and if so, how iconic architecture potentially contributes to the creation and sustaining of a building's iconic status.

3. Methodology

3.1 Case study selection

In architectural literature, qualitative analyses-and often through single case studies-are the common approach of choice. A systematic literature review of star architecture by Alaily-Mattar *et al.* (2022b) reveals that the use of quantitative methods in research concerned with star architecture is rather an exception, Patterson (2022) and Plaza *et al.* (2022) are some of the few examples of such exceptions. Especially in the literature on iconic architecture, it is common for authors to rely on personal observations and experiences (see for example Jencks (2005), Sklair (2017), Smith and Strand (2011)). While such an approach can produce valuable insights, it does not overcome the fact that the perception of architecture remains highly subjective in nature and can introduce certain individualistic biases in research. In this article, we aim to extend current insights on iconic architecture by investigating the large-scale reception of such buildings using quantitative digital methods. This methodological section outlines how we have selected the case studies investigated in our study, in order to subsequently explain how we have collected and processed the relevant data from Instagram.

To identify buildings that can be considered as iconic architecture projects, we focused on buildings commissioned within the public sector and designed by internationally renowned architects, otherwise considered as star architects (Ponzini and Manfredini, 2017; Alaily-Mattar and Thierstein, 2020; Gravari-Barbas and Renard-Delautre, 2015). Star architects were initially selected from the comprehensive compilation by Ponzini and Manfredini (2017), who cataloged renowned transnational architectural firms according to such reputation indicators as architecture prizes, publications and media presence. We acknowledge that the commissioning of a star architect for a new building project does not automatically lead to the

creation of iconic architecture. Yet, we have assumed that the deliberate allocation of resources to architects renowned for their ability to conceive extraordinary designs and promote projects through their global reputation serves as a sufficient indicator of the desire to commission an iconic architecture project. This is why we have narrowed the field of our investigation to star architecture, while acknowledging that most buildings depicted on social media are likely not designed by star architects. Several other criteria such as the location and date of inauguration were also considered for the selection of research cases.

Concerning the study's geographical scope, we focused on European cities to ensure a consistent cultural context in our investigations. At the same time, capital cities were excluded from the case study selection to mitigate potential biases stemming from these cities' elevated status, for instance in relation to influencing visitor numbers and motivations. The study's temporal scope was on the one hand limited by Instagram's launch in late 2010, and on the other by the COVID-19 pandemic, potentially introducing biases post-2020. To ensure an appropriate observation period in terms of social media content, we selected buildings that were completed between 2011 and 2016. To reduce any further biases stemming from visitor accessibility, we also limited our selection to buildings with a public function, i.e. those that are accessible to the public. Lastly, as past research has shown, sufficient data availability is crucial for the quality of results of quantitative digital methods such as image and text analysis. For the selection of case studies, we were faced with the challenge that Instagram does not allow viewing the number of posts associated with a hashtag in granularity, only showing all postings including video and images and across the whole lifetime of Instagram (until January 2023 at the time of the data collection). To ensure selecting case studies with sufficient sample size, we opted to initially select buildings with at least 5,000 posts associated with them in total, and at least 1,000 posts after filtering posts containing images only (excluding videos) and limiting to the observation period of 2011–2019. Table 1 specifies each of the 16 selected case studies, and Figure 1 maps their locations. Represented by ten architectural firms each firm has contributed one to three designs in the final list of 16 projects. The projects span a variety of building functions: eight museums, four event arenas, two concert halls, a dual-purpose cultural center (Centro Niemeyer in Avilés) and a market hall (Markthal in Rotterdam). While some are freely accessible, others require an entrance ticket or offer partial access without one.

3.2 Data collection

The vast and rapidly changing nature of large-scale, heterogeneous data generated on social media platforms like Instagram necessitates the use of appropriate methods to extract data for research purposes. To collect the desired architecture-related data from Instagram, we utilized two tools: CrowdTangle, Instagram's official API directed at researchers, and a third-party scraper, considering Instagram's limited accessibility to data using only its API. More specifically, we used the third-party scraper to obtain posts about the selected buildings, while using CrowdTangle to obtain posts about their respective cities, for comparative analysis purposes as shown later [1].

We designed an automated pipeline to collect and clean the data (see Figure 2). The first step of the pipeline includes collecting post data from Instagram. Posts relating to specific buildings were identified by hashtags. The process of identifying relevant hashtags began with the primary hashtag corresponding to the official name of the building, such as "#thehepworthwakefield". Subsequently, a manual examination of posts tagged with this primary hashtag was conducted to identify associated hashtags, for instance, "#hepworthwakefield" and "#thehepworth". Table 1 shows the complete list of hashtags utilized for each building. The collected data was then filtered according to the selection requirements discussed in the previous section. Additionally, textual post data was translated into English using Google Translator. Images were pre-processed as follows: a

Table 1. List of selected buildings

No.	Project	Architect/Firm	Hashtag(s)	Date of completion	Function	# Posts (after filtering)	# Images
1	Centro Niemeyer	Oscar Niemeyer	#centroniemeyer	2011	Museum/Concert Hall	4,823	4,823
2	Elbphilharmonie	Herzog & de Meuron	#elbphilharmonie	2016*	Concert Hall	26,491**	12,638
3	The Hepworth Wakefield	David Chipperfield	#hepworthwakefield #thehepworth #thehepworthwakefield	2011	Museum	12,989	8,450
4	ICE Krakow	Isozaki	#icekrakow	2014	Event Arena	6,849	6,849
5	Louvre Lens	SANAA Architects	#louvrelens	2012	Museum	13,760	10,082
6	Markthal	MVRDV	#markthal	2014	Marketplace	57,027	12,005
7	Matmut Atlantique	Herzog & de Meuron	#matmutatlantique	2015	Event Arena	5,120	5,120
8	Messeplatz	Herzog & de Meuron	#messebasel	2013	Event Arena	7,301	7,301
9	MUDEC	David Chipperfield	#mudec #mudecmilano	2015	Museum	48,433	10,005
10	MUSE	Renzo Piano	#musetrento	2013	Museum	3,534	3,534
11	Musée des Confluences	Coop Himmelb(l)au	#museedesconfluences	2014	Museum	22,753	10,512
12	Musikkens Hus	Coop Himmelb(l)au	#musikkenshus #houseofmusic	2014	Concert Hall	5,705	5,705
13	Ragnarock	MVRDV	#ragnarock #ragnarockmuseum #museumragnarock	2016	Museum	1,746	1,746
14	Riverside Museum	Zaha Hadid	#riversidemuseum	2011	Museum	9,281	9,281
15	SSE Hydro	Foster + Partners	#ssehydro	2013	Event Arena	23,136	23,133
16	Turner Contemporary	David Chipperfield	#turnercontemporary	2011	Museum	15,049	9,470

Note(s): * Opening January 2017. Completion aligns with the opening for all other projects
**Initially, 182,286 posts were collected. Due to the large volume of data, 26,491 posts were sampled for pre-processing
Source(s): Authors' own work

Figure 1.
Location and images of selected buildings

Source(s): Map adapted from OpenStreetMap by authors; Images from Wikimedia Commons

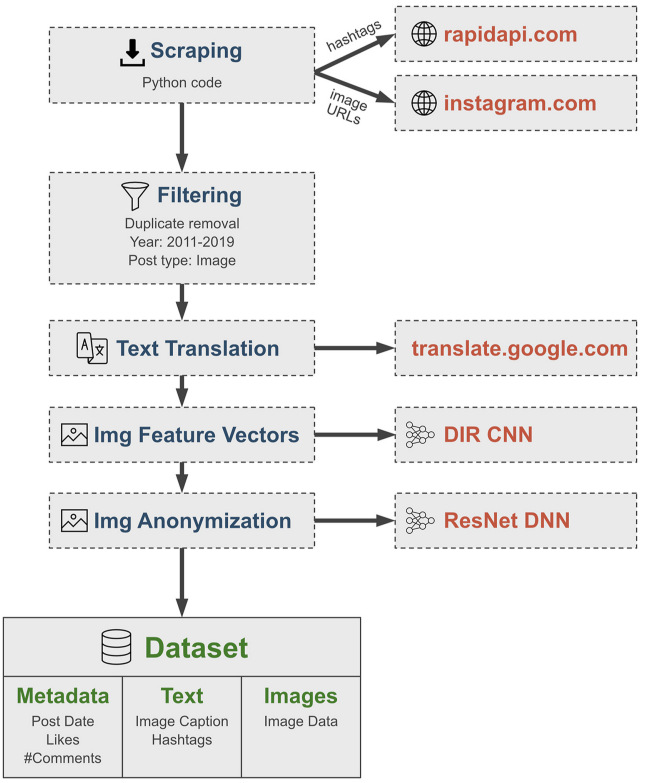
feature vector was calculated for each image, as proposed by Gordo *et al.* (2016), which is a numerical representation that captures essential information (such as geometric features, surface characteristics and color) about the image, used in the image classification discussed subsequently. Applying the pipeline to the selected projects resulted in 16 datasets, totaling 263,997 posts and 140,654 images. To maintain user privacy, all extracted data underwent anonymization of images and text [2].

3.3 Visual and textual data classification

A key part of social media users' architecture experiences is shared through the objects captured in images. For this purpose, we employed a two-step method for image classification to distinguish the main points of interest in the Instagram images. First, an exploratory analysis was set up to discover common photographic objects across the datasets. Based on this exploration, five image classes were identified: architecture, building function (e.g. exhibitions, concerts), people (selfies, group photos), food and images not directly related to specific buildings.

In a second step, a visual data classifier was trained to assign all collected case study images to one of the five categories. While some images could be assigned to multiple classes simultaneously, such as a concert hall picture showcasing both the building's function and its interior architecture, the classifier training prioritized extracting the primary focus of the images. We employed k-nearest-neighbor (knn) classification on a training and test set, which produced an accuracy of 80%. By applying the classifier to the full dataset, each image was categorized according to the five image classes listed in Table 2.

Accompanying their shared images, users can add text to their Instagram posts in the form of hashtags and a post caption. On social media, hashtags have turned into a common tool to add context to a post, for example by mentioning the city in which a building is located,



Source(s): Authors' own work

Figure 2.
Process of data collection

while post captions are often used to further describe users' experiences to larger communities on the platform. In addition to images, these textual elements that make up Instagram posts add important context and information to how the selected buildings in our study are experienced by users.

Understanding and analyzing social media captions poses practical challenges as they are written in free form, necessitating the application of specialized computational methods for natural language processing and comprehension. To tackle such complexities, we relied on topic modeling, an approach aimed at extracting common word groups or topics from large amounts of text. With topic modeling, a topic extracted from a text is represented by keywords - for example: "architecture, photography, beautiful, stairs" indicating a discussion about architectural photography. BERTopic by Maarten Grootendorst (2022) was used for the topic modeling. It stands out above other topic modeling approaches for several reasons, including its abilities to produce more coherent topics and to identify outliers as are common in texts found on social media (e.g. short utterances of text, emojis, etc. (Egger and Yu, 2022)). Although such outliers may be insightful for more advanced sentiment analysis of social media data, they were excluded from our adopted topic model to improve overall topic interpretability.

The topic model was applied to the collected Instagram image captions and hashtags to produce a set of general topic classes, similar to the previously discussed image classification. Since the initially generated topics proved highly specific to the selected buildings themselves, topics were then manually classified for further analysis into five major classes,

	Topic	Description
Image analysis	Architecture	Exterior and interiors of the building
	Function	Exhibition space, art, performances, talks, sports, tickets, posters
	Food	Food, drinks, dining
	People	Selfies and group photos, not including performing artists or sports players
	Unrelated	City views excluding the building, nature, maps, screenshots of webpages, etc.
Text analysis	Architecture/Architect	Focusing on general architectural concepts or specifics related to architects
	Location	Related to geographical context
	Function	Encompassing discussions on specific events, exhibitions, concerts, or the foundational function of the building
	Photography/Instagram community	Themes around photography trends or directly related to the Instagram community
	Other	Subjects unrelated to the projects under investigation

Source(s): Authors' own work

Table 2. Topics of image analysis and text analysis

namely discussions related to: (1) the building's architecture/architect, (2) location, (3) function, (4) photography as a general topic and related to Instagram as a platform and (5) topics either too specific or incoherent to be related to any of the previous classes (see Table 2).

4. Data analysis [3]

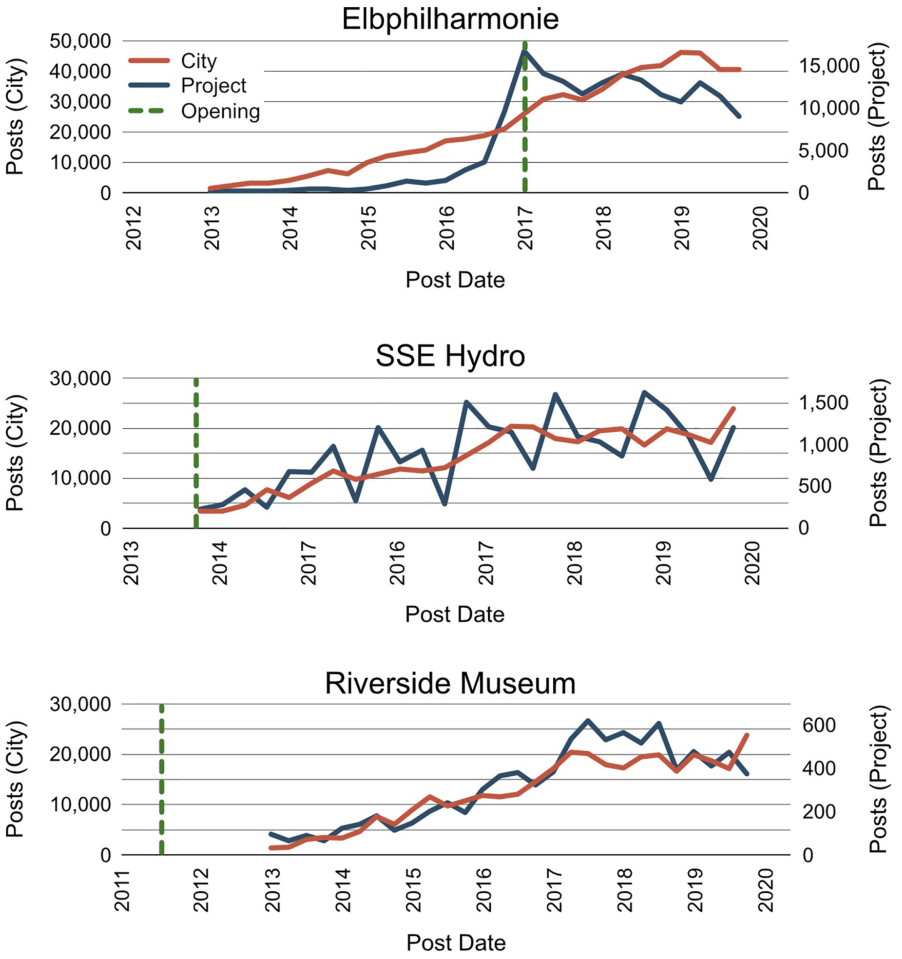
4.1 Patterns in post activity

One of our study's aims was to identify patterns in Instagram post activity throughout the observation period 2011–2019 for the 16 selected buildings. The evaluation of temporal trends necessitates considering the overall growth of Instagram as online platform throughout the selected time period, and recognizing the parallel growth of online popularity for the cities in which the selected building cases are located. To achieve this, we compared the growth trajectory of post activity on Instagram for the various buildings with the growth trajectory of their respective cities. This comparison allowed us to delineate every building's online media presence growth relative to that of their city and to understand how Instagram's general growth was reflected in the building's post activity development. Highlighted results of this analysis are shown in Figure 3.

The data exhibits different trends. A first trend pertains to buildings whose post activity trends are remarkably similar to the rather steady growth patterns evidenced by the city data. Examples of such buildings include the Riverside Museum, MUSE and Turner Contemporary. Other trends pertain to post activities about buildings that markedly diverge from the city post activities. This manifests itself in different forms. The first form is that of an initial surge in post activity followed by decline or stagnation. For some buildings, there is a peak or burst of posts around the time of their inauguration, for instance, which subsequently steadily reduces or stagnates despite the growing online popularity of their host city. Notable instances of this pattern are the Elbphilharmonie and Musikkens Hus. The second form is that of pronounced periodic fluctuations characterizing certain buildings' post activity. This is the case for buildings such as the SSE Hydro and Matmut Atlantique. A plot showing examples of the described differences in posting trajectories can be found in Figure 3.

4.2 Representation of buildings in image content

Following the analysis of post activity, we examined the results of the image and text classification. As previously mentioned, images were categorized into five classes. Food,



Note(s): Top: Rise and decline. Middle: Seasonal fluctuations. Bottom: Steady growth
Source(s): Authors' own work

Figure 3.
Different trends in post evolution

people and unrelated images ultimately made up only about 10% of the collected Instagram images, while images of the architecture and function posed the largest share. Images of the architecture predominantly depicted the outside facades of buildings, although interior architecture features were also present in the data, such as the staircase of the ICE Krakow. Functional images were directly related to buildings' functional offerings, i.e. museums were posted about for their exhibited art pieces whereas event arenas and concert halls were posted depicting their hosted events and concerts (see Figure 4).

When further comparing the occurrence of the two largest image classes, architecture and function, we observed significant differences (X^2 (60, N = 140 k) = 38179, $p < 0.001$). Certain buildings were primarily represented in the Instagram images through their architectural features, with the Elbphilharmonie serving as the most notable example in this case, featuring 69% of the building's images focused on its architecture (see Figure 5). In contrast,

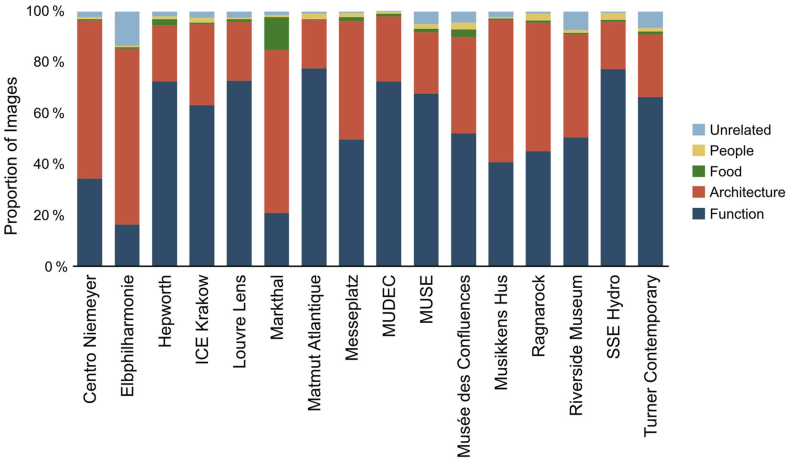


Figure 4.
Image class occurrence by building

Source(s): Authors' own work

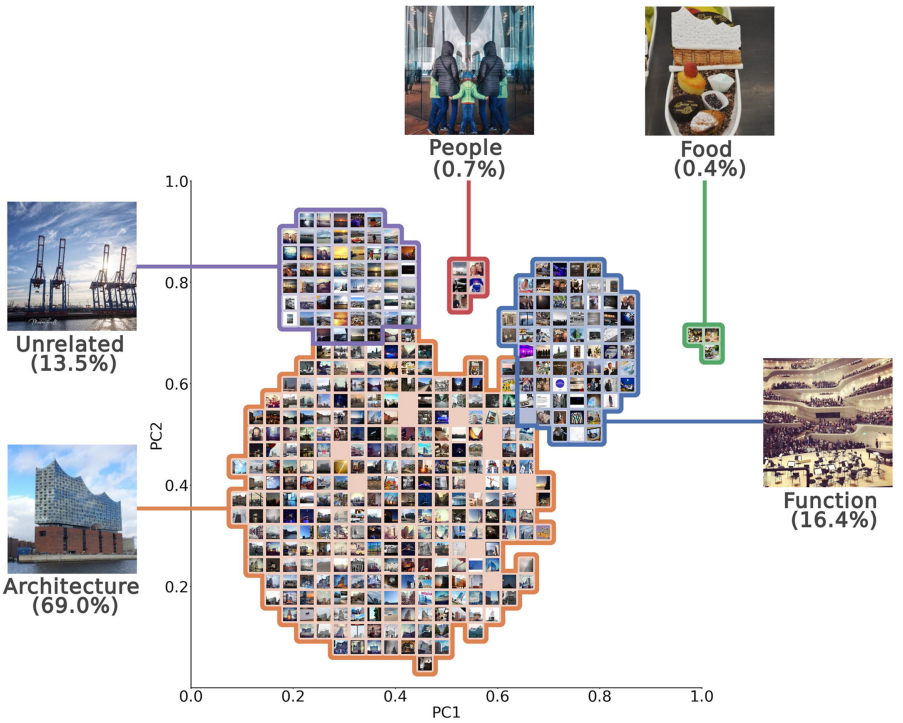
other buildings were primarily photographed for their functional aspects. The SSE Hydro, for instance, exhibited the smallest proportion of images depicting its architecture (18%), with a much larger share covering the events hosted inside the arena.

4.3 Discussion of buildings in text content

While the Instagram image content provides insights into how the buildings are perceived and shared, textual elements such as the accompanying post captions and hashtags can help further contextualize these findings. As previously mentioned, Instagram posts' texts were classified into five classes: (1) architecture/architect, (2) location, (3) function, (4) photography and (5) other topics.

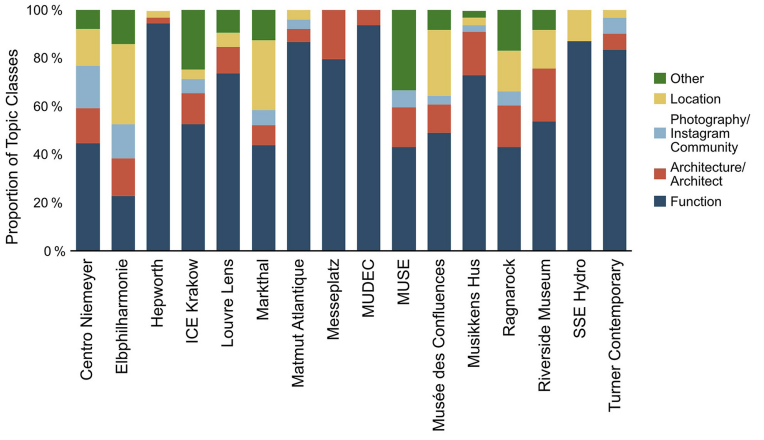
Discussions on Instagram about the function of buildings frequently included specific mentions of exhibitions, concerts or other events, corresponding to specific buildings' purposes. The function topic also proved the most prevalent in the text data, accounting for over 80% of the content for some buildings. The second most prevalent topic was the location of buildings, often highlighted through hashtags referencing the respective host city or country. While explicit references to architectural aesthetics proved to be rare, notable exceptions included text content related to the concrete facade of the Hepworth Wakefield, the monumental staircase of ICE Krakow, and the facade of the Louvre Lens. More frequently, discussions were centered around the architects and architecural firms (e.g. *#mvrdv*, *#herzogdemeuron*) or general architectural themes via hashtags. Additionally, a distinct topic focusing on photography and the Instagram photographer community was identifiable (e.g. *#fineartphotography*, *#archilovers*, *#igershamburg*).

Analysis of the distribution of the text topic classes yielded significant differences among the buildings (X^2 (60, N = 87.1 k) = 33886, $p < 0.001$). Figure 6 shows the overall topic class distribution. While certain buildings, such as the MUDEC, SSE Hydro and Turner Contemporary, predominantly featured discussions about their cultural function on Instagram, the online textual content for others included more contextual information, such as in relation to location or the architect. A clear distinction can be observed in how content is represented differently through images and text. While architectural features are often directly captured in images, our study finds that architecture is seldom explicitly discussed in text on the social media platform. Instead, text more commonly includes



Source(s): Authors' own work, including images from Instagram as follows (clockwise): People: ovegur_is (13 October 2019) https://www.instagram.com/p/B3kF5wMIgN6; Food: hotellouiscjacob (13 January 2017) https://www.instagram.com/p/BPNNTu0gGZK Function: sa00.de (14 October 2019) https://www.instagram.com/p/B3nBDKrIJJn Architecture: hamburgskarsten (20 March 2016) https://instagram.com/p/BDLyybwPAlj Unrelated: reisefotografie_martina_friedl (31 May 2019) https://www.instagram.com/p/ByHjNxyCWtO

Figure 5.
Proportion of image class occurrence for the Elbphilharmonie



Source(s): Authors' own work

Figure 6.
Topic class occurrence by building

contextual details related to location and involved architects. Further research is needed to test whether this finding is generalizable beyond our case studies.

4.4 Correlation between post activity and content characteristics

When comparing findings from the image and text analysis, similarities were identified. Measurements of the proportion of images related to buildings' function and text topics related to buildings' function showed a notable correlation ($r_s(14) = 0.653$, $p = 0.006$), indicating a consistency between the proportions of text and image content from the Instagram posts. However, we must note that while the "function" is present both as an image class and a topic of textual discussion, the other classes used in our analysis differ and cannot directly be compared.

Finally, an overarching trend was observed: buildings that were particularly highlighted for their architectural design in images and text often experienced an initial surge in social media posts since their openings, which peaked and then declined, as exemplified by the Elbphilharmonie, Markthal and Ragnarock. The corresponding chart in Figure 7 shows a substantial rise in posts followed by a decline, all with a focus on architecture-related images. Conversely, the trend for buildings that are predominantly featured for their function on Instagram, such as the Turner Contemporary, MUSE and Riverside Museum, showed a steadier growth pattern. We note, however, that while a correlation was observed between these trends in post activity and content distribution, not all buildings in this study clearly fall into one of the two categories.

5. Images of iconic architecture matter but not always nor sustainably

Our data analysis reveals distinct patterns of how social media content of the selected buildings on Instagram evolved over the observation period. It has become evident that

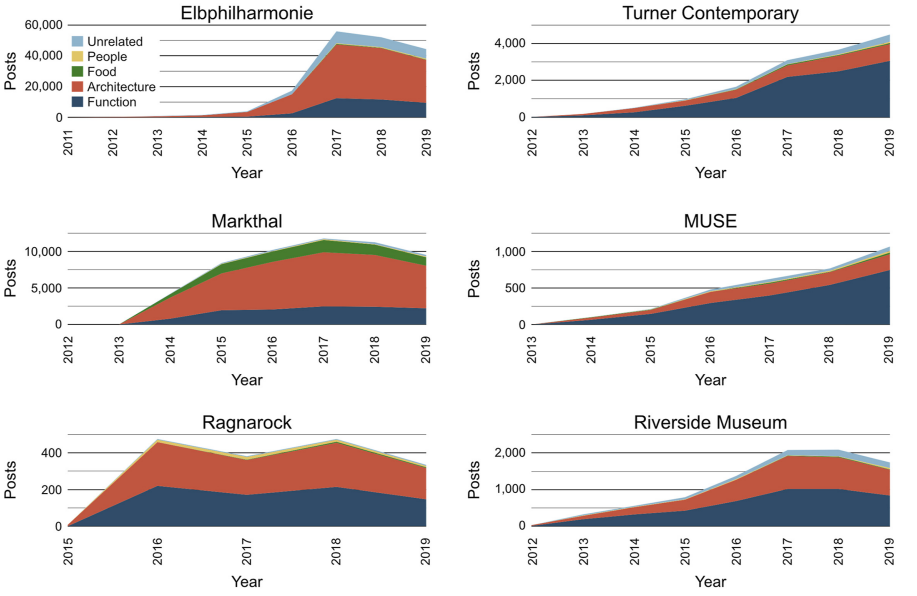


Figure 7.
Development of post activity and image class occurrence for example buildings

Source(s): Authors' own work

certain buildings share similar growth trajectories of posts with their host cities on Instagram. In contrast, other buildings experience an initial surge in Instagram posts, but once this initial interest diminishes, a decline in post activity becomes evident. Besides these two main identified trajectories, buildings that are used as event arenas, such as the SSE Hydro, have associated post activities that show pronounced periodic fluctuations linked to their hosted events.

When it comes to image and text content itself, a dichotomy emerges. Some of the selected buildings are primarily perceived by users as visual spectacles, with built exterior or interior features seemingly providing the desired canvas for that quintessential "instagrammable" moment. Other buildings are primarily perceived according to their cultural facilities, with the hosting of exhibitions, events and other public programs as the focal point in shared images. This dichotomy is also further reflected in the textual analysis of the Instagram posts. Therefore, our study shows that even though all buildings were commissioned to star architects and feature spectacular architectural designs, some buildings are experienced not only or primarily through their architecture, but as much or even more so through the cultural offerings that they house over time.

Furthermore, our analysis reveals a correlation between the predominant type of post content as shared on Instagram and the growth trajectory of buildings' posts, suggesting two distinctive patterns. First, buildings whose spectacular architecture tends to captivate users most, as revealed through image and text content of their Instagram posts, are also those that report a gradual decline in attention after experiencing an initial peak in users' interest. Conversely, buildings whose functional program offerings are covered more in image and text content tend to adhere to the other identified trajectory of post activity, showing rather modest beginnings in generating online attention but gaining more traction over time.

If Walter Benjamin (2008 [1936], 34) stated that "Buildings are received twofold: through how they are used and how they are perceived", then the two main trends uncovered in our combined analysis of Instagram post activity and content very much reflect this dichotomy. On the other hand, and particularly in relation to user reception and engagement with the aesthetically spectacular nature of iconic architecture projects, the characteristic peak and decline trend that our study uncovered points to the fact that this public architectural perception remains rather distracting in nature (cf. Benjamin, 2008 [1936]: 33), as its effect wanes rather quickly. In a more general sense this can be further linked to user dynamics of instantaneity, distraction and ephemerality that come into play on social media platforms, and in relation to Instagram's visual content orientation specifically (Paasonen, 2016; Arda, 2021; MacDowall and Budge, 2022).

As stated earlier, Instagram has reshaped architectural interaction and appreciation, by emphasizing aesthetics that cater well to the platform's visual-centric logic for achieving online popularity. This marks a distinct shift towards a more image-centric approach in architectural reception and appreciation. In this particular social media context, spectacular architectural designs can then often act as the initial pull for audiences, targeting the platform's principal currency, that of aesthetic appeal. Such buildings, with visual spectacle inherently built into their shape and form, undeniably capture the zeitgeist of the digital age, which can already make them iconic in their own right.

However, as the other findings from our Instagram data analysis show, iconicity does not remain confined to mere visuality. Cultural and functional significance, as manifested through exhibitions, concerts and various other events that social media audiences engage with, prove just as potent a tool in letting a building gather online traction, gain popularity and become entrenched in public discourse and memory. In fact, as our findings suggest, while a spectacular architectural design might draw in an initial audience group, it is the repeated cultural experiences and events in its wake that can foster genuine long-term engagement with buildings, fostering deeper public connections, or at least ensuring

longevity on social media. The symbiotic relationship between buildings' architectural characteristics and cultural offerings that we discovered through our data analysis also implies that both facets, when effectively harnessed together, can solidify a building's status as an icon on platforms such as Instagram and beyond.

While Instagram undeniably amplifies architecture's visual dimension, effectively rendering buildings into online media spectacles, it does also serve as an instrument for showcasing their cultural embedding. This dual role of iconic architecture on Instagram, evident in our data, reveals that digital platforms also have the potential to foster more sustained engagement with the cultural and experiential aspects of architectural works, rather than merely reducing them to images. Thus, in this digital context, architecture can transcend its reduction to static and fleeting imagery, inviting users to also and repeatedly explore and engage with its cultural offerings. Our previously posited hypothesis, that the accentuated visuality of iconic architecture attracts and sustains the attention of social media users, is therefore only partially proven as true.

6. Conclusion

Knowing that with the development of contemporary digital media, the role and function of photography have changed substantially, the reproducibility and scalability afforded to architecture by photography as described by Frampton (1986) has been taken to new levels. While "Le Corbusier used to make a distinction between real space and the *space of the page*" (Colomina, 1994, 111 emphasis added), architects today arguably must make a distinction with the space of social media. A central premise of this paper has, therefore, been that it is imperative to investigate the interaction of architecture on and with social media platforms, such as Instagram, because architecture's performance is increasingly viewed through and tailored to these environments. In doing so, architecture has become immersed in the logics that drive social media as global online platforms capturing, displaying and steering cultural behavior, trends, flows and happenings in real-time, from "the release of a new version of popular software, the announcement of an important architectural project, or any other important cultural event" (Manovich, 2020, 31).

Our data-driven exploration into the online perception of buildings designed as iconic architecture offers a new perspective to existing literature. The findings of our study do give empirical evidence for the intuitive sentiments related to the performance of iconic architecture on social media. A building's function does indeed relate to its performance on social media. As such, our research demonstrates that the spectacularity of a building is not sufficient on its own to maintain public interest once the novelty of architectural form has worn off. Popularity is maintained through function or repeated documentation of the use of a building.

For stakeholders involved in iconic architecture projects, it therefore becomes imperative to allocate sufficient funds both to the architecture project proper, as well as the sustainment of its cultural offerings. Envisioning and creating an icon becomes a two-fold endeavor, then. Its design may draw in the public's gaze, while its cultural offerings can hold that attention, ensuring the building's lasting significance and relevance in an ever-evolving landscape. This finding can help liberate architecture from its "debt to promises it didn't make and ultimately can't fulfill" (de Graaf, 2023, 26), namely, the promise that architecture triggers measurable economic spin-offs.

While our findings provide valuable insights into the online workings of iconic architecture, it remains essential to acknowledge the following limitations of our study. Firstly, our focus on specific star architecture projects within European cities may have introduced selection biases, and the derived insights may, therefore, not necessarily echo global sentiments or trends. Secondly, we have investigated only a relatively short period in

the lifespan of the selected buildings, centering on their inauguration phases as informed by methodological restrictions from our investigation of social media data. Knowing that iconicity is not a static condition but rather a dynamic process that potentially fluctuates over time and knowing that outside the realm of social media, other influences also come into play, we must acknowledge that our investigation sheds light only on a particular moment in the lifespan of buildings on a particular media platform. We, therefore, must remain careful about not reducing the performance of the selected building cases to our findings only. Thirdly, social media content, in its fleeting and impulsive nature, poses challenges in interpretation. To single out one aspect, the inherent quirks characterizing digital media communication, with its emojis and other discursive idiosyncrasies, may lead to outliers and skewed observations in the investigated data, potentially influencing our study's results.

Further research can shed more light on whether the dual trend in iconic architecture's performance is specific to Instagram or mirrored in buildings' wider public perception, i.e. beyond this particular platform. It would prove interesting and fruitful to expand further research into different media platforms and contexts, and related demographic profiles in order to further parse out potentially diverging influences of different audience segments, which together act upon the iconic allures that certain new building projects try to stir up in the built environment.

Notes

1. The reasons for using two tools together are as follows: the third-party scraper can access all public posts, but is limited to scraping chronologically. Its use necessitates scraping all available posts in order to reach posts back until 2011. CrowdTangle on the other hand can access arbitrary time spans, but only for posts related to at least 50,000 followers. Since cities feature millions of posts, infeasible to obtain using the third-party scraper, we used CrowdTangle to scrape the city data. However, scraping posts about the specific buildings would result in very small datasets due to CrowdTangle's follower limitation. Therefore, we used the third-party scraper to obtain posts about the buildings. We note this as a possible limitation to the comparability of the data.
2. The code used for the data collection can be found on GitHub: https://github.com/solfang/Social-Media-Data-Pipeline
3. The code used for the data analysis can be found on GitHub: https://github.com/solfang/IconicArchitecture

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