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Digital Public Art in Historical Urban Open Spaces: The Impact of New Technologies

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1 ABSTRACT

For centuries, public art has been used to commemorate historical events, celebrate heroes, inspire citizens, decorate public spaces, and attract tourists. It represents the current cultural and social situation and aesthetic and artistic tendencies. Now, contemporary public art often ignores the "Do not touch" sign and encourages users to involve in shaping art pieces to their own preferences. In this process, digital public art (DPA) takes on a new role as a connector between people and art, and public space acts as the interaction context.

In the digital era, despite the blame attributed to new technologies for diminishing social contacts and degrading the identity of public spaces, today's application of new technologies with public art frequently produces astounding and surprisingly positive effects on people's feelings, perceptions, and behaviours. Digital public art can stimulate human senses while improving non-visual aspects of space.

The study's main concern is to redefine the role of public art in the digital era to cope with the changes in users' behaviour and the rapid changes in technology. In the context of historical urban spaces, the study looks into the relationship between three main pillars: digital public art, urban spaces, and users' behaviour. It investigates the role of new technologies in shaping the future of public art. It also reviews types of DPA in historical urban spaces and their impact on boosting user interactions and urban space identity. Finally, a comparative analysis study presents some DPA types for historical urban spaces to achieve the required interaction and identity.

Keywords: Digital public art, Digital era, Historical Public Spaces, identity, Users' behavior, Social Interaction

2 INTRODUCTION

Public art is not new; it goes back to ancient times. It has historical traditions and roots in different periods and cultures. It has taken multiple forms in various periods as it has been associated with its society (Fig. 1) (Senie, 2003). public art was introduced to the public as a religious and social art virtue (Post, 2011). However, as time goes by, the functions of public art have also expanded and evolved. It is a visual aid for public enjoyment by enriching the public's perception of those spaces (Miles and Mannion, 1997, Robinson, 1904).
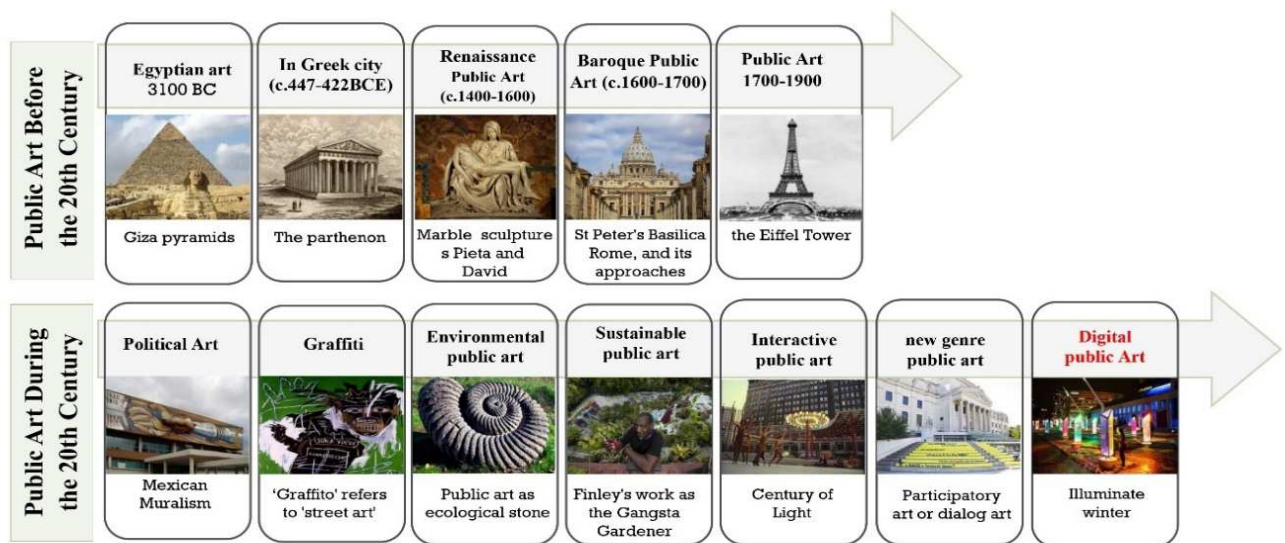

Fig. 1: The forms of public art through history.

Public arts need new carriers, materials, and languages to thrive in the age of new technologies, from static forms to dynamic and interactive forms (Wang, Hu and Rauterberg, 2012). This digital art combines technologies and smart materials to produce interactive artworks. It is an artistic configuration that attracts and motivates people to interact by moving it, moving through it, changing its sounds and lights, giving them a sense of ownership over the installation. Also, it generates a human-computer and human-human interactions in space. (Becker, 2004) (Ahmed, 2018, Ahmed, Jaccheri and M'kadmi, 2009).

The study investigates digital public art's role in historical urban spaces. Specifically, whether it can offer high levels of interactivity and identity, which are presented in interactive and participatory forms of installations.

3 THE ROLE OF PUBLIC ART IN URBAN SPACES

Public art gives public space identity and shape, making it more memorable (Moughtin, 2003). Lynch defines identity as "the ability to distinguish a place from others" (Lynch, 1984). It can develop a sense of place by creating a unique physical character and enhancing the links between communities and places; develop a sense of identity by helping people understand where they come from, particularly through historical connections (McCarthy, 2006); projecting an external image of a place; and develop a sense of community by revitalising poor-quality spaces and buildings with a sense of pride and ownership through involvement in the creative process (Hall and Robertson, 2001).

According to the literature analysis, public art researchers have discussed the values of public art to cities and public spaces. Their findings are primarily divided into three categories (Hall, 2003, Hall and Smith, 2005, Haus, Heinelt and Stewart, 2005, McCarthy, 2006, Miles and Mannion, 1997, Sharp, Pollock and Paddison, 2005):

(1) Aesthetic value: Public art improves the visual appearance of urban spaces.

(2) Economic value: Public art provides communities with competitive advantages and local uniqueness, which may attract investment, stimulate cultural tourism, and increase land use.

(3) Social and cultural value: Public art strengthens a sense of identity and place. It can foster social inclusion and link society with its history.

Public spaces with interactive public art provide new experiences in dealing with technology while meeting people's needs. Public art and urban spaces are interaction boosters and community expression tools, especially digital public art and historical urban spaces. This idea was evoked by Margareth Worth, who believes that "Art and design give way for telling the stories that remind communities of their foundations".

Material is a public art language that has evolved over several generations, from natural materials to smart materials (Dewey, 1934). The most recent materials used in public art installations encourage interactivity and participation, posing new issues for the innovative design process and how to include users.

4 DIGITAL TECHNOLOGY IMPACTS ON THE FUTURE OF PUBLIC ART IN URBAN SPACE

According to Hampton, a design that considers technology is paramount for the future of cities. As much as urban designers use trees, water, and other amenities to attract people to spend time in urban spaces and facilitate group interaction, it's advisable to start thinking about using other infrastructures. Considering how new technology and smart materials will fit into public places is a must to cope with the digital era (Project for Public Spaces, 2007). Compared to traditional public art, digital public art has four new features: interactivity, technologicalness, dynamism, and interestingness (Li and Luo, 2017).

Interactivity: Unlike traditional public art, which only provides a visionary impression, interactive public art will allow the audience to interact with the surrounding. Public art is becoming increasingly interactive, bringing more vitality to city spaces.

Technologicalness: It represents the basis for the realisation of digital public art. The use of virtual reality technology and mechanical control devices makes it possible for public art to create an interactive environment.

Dynamism: It has gotten rid of the rigidity and statics of traditional public art and has become more dynamic.

Interestingness: In interacting with modern public art, the audience will undoubtedly receive some feedback, most of which is interesting.

4.1 The contemporary types of digital public art in urban spaces

Digital public art is a type of artistic work or activity that integrates digital technology into the creative or presenting process. It belongs to the larger category of new media art (Mathew and Manohar, 2017, Paul, 2011). New media art refers to all forms of contemporary art made, altered, or transmitted using new media technology. This includes digital art, interactive art, virtual art, and works of art created using robotics, video games, biotechnology, 3D printing, and computer animation. New media art is a category that defies static categorisation as the form continues to expand and new media technologies are invented (staff, 2021).

The types of digital public art vary widely. Painting, drawing, sculpture, and music/sound art have all been affected by the impact of digital technology, while new forms, such as digital installation art and virtual reality have emerged (Fig. 2).
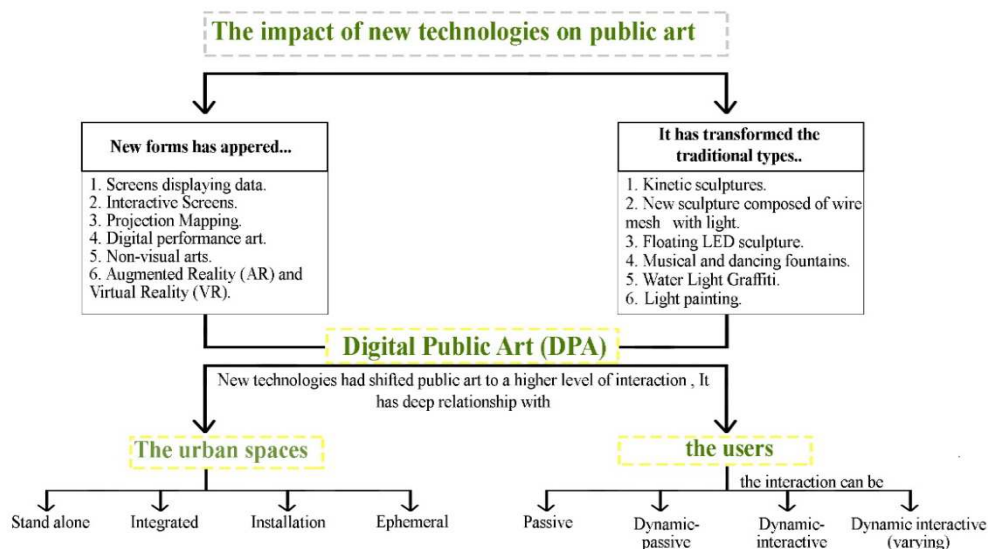

Fig. 2: The impact of new technologies on public art (contemporary digital public art classification).

4.2 The power of digital public art as placemaking in historical urban spaces (the identity)

In the digital age, some historical urban spaces face the threat of losing their identity and interactivity. The role of digital public art changed from a purely aesthetic phenomenon to a more and more recognised phenomenon for its contribution to "urban regeneration" (Hall and Robertson, 2001).

According to (Cant and Geography, 2006), placemaking uses design talents to develop images and enhance identity that reflect the historical and culture of a community. The urban planner Ronald Fleming (Fleming, 2007) was the first author to favour the term "placemaking" over "public art". Placemaking has recently evolved into 'creative placemaking,' a movement focused on public art and creative activities in public spaces (Kent, 2009). Creative placemaking studies people's benefits from interacting with public art, focusing on citizen participation and social interaction. (McCarthy, 2006). It is highly related to the concept of a sense of place (Cant and Geography, 2006).

Digital Placemaking is the strategic deployment of technology to support and enhance community participation in public places. It is a collaborative practice intended to strengthen community connections. Digital art, in this context, can provide new relationships to a space or provoke new sensory experiences in a way that can also be dynamic and renewable. Having access to DPA in historical open spaces is a way to experience the past in modern ways. (Tomitsch, 2016).

4.3 The impact of digital public art on users' perception and interaction (the interactivity)

The new dynamic, interactive or participatory forms of DPA require the artists and designers to construct their work with a good understanding of human-system interaction (Hu, Wang, Funk, Frens, Zhang, Van Boheemen, Zhang, Yuan, Qu and Rauterberg, 2013, Wang, Hu and Rauterberg, 2012). It frequently positively affects peoples' perceptions, emotions, and behaviour. People are encouraged to express their

presence, emotions, and feelings. Interactive DPA can stimulate human senses while also improving non-visual features of space (Urbanowicz and Nyka, 2012). It supports inclusion in the urban space, giving people more options for engaging with their public spaces and creating a personal identity for the individual and the city (Cartiere and Zebracki, 2015, Lossau, 2015).

The perception of DPA is acquired visually and psychologically, which indicates that an individual's impression of a specific artwork is influenced by various factors, such as cognition, values and beliefs, personal experience, and socio-cultural environment (Setiawan, 2010). It gives the public space a focal point and a purpose for people to have a new experience (Berg, 2009, Dovey, 2016, Hawkins, 2012). DPA encourages people to interact with it and become actors in urban performances (Urbanowicz and Nyka, 2016).

The relationship between interactive public art, users, and the environment, according to (Edmonds, Turner and Candy, 2004), can be static, dynamic-passive, dynamic-interactive, or dynamic interactive (varying).

(1) Static: The art object remains unmodified. The artwork itself does not respond to its surroundings.

(2) Dynamic-Passive: The art piece contains an inbuilt mechanism that allows it to change or be altered by an external factor such as temperature, sound, or light.

(3) Dynamic-Interactive: All of the characteristics of the dynamic passive category apply, with the addition that the human 'viewer' actively influences the changes in the art object.

(4) Dynamic-Interactive (Varying): Both 2 and 3 above apply, with the addition of a modifying agent that modifies the original specification of the art object. The agent could be a person or a computer program.

5   METHODOLOGY

This study is an exploratory study that is based on two main sectors. The first is a literature review presenting the impact of new technology on public art and illustrating the contemporary types of digital public art in urban spaces. It then investigates the role of digital public art in historical urban spaces, focusing on its impact on two aspects (users' interaction and the identity of urban space) (Fig. 3), considered later as the main criteria for the study. The second part presents five examples of historical urban spaces with different types of digital public art. Finally, a comparative analysis refers to the two main criteria mentioned above.
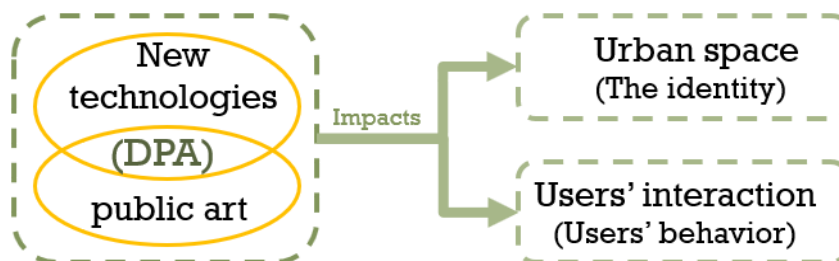

Fig. 3: The impact of DPA on historical urban space and users' interaction (the three main pillars of this study).

6   COMPARATIVE ANALYSIS

This comparative analysis includes five examples of public urban spaces worldwide with great historical backgrounds (Trafalgar Square in London, Central Business District of some countries, Plaza Mayor in Madrid, Giza Pyramids in Egypt, and Historic streets in London). These urban spaces already have various types of traditional public art (sculptures, fountains, historical buildings, and so on) from ancient times, reflecting the urban space's history. But now, they have undergone many renovations to cope with the digital era. New types of digital public art were added, presented in new technology which affect the existing public art or add new digital artworks. This comparative analysis aims to investigate the impact of digital public art on identity and interaction in these historic spaces.

6.1 Trafalgar Square, London.

Trafalgar Square is a well-known landmark in London, which has become a major tourist destination and a civic space open to the public. It has undergone many regeneration renovations to provide more attractions for visitors. The most recent redevelopment was in 2003 when the public space was pedestrianised. More

artworks were added. It included the fourth plinth and public art across the square. The square has four plinths with public statues or artwork. People sit on and play with a huge fountain (Fig. 4). It also has various public artworks, including Nelson's Column guarded by four lions. People sit on, touch, and photograph lion statues (Fig. 5). Many statues of famous people are in Trafalgar Square, although they are not interactive. (Escobar, 2014, Lossau, 2015, Searle, 2009).

Fig. 4: Public life around the fountain.(Balint). Fig. 5: People interacting with the lion statues (Balint).

6.1.1 London's Lumiere festival

From the 18th to the 21st of January 2018, London's most iconic landmarks were lighted, with more than 50 enormous sculptures, video mappings, and installations produced by influential artists and designers worldwide who utilise light as a medium (Fig. 6). Originally, this kind of celebration had a religious and spiritual meaning, to celebrate the end of the year's dark period and the beginning of lighter days. Nowadays, the spiritual sense has given way to amusement and stupefaction (Porter, 2018) .
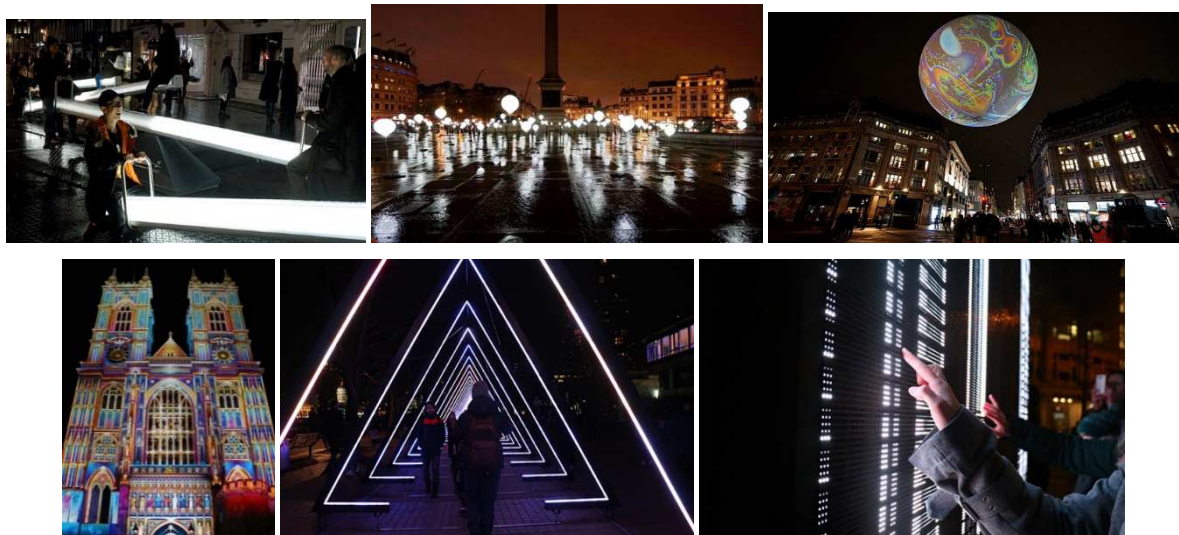
Fig. 6: Some of the most interesting installations during London's Lumiere festival in January 2018(Porter, 2018, urban75, 2018).

6.1.2 Please Feed the Lions

This is a stunning interactive sculpture created by artist and designer Es Devlin. The luminous, fluorescent-red paint finish sang out against the grey stone of Trafalgar Square, encouraging visitors to feed words to the open-mouthed lion via a touch screen mounted within a podium. The terms and selected poetry appeared on a monitor mounted in the lion's mouth and projected up the full height of Nelson's Column at night (Fig. 7) (Festival, 2018).

Fig. 7: Please Feed the Lions (Festival, 2018).

Identity: This digital artwork keeps the identity of the open space and increases public awareness of the city's history. This kind of celebration had a religious and spiritual meaning, to celebrate the end of the year's dark period and the beginning of lighter days. Nowadays, the spiritual sense has given way to amusement and stupefaction.

Interactivity: The people are no longer passive participants in urban art. The square has a high level of interaction. Over the last few decades, the visitor has transformed from a passive spectator to a user who interacts with the object and contributes to the meaning-making process of art (Haus, Heinelt and Stewart, 2005).

6.2 In the Central Business District of some countries

Paul Virilio called the digital screens on high-rise structures "Electronic Gothic" like gothic architecture. It has an emotional and cognitive impact on city dwellers, like stained glass windows in gothic cathedrals. Looking at the world's most crowded cities, where most public space is covered with information surfaces based on capital, all seem the same. There are pictures in (Fig. 8) of Hong Kong, Tokyo, New York, and Las Vegas, where the perception of the urban place is almost identical. They are oblivious of any context; the selling image is the primary goal. Large digital displays are becoming ubiquitous in public spaces, but their potential for interactivity remains unrealised as they are mostly used to deliver content(Sökmenoğlu and Türkkan, 2009) (Dubois, Colangelo and Fortin, 2015).

Fig. 8: the perception of the urban place is almost identical (Sökmenoğlu and Türkkan, 2009).

Identity: These digital information screens are similar everywhere; The urban place perception is almost identical. They bring nothing except a sense of "placelessness." These digital information screens are not designed for specific urban spaces (Sökmenoğlu and Türkkan, 2009).

Interactivity: The viewer passively observes these urban screens. The art piece contains an inbuilt mechanism that allows it to change or be modified without being affected by its surroundings (Edmonds, Turner and Candy, 2004).

6.3 Plaza Mayor, Madrid.

Fig. 9: Madrid suspended above Plaza Mayor. Image by Joao Ferrand (Travel, 2018). Fig. 10: The fabric is lightweight and flexible—Echelman studio (Travel, 2018). Fig. 11: Public life around the colourful sculpture. Image by Joao Ferrand (Travel, 2018).
To commemorate the 400th anniversary of Madrid's Plaza Mayor, American artist Janet Echelman suspended her latest woven artwork, "A colourful conversation with the past." Below it was the statue of Felipe III who oversaw the plaza's creation, to depict the space's history of violence and regeneration. (Fig. 9) (Alaimo, 2018).

Identity: The sculpture aims to commemorate the good evolution of culture and society over time (Fig. 11). "People have gathered in Plaza Mayor for almost 400 years to watch bullfights and Spanish Inquisition burnings. Today, we gather to debate concepts via art that investigates our understanding of time." Janet Echelman said.

Interactivity: The sculpture is made of lightweight, flexible fibre to twist and create one enormous piece that changes with wind and weather. It interacts with the environment more than with visitors. The structure becomes an eye-catching sea of colour at night when lights are projected onto it (Fig. 10).

6.4 Giza Pyramids and the temple of Philae in Egypt

Egypt has a lot of historical public spaces. These include the Giza pyramids, the temple of Karnak, and the Temple of Philae. In 1961 the government decided to develop the area of the Giza pyramids by performing the "Son et Lumiere" shows, recently called "sound and light" shows; light is used to illuminate the historical sites while a narrator or a voice through a space system tells the story of the place. Additional background music could be used.

Identity: the story and the lights give more perception of the site and tell the historical background of the public space, enforcing the sound of the identity of the place.

Interactivity: the show is passive. The changes in light and sound are pre-programmed without being affected by their surroundings.

Fig. 12: The memorable Giza Pyramids and the temple of Philae Sound and Light Show(Experts, 2022)

6.5 Historic streets in London "StreetMueum application"

Today, the various applications of mobile phone-based AR technology for guiding users through historic sites are constantly developing. The street museum is an augmented reality application developed by the Museum of London. It allows the user to browse historical photographs of various streets of London while walking through these streets using GPS or a map. The app recognises the location and overlays the historical photograph over the live feed of the current real world (Eccleston-Brown, 2010).

Identity: the application gives the user a sense of acquaintance with the place and deepens the historical background of the place. It allows users to see old London with new eyes (Fig. 13,14).

Interactivity: the application is a good tool for human-mobile interaction as the users can choose the street they want to explore, although this is limited by the number of old photos of some streets.

Fig. 13: iPhone shot of Carnaby Street in 1968 is aligned with today's perspective (Mohammed-Amin, 2010). Fig. 14: iPhone view of 1958 Carnaby Street with historical facts (Mohammed-Amin, 2010).

7 FINDINGS AND CONCLUSION

The following table shows the different levels of interactivity with digital public art in the selected examples. It shows that Trafalgar Square used passive and interactive types of digital public art to have a high level of interactivity. The times square and Giza pyramids used passive types with no interaction. The viewer passively observes. In Plaza Mayor, the interactivity of sculpture is higher with the environment than with the visitors. In StreetMueum application, there is no human-human interaction. It encourages human-mobile interactions.

	Passive (Passive - passive)						Dynamic (Dynamic-passive)		Interactive (Dynamic- interactive)							
									Direct				Indirect		
	Media facades	Screens displaying data	Sound art	light painting	Projection-Mapping (on façades, walls, floors, stairs, or ceilings)	Kinetic sculptures with light	Installation changes with the weather conditions	Installation changes with the water conditions	Through touch: Interactive LED panels	Through gesture	Through sound monitors	Through movement sensors	Virtual reality With VR BOX	Augmented reality with Mobile applications	Interactive public Screens
Trafalgar Square in London.		√		√	√	√			√						√
CBD of some countries	√	√													
Plaza Mayor in Madrid.						√	√								
Giza Pyramids in Egypt.			√		√										
Historic streets in London.														√	

Table 1: the different levels of interactivity with digital public art in the selected examples.

The following table presents selected examples of historical urban spaces with different types of DPA. Examples are being analysed according to the types of public art and their impact on two main futures (interactivity and identity).

Historical urban spaces	Types of public art	Interactivity	Identity
Trafalgar Square in London	Massive sculptures. Video mappings. Interactive artworks	The square has high levels of interaction The visitors have transformed from passive spectators to users who interact with artworks.	It attracted more visitors and taught about the history of the place, but this kind of celebration had a religious and spiritual meaning. Spiritual meaning has given way to amusement and stupefaction.
CBD of some countries	Urban screens. Media facades	The public screens contain an internal mechanism that allows them to alter or be modified without being affected by their surroundings. The viewer passively observes these activities (Edmonds, Turner and Candy, 2004). There are no interactions.	These digital information screens are similar everywhere; The urban place perception is almost identical. They bring nothing except a sense of "placelessness." These screens are designed for commercial purposes only without engaging the space. (Sökmenoğlu and Türkkan, 2009).
Plaza Mayor in Madrid	Suspended fibre sculpture with light projection	The sculpture moves and changes with the wind and weather; when lights are projected onto it at night, it transforms into a colourful sea. The sculpture interacts more with the environment than with the visitors.	"For 400 years, people have gathered at Plaza Mayor to witness bullfights. Today, they get together to explore their sense of time via art" Janet Echelman According to the visitors' recorded video interviews, it is a cheerful and colourful sculpture regardless of the identity of the6 space.
Giza Pyramids in Egypt.	Sound and light Show with projection mapping.	Most of the digital public art in Egypt has no interactions. The viewer passively observes these activities (Edmonds, Turner and Candy, 2004).	The Sound Light shows take the spectators on a journey thousands of years back, bringing the Egyptian legacy back to life, and enhancing the identity (Experts, 2022).
Historic streets in London	Mobile application	An individual engagement using a smartphone app compatible with over 200 places in the capital by seeing a photo or painting of it in the past (Eccleston-Brown, 2010).	This application makes Old London more accessible. It strengthens the identity by helping Londoners discover the city's hidden past (Eccleston-Brown, 2010).

Table 2: Comparative analysis of the five examples

The analysis of the five examples shows that various types of digital public art have varying effects on the interactivity and identity of the historical urban spaces. Some types, such as light and sound shows, can enhance identity through passive interaction. They tell stories about the history of spaces in the same way that the StreetMueum app provides users with a feeling of identity, but it stimulates connection with new technologies.

Other types stimulate more interaction, but this reduces identity enhancement because it makes people feel cheerful and have fun without emphasising identity. Trafalgar Square has a high level of interaction, but its

spiritual meaning has given way to amusement and stupefaction. Other types, such as Times Square, destroy identity and diminish the sense of distinction and uniqueness. The perception of the square is nearly identical to other urban spaces. Also, in Plaza Mayor, the relationship between this sculpture and the square's identity is questionable, as it resembles other sculptures the designer used in other urban spaces.

This study tries to re-conceptualise the role of public art by merging digital technologies into our everyday lives. It speculated how digital forms of public art could promote interaction and construct or deconstruct the concept of identity in historical urban spaces. As seen through the five examples (Table 2), the digital public art interventions in the public spaces have the potential to influence the perception of space and attitude towards it, creating new identities.

Globally, digitalisation significantly impacts cities and how people interact with their spaces. It inspires and catalyses social engagement and participation with space elements and the surrounding environmental context. Digital interactive public art is one of the main tools for liveable cities and more functional spaces. However, some screens serve mainly commercial purposes, showing objects in different scales and proportions without considering the surrounding environment.

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