THE USE OF SMART TECHNOLOGIES TO ADDRESS STAKEHOLDER-RELATED BARRIERS IN HERITAGE MANAGEMENT

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1. Introduction

Smart technology and heritage management are expanding fields with numerous opportunities for researchers to consider different domains for exploiting the available smart objects. Heritage management is the process of identifying and protecting cultural heritage within public interest [1]. Moreover, a growing population of end-users, including non-technical individuals, are embracing smart technologies to serve other purposes. By definition, smart technologies refer to technology that relies on big data analysis, machine learning and artificial intelligence for the cognitive awareness of originally inanimate objects [2]. In addition, smart objects refer to things that augment interaction with people and other objects. Stakeholder-related barriers to heritage management refer to hindrances to heritage management resulting from various challenges among parties interested in cultural heritage sites and those stakeholders who may be affected by its conservation or destruction.

Heritage management is among the most promising sectors for adopting smart technology. It fosters a smart experience by providing visitors with a cultural heritage context in which they can interact with smart objects within the environment. However, the importance of stakeholders, such as local communities among others, in building heritage management, cannot be downplayed [3]. Nevertheless, stakeholder-related barriers exist. They can include financial constraints, the tendency to see heritage sites as hindrances to economic growth, and the exclusion of surrounding communities from the decision-making concerning heritage conservation policies [3]. Thus, despite smart technologies, stakeholders face significant barriers to heritage management efforts as they find difficulty in facilitating the seamless management of heritage buildings. The solution lies in the existing smart technologies.

The main objective of the present study is to identify ways of using existing smart technologies to minimize stakeholder-related barriers to architectural heritage management and to identify patterns in using existing smart technologies to reduce said barriers. The study is organized as follows. First, it identifies and explains the stakeholder-related obstacles to the successful management of built heritage. Second, it describes and analyzes some of the typical smart technologies that can be considered an immediate solution to stakeholder-related barriers to heritage management. Finally, it discusses ways how existing smart technologies can solve the problems regarding stakeholder-related architectural barriers.

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2. Heritage management problems

Scholars of the existing literature in architectural heritage management investigate the challenges resulting from different barriers that hinder the successful management of heritage buildings. Corsale & Vuytsyk contribute to the heritage management literature by explaining cultural commodification risks that may ensue when heritage selectors display their discourse in various multi-ethnic contexts [4]. Lviv, Ukraine, is the case used to present the specific theme of Jewish heritage tourism by interviewing key stakeholders to cross-analyze multiple approaches and viewpoints [4]. The study dealt with memories of an ethnic group that was left out, despite its influence and contribution to the development and management of architectural heritage.

"The risk of heritagization processes to paradoxically exclude the communities who created and ran that heritage in the past but is discussed through the reactions, perceptions, and suggestions of the various groups involved" [4], explains how local communities' participation may be hampered by external barriers like ethnic discrimination, the heavy presence of tour operators from other nations, a negligible tourism experience, and financial constraints [4]. The study ultimately highlights the paradoxical exclusion of communities involved in creating and managing architectural heritage as one of the potential barriers to heritage management.

Amar et al. further studied the perceived motivations and barriers to conserving heritage buildings in Australia. The study recognized stakeholders as significant built heritage management drivers [5], but often have diverse, eclectic views when it comes to the management of World Heritage Sites. The study aimed to draw stakeholders from related fields and understand their opinions on issues hindering heritage management by identifying factors motivating the management of architectural heritage in Australia [5]. A qualitative design was used in the research, which conducted two focus groups with key informants from Australia's heritage industry who were purposefully selected, in New South Wales and Queensland.

Amar et al. present stakeholders' interests in managing architectural heritage and their views on adopting conservation guidelines and measures in Australia's architectural heritage sector [5]. The study reveals that the participants' interdisciplinary backgrounds influence their opinions [5]. Hence, the literature further explains the motivators of heritage management and its barriers, besides exploring their policy implications in Australian architectural heritage management. The scholars based their studies on the key informants' views. Therefore, from the implications and the analysis of the research, it appears that the stakeholders' varied familiarity and interests lead to theoretically influential and inclusive viewpoints.

3. Stakeholder-related heritage management problems

3.1. Exclusion of local communities

The first barrier to heritage management efforts is excluding local communities in various heritage management efforts [4]. To manage built heritage, multiple organizations and efforts mainly focus on minimizing human influence even though such areas also face several crises. The long-term viability of built heritage relies on the integrity of intricate processes stretching beyond the existing geographical boundaries [4]. Incorporating multiple-use habitats where wildlife and people live is an essential step to-

wards efficient landscape-level heritage management. Therefore, the failure of traditionally built heritage management efforts results from their design, which excludes the human population due to the continued lack of initiatives to foster the active involvement of local communities.

The exclusion of local communities is a barrier to successful heritage management as it leads to the degradation of heritage buildings resulting from a general unsupportive attitude towards any action [6]. Underlying principles, theories, and explanations about integrating heritage management and development fuel serious debates at numerous levels although researchers have not fully explored the evidence of its successful implementation. Hence, the continued occurrence of significant diversity in heritage buildings that involve people from different ethnic backgrounds indicates the intimate interconnection between heritage management and poverty eradication. Therefore, heritage management initiatives need to simultaneously address the two challenges to achieve durable and tangible outcomes.

The problem significantly arises from the vague and elusive definition of the word "community". The most useful definition of a community is its description of a group of individuals with shared interests or a geographical area [6]. A geographical definition leads to a community's description as a group of citizens residing in a given locality. Contrarily, while considering common interests, the business sector often represents a local community by focusing on economic factors.

3.2. Diverse views of stakeholders

The literature review reveals that the diverse approach of various stakeholders hinders the successful management of built heritage. Heritage management is a fragmented initiative requiring stakeholders to collaborate and coordinate during planning even though they have diverse interests [7]. Successful heritage management planning majorly depends on stakeholders' ability to cooperate and adopt sustainable heritage management programs. Hence, the adoption of a collaborative plan is necessary as it identifies and legitimizes each potential stakeholder. The task of identifying stakeholders proves to be problematic in heritage sites without collectively organized heritage management interests. The main aim should be to involve every stakeholder who may be affected by the proposed heritage management initiative. Indeed, ensuring that all stakeholders' interests are brought together is critical during the initial stages of implementing a collaborative heritage management plan [8]. Complications further arise when it comes to the stakeholders involved in representing the local community in such initiatives.

A stakeholder is an individual or a group with the capacity and the right to participate in any given process [8]. Therefore, stakeholders in heritage management include individuals who experience the impacts of management efforts, and whose input should be considered. In this context, the heritage management stakeholders consist of everyone who may experience positive or negative impacts of the management efforts. Stakeholder involvement reduces possible struggles between the local community and heritage management organizations through the former's participation in shaping the development of the heritage management plan. Collaboration also fosters a means of ensuring that all interested factions participate in decision-making processes [7]. This can be achieved by enabling stakeholders to enjoy shared ownership by enhancing their awareness of important issues and being responsible for various activities during the management of historical sites.

4. Smart technologies

Smart cities are an integral emerging concept representing the advanced adoption of smart technologies, which can also aid architectural heritage management. Accordingly, Mohanty et al. introduce the idea in a study that familiarizes scholars with a wide range of possible research in the domain of smart cities [9]. The research highlights that smart technology is a vital component of smart cities. Smart healthcare, smart infrastructures, smart energy, and smart transportation are other crucial components of the concept resulting from the availability of smart technology options [9]. The development of smart cities and their subsequent efficiency depends on these components. Thanks to information and communication technology (ICT), the transformation of architectural heritage into smart cities is possible, because smart technologies can aid in redesigning heritage buildings to optimize the relationship among their structures, management, systems and services [9]. The response and efficient nature of smart cities depends on the closely related Big Data (BD) and the Internet of Things (IoT).

Furthermore, existing smart technology has developed significantly, indicating its maturity to allow individuals to build smart cities. However, "there is much needed in terms of physical infrastructure to build a smart city, the digital technologies translate into better public services for inhabitants and better use of resources while reducing environmental impacts" [9]. The study also provides formal descriptions. One of them is that a smart city connects physical, information technology, business, and social infrastructures to enable the city to attain its optimum intelligence levels [9]. Hence, cities can be smart by combining the various components of a smart city. All the features jointly make a city smart. The study finalizes by reporting that the available smart technology and cost determine the implementation of various smart components in the city.

Borda & Bowen also explored smart technology by reviewing milestones and future cultural heritage possibilities [10]. The study focuses on a cross-sectional review of various smart city developments worldwide and their consequences on architectural heritage management. Figure 1 shows the use of different spatial data, including data from 3D models and Geographic Information Systems (GIS), in the documentation of Ethiopia's House of Abbot Libanos according to the website developed for the Zimani

Figure 1. Navigable computer 3D model of Ethiopia's Beta Abba Libanos [10].

Project. The paper mainly assessed selected heritage management case studies and explored existing visualization platforms and smart technologies. The findings showed a specific combination of current challenges in the adoption of smart technologies. They provided an opportunity to help researchers discover the possibilities of adopting smart architectural heritage management in the future.

Cleveland Museum of Art (CMA) is an example of one of the many smart technologies used in heritage management. Smart technology facilitated the development of a digital collection wall measuring 5 feet by 40 feet.

The MultiTile system known as *The Collection Wall,* allows the thematic and real-time exploration of CMA's digital collections by multiple users [11]. Smart technology facilitates frequent updates of *The Wall* with new exhibitions and high-resolution images. Figure 2 shows the image of *The Collection Wall* in use at the Cleveland Museum of Art in 2017. The CMA also developed *the ArtLens* App to enable people to mark as "favorite" the desired artwork while on or off the museum site [11]. such technologies show how the early adoption of mobile technology in the heritage management sector, to support and manage users, can enhance and improve the visitor experience. Therefore, smart technology can aid in the realization of smart heritage by providing and offering innovative frontiers to curate historical narratives and heritage experiences.

Finally, the Internet of Things (IoT) is another evolving technology that scholars synonymously associate with smart cities. The technology is not yet fully operational to foster smart architectural heritage management. However, IoT can underpin various services that may adopt smart heritage management approaches [12]. Hence, *ArtLens* App and *The Collection Wall* are some of the key architected features supported by mobile devices and sensors developed due to IoT smart technology.

Built heritage is vulnerable to modern pathological effects resulting from a progressive transformation, industrialization, and urbanization that can completely change the landscape of various cities. Natural phenomena like floods and earthquakes also significantly impact strategic areas due to the seriousness and heterogeneity of activities and the quick transformation of such spaces. The literature reveals some hurdles that hinder the successful management of built heritage like stakeholders' communication and financial challenges that smart technologies can eliminate. Therefore, smart technologies can enable stakeholders to minimize architectural heritage management barriers resulting from technological hitches.

Figure 2. Image of the Collection Wall in the Cleveland Museum of Art in 2017 [10].

5. Smart technologies in heritage management

Furthermore, it also emerged that many smarter technologies have emerged since the 1950s, thereby increasing the difficulty of listing all of them [13]. However, some technologies have significantly contributed to revolutionizing the way people live. The following are some of the smart tools for minimizing stakeholder-related barriers to heritage management.

5.1. The Internet

The study revealed that the Internet is the crucial smart technology that minimizes stakeholder-related barriers to heritage management [14]. The Internet has a unique strength that makes it a formidable force behind smart approaches, including smart cities. The Internet is the unruliest and the most extensive library globally [14]. It also serves as a multimedia kiosk, research archive, town hall, social club, shopping service, and international news channel.

5.2. Digital media

Digital media is another smart technology that can minimize stakeholder-related barriers to the management of built heritage. Digitized media like pictures, text, movies and audio, enable people to use their mouse and keyboards to edit reality [15]. This provides an easy means of fixing blemishes in photos, bad notes in songs, and overcast scenes in movies. Figure 3 below shows images of some digital media that allow the free copying of media, permanent storage without fading, and seamless sharing across the world.

Figure 3. Images of some of the digital media [16].

5.3. Mobile phones

A mobile phone is another common smart technology. Cellular phones emerged in 1947, although Martin Cooper, in Figure 4, working with Motorola, was the first researcher to make the first cellphone call in 1973. Cooper tested the new phone outside Manhattan by ringing up his rival, AT&T Bell Labs [17-18].

Mobile phone ownership has grown exponentially in recent years, as Pew Research Center reports that over 5 billion individuals in the world own mobile devices [19].

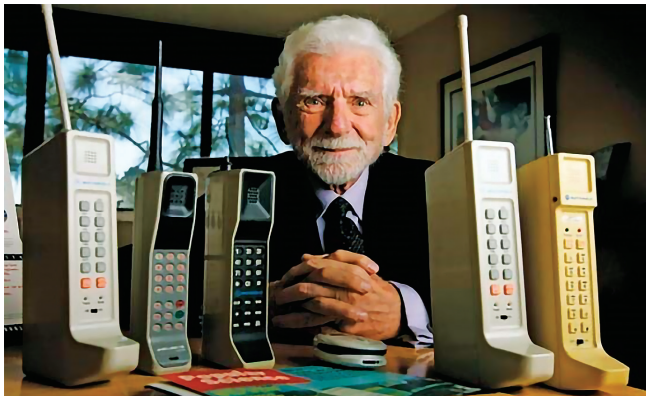

Figure 4. Image of Martin Cooper, Motorola's first researcher who made the first call in 1973 [20].

5.4. Electronic funds transfer (EFT)

EFT facilitates the transfer of money between accounts. The accounts where the money is being transferred can be from the same, or different financial institutions [21].

Figure 5. Images of the most popular e-wallets [22].

A computerized network electronically facilitates the transfer of funds. Electronic banking is another name used to denote EFT since it allows people to move money without paperwork. Figure 5 shows some of the most popular e-wallets that facilitate EFT. Smart technology supports various payment types, including ATMs, direct deposits, PC banking, debit cards, and wire transfers.

5.5. Personal computers

Personal computers (PCs) are also critical digital technologies designed to be used by one individual at a time. Typically, a PC's assembly consists of the control, arithmetic, and logic circuitry of a computer, which forms the central processing unit (CPU) [17]. The second component of a PC is the computer's main memory, known as random-access memory (RAM), alongside read-only memory (ROM), which includes an auxiliary memory, such as hard disks and DVD-ROMs, memory sticks, flash drives, USBs, and other technologies. The personal computer's final component consists of input and output devices like a mouse, display screen, printer, modem, and keyboard, as shown in Figure 6.

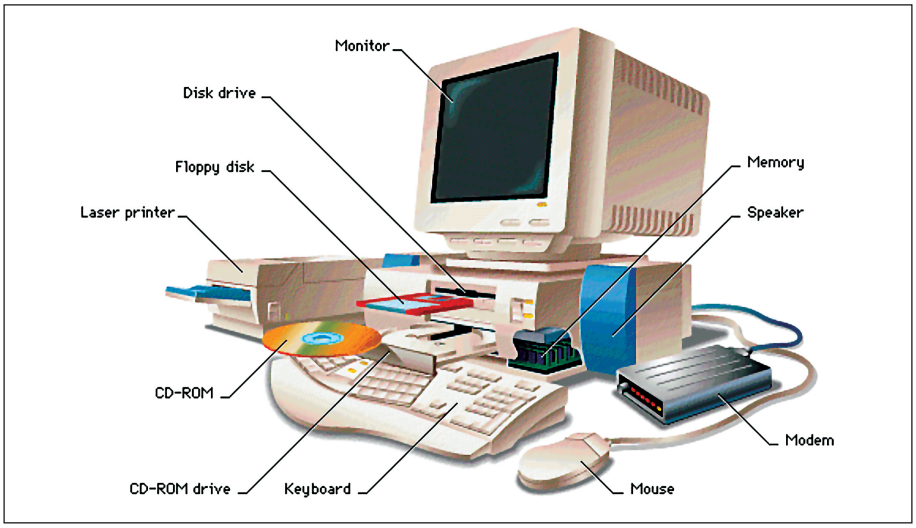

Figure 6. Parts of a Personal Computer [23].

6. Smart technologies-based solutions to stakeholder-related problems of heritage management

The review of various built heritage management literature reveals a gap in the study of how common smart technologies can reduce stakeholder-related barriers to heritage management. Smart technologies can minimize the issue of excluding local communities in the planning of heritage management. The diverse views of stakeholders are also an integral hindrance to the management of architectural heritage. However, some common smart technologies can play a significant role in reducing such barriers.

The internet is the first common technology to eradicate local communities' exclusion from heritage management planning [14]. One of the main reasons for the local community's exclusion is the lack of information or knowledge about their role in managing built heritage. However, the internet provides a solution to this problem by endlessly supplying information and allowing people to learn about the essence of their participation in heritage management. Also, digital media solves the stakeholder-related barriers to heritage management by empowering people and facilitating social interaction. As a result, collaboration can be achieved due to people's connection in numerous ways by reducing certain barriers like distance and time that may hinder collaboration [15]. Therefore, digital media can enhance stakeholders' understanding from diverse ideological, religious, social, political, cultural, and economic backgrounds.

Personal computers can further eradicate stakeholder-related barriers to architectural heritage management. Smart technology can enable stakeholders in heritage management to communicate, educate, and entertain all kinds of users. PCs can allow end-users to learn about the built heritage and have fun while interacting with shared files [17]. Similarly, mobile phones may also come in handy in minimizing stakeholder-related heritage management due to their ability to foster collaboration. Mobile phones can help stakeholders to reduce the possibility of hindering management efforts due to a lack of information [19]. Phones may also be used to send reminders, participate in video calls, and do research, all of which foster collaboration. Finally, EFT can also reduce heritage management barriers resulting from stakeholders by reducing financial constraints that may limit management efforts.

7. Conclusion

Stakeholders present a significant challenge in managing built heritage due to the positive and negative impact of such initiatives on their normal operations. However, the use of common smart technologies can minimize barriers. The management of architectural built heritage is a field that has been under investigation, especially due to traditional challenges and the advent of smart technologies. Heritage management should be a joint venture involving all stakeholders to reduce the possible challenges arising in multi-ethnic contexts where heritage selectors display their discourse. Stakeholders have diverse viewpoints on their participation and contribution to the management of heritage buildings. Therefore, it is important for organizations taking part in heritage management to consider all stakeholders' opposing and supporting views.

Smart technology is the driving force behind smart cities that presents a solution to stakeholder-related barriers to heritage management. The concept is still emerging with ongoing investigations as academia seeks to clearly define and explain efficiency, sustainability, and flexibility, while using digital technologies to benefit inhabitants by improving the city's operations. Smart technology leads to the adoption of smart healthcare, smart infrastructures, smart energy, and smart transportation, all of which smart cities significantly depend on.

In sum, these two major stakeholder-related barriers have common smart solutions in the form of the Internet, digital media, personal computers, mobile phones, and electronic fund transfers. The Internet is a common smart technology that can bolster stakeholder support for heritage management by relaying information to stakeholders regarding their heritage management role. Digital media can also help stakeholders' empowerment to promote their social interaction for efficient collaboration in such efforts.

Personal computers are another common smart technology for communicating, educating, and entertaining stakeholders to include them in managing heritage buildings. Mobile phones and EFT provide seamless opportunities as the former foster collaboration through communication and research, while the latter reduces financial constraints.

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Biographical Notes

Jawdat Salem Goussous is an architect, with a Ph. D. in Architecture. He is interested in research related to architectural and environmental resources, especially the conservation of architectural heritage of recent periods. Dr Goussous is an Associate Professor of Architecture at the University of Jordan. He earned his Ph.D. in 1991 from Kiev engineering institute, and a diploma in architecture in 1987 from Kharkov engineering institute (USSR). During his graduate studies he taught on several undergraduate courses. He has extensive academic, consultancy and administrative experience, having served as the Head of the Architecture Department, University of Jordan, for several years and participating in several specialized committees for the Greater Amman Municipality (GAM) and Ministry of Public Works and Housing among others. He has published a number of papers in his research areas of interest, which include heritage tourism, cultural resources management, cultural anthropology, and ethnology. Dr Goussous has held the position of research architect at Artex Company and represents them in Jordan and the Middle East. He also holds a teaching position in the architectural faculty at the Kiev engineering institute. In addition to architectural and environmental conservation, he is also interested in heritage tourism, cultural and environmental resources management, cultural anthropology, and ethnology; he was a teaching assistant at the Faculty of Architecture, Kiev engineering institute, USSR 1987-1991.

Summary

Heritage management initiatives often focus on minimizing human interference, an approach that often results in stakeholder related barriers. Smart technologies are an emerging aspect that provide a solution to such stakeholder-related barriers. However, academia and researchers concentrate on future possibilities and technical aspects of smart technologies, such as in smart cities, without addressing how the existing smart technology can reduce the detrimental impacts of stakeholder-related barriers to heritage management. This study investigates the stakeholder-related heritage management barriers and the possibilities of using current smart technology to eradicate them. Some of the stakeholder-related barriers include financial constraints, the ten-

dency of seeing heritage sites as hindrances to economic growth, and the exclusion of surrounding communities from decision-making concerning heritage conservation policies. The study reviews smart technology and heritage management literature to reveal obstacles to successfully adopting intelligent architectural heritage management technology. The research compares various scholarly findings, a research design that facilitates a rich and in-depth analysis of the problem in question. The study results indicate that the exclusion of local communities and diverse stakeholders' views are some of the main barriers to heritage management. Mobile phones, the internet, personal computers, electronic fund transfers, and digital media are available and straightforward smart technologies for minimizing stakeholder related barriers to heritage management. The study concludes that stakeholders present a significant challenge in managing built heritage, although standard smart technologies can reduce obstacles.

Riassunto

Le iniziative di gestione del patrimonio spesso si concentrano sulla riduzione al minimo dell'interferenza umana, un approccio che spesso si traduce in ostacoli per gli investitori. Le tecnologie intelligenti sono un aspetto emergente che fornisce una soluzione a tali ostacoli. Tuttavia, il mondo accademico e i ricercatori si concentrano sulle possibilità future e sugli aspetti tecnici delle tecnologie intelligenti, come nelle città intelligenti, senza affrontare il modo in cui la tecnologia intelligente esistente può ridurre gli impatti negativi degli ostacoli alla gestione del patrimonio legati agli investitori e a tutte le parti interessate. Questo studio esamina gli ostacoli per la gestione del patrimonio e le possibilità di utilizzare l'attuale tecnologia intelligente per sradicarli. Alcuni degli ostacoli per gli investitori riguardano vincoli finanziari, la tendenza a vedere i siti del patrimonio come ostacoli alla crescita economica e l'esclusione delle comunità locali dal processo decisionale relativo alle politiche di conservazione del patrimonio. Lo studio esamina la gestione del patrimonio per rivelare gli ostacoli all'adozione con successo della tecnologia intelligente per la gestione del patrimonio architettonico. La ricerca mette a confronto vari risultati accademici e un progetto di ricerca che facilita un'analisi ricca e approfondita del problema in questione. I risultati dello studio indicano che l'esclusione delle comunità locali e dei punti di vista delle diverse parti interessate sono alcuni dei principali ostacoli alla gestione del patrimonio. Telefoni cellulari, Internet, personal computer, trasferimenti di fondi elettronici e media digitali sono già disponibili per ridurre al minimo i suddetti ostacoli. Lo studio conclude che il coinvolgimento di tutte le parti interessate rappresenta un problema significativo nella gestione del patrimonio costruito, sebbene le tecnologie intelligenti standard possano ridurre gli ostacoli.