



## **Towards Developing the Smart Cultural Heritage Management of the French Colonial Villas in Hanoi, Vietnam**

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**Abstract:** Hanoi city was formed and inherited a unique urban heritage. Among them are the French-colonial Villas, which were constructed in the pre-1954 period. During the development process, the local government and community have always paid special attention to these heritage sites and organized many conservation and research activities. However, the management and preservation of these sites are still facing many challenges under pressure from urbanization, environmental impact, leading to the risk of being invaded and destroyed. The objective of this paper is to discuss the potential of developing the management strategy for French colonial villas in Hanoi within contemporary society using the concept of the Smart Cultural Heritage. The authors believe that will support various cultural services as well as promoting and preserving cultural heritage. It does so by presenting the results of the survey of the status of villas in the French period in Hanoi to classify and evaluate establish the regulation of use management and value conservation, build up the Big Data system. At the same time, the proposal will use smart platforms and participatory processes to encourage community access to raise awareness and assess the villas' value.

**Keywords:** Smart Cultural Heritage; Heritage management; Colonial villa; Urban Heritage; Sustainable Development

## 1. Introduction

The villas in the French Quarter, constructed before 1954 in Hanoi, French-colonial villas for short, are valuable urban heritages, as well as evidence of the history of the development of the city, contributing to generating a sense of identity to the city's urban space. The more expanding Hanoi develops, the more valuable villas are interested and preserved as cultural heritage (Hanoi capital construction master plan to 2030, vision to 2050, 2011). However, these architectural works are severely degraded, deformed and even destroyed due to various reasons. The fundamental reason is the inefficiency and shortcomings in the management, administration, and the lack of awareness towards this type of architectural heritage in Vietnam in general and Hanoi in particular. These buildings have not been evaluated, classified, and correctly recognized with their historical-cultural nature and value. The lack of official information and the ability to update and access accurate information has caused many difficulties in the management, conservation, promotion of heritage values and the development of real estate market activities for this particular type of project. In recent years, the Hanoi Authorities has enacted measures for better management of these Villas Heritage. Nevertheless, the overall situation has not seen any improvements.

Nowadays, the term "smart cities" represents a widely established development model around the world. In Europe, one of the cradles of world culture and civilization, home to many historic urban landscapes of the world (UNESCO, 2019). There are more than 240 medium and large-sized cities developing smart city goals and implementing smart city programs (Euractiv, 2017). It is a clear demonstration that most cities that pursue the smart city orbit can also own remarkable cultural heritage assets. They cannot deny and be indifferent towards their history, culture, and tradition. Thus, facing the constant change of times, the preservation and behavior towards cultural heritages based on technological solutions, management and the participatory process are gradually generating impact and gaining attention from researchers.

Vietnam, in general, and Hanoi, in particular, is no exception to this trend with the policy of developing sustainable smart cities in Vietnam, of which Hanoi is the pioneer city (Decision No. 950/QĐ-TTg dated August 01, 2018 of the Prime Minister). However, the concept of smart management and smart cultural heritage management in Vietnam still leaves a void in the research area and is not yet realistically applicable. Numerous researches in the world indicated that despite the significance of developing values of local cultural heritage, the promotion of the values on the basis of preserving local cultural heritage remains just a fragmentary goal in smart city strategies. (Angelidou, M. and Stylianidis, E, 2020), (Borda, A and Bowen, J, 2017) This represents a missed opportunity to use the element of cultural heritage as a reference point for local innovation. Cultural heritage is a powerful tool that contributes to building the identities of cities and increasing their attractiveness. With good management, heritage sites can promote economic activities and become the center of creativity, culture, community interaction and social integration. During 2010 – 2012, our research team from the Urban & Architectural Institute — National University of Civil Engineering (UAI) has conducted and announced results from the project of reviewing, classifying, and cataloging French-colonial villas in Hanoi city and proposed a direction to preserve and promote the values of the French Quarter of Hanoi city (UAI-NUCE, 2012). In this paper, based on the above results, the research team proceeds to develop and expand the research issue with the objectives as followings:

- (1) Clarifying the definition of smart cultural heritage management, in which the research objects are French colonial villas in Hanoi;
- (2) Investigating the scientific basis and determine the basic concept of smart cultural heritage management in the context of developing Hanoi city toward the "Smart City" model;
- (3) Developing a management method for French-colonial villas based on the support of smart technologies and the participation of stakeholders such as authorities, departments, people, businesses with harmonic and responsibility.

## 2. Methodology

This paper is drawn from the case study approach, literature review, analytical research, and experimental research.

- **Case Study:** Our team used a case study approach (Yin, R. K, 1994), (Siggelkow, N., 2007) to research on building management methods for French colonial villa heritage in Hanoi with the focus on the application of smart technology in managing architectural heritages.
- **Literature Review:** In our case study, the research subject's current context along with the relationship between the management of cultural heritage and the development of intelligent technologies, the theories, concepts, fundamental issues have been determined through desk study.
- **Analytical Study:** We have conducted a quantitative analysis of documents on heritage management methods in 2 ways: the traditional way and the use of digital technology that has been applied today in Hanoi and the world to show how to determine the method of operation, implementation, and its outcomes.
- **Syntheses and Comparison:** The following step is considering the results and analyzing them to find answers to the research questions by comparing these results to hypotheses, information on different references.

- **Applied Study:** Research on the application of the Smart management method in the French colonial villa heritages in Hanoi and analysis on its application on factors and principles of the preservation of cultural heritage.

### 3. Theoretical study

#### 3.1 Cultural Heritage

The term ‘heritage’ has many interpretations, depending on the background and interests of the party involved. It can be tangible or intangible, movable or immovable, old or new, privately, or jointly owned (Ahmad, Y, 2006). In the past, individual buildings or monuments, such as churches and temples, were often regarded as heritage ‘assets’. Nowadays, it is assumed that the entire environment (or place) of a heritage asset is of great importance and is being affected by its relationship with humanity. (Ahmad, Y, 2006), (UNESCO, 1972), (ICOMOS-2008). It can be said that all aspects of the past and present of a community that they consider valuable and want to pass on to future generations are heritage. Heritage, therefore, is valuable and cannot be recreated.

#### 3.2 Cultural Heritage Management

In the last decades, cultural heritage has suffered the consequences of urbanization, industrialization, climate change, pollution, and great pressure from tourism development (Jokilehto, J., 2005). Before the 1970s, there was no proper practice in the world to manage cultural heritage, mainly using the "conservation" approach to protect these monuments (Boztaş, F., 2014). Research on heritage management dates back to the 1970s, and this concept was first used by The International Council on Monuments and Sites (ICOMOS) on the International Commission on Archaeological Heritage Management (ICAHM). During this period, the concept of Cultural Heritage Management was studied towards several areas related to cultural and archaeological resource management, management of historic buildings and sites, monitoring, and evaluating historical heritage. In the 2000s, the approach to Cultural Heritage Management was changed globally with the concept of sustainability becoming a crucial principle for heritage conservation (Jokilehto, J., 2005); moreover, many conservation projects in Europe and Asia have adopted this approach (Li J., Krishnamurthy S., Roders A. P., Wesemael P. V. , 2020), (Rowe, C., 2010). They have been shifted from a "conventional approach" that gives more attention to the heritage site itself to a "human approach" paying attention to the relationship between the site and the visitors to ensure the quality of the visiting experience (Rowe, C., 2010), while adhering to heritage conservation principles and practices. Furthermore, the participation of the local community in managing heritage and ensuring their benefits has become one of the most dominant principles in cultural heritage management (UNESCO, 2013), (Phillips, A, 2003). This approach aims to conserve, manage individual and diverse elements of the heritage site; relevant to the expansion of society and its changing needs; and make it sustainable for future generations through its creative use (Boztaş, F., 2014), (Jureniene, V., & Radzevicius, M, 2014), (Mangialardi, G. Corallo, A. Esposito, M. Fortunato, L., Monastero, A., & Schina, L., 2016).

**Table 1 - A new paradigm for protected areas (Meijer, A. & Rodríguez B., Manuel P, 2015)**

Topic	As it was: Protected areas were...	As it is becoming: Protected areas are ...
Objective	<ul style="list-style-type: none"> <li>• Set aside for conservation</li> <li>• Established mainly for spectacular wildlife and scenic protection</li> <li>• Managed mainly for visitors and tourists</li> <li>• Valued as wilderness</li> <li>• About protection</li> </ul>	<ul style="list-style-type: none"> <li>• Run also with social and economic objectives</li> <li>• Often set up for scientific, economic and cultural reasons</li> <li>• Managed with local people more in mind</li> <li>• Valued for the cultural importance of so-called ‘wilderness’</li> </ul>
Governance	<ul style="list-style-type: none"> <li>• Run by central government</li> </ul>	<ul style="list-style-type: none"> <li>• Run by partners and involve an array of stakeholders</li> </ul>
Local people	<ul style="list-style-type: none"> <li>• Planned and managed against people</li> <li>• Managed without regard to local opinions</li> </ul>	<ul style="list-style-type: none"> <li>• Run with, for, and in some cases by local people</li> <li>• Managed to meet the needs of local people</li> </ul>

Wider context	<ul style="list-style-type: none"> <li>• Develop separately</li> <li>• Managed as “islands”</li> </ul>	<ul style="list-style-type: none"> <li>• Planned as part of national, regional and international systems</li> <li>• Developed as “networks” (strictly protected areas, buffered and linked by green corridors)</li> </ul>
Perceptions	<ul style="list-style-type: none"> <li>• Viewed primarily as a national asset</li> <li>• Viewed only as a national concern</li> </ul>	<ul style="list-style-type: none"> <li>• Viewed also as a community asset</li> <li>• Viewed also as an international concern</li> </ul>
Management techniques	<ul style="list-style-type: none"> <li>• Managed reactively within a short timescale</li> <li>• Managed in a technocratic way</li> </ul>	<ul style="list-style-type: none"> <li>• Managed adaptively in a long-term perspective</li> <li>• Managed with political considerations</li> </ul>
Finance	<ul style="list-style-type: none"> <li>• Paid for by taxpayer</li> </ul>	<ul style="list-style-type: none"> <li>• Paid for from many sources</li> </ul>
Management skills	<ul style="list-style-type: none"> <li>• Managed by scientists and natural resource experts</li> <li>• Expert led</li> </ul>	<ul style="list-style-type: none"> <li>• Managed by multi-skilled individuals</li> <li>• Drawing on local knowledge</li> </ul>

According to The Operational Guidelines for the Implementation of the World Heritage Convention in 2008 of UNESCO, the stages of “determining the location’s features, determining factors that influence management and the formation of management, implementation, and supervision” are the foundational elements of planning, programming, and financing in cultural heritage management.

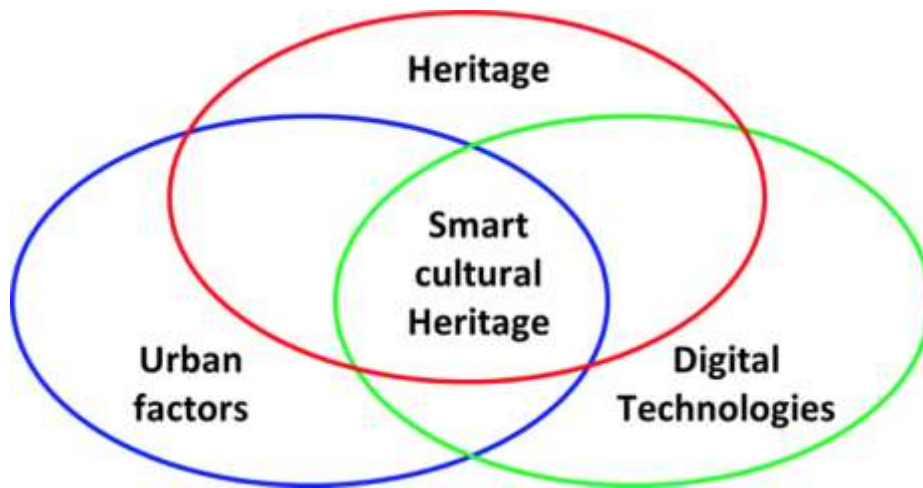
### 3.3 Cultural Heritage and Cultural Heritage Management in Smart Cities Environment

Recently, the term ‘smart’ has become a trend and used widely as a synonym of almost everything considered modern and intelligent (J. Ramon G.G., Jing Z., Gabriel P.C., 2016), (Cellary, W, 2013). Some definitions of smart cities emphasize information and data technology, while others highlight their sustainability, openness, innovation, and resilience. In general, many authors claim that all definitions of smart cities describe the same or very similar phenomenon regarding the use of infrastructure and services based on information technology — media to enhance the urban life of the people, the society, the governance, the economy, the movement and the environment (Anthopoulos, L. G., & Reddick, C. G., 2016), (Gil-Garcia, J.R., Pardo, T.A. and Nam, T. 2015), (Allam, Z., & Newman, P, 2018). Nowadays, the definition of the term "smartness" not only covers the use of smart technology from the technical perspective but also includes the use of smart technology from the human perspective, with the active role of the human in daily use and management. Carlo Ratti and the philosophy of “Senseable cities” (Carlo Ratti, 2020) have proved this. He believes that new advanced technologies can anticipate and respond to people needs. In which, “smart innovation” is a collaborative effort of different opinions and feedback. Citizens should become active participants in shaping urban space while the government needs to develop mechanisms to receive and act on public input. It is similar to the concept of “Participation culture” in the context of a “smart city”. Thanks to the explosion of digital technology, especially internet and mobile phones, people no longer limited by barriers of information and communication. They can freely contribute ideas, share experiences, introduce their values and believe that their contributions have value (Jenkins, H., 2009). The above researches all show the significance of management, culture and community involvement in the development of smart cities.

In the present society, most statements acknowledge the contrast between technology and culture, the confrontation between development and conservation. However, in the context of "smart cities", the framework of a smart city is a combination of all three factors: Culture, Metabolism, and Governance (Angelidou, M., Karachaliou, E., Angelidou, T., & Stylianidis, E., 2017). In particular, cultural heritage gradually becomes an industry that contributes significantly to the economic growth of the city, attracting millions of tourists to visit. This achievement is by applying the advanced technology, smart governance, operated with the participation of stakeholders: authorities, architectural experts - urban planners, heritage experts, residents and others (Angelidou, M. and Stylianidis, E, 2020), (Borda, A and Bowen, J., 2017), (Siountri, K., & Dimitrios, V. D, 2018).

According to Italian researchers (DATABENC, 2014), the concept of "Smart Cultural Heritage" is about digitally connecting organizations, visitors, and objects in dialogue. Traditional patterns of heritage dissemination are the teaching:

experts transmit information to people. The “smart” legacy means adopting more participatory and collaborative approaches, making cultural data available for free (open), and thus increase opportunities for interpretation, content management, and testing. The new approach works attracted the participation of local communities, strengthen accountability and their sense of ownership. The involvement of the community is the motivation for the change method of heritage conservation (Community Involvement in Heritage Management Guidebook in cooperation with Joint Project European Union / Council of Europe COMUS and EUROCITIES, 2017). That is quite similar to the statement of Siountri & Dimitrios (2018). They believe that to make the Heritage “smart” it is necessary to have the parameters of the cultural heritage of the City. These cultural indicators should be considered as a key to community infrastructure, shaping a city, its social composition through its social customs and ethics. Smart heritage indicators need to be standardized, consistent, collated, updated over time, and space with the purpose of smart governance, emphasizing cultural and architectural features. In other words, Smart Cultural Heritage can serve to preserve the identities (tangible and intangible) of places and communities by using smart technologies. (Fig. 1)



**Fig. 1 - The smart cultural heritage concept combines all the urban Factors, the novel digital technologies with tangible and intangible heritage of the city (Siountri, K., & Dimitrios, V. D, 2018)**

Besides, "smart management" is also an increasingly popular topic. There has not been a standard and widely accepted definition for "smart management"; however, it appears to be the next step towards e-government with governments/managers utilizing technology and innovation to gain more efficiency (Anthopoulos L.G., 2017), (Anthopoulos, L. G., & Reddick, C. G, 2016). In a study by Meijer et al. (2015), they distinguished the concept of "smart governance" through managing the foundational elements of a smart city. It is creating a new form of human cooperation by using information and communication technology to create a large data source and an open - accessible management process. In this conceptualization, smart governance is just the governance of a smart city, which is about making the right policy choices and implementing these effectively. This theory can fully apply to the concept of Smart Cultural Heritage Management. The goal of Smart Cultural Heritage in terms of governance shows two legal criteria. The output criterion is sustainable heritage conservation and development. The process criterion is the assurance of community participation, and there is plenty of open space for cooperation in the development process.

Across the literature, there is a common set of key technologies that are supporting the implementation of Smart Cultural Heritage as Table 2 below (Borda, A and Bowen, J, 2017), (Garau, C., 2014)

**Table 2. Recommendations regarding implementing technology in cultural heritage**

No	Technologies	Features	Application
1	<b>Internet of Thing (IoT)</b>	An extensive network of Internet-connected devices, including smartphones, tablets, and any other devices/objects with embedded capable sensors of transmitting data across the internet. These ‘things’ collect and exchange data through networks in real-time.	To connect between the community and heritage management to notify the phenomenon of deformation or degradation of the heritage during use.

2	<b>Cloud computing</b>	The provision of on-demand computing resources through the internet via applications to information centers. It provides a flexible and fast framework to connect websites, people and applications securely and allows a large-scale sharing of information and resources.	For transmission of information on assessment indexes of classification of villas
3	<b>Wireless Sensor Network (WSN)</b>	Consists of a combination of sensory devices using wireless links (radio, infrared or optical) to coordinate the task of collecting dispersed data on a large scale, under any condition, in any geographic area.	For monitoring management, people can detect negative conservation-related phenomena and share them in the community.
4	<b>Mobile broadband</b>	A term referring to the access to wireless Internet through a mobile modem, a USB wireless modem, a tablet/smartphone, or a different mobile device.	Allow diverse uses of intelligent tools in the community.
5	<b>Short range wireless</b>	A wireless sensor network technology with short range, from a few centimeters to several meters (e.g. Bluetooth)	
6	<b>Artificial Intelligence (AI)</b>	A wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. The efficiency of the models depends on the quantity and quality of the data, which can be obtained by applications, cameras, and sensors.	Support survey, anticipating the change and transformation in the process of heritage use. Support interpretation and presentation of heritage through the interaction applications with the user.
7	<b>2D/3D visualization</b>	Using graphic soft wares to create 3-dimensional or 2-dimensional drawing of the architectural landmarks existing in the public space.	
8	<b>Geo-visualization</b>	A set of tools and techniques to assist the analysis of spatial data by using interactive visualization, in which the map can be overlap with additional information based on map coordinates and geographic information systems (GIS).	Monitor changes in geospatial space when new buildings appear, or environmental impacts on heritage.
9	<b>Augmented Reality (AR)</b>	An interactive experience where objects are the combination of data, graphics, sound, and other sensory enhancement in a real-world environment and displayed in real-time.	Support to promote heritage values, the image of heritage, increase the service experience to develop public awareness and sustainable tourism.

### 3.4 The perception of Smart Cultural Heritage in Vietnam Context

Over the past years, the preservation and promotion of cultural heritage in Vietnam have achieved remarkable results, thanks to the way of heritage management and the use of digital technology. There have been significant improvements

contributing to creating attractive tourism products, attracting millions of visitors to visit. However, the cities are still facing many challenges related to the relationship between conservation and development, economic development and cultural identity preservation, towards the model of "Smart City".

Vietnam has a system of legal policies to manage and protect cultural heritage. Starting in 1945, President Ho Chi Minh approved "Assigning tasks for the Institute of Oriental Studies" to preserve all the "antiques" in the entire territory of Vietnam. In 2001, the National Assembly of Vietnam enacted the Cultural Heritage Law, which was amended and supplemented in 2009. More than four years later, on November 29, 2013, the Ministry of Culture, Sports and Tourism issued Decision No. 4227 / QĐ-BVHTTDL approving the Strategy for the development of science and technology for the culture, sports and tourism sector for the period 2013-2020, with a vision to 2030. Regarding the application of advanced technology in conservation, many legal documents have been assigned and completed. (Loan, Tù.,2019) However, at the time of their issuance, there was a gap in the system to approach the industrial revolution 4.0. The application of technology in heritage conservation and promotion has not been considered properly.

In Vietnam, the application of heritage conservation technology begins through the digitization of massive data on ancient colonial heritage architecture documents preserved in the National Archives Institute. Recently, high technology has been applied more and more, with the emergence of virtual museums, virtual relics through virtual reality technology; 3D, 4D film technology. The automatic narrative system, the heritage data system is connected, shared, extracted more and more modern. Some examples for the new technologies applied to heritage in Vietnam are 3D digital ancient Community house Tien Le, Temple of Literature - Quoc Tu Giam, Opera House, National Museum and some French-style architectures (Hanoi), Hoi An old town (Da Nang), Tu Duc mausoleum, An Dinh palace, Long Van Khe Hoi painting (Hue ancient capital). In particular, the Tomb of Tu Duc was put into the Google Art and Culture application by Google Corporation. The application of 3D technology creates an online museum that allows a close-up view of the world's heritage. In addition to the above applications, many agencies and units have built applications, put on the platform of iOS or Android software for people to download to phones, tablets and experience the legacy with ease. In some central districts, recently, residents have been instructed to apply software on mobile phones to monitor fire safety in residential areas. Experts are proposing the Hanoi Old Quarter Management Board to connect more mobile software to monitor "heritage health" and phenomena of heritage destruction. From there, the authorities will promptly receive information and take actions to handle it.

Although initially approaching new technologies of the era, the preservation and promotion of heritage in Vietnam still have a large gap compared to the world. Technologies such as artificial intelligence (AI), combined with the internet of things (IoT), attach electronic chips of artifacts to continuously collect information about the state of objects, or use biotechnology in conservation still quite strange in Vietnam.

Besides, investment in technology application makes a big difference in the preservation of public and private heritage works. The special-type monuments are mostly owned and used by the Party agencies, the Ministry of Foreign Affairs and the Ministry of Defense. They are regularly maintained, repaired and archived the information at the National Archives Center. Meanwhile, private-owned buildings always lack regular management and maintenance. There are no statistics on the damage to the estate during its use and the general maintenance plan. That leads to disruptions in the management system, statistics and the ability to identify this heritage in the community.

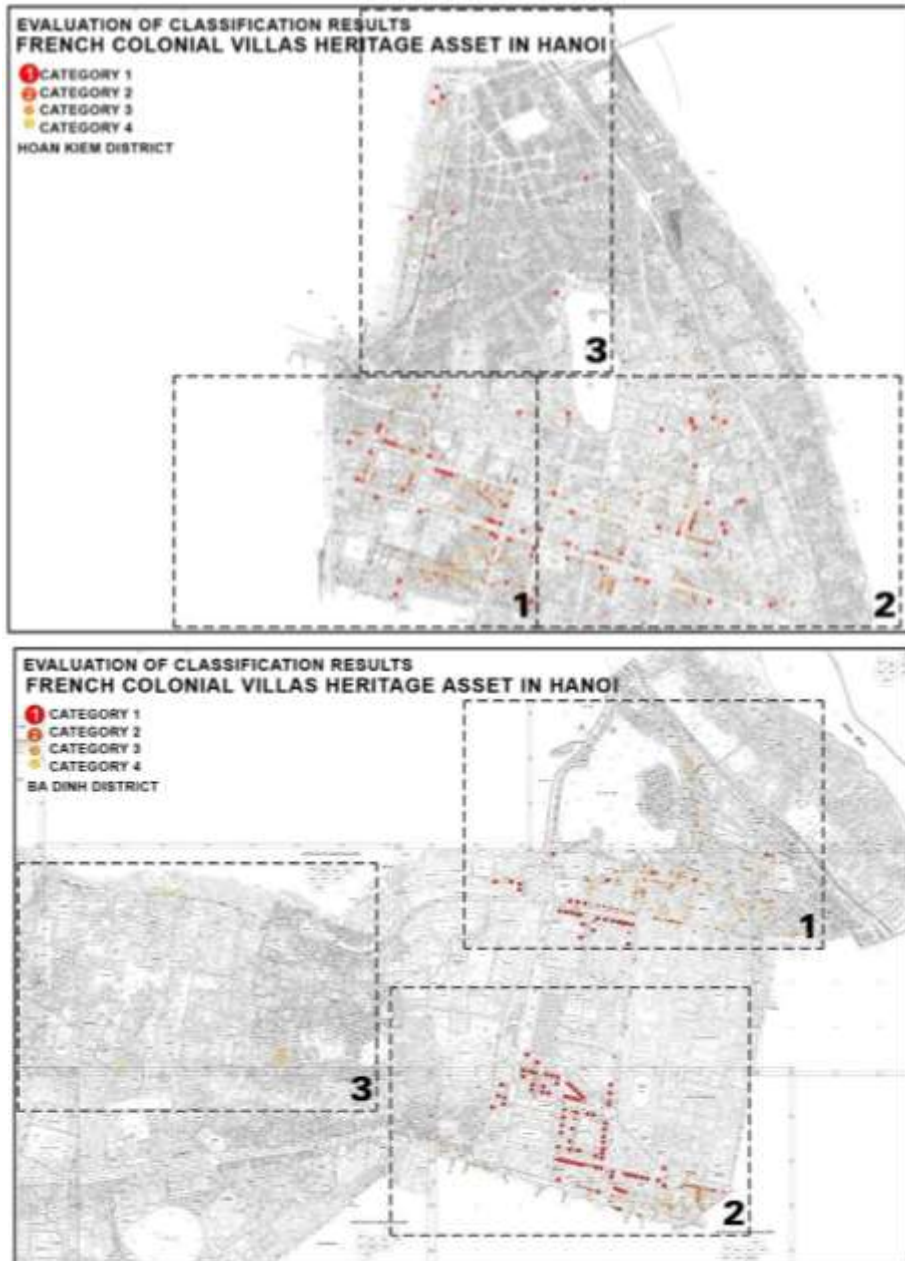
## **4. The French-Colonial Villas in Hanoi**

The French-Colonial Villas that were constructed before 1954 in Hanoi is a valuable urban heritage, as one of the last intact French-colonial architectural collections in the world with more than 1000 villas remaining and still in use.

### **4.1 Location, History of Development, Heritage Value**

First appeared from 1888 to around 1954, the new constructions were built by the French along the first modern urban area of Hanoi, starting from the French Concession, a plot of land on the banks of the Red River, across Hoan Kiem Lake to the West side of Hanoi. After World War I, to restore the economy, France carried out the second colonial exploitation program; which was implemented by expanding urban areas and encouraging production, business, and commercial activities of the indigenous community instead of prohibiting or restricting like before (Bao, T.Q. and Dinh, N.V, 2012), (Hoang, Đ.T., 1999). During this period, French construction contractors were permitted to build many villas in the Western area of the city (Ba Dinh District today) for leadership class and in the Southern (a part of Hoan Kiem District and a part of Hai Ba Trung District today) for officers and civil servants.

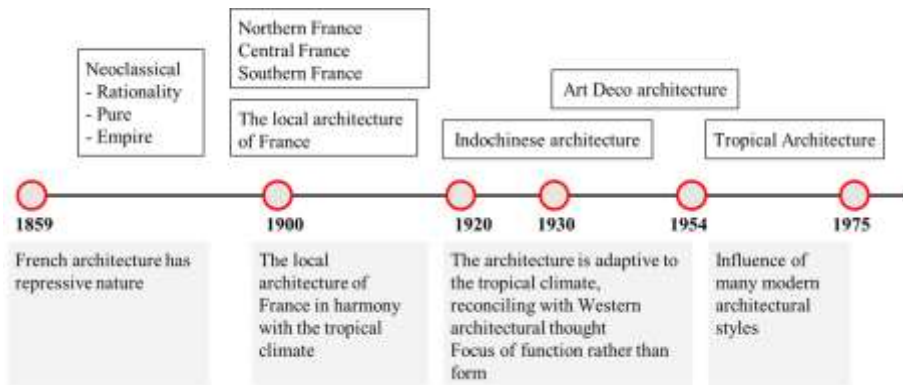




**Fig. 2 - a,b** The map of French colonial villas heritage asset in Ba Dinh and Hoan Kiem District, Hanoi (UAI-NUCE, 2012)

The scale of the construction and the size of the plot of land are different based on the owner's title. In terms of architectural styles, the variety in form and style depends on the time this type of French colonial villas entered Vietnam. For instance, most villas constructed before 1900 featured the Neoclassical architectural style of Europe. In the next period to 1920, the local French architectural style was dominant. People can distinguish villas' architectural features of Northern, Central, and Southern France through roof shapes with differences in slopes. The roof in Northern French villas is much steeper than that in Southern French villas. However, from 1920 to 1930, the integration of the symmetrical layout style of Europe and architectural forms from Indochina countries (Vietnam, China, Khmer) created the Indochina style in these villas, which is not only familiar aesthetically but also in harmony with the local climate. In the last period — from 1930 to 1954, a majority of villas had the Art Deco architectural style, demonstrating the combination of the Eastern and Western culture; the interference of the Vietnamese and French architecture; which prioritized functionality over appearance; forms and shapes over decoration. (Khoi, D.M., 2020) (Fig. 3, 4)





**Fig. 3 - Diagram of development history of French colonial architecture in Hanoi (Ho Chi Minh City Department of Planning and Architecture, 2017)**



**Fig. 4 - Typical villas in downtown Hanoi in the list of conservation (Khoi, D.M., 2020)**  
**From left to right, up to down: a) Villa No. 107 Tran Hung Dao, Hanoi- European Neoclassical style; b) Villa No. 4 Le Hong Phong, Hanoi- local architectural style in Central France; c) Special letter No. 4 Ly Nam De, Hanoi - Indochina style; d) Villa at 58 Nguyen Thai Hoc street, Hanoi - Art Deco style**

#### 4.2 Current Research Situation of France Colonial Villa Heritage Management in Hanoi

Despite holding the potential for development in both cultural - social-economic value, the law still leaves some "gaps" in the management of these villas. Therefore, along with the loose and ineffective process management, long-term usage and the process of urbanization have caused French colonial villas in Hanoi to degrade, deform, divide using space and no longer retain the original architectural value.

According to the Hanoi Department of Construction in 2008, the city currently manages 978 state-owned villas out of a total of 1540 villas in general, accounting for 63.5, which are including 42 not-for-sale villas, 228 villas not yet sold; 164 villas completely sold; 536 villas partly sold (of which 55 villas have architectural values). Thus, the number of private-managed villas is 562, taking up 36.5%. Also, the number of buildings managed by the Office of the Party Central Committee, Ministry of Foreign Affairs, Ministry of National Defense, Ministry of Public Security is estimated to be more than 200. The survey's results show that villas staying intact account for 15 percent; renovated, and repaired villas that were deformed during usage take up to 80 percent; lastly, the percentage of demolished and reconstructed one is 5 percent. Otherwise, there is 50 percent of villas having 5 to 10 households; while one's having 10 to 15 households is about 40 percent; some exceptions have up to 35 to 50 families sharing the same building. Due to the arrangement of too

many households in a cramped space, disputes regarding possessing the property often occur, many buildings were renovated, deformed and their original valuable features were damaged. Therefore, 235 villas have been assessed as category 4 and removed from the list of villas.

**Table 3 - a,b,c,d Summary of survey results of French villas in the area of four districts of Hanoi in 2008**

No	District	Number of villa in Hanoi				Total
		Category 1	Category 2	Category 3	Category 4	
1	Ba Dinh	117	136	218	88	559
2	Hoan Kiem	87	190	269	94	640
3	Hai Ba Trung	24	100	148	33	305
4	Dong Da	0	5	11	20	36
	<b>Total</b>	<b>228</b>	<b>431</b>	<b>646</b>	<b>235</b>	<b>1540</b>

No	District	Number of state-owned villas				Total
		Category 1	Category 2	Category 3	Category 4	
1	Ba Dinh	41	65	151	79	336
2	Hoan Kiem	36	129	170	88	423
3	Hai Ba Trung	19	65	79	30	193
4	Dong Da	0	2	4	20	26
	<b>Total</b>	<b>96</b>	<b>261</b>	<b>404</b>	<b>217</b>	<b>978</b>

No	District	Number of private-owned villas				Total
		Category 1	Category 2	Category 3	Category 4	
1	Ba Dinh	76	71	67	9	223
2	Hoan Kiem	51	61	99	6	217
3	Hai Ba Trung	5	35	69	3	112
4	Dong Da	0	3	7	0	10
	<b>Total</b>	<b>132</b>	<b>170</b>	<b>242</b>	<b>18</b>	<b>562</b>

No	District	Special Category	Number of villas in category 4			Total
			Category 2	Category 3	Category 4	
1	Ba Dinh	89	53	0	35	88
2	Hoan Kiem	60	84	8	2	94
3	Hai Ba Trung	14	27	6	0	33
4	Dong Da	0	3	0	17	20
	<b>Total</b>	<b>163</b>	<b>167</b>	<b>14</b>	<b>54</b>	<b>235</b>

The reports from the seminar on Methods of evaluating Villa Heritage in Ho Chi Minh City showed two different perspectives when it comes to assessing villas in Hanoi and Ho Chi Minh City. The presentation of experts from Hanoi proposes a quantitative method that evaluates the heritages according to five criteria with different scores over 100 points such as Historical Culture (15p), Architecture (35p), Landscape (20p), Originality (20p), Ownership (10p). On the other hand, the Ho Chi Minh City team does not support that method and proposes a qualitative approach to evaluating these villas as follows: category A, very valuable; category B is notable; Category C is valid. Ho Chi Minh City experts only propose four criteria: Cultural, Historical, Architecture, Current Status and Criteria of the Region. So basically, the view of the measure is the same in that Criterion 5 on Ownership of Hanoi is integrated into Criterion 2 - Current Status of Ho Chi Minh city.

Considering that the life of the site is constantly changing and transforming, the previous results need to be updated. In 2017, the City had the policy to revise and review this heritage asset based on the survey results in 2012. There are two possible explanations for this decision. Firstly, after five years, the condition of some villas was degraded, which can

be considered to renovate, repair, or be demolished. Secondly, many suggest that the evaluation of the villas' values at a specific time may be inaccurate since the perspectives of experts are somewhat different, and the evaluation method is still subjective, not yet logical. However, all parties agreed that the main cause leading to the loss and transformation of these villas is the traditional management process, which has many existing shortcomings.

Facing this challenge, as well as to be realistically applicable, it is essential to make changes in the method and process of managing urban heritage in general and villas in particular in Hanoi.

## 5. Research Result and Discussion

### 5.1 A Proposal of the Smart Cultural Heritage Management of French Colonial Villas in Hanoi

As discussed above, the two legal criteria of the goal of Smart Cultural Heritage Management focus on:

- Sustainable heritage conservation and development.
- The assurance of community contribution, and plenty of open space for cooperation in the development process.

Those criteria are in line with the goals of THE ICOMOS Charter for the Interpretation and Presentation of cultural heritage sites (2008). This Charter establishes seven objectives corresponding to the seven principles for the interpretation and presentation of heritage, in any form or means deemed appropriate in particular circumstances.

Principle 1: Approach and Understanding

Principle 2: Information sources

Principle 3: Pay attention to settings and context

Principle 4: Preserving authenticity

Principle 5: Planning for sustainability

Principle 6: Pay attention to inclusion

Principle 7: Importance of Research, Training and Evaluation

Besides, Vietnam's heritage management system always complies with the legal provisions on the content of state management of cultural heritage specified in the Cultural Heritage Law. (Law 32/2009/QH12 on Cultural Heritage of Vietnam, 2009)

Based on the analysis, evaluation and combination of these statements, the research team has come up with a Proposed of smart cultural heritage management of French colonial villas. This process is built with five steps and should meet the following requirements:

- Sustainable development of activities to provide information on heritage and heritage protection.
- Smart and "open - mind" administration toward heritage and community.
- Reshaping the relationships between citizenship and authorities with openness and clarity.

The process is as follows:

**Smart data supply management.** The first requirement of establishing a villa heritage file is to collect highly reliable, accurate data, documents from several different sources. The first data source is the original source from departments, boards and authorities that directly manage these French colonial villas. The second data source is the current status survey records identified at a specific point in time. In addition, resources can come from Vietnamese and foreign researchers, experts.

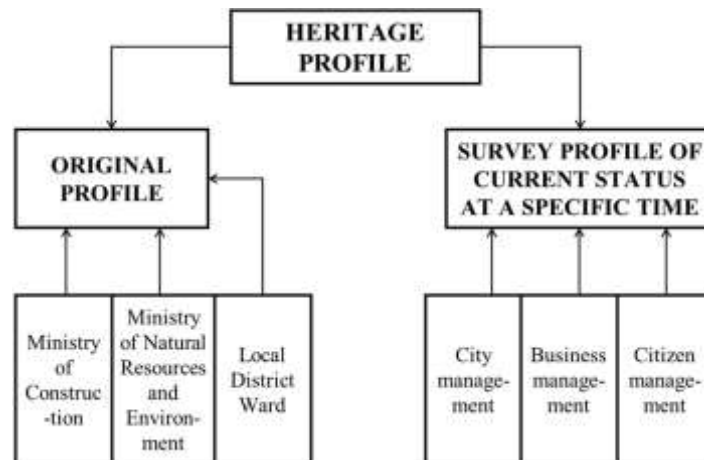
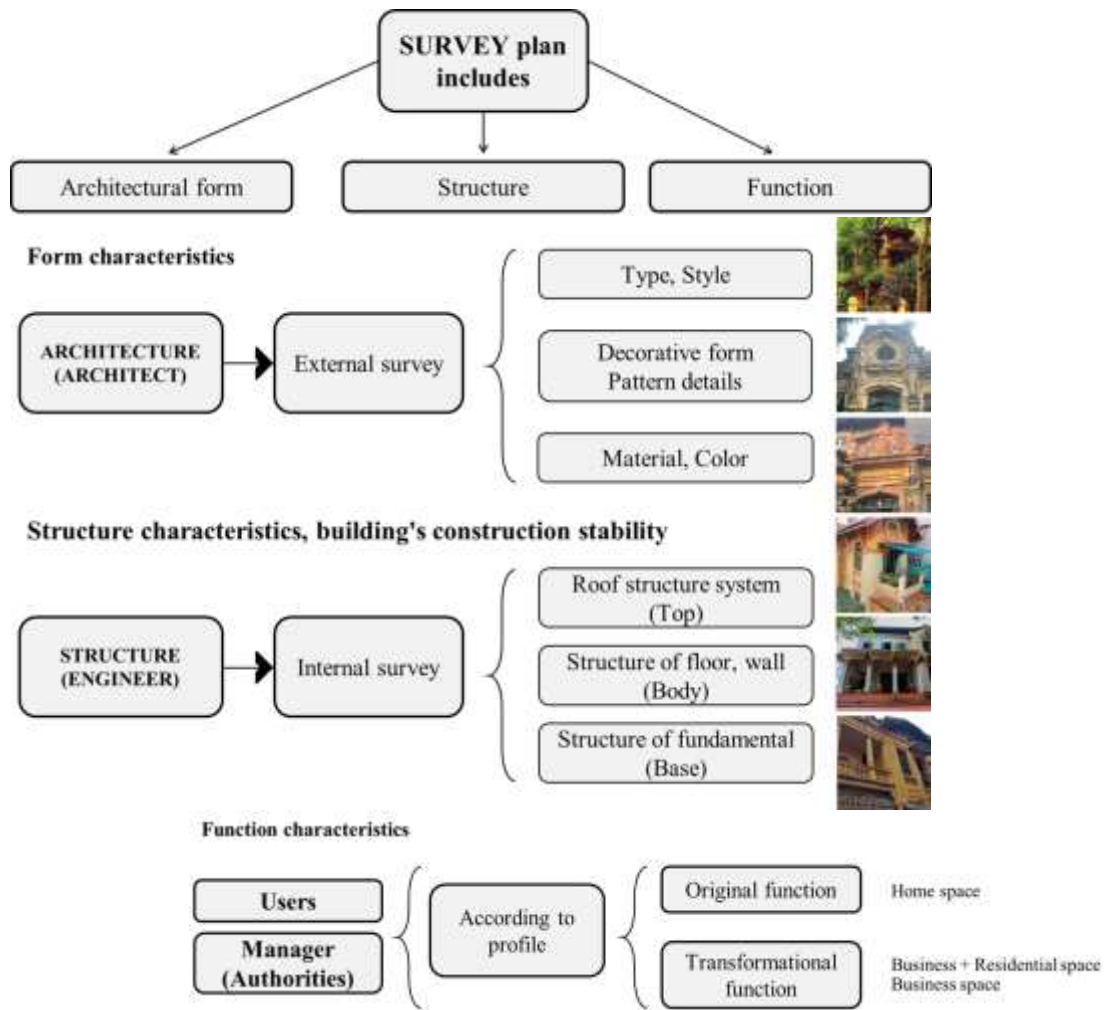


Fig. 5 - Data collection process diagram

**The smart survey program of French colonial villas.** There are three aspects on which surveys need to be conducted: the outer appearance, the internal structure, and the management of usage.

- The survey of the outer appearance is related to the facets, including three parts: the roof area, the wall area, and the base area. The survey must show two results: the form and the type of the villa’s architecture and can determine each area’s integrity.
- The survey of the internal structure relates to the bearing system: wall, ceiling, floor, pillar; describe the building deformation.
- The survey of the management of usage relating to the owner is identifying whether if there is one or many owners, they are individual or business tenant, private or state-owned. It aims to monitor the function transformation process of the villas.



**Fig. 6 - Diagram of survey program**

**The smart classification criteria of French colonial villas.** The Heritage Conservation Experts Council defines and approves the Villa Assessment Criteria and Value Scales.

Identify five criteria to evaluate heritage values with importance levels tagging assessment score (total 100 points) mapped out as follows:

- a. Historical and Cultural value (15 points)
- b. Architectural value (35 points)
- c. Landscape value (20 points)
- d. Current Situation, Originality (20 points)
- e. Functions possessed (10 points)

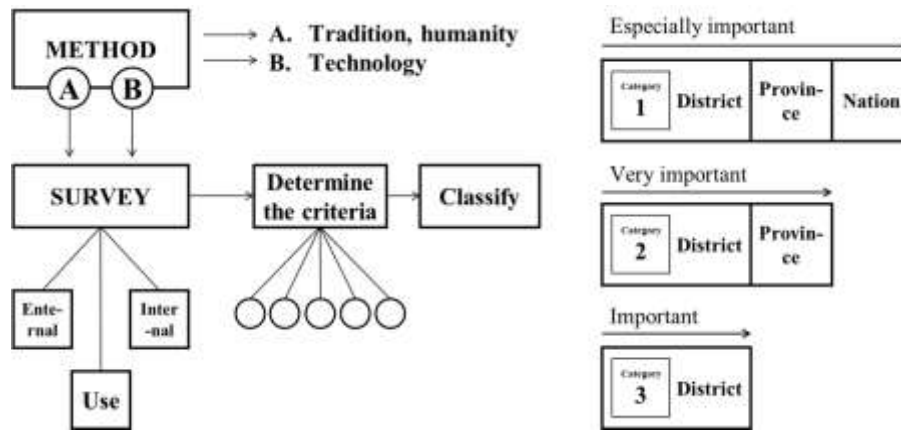
The criteria a, b, c are the stable features, considered as the heritage’s potential, needs conservation.

The criteria d, e are the features with the reciprocal impacts, considered to need exploitation for development.

**The heritage management regulations.** The management regulations are established based on the results of classifying villas according to levels:

- Type 1 is a significant value type, needs the highest protection, managed at the city-province-central level.
- Type 2 is very valuable, under the high protection at the city to the provincial level.
- Type 3 has less valuable with partly protection at the city level.

Each level should have a detailed document presenting rights and obligations of the direct management units; the order of making conservation and restoration projects; content of management activities promote the value of relics; management and use of the income of the site [Hanoi People's Committee Decision] and the level of public participation in heritage management and conservation.



**Fig. 7 - Diagram of assessment and classification process of French colonial villas**

**Community management - enhance the heritage understanding to become a smart community towards cultural heritage.** Determining primary stakeholders that directly affect the heritage:

- Implement Stakeholder: The key stakeholders who carry out the action plan of an obligation (e.g. authorities, heritage managers, conservation experts, architects, engineers, real estate market manager)
- Impact Stakeholder: The key stakeholders who will have an impact after the action plan has been carried out. (e.g. villa owners, tenants, citizens, visitors, people who have interests in French colonial villa heritage as researchers, students...)

To improve the community’s understanding of heritage, the Implement Stakeholders must be the ones who suggest and organize supporting actions following the heritage development goals. The principles encouraging community education include: (a) Provide online heritage information for easy look-up and research, (b) Propagating education of heritage through the professional society and cultural activities, (c) Training course through forums, topics introducing methods to sustainable heritage conservation, and development, (d) Enhance the attention for heritage by social activities such as sketch drawing, photographing, contests learn about heritage.

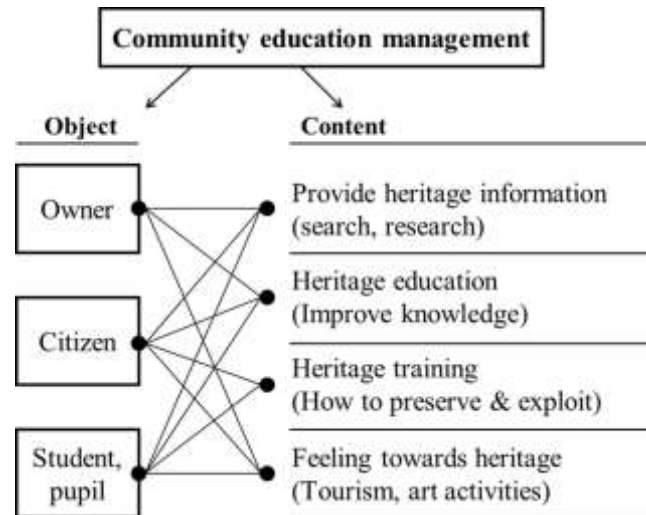


Fig. 8 - Diagram of community education management in heritage conservation

## 5.2 Smart Infrastructure for Smart Cultural Heritage Management

Currently, most cities are using 'soft' infrastructure (innovation, creativity, intelligence, and users) as the foundation for the heritage management system. Towards a smart government and community, it is essential to build a 'smart' infrastructure (new technology) that strongly links to the existing 'soft' infrastructure. This infrastructure will provide its maximum support for different stages of the mentioned proposal:

**The fact-finding phase** includes *Data supply management* and *Survey* of French colonial villas: using IoT and cloud computing infrastructure to support data documentation with technical tools such as 2D, 3D scanning; building a data warehouse on the Internet where all provided data sources are connected and exchanged regularly; and the data mapping system (for example GIS, Google Map) that synthesizes and builds accurate information maps about sites, relic protection areas such as location, plot number, plot area, current housing status, length of residence of households, number of people per household, the increasing/decreasing rate of the population, illegal housing construction and factors polluting the environment of the sites; developing a system to look up information on the digital map, and a geographic information system to support management authorities. These platforms support the management of available resources, ensuring accurate reliability, and easily accessible by stakeholders. That is the most important stage with the basic platforms supporting the next development steps.

**The diagnostic phase** includes *Survey* and *Classification* of Villas: carried out with the support from the Historic Building Information Modelling (HBIM) to identify a specific degradation over time and space, classify and evaluating the situation to determine proper steps to be taken for maintenance or recovery operations.

**The participatory phase** includes *Heritage management regulations* and *Community management*: Based on the constructed foundations in the two previous stages, develop a friendly multimedia platform for users in a smart environment. Among enabling technologies, the combination of Wireless Sensor Network (WSN) and Mobile Broadband has created convenient tools such as websites, mobile learning applications, and games, which enhance efficiently users' experience, while they can access information as well as participate in heritage activities with others anywhere. Besides, the implementation of short-range wireless technology provides the ability to identify context more detailed, enabling users to receive customized information and more realistic experience in a close distance. A solution that makes approaching cultural and educational objects more easily is the utilization of virtual reality applications, 3D models, 3D films, and "virtual visit".

In brief, with the proposed Villa Heritage Management Process as above, the authors hope it will intelligently solve problems in the management and governance of French villas in Hanoi with expected results as follows:

- Increase the quality and quantity of information that is regularly updated and accessed. Ensure the publicity and reliability of the figures, easy to access.
- Increase objectivity and accuracy in the survey, evaluation and classification of architectural heritages, in particular the French Villa, thereby offering the most reasonable and beneficial solutions.
- Increase the experience, cohesion, and participation of the community in the heritage;
- Increase the connection between the stakeholders: community, managers, investors, experts. Ensuring the accessibility and quick handling of heritage issues.

The strength of this proposal is high adaptability with the legal instruments and high-tech tools appropriate for each stage. Depending on the environmental conditions, the specific characteristics of each locality, the process can change the advanced technology applications accordingly while ensuring the work results. Nonetheless, funding for smart engineering technologies is still an obstacle. Overall, this study is a suitable model for the management and administration of cultural heritage in general and French villas in particular. The application of this model can be not only in Hanoi but also in many other cities of Vietnam carried on unique heritages such as Ho Chi Minh City, Hue, Da Nang, Hai Phong, Nam Dinh.

## 6. Conclusion

In the general context of the world and especially in Vietnam, heritage always faces challenges of development. On the other hand, it is also the pride of cities through which one can experience the cultural identity of that place. Smart management of urban cultural heritage in the case of managing French-colonial Villa heritage in Hanoi, as mentioned above include the following issues: control of data supplies; establish a survey program and monitoring villas; identify potential heritage value through villa classification criteria; identify management regulations based on collaborative networks, and public management through supporting education program on heritage conservation.

In the current conditions of Vietnam, the development of e-government is being implemented, at the same time with a relatively large smartphone penetration rate (44.9% according to Vietnam Advertising Market Report 2020 by Adsota) and network coverage mostly in the central area, is a supportive basis for the proposal.

Some limitations in preserving and promoting heritage values today are the openness in the publication of heritage classification assessments to the community. There should be a system to digitize and regularly update the status of the heritage. On the other hand, the management of the state-owned villa heritage division is more convenient than the private sector. The main reason comes from the unsynchronized infrastructure, low awareness and ability to participate in smart governance of the community. It is a matter of the management system at all levels, in which in-depth studies, multi-disciplinary solutions are needed to improve in this field.

However, with this proposal, the research team wants to focus on dealing with the core issues of a smart cultural heritage governance process that is collaborative management between stakeholders, especially between government, businesses and inhabitants. Management must focus on both sides: preservation and development of value. The proportion of them in the above proposal is currently 70/30. In the future, if the implementation of the proposed measures shows the more beneficial results, there will be an increasing rate of development without affecting the value of the heritage. It also depends on the quality of the operation of the processes that can sustain urban heritage conservation.

## References

- Hanoi capital construction master plan to 2030, vision to 2050 (2011)
- UNESCO, 2019. World Heritage Cities Programme, <https://whc.unesco.org/en/cities/> (4 January 2020)
- Euractiv, 2017. How Many Smart Cities are there in Europe? Accessed 30 May 2017, <https://www.euractiv.com/section/digital/infographic/how-many-smart-cities-are-there-in-europe/> (6 October 2018)
- Decision No. 950/QĐ-TTg dated August 01, 2018 of the Prime Minister on approving the scheme for development of smart sustainable cities in Vietnam in the 2018 – 2025 period with orientations by 2030 (1 August 2018)
- Angelidou, M. and Stylianidis, E. (2020): CULTURAL HERITAGE IN SMART CITY ENVIRONMENTS: THE UPDATE, ISPRS Ann. Photogramm. Remote Sens. Spatial Inf. Sci., V-2-2020, 957–964, <https://doi.org/10.5194/isprs-annals-V-2-2020-957-2020>
- Borda, A and Bowen, J. (2017): Smart Cities and Cultural Heritage - A Review of Developments and Future Opportunities. Bowen, JP, Diprose, G and Lambert, N (ed.) Electronic Visualisation and the Arts (EVA 2017). London, UK, 11 - 13 Jul 2017 BCS
- UAI-NUCE (2010-2012): Project “Review, classify, and catalog villa heritage asset in Hanoi”
- Yin, R. K. (1994): Case Study Research Design and Methods: Applied Social Research and Methods Series. Second edn. Thousand Oaks, CA: Sage Publications Inc



Siggelkow, N. (2007): Persuasion with case studies. *Academy of Management Journal*, 50(1), 20-24

Ahmad, Y. (2006), "The scope and definitions of heritage: from tangible to intangible", *International Journal of Heritage Studies*, 12 (3): 292-300

UNESCO (1972): Convention Concerning the Protection of the World Cultural and Natural

ICOMOS (2008), The International Council on Monuments and Sites, [http://www.international.icomos.org/quebec2008/resolutions/pdf/GA16\\_Resolutions\\_final\\_EN.pdf](http://www.international.icomos.org/quebec2008/resolutions/pdf/GA16_Resolutions_final_EN.pdf)

Jokilehto, J. (2005). Definition of Cultural Heritage References to Documentation History, ICCROM Working Group 'Heritage and Society.' (Originally for ICCROM, 1990) Revised for CIF: 15 January 2005. Retrieved May 27, 2017, from [http://cif.icomos.org/pdf\\_docs/Documents%20on%20line/Heritage%20definitions.pdf](http://cif.icomos.org/pdf_docs/Documents%20on%20line/Heritage%20definitions.pdf)

Boztaş, F. (2014). Site management plan as global norm for best local practice: Bursa. *European Journal of Research on Education*, 2, 53-61

Li J., Krishnamurthy S., Roders A. P., Wesemael P. V. (2020) : Community participation in cultural heritage management: A systematic literature review comparing Chinese and international practices, *Cities*, Volume 96, 2020, 102476, ISSN 0264-2751, <https://doi.org/10.1016/j.cities.2019.102476>

Rowe, C. (2010). Heritage management of archaeological, historical and industrial resources on the Blyde River Canyon Nature Reserve. Unpublished Doctoral thesis, University of Pretoria, Pretoria, South Africa. Retrieved May 13, 2017, from <https://repository.up.ac.za/bitstream/handle/2263/27115/dissertation.pdf>

UNESCO (2013): Managing Cultural World Heritage, [http://whc.unesco.org/en/managing-cultural-world-heritage/\(16/11/2013\)](http://whc.unesco.org/en/managing-cultural-world-heritage/(16/11/2013))

Phillips, A (2003): 'Turning ideas on their head: the new paradigm for protected areas', in: *The George Wright Forum* 20, No. 2. 2003, pp.8-32. <http://www.uvm.edu/conservationlectures/vermont.pdf>

Jureniene, V., & Radzevicius, M. (2014): MODELS OF CULTURAL HERITAGE MANAGEMENT. *Transformations in Business & Economics*, 13(2).

Mangialardi, G. Corallo, A. Esposito, M. Fortunato, L., Monastero, A., & Schina, L. (2016). An integrated and networked approach for the cultural heritage lifecycle management. *ENCATC Journal of Cultural Management and Policy*, 1 (6), 80-95.

Meijer, A. & Rodríguez B., Manuel P. (2015): Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*. 82. 10.1177/0020852314564308

UNESCO (2008), Operational Guidelines for the Implementation of the World Heritage Convention, <http://whc.unesco.org/archive/opguide08-en.pdf>

J. Ramon G.G., Jing Z., Gabriel P.C. (2016): Conceptualizing smartness in government: An integrative and multi-dimensional view, *Government Information Quarterly*, Volume 33, Issue 3, Pages 524-534, ISSN 0740-624X, <https://doi.org/10.1016/j.giq.2016.03.002>

Cellary, W. (2013): Smart Governance for Smart Industries. In *Proceedings of the 7th International Conference on Theory and Practice of Electronic Governance (ICEGOV '13)* (October 22-25 2013, Seoul, Republic of Korea), 91-93.

- Anthopoulos, L. G., & Reddick, C. G. (2016, April): Smart city and smart government: Synonymous or complementary?. In Proceedings of the 25th International Conference Companion on World Wide Web (pp. 351-355)
- Gil-Garcia, J.R., Pardo, T.A. and Nam, T. (2015). What makes a city smart? Identifying core components and proposing an integrative and comprehensive conceptualization. *Information Polity*, 20(1), 61-87
- Allam, Z., & Newman, P. (2018): Redefining the smart city: Culture, metabolism and governance. *Smart Cities*, 1(1), 4-25
- Digital Future Society, Interview Carlo Ratti (2020): "Let's use the data to better understand the city, to inform the design and to improve our lifestyle, empowering citizens to take urban action", <https://digitalfuturesociety.com/qanda/carlo-ratti/>, last accessed 2020/10/16
- Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century* (p. 145). The MIT Press.
- Angelidou, M., Karachaliou, E., Angelidou, T., & Stylianidis, E. (2017): CULTURAL HERITAGE IN SMART CITY ENVIRONMENTS. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 42
- Siountri, K., & Dimitrios, V. D. (2018): Smart Cultural heritage in Digital Cities. *Journal Sustainable Development, Culture, Traditions, SDCT-Journal*, 23-32
- DATABENC (2014) Distretto ad Alta Tecnologia per i Beni Culturali. Italy. URL: <http://www.databenc.it/en/> (retrieved 30 March 2017)
- Community Involvement in Heritage Management Guidebook in cooperation with Joint Project European Union / Council of Europe COMUS and EUROCITIES (2017). URL: [http://openarchive.icomos.org/1812/1/FINAL\\_OWHC%20Guidebook%202017.pdf](http://openarchive.icomos.org/1812/1/FINAL_OWHC%20Guidebook%202017.pdf)
- Anthopoulos L.G. (2018): Smart Government: A New Adjective to Government Transformation or a Trick?. In: *Understanding Smart Cities: A Tool for Smart Government or an Industrial Trick?*. Public Administration and Information Technology, vol 22. Springer, Cham. [https://doi.org/10.1007/978-3-319-57015-0\\_6](https://doi.org/10.1007/978-3-319-57015-0_6)
- Garau, C. (2014). Smart paths for advanced management of cultural heritage. *Regional Studies, Regional Science*, 1(1), 286-293
- Loan, T. (2019). Cultural Heritage in Vietnam With the Requirements of Sustainable Development. *International Relations and Diplomacy*. 7. 10.17265/2328-2134/2019.04.004.
- Hue city, Google Art and Culture, URL: <https://artsandculture.google.com/entity/hue/m0g7sl>
- Bao, T.Q. and Dinh, N.V. (2018): *Architecture and urban planning of Hanoi in colonial period*. Construction Publishing, Hanoi
- Hoang, Đ.T. (1999): *Hanoi architecture in XIX - XX centuries*. Hanoi Publishing, Hanoi
- Khoi, D.M. (2020) Method of evaluating villa heritage in Hanoi. Accessed 14 July 2020, <https://www.tapchikientruc.com.vn/chuyen-muc/phuong-phap-danh-gia-di-san-biet-thu-tai-ha-noi.html>
- Ho Chi Minh City Department of Planning and Architecture (2017): *Methods of evaluating Villa Heritage in Ho Chi Minh City*. CONFERENCE. Ho Chi Minh City

Hanoi Department of Construction (2008): Project "French villas management in the area of Hanoi".

ICOMOS Charter on the Interpretation and Presentation of Cultural Heritage Sites (2008), URL: [https://www.getty.edu/conservation/publications\\_resources/research\\_resources/charters/charter75.html](https://www.getty.edu/conservation/publications_resources/research_resources/charters/charter75.html)

Law 32/2009/QH12 on Cultural Heritage of Vietnam. (2009), URL: [http://vanban.chinhphu.vn/portal/page/portal/chinhphu/hethongvanban?class\\_id=1&mode=detail&document\\_id=91024](http://vanban.chinhphu.vn/portal/page/portal/chinhphu/hethongvanban?class_id=1&mode=detail&document_id=91024)