

# Digital Historic Urban Landscape Methodology for Heritage Impact Assessment of Singapore

Widodo, Johannes; Wong, Yunn Chii; Ismail, Ismail, Fauzy  
E-Mail: [m.fauzy@u.nus.edu](mailto:m.fauzy@u.nus.edu)

**KEY WORDS:** Singapore, Heritage Urban Landscape, Heritage Impact Assessment, Human Computer Interaction, Conservation, Digital Media, Interpretation, End Users

## ABSTRACT:

Digital heritage projects remain descriptive despite diverse objectives with the assumption that technology will deliver greater interpretation. The use of new and high technology may emphasise the experience and provide visual fidelity but only produce limited interpretation as technology is insufficient to provide the past from multiple perspectives. Those projects provide linear narratives developed through a top-down approach that assumes the end-users as an individual entity and limits heritage as a consumable product.

This research will probe the circumstances of this emergent technology and practice, examining issues, challenges & new opportunities. It hopes to uncover for better experience of digital heritage architecture where interpretation is an evolving 'process' that is participatory and contributory that allows public participation, together with effective presentation, cultural learning and embodiment, to enhance the end-users' interpretation of digital heritage architecture.

Additionally, this research seeks to establish an inventory in the form of a digital platform that adopts the Historic Urban Landscape (HUL) to better and deepen the understandings of the public towards architectural as well as cultural heritage through an intercultural and intergenerational dialogue. Through the dialogue, this research hopes that it will better shape conservation strategies and urban planning.

## 1. INTRODUCTION

The practice and discipline urban heritage conservation have notably progressed over the last decades as planners and policy-makers strive to deal effectively with new obstacles. These obstacles such as the extent in the momentum of development as a result of the rapid growth world's urban population, have resulted in cities and their historic areas becoming centres of economic expansion in many countries of the world. Additionally, they have taken on a new role in social and cultural life. Additionally, these urban settlements historic areas have come under an ample amount of new pressures.

As a result, the United Nations Educational, Scientific and Cultural Organization (UNESCO) have recommended the HUL as a tool to integrate practices and policies of conservation and urban planning into the wider goals of urban development with consideration of the inherited traditions and values of different cultures. The HUL approach supports communities in their quest for adaptation and development while retaining the values and attributes linked to their history, collective memory and environment.

One of the critical steps recommended by UNESCO to implement the Historic Urban Landscape tool is "to reach consensus using participatory planning" (UNESCO HUL Methodology, 2012). Additionally, UNESCO recommends using civic engagement tools to facilitate "intercultural dialogue by learning from communities about their histories, traditions, values, needs and aspirations" (UNESCO HUL Methodology, 2012).

Such civic engagement tools could come in the form of information and communication technology, such as a digital platform to understand, document and present the elaborate layers of urban areas and their integral sections. Youth in and minority groups that are usually under-represented are particularly important to be reached out to, to communicate with the society and encourage their participation.

## 2. UNESCO HISTORIC URBAN LANDSCAPE

UNESCO (2003) created a charter on the "Preservation of Digital Heritage" which defines "Digital Heritage" as intangible heritage that is born digitally or acts as a digital surrogate, and its primary role is to protect the loss of tangible and intangible data on the digital platform or within the technological domain and its features includes weaving, conservation, facilitating, representation, reproduction digital reprocessing (Roussou 2002) and actualizing heritage architecture (both tangible and intangible contents) digitally using the advancement of virtual reality technologies and simulate it using graphics technology (Reffat, Nodal 2013). However, there are scenarios where the built physical heritage architecture exists simultaneously with the digital heritage, and it produces a new realm, which the digital and physical subsist and interact (Milgram et al 1994, Siltanen 2012).

The rise in popularity of heritage architecture on the digital platform and its increasing value of the digital resources prompted UNESCO to adopt the charter. By adopting the charter, UNESCO is acknowledging heritage architecture on the digital platform as a legitimate space. Therefore, it becomes necessary for the digital platform on heritage architecture to effectively communicate, learn, store and manage the heritage architecture on the digital platform to increase the end-users awareness and empathy to the heritage architecture over time as well as across space. However, there are instances where intangible data are lost in the preservation of digital heritage (tangible data).

Consequently, UNESCO came up with recommendations for the as a tool to integrate practices and policies of conservation and urban planning into the wider goals of urban development with consideration of the inherited traditions and values of different cultures. This tool is a "soft law", and Member States implement it on a voluntary basis. HUL is a series of methodologies that will be used for heritage impact assessment (HIA) for the country.

The recommended methods are modified to suit the context of the city on which the Member States intend to implement. These methods are also used for urban planning and conservation strategies. In this project, the final digital outcome (initially a website) means to allow for analytical frameworks and processes



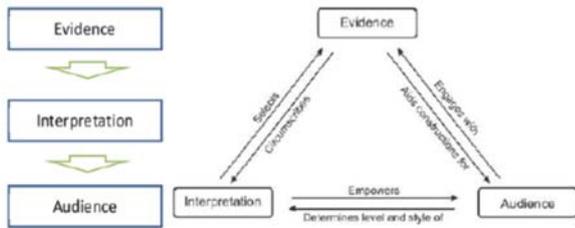


Figure 3. Copeland's Information Flow of Approaches

#### 4.2 Theoretical Model B: Langer's Model for Mindful Interpretation

The quality and quantity of contributions to, as well as the learning and understanding as a result of the digital platform, however, are dependent, as Langer argues (1989) on the cognitive state of the audience.

According to Langer (1989) the Mindfulness cognitive state occurs when an interface provides novelty, conflict or unfamiliarity that does not follow a script that is didactic, typically found in the constructivist's information flow approach. Mindlessness, on the other hand, occurs when an interface is repetitive, irrelevant and unimportant. This she states results in the audience to behave in a way that follows a cue from a script, typical of the positivistic information flow approach.

Langer also refers to two sets of factors that influence the cognitive state (Mindful or Mindless) of the audience. Firstly, communication elements which refer to the interface feature that facilities that interpretative process or method. Secondly, audience factors which refer to the state of the audience as a result of these communication factors.

The digital platform thereby should seek to have an interface that facilitates the mindful cognitive state as it brings about high levels of learning, satisfaction as well as understanding. Moreover, this cognitive state promotes mindful contributions further refining the interpretation of digital heritage as presented on the site and as a result strengthening the constructivist information flow approach. The mindless cognitive state, on the other hand, brings about otherwise and hence not facilitating mindful contributions to be made to the digital platform, weakening the constructivist information flow approach and possibly altered into one that is positivistic instead.

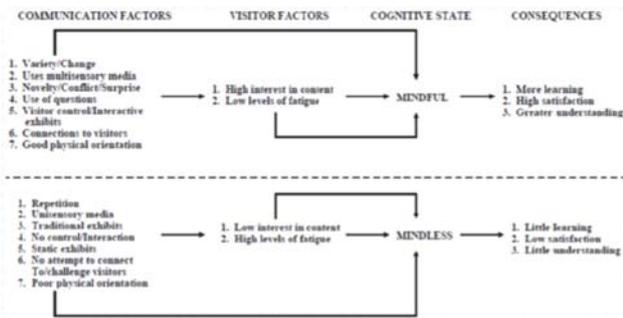


Figure 4. Langer's Model for Mindful Interpretation

#### 4.3 Theoretical Model C: Heritage Butterfly Model

mAAN created a standardised evaluation of the urban cultural heritage and property through a heritage butterfly model. The left wing represents the value of the ordinary people, and the right wing represents that of the experts. In addition to that, time-related value (the past, present & future) is also considered. The

heritage is evaluated using six factors. Hopefully, after the evaluation, there will be greater public awareness among the people of some significant heritage architecture around the city and encourage experts to think of efforts to treat the environment which is historically significant to the public.

Standards for Evaluation of the Urban Cultural Heritage and Property			
		A (Public)	B (Experts)
		<i>The large number of people except experts</i>	<i>Experts</i>
1 Past	Value in terms of Memory	- Memory of those who exist there - Memory of the humanity	- Value in the study of history
2 Future	Value in terms of Future Happiness	- Possibility for the establishment of value in the future - Generating happiness for the humanity	- Proper condition of preservation - Possibility for revitalization
3 Object	Value in terms of the Object	- Loved by the public - Valuable to the daily livelihood of the people - Giving a great degree of inspiration to the humanity	- The fact of being "Old" - Rarity - Evidence of the regional characteristics - Giving inspiration to experts

Table 1. The six factors to evaluate heritage architecture (Muramatsu et al. 2007)

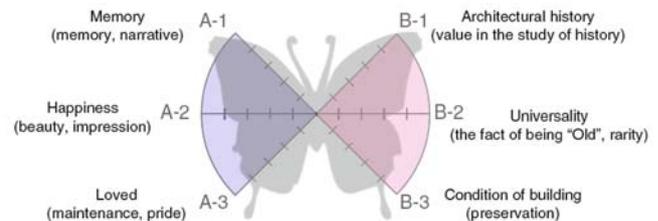


Figure 5. The 6 factors imagined in a butterfly diagram (Muramatsu et al. 2007)

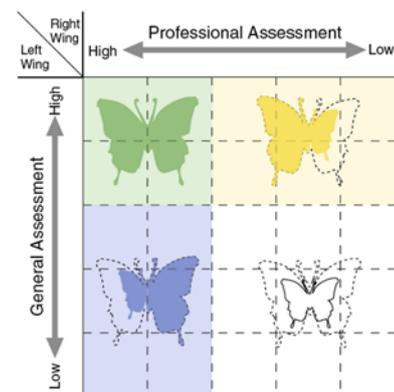


Figure 6. Analysis of built heritage architecture using the "heritage butterfly" model (Muramatsu et al. 2007)

The "heritage butterfly" illustrates the sets of evaluation based on table 1 and figure 5, and fig. 4 shows the various evaluation outcomes. The assessment should aim for a heritage butterfly whose wings are of similar shape and size, which means that the heritage architecture is important to both experts and public. Not only that, it also means that the tangible heritage architecture is as important as the intangible heritage. The analysis is also an indication of how we should make intervention should the size

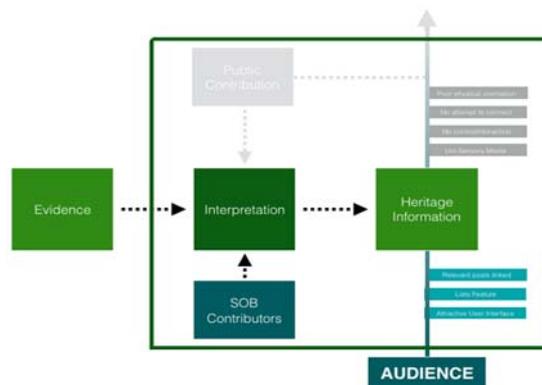
differ, which indicates uneven resources are being put to specific heritage architecture. If the expert right wing is small, it suggests that the experts should be more involved in the heritage architecture to raise the value of the built heritage architecture or there might be a reason why the experts do not value the heritage architecture. If the public left wing is small, the expert should take the effort to make the public aware of the building's value.

The heritage butterfly model is an ideal model in the assessment of heritage architecture as it considers both the views of the public and experts. It also considers both tangible and intangible heritage architecture. It is simplified to a level, which everyone could understand. The butterflies of different shapes have a different repercussion to the heritage architecture, and there are remedies to rectify the shape of the butterfly to a uniform shape. Thus, it could be used on an international level.

## 5. CASE STUDY OF EXISTING HERITAGE WEBSITES IN SINGAPORE

The research surveyed some digital platforms that document of heritage architecture, from both the government and public enthusiasts to draw insights from how they adopt the constructivist information flow approach and facilitate the Mindful cognitive state. The survey revealed the shortcomings of the various digital platforms.

### 5.1 Case Study A: State of Building



**Figure 7. State of Building Information Flow Analysis**

The State of Buildings (SOB) attempts to employ the constructivist information flow model. It relies on SOB contributors as well as the contributions of active users to construct understandings and interpretations of Singapore's Urban Heritage based on existing evidence. Additionally, these contributions are anchored to existing sites or buildings that are usually presented with concepts such as chronological changes to the site, evidence and interpretations emphasised. The audience of the site is supposedly viewed as thinkers whose exploration, assessments and contributions are highly valued.

SOB features an attractive user interface with a consistent colour theme and fonts to retain audience attention. Contributions are compiled into Places, Neighbourhoods, Trails, Lists and Stories linking relevant contributions together. These categories also accompany all contributions to encourage the audience exploration and discovery of the site's or building's relationship with others.

Heritage information as presented on SOB, however, appears to be didactic. This could be a result of various factors that have to cause the interpretation of heritage information on SOB to be predominantly shaped by its contributors as opposed to being equally shaped with active participants through their contributions. Conceivably, due to several communication factors.

Firstly, the SOB interface lacks the ability for user control and interaction. For example, maps that accompany contributions while are informative in delineating the location the sites or buildings, are static, non-interactive and do not display and link other relevant or related sites or buildings in the vicinity. This results in the contribution to be viewed by the audience without the context of other relevant or related sites or buildings. Additionally, contributions do not take advantage of multi-sensory media, only using pictures to illustrate concepts such as chronological changes to the site or building. These communicational factors regrettably misses out on the opportunity to encourage audience exploration, mindful conception for discourse and further contribution.

Secondly, the SOB interface does not encourage dialogic interaction. Basic features that could encourage dialogic interactions amongst users such as a "comments section" to reveal the reactions and comments of the contribution are not present. Additionally, active participants are unable to interact with SOB contributors to shape the interpretation of heritage information presented on the website. Contributions that are made by active participants, unfortunately, do not build upon SOB contributions and are instead compiled in another section of the website; Stories.

The culmination of these communication factors might have unfortunately resulted in low levels of interest in the content and thus little motivation for the audience to make mindful contributions to shaping the interpretation of heritage information presented on the website. Additionally, the constructivist information flow model, originally intended for the website, when coupled with sparse and non-meaningful user contributions has unfortunately altered it to be one that is positivistic.

### 5.2 Case Study B: Singapura Stories

Singapura Stories likewise attempts to employ the constructivist information flow model. It relies on Singapura Stories contributors, collaborators as well as the contributions of active users to construct understandings and interpretations of Singapore's Urban Heritage. Additionally, these contributions are anchored to existing sites or buildings that are usually presented with concepts such as chronological changes to the site, evidence and interpretations emphasised. The audience of the site is supposedly viewed as thinkers whose exploration, assessments and contributions are highly valued.

Some Singapura Stories contributions make use of multi-sensory media such as photos and maps. These maps animate to identify chronological changes to a particular building or site. Additionally, Singapura Stories contributors and collaborators often provide in-depth analysis of chronological changes as well as interpretations of Singapore's Urban Landscape. These features help the retain audience interest in the content and help to construct mindful interpretations.

As with SOB, however, heritage information presented on Singapura Stories appears also to be didactic. Similarly, this is possibly a result of heritage information predominantly shaped by Singapura Stories contributors as opposed to being equally shaped with active participants through their contributions. Conceivably due to several communication factors.

Firstly, the Singapore Stories' again lacks the ability for user control and interaction. For example, the aforementioned animated maps, while informative in identifying chronological changes to a particular building or site, are static and non-interactive. Additionally, contributions that are accessed by the audience are not linked to others that are relevant or related. Furthermore, this results in the contribution to be viewed by the audience without the context of other relevant or related sites or buildings. These communicational factors again, regrettably miss out on the opportunity to encourage audience exploration, mindful conception for discourse and further contribution.

Secondly, Singapura Stories' interface attempts to encourage dialogic interaction with features such as the "comments section" to reveal the reactions and comments of the contribution. These sections, however, are usually empty. Moreover, comments that are left in this section are usually not replied by Singapura Stories' administrators or contributors. Additionally, like SOB, active participants do make contributions are unable to interact with Singapura Stories contributors to shape the interpretation of heritage information presented on the website.

The culmination of these communication factors might have, unfortunately, resulted in low levels of interest in the content and thus little motivation for the audience to make mindful contributions to shaping interpretation of heritage information presented on the website. As was with SOB, the constructivist information flow model that was originally intended for the website, when coupled with sparse and non-meaningful user contributions has unfortunately altered it to be one that is positivistic.

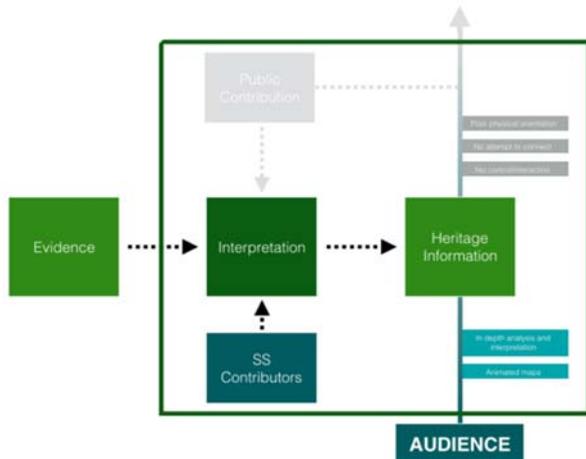


Figure 8. Singapura Stories Information Flow Analysis

### 5.3 Case Study C: Roots

Roots unlike SOB and Singapura Stories employs the positivistic information flow model. It relies solely on the National Heritage Board's (NHB) contributors to construct understandings and interpretation of Singapore's Urban Heritage. Posts are presented with emphasis on locational and factual knowledge. The audience of the site are viewed solely as consumers of knowledge and as such heritage information presented is didactic.

Roots features an attractive user interface, with consistent a colour theme and fonts to keep audience attention to the site. Posts make use of multi-sensory media such as high-quality photos and videos to enhance content and retain interest. Additionally, posts accessed by the audience, unlike Singapura Stories are accompanied and linked to other relevant posts. Occasionally, these posts are also integrated with trail maps that help to reveal the links between buildings or sites, encouraging user exploration and discovery of relationships between them. Additionally, Roots integrates mediate social features to give the audience the ability to share and react to these posts on popular social media sites such as Facebook and Twitter.

Roots' however does not feature a clear central user interface. It features various sections, Read Stories, Visit Museums, Visit Monuments, Read Publications, Explore National Collection, each of which features its interface. This has unfortunately resulted in an experience that is convoluted for the audience.

Most posts on Roots also lacks the ability for user control and interaction. Maps that delineate the sites or buildings that could encourage user exploration and the discovering of the context and relationships between sites or buildings do not accompany most posts. These interactive maps are instead the main interface used for the "Trails" and "Places" section. While these maps are integrated into some posts, most posts that audience does visit are mostly seen as individual sites or buildings not understood in context to its surroundings.

While as stated previously, social media integration of Roots gives the audience the ability to share are react to posts, it does not attempt to interact its audience in a dialogical manner to shape its interpretation of heritage information presented on the website. Posts are not accompanied by "comments section", there is no ability for active participants to contribute their perspectives.

The lack of dialogic interaction between the audience and the NHB contributors and the lack of ability for the audience to contribute their perspectives to shape the interpretation of heritage information presented on the website is, however, typical of a positivistic information flow model that instead seeks for validation of its content from the audience. This model however coupled with aforementioned communication factors between the audience and the website interface, namely a convoluted user experience, the lack of interactive maps that accompany posts and a lack of dialogic interaction may result in low levels of interest in the content. This is despite an attractive user interface and the use of multi-sensory photos and video.

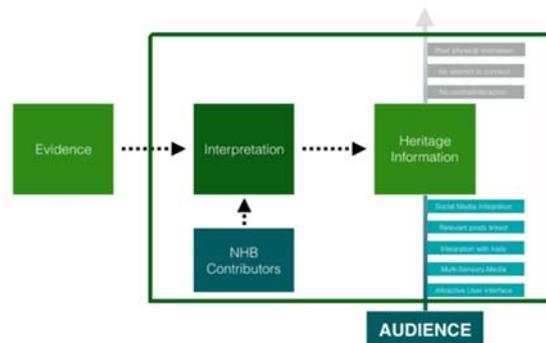


Figure 9. Roots Information Flow Analysis

## 5.4 Case Study D: Singapore Memory Project (SMP)

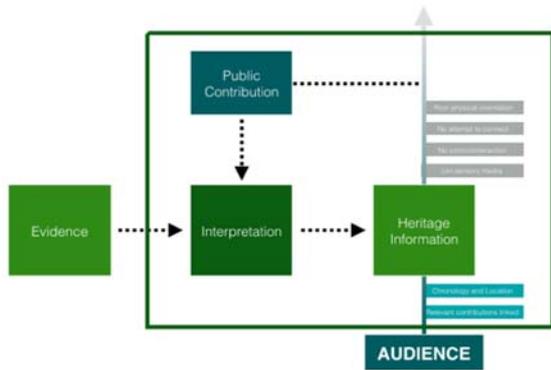


Figure 10. SMP Information Flow Analysis

Singapore Memory Project employs the constructivist information flow approach. However, unlike SOB and Singapura Stories, it relies solely on contributions of active users to construct understandings and interpretation of Singapore's Heritage. These contributions are anchored to points on a map and are usually presented as narratives and memories of a particular site or building. The audience of the site is viewed as thinkers whose contributions and assessments are highly valued.

In contrast to the aforementioned websites, Singapore Memory Project has a lot of public contributions. While most public contributions on Singapore Memory Project are largely written and make use of photos, contributions made by NLB's *Memory Makers* make use of high-quality videos. These contributions are sorted into "collections" while outstanding contributions are highlighted. Additionally, all contributions are also sorted by chronology, location and time. Contributions sorted by location are geo-located on to a map further aiding user discovery and exploration. Moreover, contributions relevant contributions are linked to each other. The culmination of these features aid in user discovery and exploration as well as interest.

However, despite the large amount of public contributions to Singapore Memory Project, high quality and informative posts that are relevant to Singapore's Urban Heritage are hard to come by. This is possibly an outcome of the audience being in a Mindless cognitive state. This could be evidenced by the fact that while comments sections accompany all public contributions, they are mostly empty leading to the conclusion that contributions made by active participants might not be a result of a dialogic process between the audience. Additionally, contributions that are made to the platform are usually of low quality and low relevance to Singapore's Urban Heritage.

## 5.5 Overview of Website Comparisons

Most of the sites surveyed employed the constructivist information flow approach, relying on contributions of active users to construct understandings and interpretations of Singapore's Urban Heritage based existing evidence. Additionally, these contributions are anchored to existing sites or buildings that are usually presented with concepts such as chronological changes to the site, evidence and interpretations emphasized.

The most of the sites surveyed also lack the ability for user control and interaction. For example, maps that are display narratives of built heritage are often static and non-interactive. Additionally, contributions that are accessed by the audience are not linked to others that are relevant or related. This results in the

contribution to be viewed by the audience without the context of other relevant or related sites or buildings. These communicational factors regrettably miss out on the opportunity to encourage audience exploration, mindful conception for discourse and further contribution.

The survey informed the gaps and linkages, which arise between the existing landscape of heritage architecture on a digital platform and published research that the proposed digital platform hopes to fill.

## 6. OBJECTIVES FOR A DIGITAL PLATFORM

As a result, this research has developed the following objectives for an effective Digital Platform.

1. Develop holistic (tangible and intangible) building information for all buildings in Singapore (UNESCO HUL Methodology, 2012)
2. Facilitate high levels of interest from the audience (Langer's Model of Mindful Interpretation, 1989)
3. Accommodate for Mindful heritage professional contributions for "tangible and intangible" heritage information (Langer's Model of Mindful Interpretation, 1989 & Copeland's Constructivist Information Flow Approach, 2006)
4. Accommodate for Mindful public contributions for "intangible" heritage information (Langer's Model of Mindful Interpretation, 1989 & Copeland's Constructivist Information Flow Approach, 2006)
5. Facilitate dialogic interaction (amongst heritage professionals and active participants from the public) to develop and shape a holistic interpretation of Singapore Urban Heritage. (Rahaman, 2012)

## 7. FEATURES OF A DIGITAL PLATFORM

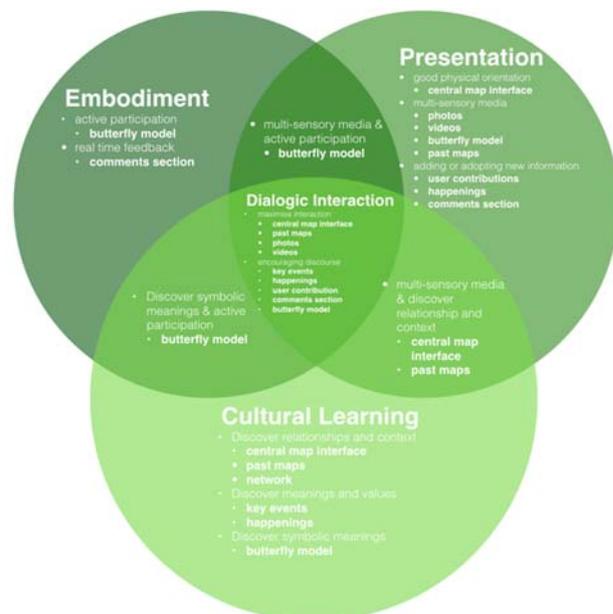


Figure 11. Classification of website features based on Rahaman (2012) recommendations.

### 7.1 Effective Presentation

- easy orientation and navigation system (Langer, 1989)
- central map interface
- makes use of multi-sensory media (Langer, 1989)
- photos & video
- changing maps with time
- openness in adding or adopting new information

- user contribution
- key events
- happenings
- connection to the visitors' past experiences
- network

A mobile application should compliment the website and dialogic interface such as Facebook. It does not to be necessarily an application. It could be a website that is mobile-friendly. The purpose of the mobility is because there is a need for an openness to new information where the end-users could contribute on-demand. It also enables greater connection to the digital platform with the end-users.

Separation of the digital platform into three separate platforms (mobile/web/dialogic interaction website to facilitate discussion) ensures the effectiveness of presentation and efficiency of knowledge documentation, transmission and archiving. It creates a variety in content deliverance, creates a novelty for a surprise in content presentation and challenges the end-user to explore the interface as well as the content.

### 7.2 Cultural Learning

- Encourage audience to discover relationships and context of sites or buildings network
- Encourage audience to contribute meanings and values through sites or buildings
- Provoke audience to reveal symbolic meanings of sites or buildings

The website should act as the archive for the heritage architecture on a digital platform where it will enable greater cultural learning. The website will be collecting and storing the information on heritage architecture, and it will reveal more significant meanings on the heritage architecture should the end-users want a greater understanding of the heritage architecture. The website will facilitate discovery of new information for the end-users. There is also a greater variety of content on the website. This will enable the end-user to switch from Facebook to the website should they want to find out more about the heritage architecture.

### 7.3 Embodiment

- Promoting active participation, (through incentive or gamification)
- Encouraging task accomplishment
- Butterfly model
- Ensuring real-time feedback
- Comments section

### 7.4 Dialogic Interaction

- Maximising interaction, allow audience to explore, manipulate and contribute
- Central map interface
- Encouraging discourse
- Comments section
- Key events
- Promoting dialogue between audience, public and heritage experts
- Comments section
- Key events

Instead of creating a digital platform that facilitates dialogic interaction on the platform (website or mobile application), it should be done on a third party website where the public end-users have already frequented such as Facebook. Many companies have facilitated their discussion to happen on

Facebook such as Humans-of-New York (HONY) or SGAG. Facebook contains more than five hundred groups who are concerned with heritage, and a consolidation of those groups would be able to maximise interaction, encourage discourse and promote dialogue between the participants, locals and experts, as it will increase the number of participants. These spaces are akin to Oldenburg (1989) description of a third place as there are similar characteristics found between the virtual and physical worlds. The Facebook interface rest on the neutral ground, a leveller, there is only one main activity that is to discuss, accessible & accommodating to the users, people frequent Facebook even though they might not visit the page and it is playful where it ensures that users have fun. Thus using already available platform such as Facebook will enable greater facilitation of discussion and dialogic interaction to ensure the sustainability. In addition to that, it embodied interaction as it promotes active discussion and participation on the narrative level. Real-time feedback is a given as everyone could comment on the issue.

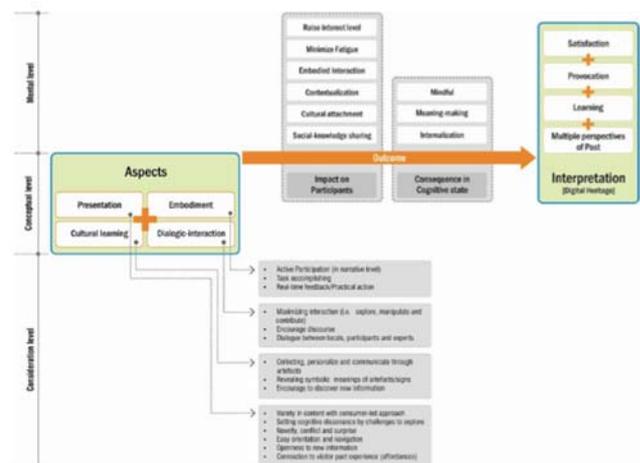


Figure 12. Framework for Interpreting Digital Heritage (Rahaman 2012)

## 8. CONCLUSION

The proposed digital platform could serve as a means of consolidation of existing digital platforms that usually duplicate each other in functions and purpose. Additionally, in taking advantage of the significant amount of data on Singapore's tangible architectural and cultural heritage that can be found in existing government databases, an architectural heritage (tangible heritage) layer on the proposed digital platform that serves as an anchor for other sources that pertain to architecture and cultural heritage (intangible heritage) of a particular building or site as well as public and professional contributions. This consolidation could also facilitate and maximise the shared economies model of knowledge, skills, and resources.

It is envisaged that the proposed digital platform with the adoption of HUL becomes a tool that holistically evaluates the value of a particular building or site to Singapore's urban heritage. This tool will then allow for critical frameworks and processes of HIA that affect the shape of conservation strategies and urban planning for lasting contributions to Singapore's heritage scene. Currently, in development, the proposed Digital Platform can be demonstrated in the enclosed video file.

There are several advantages of heritage architecture on a digital platform (El-Razaz 2007). First, it enables us to document the tangible and intangible heritage architecture from any location. It could be in the form of a mobile phone application where the

public could do documentation online by inserting intangible heritage while in public.

Secondly, it will enable the recovery of lost heritage architecture and recreate, reconstruct and reimagine it digitally. This is crucial in Singapore where they had demolished many heritage architectures or architecture of societal importance to make way for urbanisation such as the Kota Raja Club and the National Library. The URA had discussed this, but the need for such recreation is still ongoing since they are already lost and what significance of the recovery would do for the public.

Third, it will assist in the education process for students in tertiary education as well as general education schools (primary schools to junior college). It will give them a good sense of heritage and to be invested in their heritage. The details and the recreation of the heritage architecture will provide them with a good sense of spatial visualisation. Thus, they could get involved with the activities and increase the interaction with the heritage architecture to foster a greater learning experience.

Fourth, it will contribute to the tourist and those who are foreign to a particular heritage. It will help them to spread the heritage, culture and tradition beyond those who are native to the heritage. Presenting the past and the present of the heritage architecture will enable the visitors to imagine the heritage and tradition through augmented reality.

Lastly, it will help in creating an archive for the future generation, researchers who would like to study the heritage architecture and its landscape & urban environment better and conservationist who would like to restore the heritage architecture. The heritage architecture on a digital platform will contain accurate data that will assist in physical or digital restoration.

#### ACKNOWLEDGMENTS

We thank all the volunteers, and all publications support and staff, who wrote and provided helpful comments on previous versions of this document. The authors gratefully acknowledge the grant from Singapore's Ministry of Education Tier 1 Grant for the success of this research project.

#### REFERENCES

- Cresswell, Tim. 2015. *Place: An introduction*. Second edition. Malden, MA; Chichester, West Sussex; Wiley Blackwell.
- El-Razaz, Z., 2007. *Virtual Heritage in the Digital Era*, ASCAAD 2007, pp. 149-164.
- Fitch, J. M.:1982, *Historic Preservation : Curatorial Management of the Built World*, New York, McGraw-Hill.
- ICOMOS:2005, *Charleston Declaration on Heritage Interpretation*. 8th International Symposium of US/ICOMOS. Charleston, South Carolina, USA.
- ICOMOS:2007, *The Icomos Charter for the Interpretation and Presentation of Cultural Heritage Sites*.
- ICOMOS, C.:2000, *Principles for the Conservation of Heritage Sites in China*. English translation by Neville Agnew and Martha Denis (2002).
- ICOMOS:2008, *The Icomos Charter for the Interpretation and Presentation of Cultural Heritage Sites*. ICOMOS International Scientific Committee on Interpretation and Presentation of Cultural Heritage Sites.
- ICOMOS, A., *Monuments, I. C. o. & Sites:2000, The Burra Charter: The Australia Icomos Charter for Places of Cultural Significance 1999: With Associated Guidelines and Code on the Ethics of Co-Existence*, Australia ICOMOS.
- Langer, E. J.:1989, *Mindfulness*, Reading, Mass., Perseus Books.
- Milgram, P., Takemura, H., Utsumi, A. and Kishino, F., 1994. *Augmented Reality: A Class of Displays on the Reality-Virtuality Continuum*, Proceedings of SPIE, Vol. 2351, *Telemanipulator and Telepresence Technologies*. pp. 282–292.
- Moscardo, G.:1999, *Making Visitors Mindful: Principles for Creating Quality Sustainable Visitor Experiences through Effective Communication*, Sagamore Publishing, Champaign, Illinois.
- Muramatsu, S., Fujino, Yōzō, and Takafumi Noguchi. 2009. *Stock management for sustainable urban regeneration*. Vol. 4. Tokyo: Springer.
- Oldenburg, R. 1989. *The Great Good Place: Cafes, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts, and How They Get You Through the Day*. New York: Paragon House. ISBN 978-1-55778-110-9.
- Rahaman, Hafiz. 2012. *A Framework for Digital Heritage Interpretation*. Singapore: National University of Singapore.
- Rahaman, H. & Tan, B. K.:2011, *Interpreting Digital Heritage: A Conceptual Model with End-Users' Perspective*. *International Journal of Architectural Computing (IJAC)*, 09, 99-113
- Rahaman, H. & Tan, B. K.:2010, *Interpreting Digital Heritage : Considering End-User's Perspective*. in Dave, B., Li, A. I.-k. & Hyoung, N. G. (eds.) *15th International Conference on Computer Aided Architectural Design Research in Asia, CAADRIA*. Hong Kong.
- Rahaman, H. & Tan, B. K.:2010, *Interpreting Digital Heritage: Interaction, Dialogue and Multiple Perspectives of the Past*. *SMARTdoc 2010 : Heritage Recording and Information Management in the Digital Age*. Pennsylvania, Philadelphia, USA.
- Reffat, R. M., E. M. Nofal 2013, *Effective Communication with Cultural Heritage Using Virtual Technologies in International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-5/W2, XXIV International CIPA Symposium*, Strasbourg, France.
- Roussou, M., 2002. *Virtual Heritage: From the Research Lab to the Broad Public*. *Virtual Archaeology*, pp. 93-100
- Siltanen, S., 2012. *Theory and applications of marker-based augmented reality*. VTT Technical Research Centre of Finland.
- UNESCO:1989, *Recommendation on the Safeguarding of Traditional Culture and Folklore*. 25th session: The General Conference on the United Nations Educational, Scientific and Cultural Organization. Paris, UNESCO.
- UNESCO:2003, *Charter on the Preservation of the Digital Heritage*. 32nd Session: The General Conference of the United Nations Educational, Scientific and Cultural Organization. Paris, UNESCO.
- UNESCO:2003, *Convention for the Safeguarding of the Intangible Cultural Heritage*. 32nd Session : The General Conference of the United Nations Educational, Scientific and Cultural Organization. Paris, UNESCO.
- UNESCO, 2011, "UNESCO Recommendation on the Historic Urban Landscape", accessed 18 July 2016, from <http://whc.unesco.org/en/activities/638>.
- Uzzell, D.:1989, *Heritage Interpretation*, London ; New York, : Belhaven Press.