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AN OVERVIEW OF WEB DEVELOPMENT FOR DIGITAL ARCHIVE OF MALAYSIAN CULTURAL HERITAGE

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ABSTRACT

With modernization, historical structures are threatened by extinction. Preservation efforts are made, but eventually, maintaining the drawing's physical form is no longer manageable. Hence, digital archiving is the best solution to preserve data. The research approach is a design-based study that aims at data collection and analysis of website development while reviewing many aspects of digital archiving in architectural heritage. The methods involved data compilation, sustainable digital archive development, and the arrangement of data digitally. Documentation of heritage digital archive model development is made to ensure the data of building a sustainable archive is available for future reference.

Keywords: *Digital, Heritage, Heritage Building, Archive, Model.*

INTRODUCTION

According to the Oxford Dictionary (2021), heritage is the history, traditions, buildings, and objects that a country or society has had for many years and is considered an important part of that building's identity. Similarly, it is also a property that is or may be inherited, such as historic buildings that have been passed down for generations, and related to things of historic or cultural values that are worthy of preservation. In a world of modern buildings, heritage buildings are a treasure trove of traditions and valuable marks representing a nation's identity and carrying its long line of historical and architectural value (Kamal & Harun, 2002). Even determining the exact value of these precious and one-of-a-kind nature of heritage buildings is difficult as it is nearly impossible to appraise those using conventional techniques (Mohamad et al., 2021).

Two main factors contributing to the disappearance of indigenous heritage buildings are; the rise of urbanization and the typical public and owner's disregard towards their heritage, historical values, and arts (Zuraidi et al, 2017; Hamilton & Zuraini, 2002; Kayan, 2003). Due to these reasons, heritage buildings such as traditional Malay homes are rapidly deteriorating as a result of a lack of attention and care, (Yusof M, 2020; Ariffin & Talib, 2005) while some are increasingly at risk of being torn down or converted into brick structures (Mohd Isa, H., 2021; Seo et al 2009).

For these reasons, the role of a digital platform in the preservation and protection of our cultural heritage is highlighted in this study. It will provide the methods of data collection of heritage buildings in Malaysia. The pictures and retraced 2D data will be recorded and stored digitally. Malay heritage buildings' design character, unique features, principal designs, and forms will all be measured and recorded. The importance of this case study is an overview of the entire process of building a model that will suit the digital heritage archive in Malaysia.

i. To study the process and challenges of conserving heritage building digitally.
ii. To elicit the requirements and necessary steps for an online digital archive.

The difficulty that arises during the process of conserving Malaysian heritage buildings is the challenge of recording and documenting every

nook and cranny that is still obtainable and accessible (Esmaeili et al., 2014). Malaysian heritage buildings include delicate elements that capture Malay architecture's splendour. The elements serve as a living testament to the country's history and help shape the nation's unique character. Heritage buildings like these must be preserved since they can provide aesthetic and spiritual quality that cannot be found in more conventional buildings (Chin et al., 2021; Halim & Tambi, 2021; Cores, Assets and Development, 2012). It would be a waste if it were ruined and demolished without proper documentation.

By preserving heritage buildings in their original form, and maintaining their authentic values and qualities, allows our future generations to study the history of their ancestors and discover the progression of building innovations through time (Harun S.N., 2011). In light of ongoing global progress, there has been a corresponding increase in the demand for digital data preservation. This includes the conservation of buildings, which is necessary because there is no way to predict when an older structure will fall into complete disrepair, giving these buildings little to no chance to be properly saved in an archive as a national heritage (Esmaeili et al., 2014). In today's modern world, the conventional method of data storage should be upgraded to be easily accessible as well. The traditional method which entails large drawings and thick books can be replaced with online data, which is conveniently obtainable and can be accessed from anywhere on the planet.

Because cultural heritage like these buildings is a fundamental manifestation of the wealth and diversity of human civilizations of their time, the duties of documenting, interpreting, restoring, and disseminating the data are regarded as being extremely important (Portalés et al., 2018). The entire process of cultural heritage preservation is a never-ending process that necessitates the collection of related data that are still available and accessible through documentation, photography, and other appropriate methods on selected heritage buildings, which are then analysed and archived as digital data. Thus, the heritage building operation serves as a method for restoration and preservation, combining physical 3D survey techniques, building components, cataloging, and archiving, as well as non-physical documentation of rich semantics and data (Fadli. F. & Alsaeed. M., 2019).

METHODOLOGY

Before building a digital archive, the compilation of necessary data is done. Proper methods and procedures are needed as they will be archived for future reference and preservation (Figure 1). This will also ensure the data presented will be sufficient.

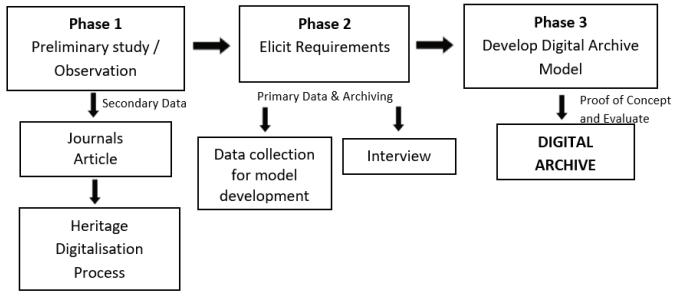

Figure 1. Three Phases for the Research Methodology
Source: Author, 2022

The overall analysis approach was qualitative. The design-based methodology was then divided into three phases. Phase 1; a critical review and a preliminary observation are carried out in order to identify the conservation methods along with the principles of digitising and archiving techniques suitable for the Malaysia heritage conservation listed in journals, books, news, and other secondary sources. Phase 2 is where the data collection for the model development requirement analysis specification begins. Upon completing the requirements specification, the functional and non-functional features will be analysed to develop the digital archive model with a proof of concept for evaluation in the next phase. An interview was also done with an expert in order to receive more information regarding the requirement of the site.

The features of the digital archive were extracted from the literature review and fieldwork study comprising site observation. Photos of windows, doors, and openings to certain spaces, walls, and even railings are taken for later identifying the component of the building and its details. The measurements and details of ornamentation of heritage buildings such as woodcarvings are also taken through the process of sketching and rubbing.

Ways to collect information on selected heritage buildings detailing includes:

i. Tracing / rubbing techniques and collecting existing historical records of the buildings.
ii. Proper measurements are taken using a ruler for smaller details and other measuring tools for bigger measurements.
iii. Photography and videography capturing the view from every angle.
iv. 2D and 3D digital reconstruction of the heritage buildings; the process is needed as it can be used later for virtual reality to give users the opportunity to understand the building even after the original structure is no longer accessible (Esmaeili et al., 2014).

The smaller details will be arranged in a table and categorised into components of the house, and their details include the name of the building component, placement in the building, and possibly its motifs. Every information provided is based on the interview data and literature in order to ensure the legitimacy of the information. Drawings were then stored in an online platform to be accessible for the public in future.

The limitations in developing a digital heritage model specifically for Malay Architecture is quite challenging as there are not many precedent archives that can be referred to as the conservation method for heritage buildings is relatively new to the country (Mohd-Isa, Zainal Abidin, & Hashim, 2011). Other than that, data collection of heritage buildings consumed a lot of time and manpower as the conventional documentation mostly depends on physical drawings and the essence of managing a hardcopy drawing relies on trusted people in handling the data. Documenting or even re-documentation needs to be done first as the physical drawings were damaged over time, lost, or misplaced in a variety of ways. Since there will be no reference files to refer to, re-documentation will have to be done from scratch.

Additional contents such as the details and historical background of each building should also be compiled for future reference. This profiling is important in data arrangement during digital archiving. Lastly, every interview should be recorded, through audio recording at least, to ensure no important information is left out in the documentation.

FINDINGS

The first process in building heritage archives is to take a look at how the precedents archive did and made more improvements if needed. This process aims to explore how similar existing archives sort and display content on their websites. It will provide a helpful guide on how to create the digital heritage archive content model. A review of two existing online heritage archive contents has been carried out. Both sites are chosen based on the relatability to the digital archive model being built.

Centre for the Study of Built Environment in the Malay World (KALAM) UTM

Concerned about the increasing destruction of Malaysia's architectural heritage, this centre was established in June 1996 on the basis of multiple detailed Measured Drawing works of Historical Buildings. For the sake of academic reference, UTM students engage in research and documentation activities and generate main drawings, details, written reports, videos, models, posters, and photographs. As architecture is influenced by three levels of identities: personal, local, and national (Ismail. N.H. et al, 2021; Mastor, 2020), the centre has spread its research through multiple types of historical buildings. As of now, over 600 structures, including homes, palaces, mosques, public and commercial structures, religious institutions (Wakaf, Madrasah, and Tombs), and many more are documented by KALAM (KALAM, 2023).

Arkib Negara

One of the many functions of the Malaysian National Archive Department is to locate, acquire, collect, store, preserve and conserve public and private archives that have national and historical value as national treasure heritage (Arkib Negara, 2023). It stores audio, video, images, and documents that are sorted according to a few categories such as Public Archives, Personal Archives, Records and Archives that are acquired from overseas, and Royal Records and Archives and many other.

UNESCO Archives

The establishment of this project was deemed necessary when it

was discovered that conservation measures that are suited for the physical property were not appropriate for intangible heritage. Therefore, the collection of these cultural expressions (proclaimed by UNESCO as masterpieces of the heritage of humanity) in both visual and aural media is necessary to ensure their survival and transmission to future generations.

The site provides images and audios with details such as place/ region, type of cultural audio, duration and date of publication, and other information regarding the subject. With a wide range set of data, there would also be large numbers of content providers. To solve the doubt of the legitimacy of data, only authorised personnel have the access to edit or add an item to the site.

Table 1. Pros and Cons of Each Digital Archive

Archives	KALAM	ARKIB NEGARA	UNESCO Archive
Content	Focuses on Malaysia and architectural heritage.	Provide the images, Audio/Visual of the items, detail description of each item.	Detail description of materials and focuses more on cultural heritage and events
Pros	Wide range of heritage buildings in collection.	Well known and trustworthy establishment with wide resources	Well known and trustworthy establishment with wide resources
Cons	Only put a list of buildings and users can only access the info after contacting the person in charge.	Documents, image, audio, and videos are available for purchase.	Only include images, videos and audios of events regarding heritage buildings

Source: Author, 2022

The content of the archives in the case studies depicts their aim and manage to solve the problem that contributes to the establishment of the archives themselves. While the Arkib Negara focuses on the events and documents that occurred in the country, the UNESCO Digital Archiving Project aims to preserve the audio / visual of cultural settings from all over the world. Both target the conservation of heritage and hope to archive the precious data in order to deliver it to the younger generations. KALAM on the other hand, focuses on Measured Drawings of historical buildings and open the doors of opportunities for people to work together for research purposes and also offer consultations.

In building a digital archive that can be used as a reference to the heritage buildings in the future, it is crucial that necessary data such as detailed drawings of plans and elevations, photographs, videos must be displayed. This is to ensure the correct or at least the most precise information of the building is passed down. Modern archiving methods will also include the utilization of cutting-edge technologies such as 3D scanning, photogrammetry, drone technology, and 3D documentation. The information will then be generated and presented utilizing animations, infographics, montages, AR (Augmented Reality) and VR technology (Virtual Reality). These will assist the audience in visualizing and understanding the heritage building by incorporating textures and colors in addition to the necessities such as layout and access. In terms of data Artificial Intelligence or AI can be used to go beyond the conventional provenance and original order concepts of organizing and accessing archives, which concentrated on inventories and descriptions of archival units (Colavizza, G. et al. 2022).

Other than that, with the assistance of technology such as IoT, Mobile applications, and social media such as Facebook, Whatsapps, YouTube, and Instagram, creative production such as new media art, Public Service Announcement (PSA) or Community Service Orders, and digital advertising, it will ensure that the heritage value can be preserved and passed on to the generation Z generation and the generation -A (alpha) generations.

Online Digital Archive Development

Prior to building an online digital archive for heritage buildings, a few steps are necessary in order to help design the website in a proper arrangement and facilitate the flow of navigation and comfort for the users while browsing through the pages.

Wireframe

Wire-framing is a way to design the layout and structure of a website. It is generally aimed to plan the layout content and functionality of a page which considers the potential user's needs and experience as the main focus. Wireframes are used in the early stages of web development to establish the basic structure of a page before any visual design and content is added.

The importance and significance of website wire-framing is highlighted

by Climer (2022) for several reasons. First of all, the wireframes help the developer to visualise the website designed by the web designer. It is a way to improve communication through graphics. In addition, it makes the website features simpler to understand and comprehend. And lastly, wireframes point out any flaws in the earlier stage of the conceptual design process. It saves the developer a lot of trouble and time, rather than realising the flaws during the website building period.

This process is also a crucial step in building the user interface design, or UI design, which is commonly referred to the visual layout of the elements that interacts with the user in a website, or technological product. Examples include the control buttons of a video, the arrangement of images and audios, or the visual layout of a webpage. UI designs should not only be aesthetically pleasing to potential users but must also be fully functional and designed with user comfort and ease of access in mind.

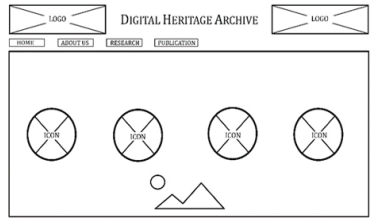

Figure 2. Example of Wireframe for Web Storyboard using Adobe Photoshop

Source: Author, 2022

Figure 2 shows a general page containing a body and a right-sidebar. On the upper part of the page, under the logo, there are a few buttons that will direct the users to the "About Us" page and other ongoing research information. The page contents are filled with images and texts related to the digital archive. The icons will represent the types of buildings available in the archive.

Security Access

In an interview, other than giving his full support and approval of the digitalisation of the tangible heritage, Wan Nurkamar Rahmatullah or better known as Mas Wanpo (2021), a professional woodcarver with more than 25 years of experience in the field has expressed his concern on plagiarism in terms of the carving motifs. Thus, a certain identification procedure is

required before access can be given to the researcher or student that applied to retrieve the drawings as shown in the figure 3 below.

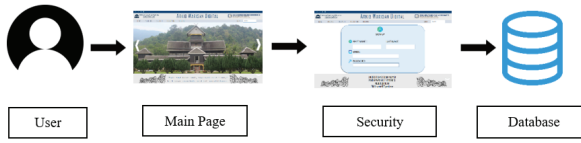

Figure 3. Conceptual Design for the Online Digital Archive System
Source: Author, 2022

In some institutional website, certain precautions have been taken to eliminate the possibility of the photos and content being stolen and used without permission. . There are two different possibilities that can be chosen. The first method involves downloading the essential plug-ins that are made available by WordPress, such as the WP Content Copy Protection plugin. This plug-in was designed expressly to prevent anybody from obtaining and unlawfully reusing the photos that are hosted on the website. The second possibility involves incorporating custom Cascading Style Sheets (also known as CSS) code into the WordPress theme. This solution is quite straightforward, but in order to use it successfully, novice web developers will need to refer to some existing websites to get the steps.

Photo Editing

There are instances where the images cannot be directly applicable to the website as certain alteration is needed beforehand (Chen, 2019). Whether it requires retouching for a clearer view, increasing or decreasing brightness due to the lighting during the photo-taking process, or a simple crop, all this activity can be done using Adobe Photoshop software. Other than being aesthetically pleasing, images are retouched to achieve the best outcome where the focus of the photo is enhanced. Thus, delivering the message as intended by the photographer.

Suggested Domain

To create and manage the digital content on the website, three well-known and beginner-level apps were chosen. In Table 1 below, the apps were then compared based on their pros and cons to choose the most suitable website builder for this project.

Table 2. List of Wix, Weebly & WordPress Pricing Plans

Category	Wix	Weebly	WordPress
Ease of use	Easy to use, has intuitive drag-and-drop design	Easy to use, but harder to locate things on the interface at first	Flexible CMS that allows multiple users to create and run a website without coding
Design	Over 500 mobile responsive themes, can't switch after publishing	Only about 40 themes by default, but changeable after going live	Unlimited customisation due to its open-source nature.
Features and Tools	Solid e-commerce tools, but lacks in blogging (Does not provide archive features)	Best tools for scaling businesses, and packs lots of built-in features.	Need to choose a plan and customise as much or as little as the user wants.
Apps Market	Over 200 powerful apps, easy to integrate	More than 300 apps	Over 54,000 plugins to choose from.
Help and Support	Has customer support, which is provided on all price plans. Also comes with onsite editor help	Help and support is available, but phone support is only available provided for paid plans	Has help and support on site, toll-free number and live chat support for paid plans. Support documentation & forums for free users.
Pricing	Free plan available	Free plan with ads.	Has a free plan with access to professional themes, 3 GB of storage space, community support, and more.

Source: Wix. Weebly. WordPress, (2021)

Table 3. List of Wix Pricing Plans

Wix Pricing Plans						
VIP First Priority Support	Combo for Personal Use	Unlimited Entrepreneur & Freelancers	Connect Domain Most Basic	Business VIP	Business Unlimited	Business Basic
US$ 24. 50 /month	US$ 8.50 /month	US$ 12.50 /month	US$ 4.50 /month *has ads	US$ 35 /month	US$ 25 /month	US$ 17 /month

Source: Wix, (2021)

Table 4. List of Weebly Pricing Plans

Weebly Pricing Plans		
Connect	Pro	Business
$5/month, billed yearly	$12/ month, billed yearly	$25/month, billed yearly

Source: Weebly, (2021)

Table 5. List of WordPress Pricing Plans

WordPress Pricing Plans			
Personal	Premium	Business	e-Commerce
$4/ month, billed yearly	$8/month, billed yearl	$25/month, billed yearly	$45/month, billed yearly

Source: WordPress, (2021)

RESULT AND DISCUSSION

Among the three suggested sites, WordPress is chosen as the best website domain. WordPress is known to be a powerful CMS (Content Management System) where the platforms allow work groups or individuals of any skill level to publish content, formatted consistently, quickly, and easily. There is no need for prior coding or technical skills at all. But with additional knowledge such as coding and web hosting knowledge, the user will be able to experience total creative control and use the website to its fullest potential.

Other than that, WordPress is known to be equipped with a wide range of plug-ins, that improves the functionality of the user interface, it also improves every aspect of the website regarding the creation, organization, and search engine optimization (Patel et al., 2011). For users that have the technical skills or experience in web hosting and coding, there is unlimited customization as WordPress comes with its open-source nature. Even then, the user without any coding background can set up a fully functional website. With over 54,000 plugins compatible with the domain, the users will have more additional features of their choice ready to be downloaded and utilized. These will help in elevating the visitor's experience while using the website. Examples of plug-ins that support AR and VR can be downloaded such as 'AR for WordPress' and WP VR – 360 Panorama and Virtual Tour Builder for WordPress.

While in terms of Search Engine Optimization or SEO, the ranking can be improved by downloading the right plugin, making it easily discoverable and more likely to pop up on the visitor's search algorithm. Even for first-time users, it is very easy to learn, navigate and use with the right guidance. It only took a matter of time to get used to its point-and-click interface. For free users, there is a large WordPress community that will provide advice and guidance for every problem or challenge (WordPress, 2021). For users that subscribe to the available paid plans, however, there are toll-free number and live chats provided, ready to help and assist in further guidance.

Lastly, the pricing for the plans offered by WordPress is the most affordable with the most features. Either for business purposes or personal purposes, it is basically a good investment that will surely attract users and make it easy for website administrators in the long run.

CONCLUSION

The significance of preserving heritage data should be put as the main priority for institutions that deal with conservation, documentation, and studies of heritage buildings, and in general the entire cultural heritage organisations. The archive is a continuous effort of collecting, compiling, and digitising data before arranging it on the website for potential users to access and benefit from.

The precedent sites done by UNESCO and ASEAN Cultural Heritage Archive provide good examples of how to build a self-sustainable digital archive that will serve its purposes, not to mention a very beneficial investment in the future. That way not only images and texts are acquired and preserved in the archives but audio/visuals and 3Ds are also provided for the visitors to access. The expansion of technologies will provide a wide range of data that can be saved and ease the delivery process to the future audience. It may also serve as a means of disseminating information about heritage sites to later generations.

With the expansion of media and the internet, there is new hope in saving heritage buildings, at least in the form of data, and to achieve that, the compilation and digitalisation of these priceless structures need to be

stored in the digital archive/platform for future access. It is important to note and recognise the role of technology in preserving our heritage and identity for the next generation. In the future, it is also a feasible goal to expand the digital archive to include other heritage elements.

In the future, it would be a good idea to investigate the impact that creative technologies like 3D printing can have on preservation efforts for historic structures. Creative technology is a branch of interdisciplinary studies that brings together the study of technology with that of the arts, design, and humanity. Everything from product design to digital media to advertising to media made with the use of computers, electronics, or data-driven engines falls under the umbrella of "creative technology." Therefore, it is crucial to empower the area of heritage as a potent method to support the development of a civilised nation in Malaysia based on Islamic teachings that fosters equality, tolerance, and understanding among the country's varied society.

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CONFLICT OF INTEREST

None

AUTHOR'S CONTRIBUTION

The author, and all the co-authors, have collaborated with one another

throughout the entire process of data collection, design, and execution of the research. In addition to this, they commented on the outcomes while discussing and analysing them in order to reach the greatest result possible. In general, each of the authors has made significant contributions toward the overall writing of the paper.

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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

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27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

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