

Digital Archiving of Architectural Heritage

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Abstract

Malaysia is experiencing disappearance of some of its post-independence architecture due to redevelopment. Historical buildings that could have been archived as national heritage have been demolished, tagged for demolition or currently are being demolished. Suleiman Courts, the first high-rise residential buildings in Kuala Lumpur were demolished in 1986. Pekeliling Flats, the first prefabricated low-cost housing in Malaysia and second high-rise residential buildings in Kuala Lumpur are now being demolished. Even the first drive-in restaurant in Malaysia is tagged for demolition regardless of the historical memories for its loyal fans. Other historical buildings are deteriorating in use without considering the importance of preservation. One example is the oldest geology department in Malaysia located in University of Malaya, Kuala Lumpur, which had a unique method of construction at the time it was built. The building is still in use but has been insensitively modified from its original state. In this situation digital archiving seems to be an alternative that at least keeps the records of a historical building before it is too late. It is important to clarify that digital archiving of architectural heritage is not solely because buildings are being demolished. A project 'Malaysia Post-Independence Architecture Atlas' is being carried out by University of Malaya, in collaboration with Multimedia University. This project aims for available data to be digitally captured and archived for future purposes. In the first stage 30 target buildings (selected based on their cultural importance) were successfully archived. The main priority after digital capture was to categorize the collected data in a way that can be used by different audiences. The following is a summary of steps taken in this project by reviewing different aspects of digital archiving of architectural heritage.

Keywords: Architectural Heritage, Digital Archiving, Capturing, Virtual Reconstruction

Introduction

In developing countries insufficient attention is being paid to conservation of architectural heritage (Steinberg, 1996) which adds to the importance of digital archiving. Malaysia is one of those countries with a fairly recent heritage building conservation system (Mohd-Isa, Zainal-Abidin & Hashim, 2011). Buildings were previously demolished without having any chance to be protected or at least be archived properly. Many cases from pre-Independence or post-Independence of Malaysia can be found. For example Bok House, an old mansion in Jalan Ampang, constructed during 1926-1929, was demolished on December 15, 2006, despite

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unsuccessful attempts by conservationists (The Star Online, December 15, 2006; The Star Online, September 6, 2006). Bok House is just an example of pre-Independence architecture of Malaysia. It was demolished soon after Malaysia National Heritage Act 2005 was gazetted (The Star Online, September 6, 2006).

Since this study covers the post-Independence architecture of Malaysia the main focus is on the buildings that were built after 1957. Malaya's independence was declared in 1957, which had an important role in the country's development (Chun and Noordin, 2005). The architecture of Malaysia was also influenced by Malaysia's independence. By the time independence was declared, more attention was being paid to development of commercial and administrative sectors, as well as considering the idea of a residential satellite town to support the capital city (Chun and Noordin, 2005).

Post-independence architecture of Malaysia is not that old but has experienced demolition after a relatively short life span. Suleiman Courts, the first high-rise apartment buildings in Kuala Lumpur, built in 1957 were demolished in 1986 after only 29 years (The Star Online, August 21, 2007). Tunku Abdul Rahman Flats also known as 'Pekeliling Flats', the first prefabricated low-cost housing in Malaysia (Thanoon et al., 2003), and second high-rise residential buildings in Kuala Lumpur, are under demolition which was started on January 2014 and is estimated to be finished by November 2015 (The Malay Mail Online, January 23, 2014). The first drive-in restaurant in Malaysia, located in Petaling Jaya (A&W PJ Drive-in) is tagged for demolition to open the space for two new office towers with a promised A&W outlet at ground floor (The Star Online, July 21, 2014). Looking at fans' comments shared on the Internet shows that they are disturbed by this decision.

Digital archiving of architectural heritage is the process of collecting and capturing available data for selected target buildings. Any existing, traceable and accessible information related to the building can be digitally archived. In addition to existing documents such as technical data, blue prints or old photos, a part of digital archiving deals with digital capturing and reconstruction techniques if needed. Digital capturing includes full coverage photography, videography, and 3D laser scan where possible. Reconstruction techniques such as digital drawing or 3D modelling (Pauwels et al., 2008) can be used for virtual reality purposes and also to provide a better understanding for users who do not have access to the real building.

This study is a part of the project 'Malaysia Post-Independence Architecture Atlas', a collaboration between 'Centre for Creative Content and Digital Innovation' (CCCDI), University of Malaya, Kuala Lumpur, Malaysia and 'Knowledge Management Centre', Multimedia University, Cyberjaya, Malaysia. In the first stage 30 buildings were fully covered and digitally archived. Main objectives followed by this project were to create a taxonomic database, which includes metadata to be provided through:

- Tracing and collecting existing historical records of the buildings
- Full coverage photography, videography, and 3D laser scan where applicable
- Digital reconstruction wherever needed

This database is presented in form of a digital atlas to be used by variety of target audience.

Digital Archiving of Architectural Heritage

Today's technology enables instant access to digitized information but the question is; what happens if information is available in different forms? The answer is; digitize it. But again the more important question appears; how to archive digitized information to be beneficial?

When it comes to archiving of cultural or historical heritage, it is difficult to answer the above question if not impossible (Dunne and Lerkenfeld, 2010). One first step to be taken before making any decision about digitization of a cultural heritage is to define its importance, purpose of digitization and prospective audiences.

Organisations still don't appear to focus on the end users, the distribution or how the public can benefit from a new type of archive.

Dunne and Lerkenfeld, 2010: 27

It is important to provide a clear view of cultural heritage for both public and specialists. This study tries to provide a better understanding of digital archiving of cultural heritage by focusing on Malaysia's post-independence architecture. Steps taken in creation of Malaysia's Post-independence Architecture Digital Atlas including instructional framework are reviewed.

How to start...?

At an early stage the main effort was around two selected targets with plenty of existing historical records, aiming to trace and collect accessible materials as much as possible. These are the National Mosque of Malaysia (Masjid Negara) and Dewan Tunku Canselor in University of Malaya, Kuala Lumpur, both gazetted as national heritage (Jabatan Warisan Negara). The reason for selecting these two building was extensive existing data in many different types and format but not categorized. The main idea was to work on a theoretical framework but with real data available in hand to produce a prototype. During the investigations many forms of information such as old photos, newspaper articles, technical drawings, etc., were collected. A well-designed interface and navigation system was needed as well. Graphical User Interface (GUI) and navigation system are two vital requirements to enable final users having easy access to all available data in this digital atlas in both online and offline versions. In addition to all requirements above another important factor was data transfer between research team members.

The First Prototype

After those two early selected targets were fully covered it was the time to compile everything together. Tree style taxonomy appeared to be safe to start with. Therefore each target was initially categorized by type and source of the collected data. This way both end-users and team members were taken into the account meaning; each team member could place collected materials into the database while considering and maintaining the end-users' needs. Main categories defined for each target were:

- Core Data Index
- Historical Records
- Digital Capturing
- Virtual Reconstruction
- References

Core Data Index is the standard guideline provided by International Council of Museums (ICOM) for documenting architectural heritage. It includes nearly 50 required and optional fields to be filled by archivists. It covers variety of information from name of the selected target and recording organization to specific details such as geographical information, coordinates, construction method, etc.

Core Data Index is more likely to be dependent on historical records. For example one section of Core Data Index is assigned to events such as opening ceremonies, renovations, incidents, etc., including date of the events. In some cases the only source to find such information, is to trace and find old documents like newspapers, magazines, etc. Historical records include any information related to the history of the selected target.

Digital Capturing includes full coverage photography, videography and in some cases 3D laser scan. Captured materials were later used as reference for virtual reconstruction. Pauwels et al. (2008), have cited that virtual reconstruction can be done by using visual materials as references.

References were included as well. For contents like scanned documents, photos and newspapers, prospective end-users have direct access within the atlas as permission was already obtained for these digitized materials. However the source of original document is included in references. Other sources such as books and journals are included only as references, which were used to collect information mostly for Core Data Index.

To bring more interactivity into the atlas, cross-referencing between related contents was introduced. This way connectivity between presented materials was maintained. Following this purpose, different types of Cross-referencing, mostly hyperlinks were used wherever needed. Considering all parameters above, a data-management tool with following features was needed:

- Supporting any type of digitized material (audio, video, image and text)
- Ability to use internal and external links for cross-referencing
- Ability to embed small content as well as using external database for large file sizes
- Visualized tree style taxonomy

Requirements above led to using a web design method only as a tool for content management and transferring the collected data to the team in charge of final compilation of this digital atlas. Within different software available for this purpose, Adobe Muse was one of the best alternatives because it was easy to learn by all team members in a short time. Archiving and digital capturing teams could easily place their collected materials into the right place using Adobe Muse. As mentioned earlier it was important to manage collected materials at the first place. Fig. 1 is a back-end sample that shows tree style taxonomy of Adobe Muse which provides fast navigation between different categories at the same time for team members. Each category is marked by circle, linked to its related tab for better understanding. This advantage of Adobe Muse enables the archivists to have access to all categories at the same time, which speeds up the process. Categories are explained in Fig.2 and Fig. 3.

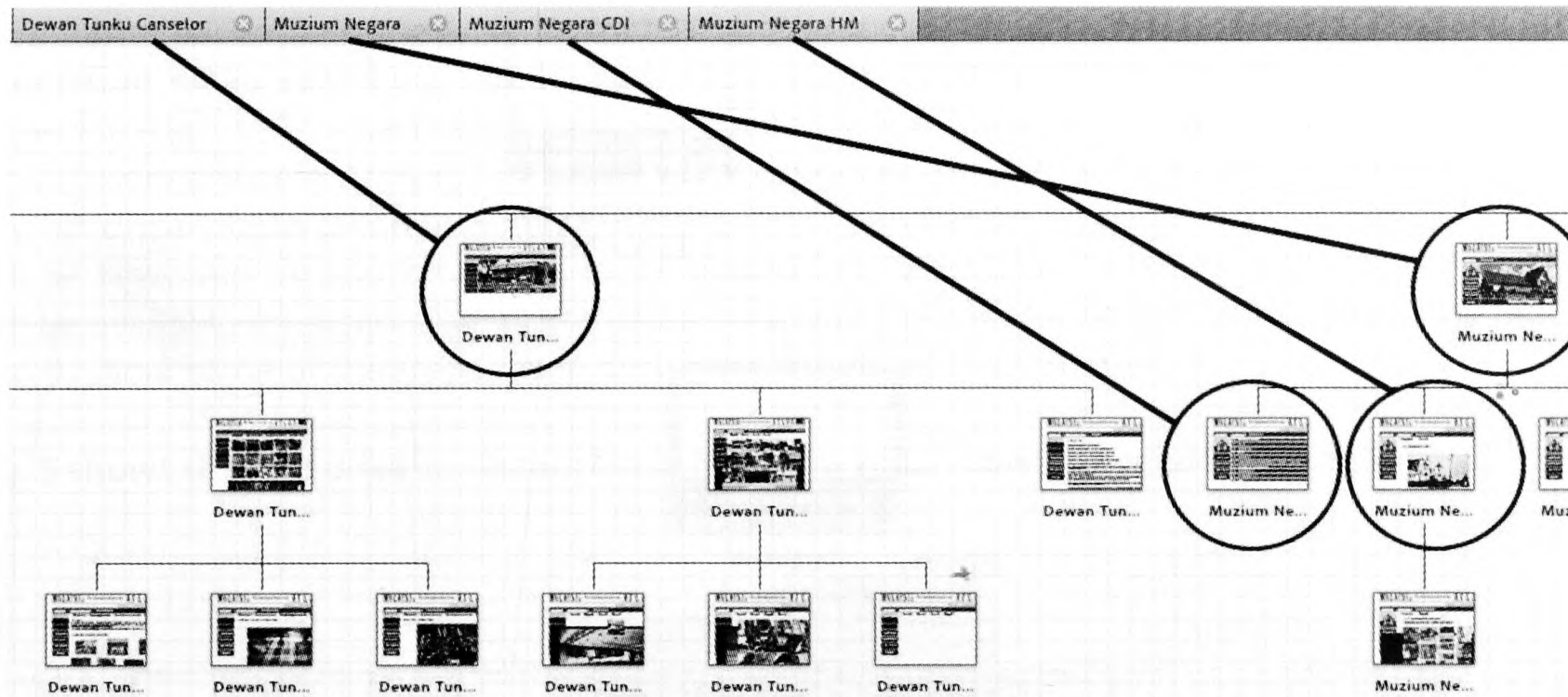


Fig. 1: Adobe Muse tree style taxonomy
 Source: Authors

Just like any other tool Adobe Muse had its own limitations. One of the Major challenges was speeding up the process by letting all team members work at different pages of atlas, and at the same time being able to observe the last modifications done by other members without interruption. To reach to this goal the backbone of database was initially established by one of the team members aiming to maintain everything under the parent directory to avoid any missing hyperlink while moving the database to another server. Fig. 2 shows a theoretical framework which was initially designed before the database was created.

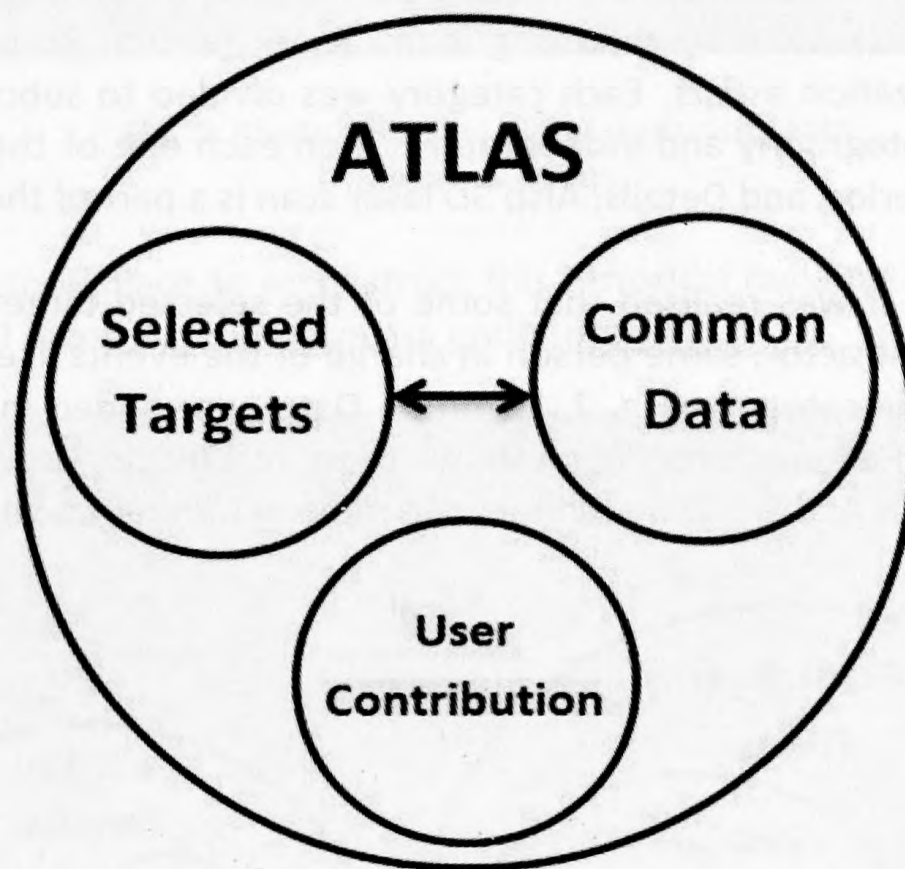


Fig. 2: Theoretical framework of the digital atlas
 Source: Authors

As mentioned earlier 30 targets were selected at the first stage, considering their importance. Therefore in Fig. 2, the 'Selected Targets' was divided into 30 categories. Fig. 3 shows an example called 'Target A' including its first layer categories.

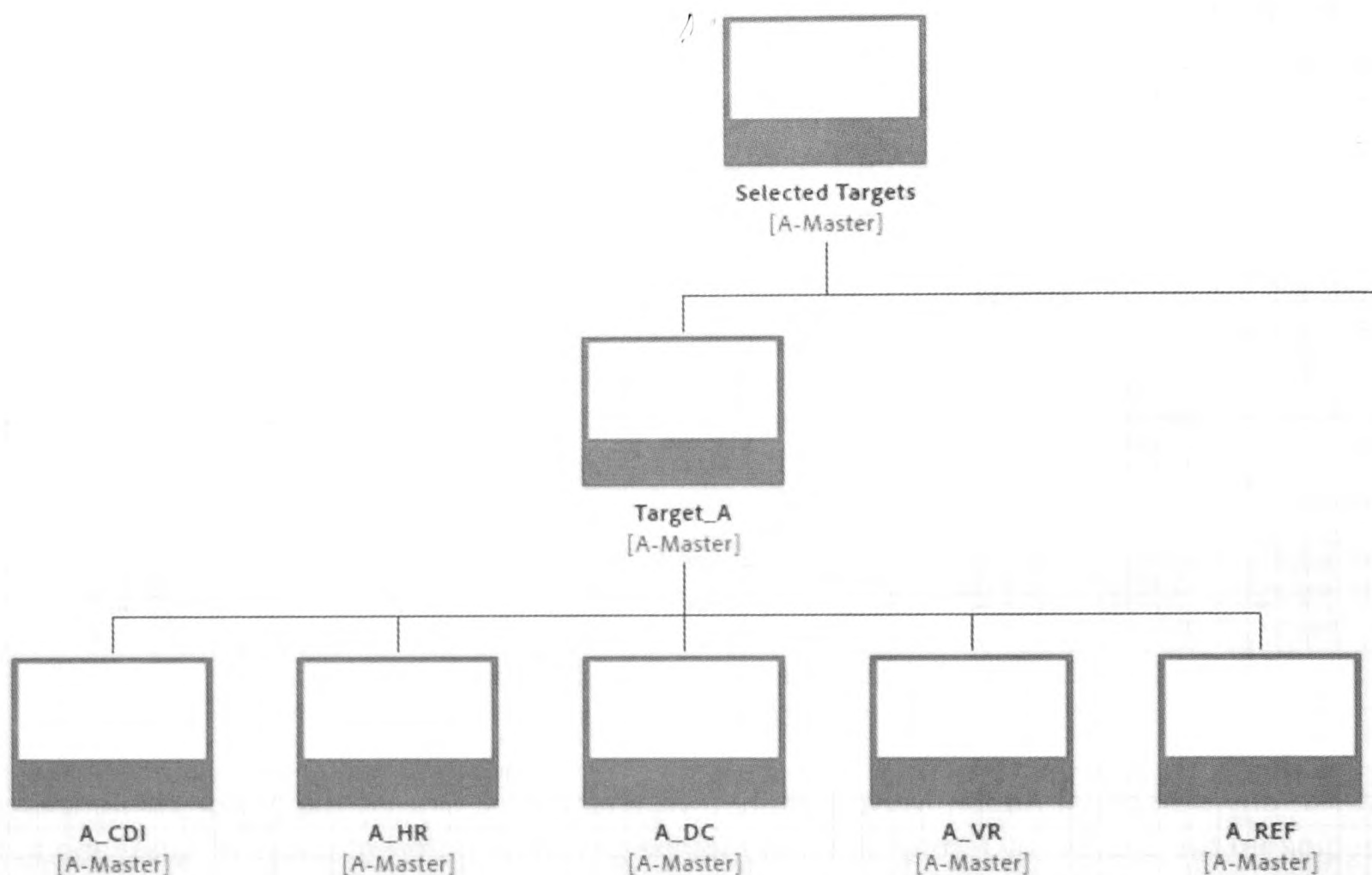


Fig. 3: Target_A's first layer categories
 Source: Authors

In Fig. 3, A_CDI (Core Data Index for Target A), A_HR (Historical Records for target A), and A_REF (References Used for CDI and HR of Target A) were covered by archiving team. A_DC (Digital Capturing of Target A) was done by capturing team. A_VR (Virtual Reconstruction of target A) was delivered by visualization artists. Each category was divided to subcategories. For example DC was divided into Photography and Videography. Then each one of these two categories was divided into Exterior, Interior, and Details. Also 3D laser scan is a part of the digital capturing.

During the investigation it was realised that some of the selected targets have similarities like same architect, same contractor, same person in charge of the events like opening, etc. To avoid redundancy another main category (Fig. 2, Common Data) was added into the atlas containing Architects, Contractors, Persons, etc. Fig. 4 shows cross referencing between Selected Targets and Common Data, where Arch1 is the architect of targets A1 and A3 while Arch2 is the architect of A2.

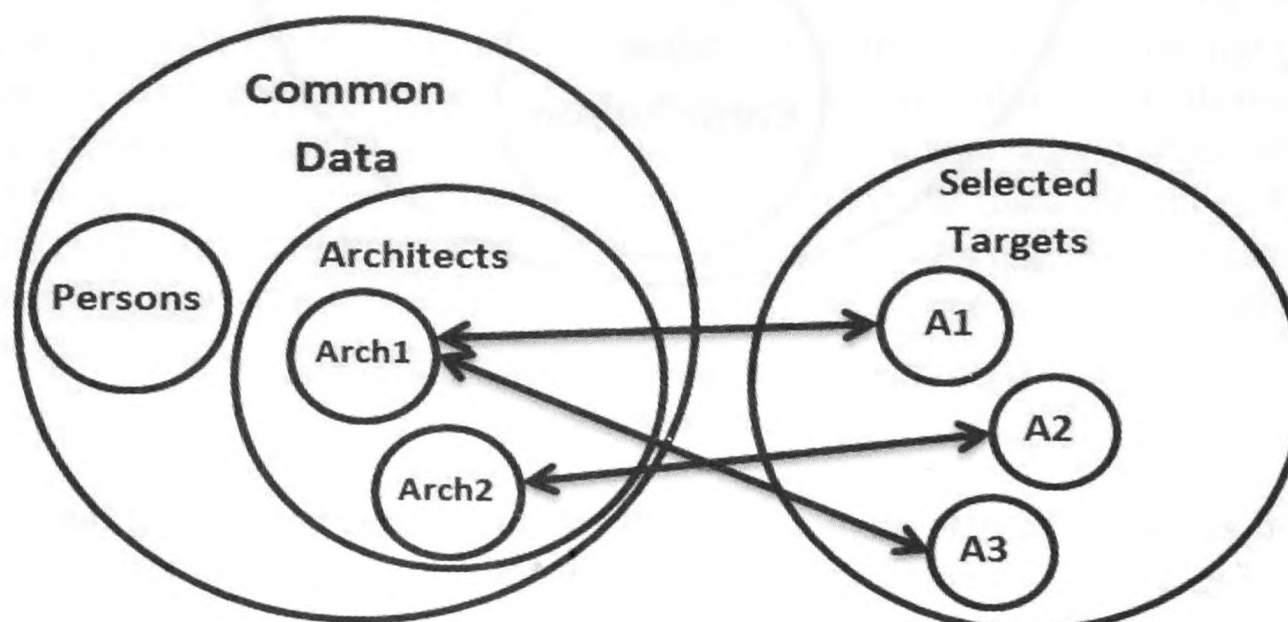


Fig. 4: Cross-referencing between different categories Source: Authors

As mentioned earlier, these types of cross-referencing enable the end-users to have more interaction while searching for desired information. A category named 'User Contribution' is shown in Fig. 2. This category works independently without cross-referencing. This is where future users are able to contribute any historical record related to selected targets. For example any historical photo taken by someone many years ago can be uploaded. These kinds of material will be reviewed by administrators to be placed into the atlas if relevant. Also an online forum will be available for discussion where users can share their ideas. To summarize the study figures 5 to 9, show some of the steps taken during making of this digital atlas.

Fig. 5 shows the first drive-in restaurant in Malaysia which now is tagged for demolition.



Fig. 5: Photo taken by digital capturing team
Source: Authors

An Immediate action took place to reconstruct this historical building in virtual reality. Figures 6 and 7 show the virtual reconstruction process under progress.

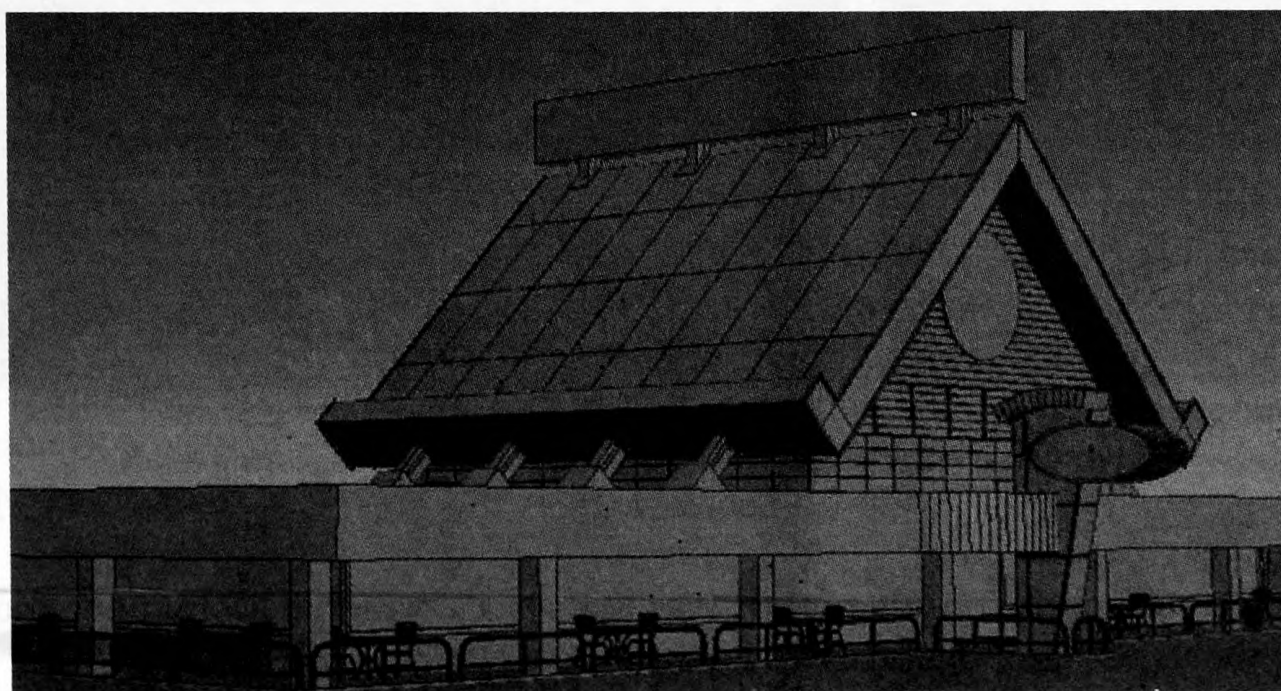


Fig. 6: Polygon model of A&W made by visualization team
Source: Authors



Fig. 7: Sample rendered image of A&W made by visualization team
Source: Authors

In some cases selected targets were heavily surrounded by buildings, landscapes, etc., which caused difficulties during photography and videography. To deal with this issue a drone was used for full coverage aerial videography. Combination of computer-generated 3D model and aerial videos enables the end-users to have a better understanding of the entire structure. Fig. 8 shows aerial views of Rifle Range Flats, Penang, Malaysia from two different angles, taken by digital capturing team.



Fig. 8: Aerial videography using a drone by digital capturing team
Source: Authors

One of the selected targets for this project was Malaysia's National Monument known as Tugu Negara. Fig. 9 shows real photo and 3D laser scan of the National Monument.



Fig. 9: Tugu Negara (left side) and its 3D laser scan (right side)

Source: Authors

Usage of 3D laser scanner was limited to the site conditions such as available space between scanner and the target, available angles, etc. For National Monument full 3D laser scanning was performed due to availability of requirements above.

For final compilation of the atlas Search Engine Optimization (SEO) was considered to provide instant access for end-users.

Conclusion

An important aspect of precedence is the record of the building. This provenance is necessary as the building may disappear. One of the most significant buildings in the USA, by its most important architect, Frank Lloyd Wright, the Larkin Building in Buffalo, was demolished forty years ago and all that is left are a few grainy photographs and plans. Without the record future generations can only speculate. We are unclear as to the original purpose of the Pantheon in Rome, yet it must have been extremely important for a building of its size to be constructed. Beyond this, provenance is crucial in promoting ideas, and has become increasingly so since the 19th century. Architects have formed cliques, frequently associated with ideas and movements in art and philosophy. Promotion of a viewpoint demands examples, and examples where the message is clearly enunciated.

(Woods, 2000)

This study reviewed multiple aspects of digital archiving of architectural heritage. Data collection was done through different methods with focusing on post-independence architecture of Malaysia as the target area. Many objectives were followed by this project. Historical buildings exposed to risk of disappearance were fully digitized as an immediate action. Full digitization achieved through digital capturing, virtual reconstruction (3D modelling/visualization), and

collecting almost any historical record which was traceable and accessible. Also a new framework was introduced into digital archiving of cultural heritage, which is somehow practical rather than theoretical. Authors believe method presented here covers variety of digital archiving aspects in the field of cultural and historical heritage. It can be beneficial in different ways for variety of target audience such as architecture schools, historians, researchers, etc. 3D models can be presented in virtual reality environment to be used by virtual museums or virtual tourists as well as being printed (using 3D printers) for exhibition purposes. However authors do not claim the method presented in this study is the answer to all questions or ambiguities but at least brings more clarity to this field by looking at multiple aspects of the process especially by defining objectives of digital archiving of cultural heritage at earlier stages.

Although software, applications and tools used for this project were not specifically designed for this purpose, the desired objectives were successfully delivered. For future development, in the next stage it is planned to design an application to be used specifically for the purpose of digital archiving of cultural heritage. To our knowledge existing applications are limited to specific tasks. The new application will be more multidimensional rather than being limited to specific areas. Both, archiving team and end-users will be taken into the account.

Currently, this digital atlas is operating on an offline database, waiting for required steps regarding the patenting, copyrights and pending permissions to be taken before getting online. However authors can be contacted via email for more information.

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