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Article

Presence of the past: Digital narrative of the Dennys Lascelles Concrete Wool Store; Geelong, Australia

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Abstract: Re-creation of the past of historical buildings sits at the intersection of the spatio-temporal manifestation of cultural memories, socio-cultural meanings, values and identity re-moulds and refines the existing understanding and sense of place. Digital technologies have become a popular tool in re-creation of the past by creating a new body of knowledge and historical discourse based on identifying the gaps within our written histories. Designers and policymakers around the world have been exploring various tools and technologies such as diachronic modelling yet there is a gap in evidence-based understanding regarding the actual functioning and success of application for place making. This paper, therefore, sets out to scrutinise the role of digital technologies in facilitating digital place making. To do so, it investigates the potential of a new "digital heritage" narrative in the revival of the lost architectural narrative of the Dennys Lascelles Wool Store, Geelong. The proposed paper aims to investigate the potential of a new "digital heritage" narrative and story-telling as a means towards digital place making framework. While exploring the new and unique capabilities provided by the digital narrative in capturing, simulating and disseminating 'lost' heritage it will further imbue a sense of place by connecting the everyday city dweller.

Keywords: Digital Narrative; Reconstruction; Memory; Place Making

1. Introduction

The meaning of a building in the collective memory is intrinsically attached to the process by which it was produced and the manner it is experienced through time and space as well as the way it is perceived. As memories are attached to the development of a sense of place and have attachment to its users, capturing the memories and the lost layers are crucial to preserve the built heritage of a place. In this regard, the City of Geelong posits an interesting case as it was born and changed rapidly along with the mode of production and economic activities. Hence, the architecture of the city of Geelong in the collective memory sits intrinsically at the intersection of multiple narratives as palimpsest. It raises questions about gaps, or histories untold, and seeks what is borrowed and lost through time and space to reconstitute the heritage. The rise of the wool industry and the development of the port town of Geelong could be dated back as early as 1836 [1]. Since then, development and the growth of the town had been closely connected with the wool industry for the next one and half a century. As wool became a booming industry for Geelong, the space for wool stores became premium and hence in the next few decades, collection of wool stores and warehouses became the main feature of Geelong's urban fabric. Major streets like Moorabool Street , Malop Street and Brougham Place etc. in the Geelong CBD are studded with great varieties of new buildings related to the wool industry. The whole central city area was physically reshaped and redesigned to accommodate the new growing business, which had tremendous social and cultural impact on everyday life of the local community of that time.

With the rapid rejuvenation of the city of Geelong in the late 1980's forced most of the industrial buildings to be relocated from the city center that resulted in the heritage overlay of the city to gradually wipe out. The lasting legacy of wool making as well as industrial architecture including the legendary Bow Truss Building (Dennys Lascelles

Wool store) and many others is eventually on the verge of getting lost from the memories of city dwellers, either because of demolition or for major renovation. The tangible as well as the intangible memories are being lost at the cost of development.

The integration of digital technologies for the interpretation of urban environment and spaces has opened up unprecedented possibilities in the way space can be experienced and also into its meaningful interpretation. Recent studies have explored the integration of digital technologies in varied contexts, cultures, disciplines and themes. Ranging from a discussion for their integration aimed at creative, artistic and cultural purposes [2] [3], scholars have also called attention to their application for better comprehension of human perception of public spaces [4] [5] [6}. For educational and recreational purposes, these technologies have been recently receiving global acknowledgement by designers and policymakers for their newly-discovered role in increasing awareness about the history and culture as well as bringing together urban audiences around issues of public interest [7] [8] [9] [10]. However, due to the elementary nature of this field, there still lies a big gap and scope in terms of analysis of application of newer inventions and applications.

To address this gap, the current research team has recently accomplished a pilot project "Digital narrative for place making: Diachronic Modelling of the Dennys Lascelles Concrete Wool Store; Geelong" to test and demonstrate the role and scope of digital technologies for the revival of the lost architecture of the Dennys Lascelles Wool Store, Geelong. Based on this project, the key research questions that this study aims to address is: (i) How can digital technologies such as diachronic modelling be applied as a tool for the facilitation of place making in spaces and structures that hold heritage significance?, and (ii) How can we define a conceptual framework that aims at establishing a connection between actual and digital recollection of memories represented through narratives and digital experiences?

2. The Case of Dennys Lascelles Woolstore

The Dennys Lascelles Concrete Wool store, popularly known as Bow Truss Building, is an early 20th century industrial building with expansive concrete roof once stood in Brougham Street, where the modern steel and glass TAC Building stands today. Along with Barwon Sewer Aqueduct this particular building is one of the two most celebrated engineering achievements by Edward Giles Stone a civil engineer who pushed design boundaries with reinforced concrete in the early 1900's. It was claimed as being the largest flat-roof space in the world (almost an acre) without visible support, and thus creating a flood of natural light on the showroom tables by means of roof lighting [11].

The site was considered very unique and was listed on several heritage registers including the Register of National Estate and National Trust register. The building was even nominated for a world heritage listing that was supported by several international referees. Although this four-storied warehouse was not the first large reinforced concrete commercial building in Victoria, it is now the most original known and possesses a number of unusual features. The bow-string roof trusses span 182 feet and contribute both a technological feat to the building and a strong visual element to the Geelong skyline. The external cladding is also of reinforced concrete and thus is structural as well as decorative in a simple Art Nouveau style. As a part of a complex (present day National Wool Museum) which began on its site in 1872 under C.J. Dennys, this building perpetuates the advances made in wool marketing by the firm in their earlier buildings.

Unfortunately the rapid rejuvenation of the city of Geelong in the late 1980's forced most of the industrial buildings to be relocated from the city centre. The heritage overlay of the city has been gradually wiped out due to the economic pressure. In May of 1990 the building was destroyed after the State Government of Victoria intervened to override the state's heritage body on its significance. The site was left as a car park for twenty years till

the TAC building was constructed. The lasting legacy of wool making as well as industrial architecture including this legendary Bow Truss Building and many others is eventually on the verge of getting lost from the memories of city dwellers. The tangible as well as the intangible memories were wiped out at the cost of development. It is high time to respond to this situation.

3. Recollection and Reconstruction of Memory using Digital Heritage:

As most of the buildings related to Geelong's booming wool industry, including our case, are demolished, its architectural impact on the morphology of the town is almost lost. Recollection and reconstruction of memories related to wool industry architectural objects and artefacts, and activities tied to it, varies based on the physical presence of the building in question because human memories are directly attached to the physicality of our environment. Consequently, the physical disappearance of the wool industry artefacts often means the disappearance of the memories related to it. At the beginning of the 20th century, Halbwachs [12], one of the most influential scholars of collective memory in social sciences, explains how all memories are recalled from the outside: the physical environment in which one resides offers different material means for memories to be reconstructed and recalled in the present. This said, architecture has always been tied to the study of human memory.

In her work on Medieval and Renaissance memorial strategies, The Art of Memory, Yates [13] explains how mnemonic systems developed in Ancient, Medieval and Renaissance ages were based on the utilization of visualized human settings where the placement of allegorical images happened inside imagined or recalled architectural edifices. She observes that this "method of loci" or "the art of memory" which uses loci and imagines, places and images, was invented by the Greek poet Simonides and recorded in 264 B.C. for the first time. We know today that this memorization technique was used by Greek and Roman orators equally, main sources being Ad Herennium of an unknown author, Cicero's De Oratore, and Quintilian's Institutio Oratoria. Yates [14] claims how this classical mnemonic device "consisted in fixing in memory as series of places, usually places in the building, or buildings, or in the streets of the city" (p. 573) was utilized to create spatial images and align them in a particular order that every one of them represents a specific point of the speech. "We have to think of the ancient orator as moving imagination through his memory building whilst he is making a speech," Yates [15] writes, "drawing from the memorized places the images he has placed on them" (p. 3).

In the intriguing essay about the interdependency between "built form and human thought," Parker [16] claims how memory, as our stock of knowledge, borrows the structure of its meaning-contexts from architectural and environmental works. The author argues, "It is evident that architectural imagery and structuring extend into intra-mental knowledge and memory" (p. 150), and further continues how the reverse extension also occurs: "Memory, personal and social value and key societal concepts also extend into architecture and material culture, where they gain stability and easy accessibility" (p. 150). This mutual extension of architectural imagery into memory and memory into architecture causes our physical premises to become our conceptual premises, continuously co-creating each other. Parker [17] named this correlation between the two as architectonics, "the art of constructing systems of thought, and thus stable contexts for knowledge and ideas… when it can draw on aesthetically charged, concrete imagery" (p. 151). In other words, mental architectonics grounded on three-dimensional, visuo-spatial structures can sustain greater permanence and organizational complexity in the mind of a user.

Similarly, Gestalt psychologist Rudolf Arnheim [18] recognizes this correspondence between human thought and architectural form. He claims that human thought has always been "architectural" in its nature. Analysis process, development of an argument, recollection of a memory, storytelling – all of them need to be laid out spatially first. Arnheim argues: "When the human mind organizes a body of thought, it does so almost

inevitably in terms of spatial imagery… any organization of thought assumes the form of architectural structure" (p. 271). As such, the mind is not only reinforced, but it relies on visualized architectural images as a part of ongoing mental processes.

Consequently, the connection between human cognition processes and visualization of images of the built environment is unquestionable. In The City of Collective Memory, Boyer [19] writes: "Architecture and city monuments can become artefacts and traces that connect the past with the present in imaginative and inventive ways and help to build a sense of community, culture, and nation" (p. 309). As such, the value of a finalized physical building is not limited only to its immediate purpose – to protect and organize our lives in a creative, effective and comfortable manner – but its significance lays in an array of intangible meanings that are assigned, through time, to its physical existence and people's interaction with it as a part of the broader urban landscape. Some would argue the immaterial aspect of architecture that only occurs after the building assumes its physicality represents the greatest value that a material edifice can attain because it aids human thought process, recollection, and is a witness of people's lives and histories through time.

Drawing on the latest discoveries in the fields of neuroscience and cognitive psychology, Goldhagen [20] observes that the physical environment that we inhabit during a particular experience plays the dominant role in memory itself. These findings are hardly novice, as they represent conformity and an addition to many studies that have been conducted in the last century throughout different scholarly fields on the relation of place and memory. Goldhagen explains: "In the contemporary world, where our environments are overwhelmingly built environments, what this means is that the buildings, landscapes, and urban areas we inhabit are central to the constitution of our autobiographical memories, and therefore to our sense of identity" (p. 83). Neurologically, different kinds of long-term autobiographical memories are consolidated and prepared for long-term storage in the part of the brain called the hippocampus and the adjacent parahippocampal region. Working with the other areas of the brain, this part of the brain also facilitates our ability to navigate space. "Place cells," Goldhagen claims, "enable us to both identify a place and consolidate a long-term memory" (p. 84). Therefore, the cognitive processes of autobiographical memory situate the built environment inside us, and that way, it constitutes "the internal architecture of our lives" (p. 88). Therefore, visualized place-based experiences create a unique framework for self-understanding and perception of who we are.

Based on the premise that architecture could be a unique and revealing frame of inquiry to gain insight into human nature, attitudes, values, worldviews and immaterial/material culture, the main aim of the project is to address three key issues using digital heritage narrative as a tool for reconstruction and recollection of the past of Geelong's wool industry. With the aim of improving the access of general audiences to the architectural-archaeological heritage content of Geelong's history, the project aims to deliver two main tangible outcomes:

1. A digital model visualizing the lost architectural asset of Dennys Lascelles Wool Store based on the fragmented archival data available for exploring the story board instead of a photo realization of the original building. The key idea is to initiate and demonstrate the process of understanding how digital place making can complement physical place making, and vice-versa, through utilization and reconstruction of collected heritage material.
2. To explore and establish a new conceptual framework that will define successful relationship between (a) recollection and (collective) memories and multiple narratives of the place, and (b) creating a web-based framework for bottom up user based and user driven storytelling online immersive environment, that can be further reapplied in the heritage industry with the purpose of meaningful, ethical and community driven representation of the past. This section may be divided by subheadings. It should provide

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a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

4. The Idea of Diachronic Modelling for Digital Heritage

The proposed Diachronic or 4D modelling is a method that is based on the premise that consider architecture as a process rather than product due to different internal and external conditions and that transforms through time. It relies hugely on a Linked Open Data Base (LOD), which is a linked database for data collected for a particular site from the earliest known date. This LOD usually collates all the relevant information in a scientific way and tries to fill in the lacuna using scientific / architectural reasoning by observing other social, political, cultural and economic etc. conditions. Based on this analysis it proposes a possible three dimensional transformation of the site in 4 (four) dimensional coordinates (X, Y, Z and T) that is also linked with particular conditions both diachronically and synchronically. It places a building in the crossroads of multiple historic narratives both tangible and intangible. This has not been used in capturing architectural history and heritage in Australia to date. The novelty lies in applying the visualization capabilities provided by developments in digital design to make clear the multiple aspects of heritage buildings, particularly the aspect of firm relations between architecture physicality and memory for the purpose of recording and disseminating of architectural heritage – showcasing how the building was actually conceived, constructed and used – and in so doing, unravelling multiple historical layers and connection to a broader geographical and cultural domain.

These dynamic narratives of the sites (with the end dimensional hybrid capturing techniques) in Geelong's CBD depicting the changing forms and patterns of storytelling of this industrial town over time and related official historical narratives, is an innovative and a novel research outcome, which will serve to reconstruct the lost heritage building to define its place in the collective conscience of the present day Geelong Community and beyond in a tangible and accessible format.

5. The Digital Modeling Process:

5.1. Collection and Analysis of Historical Data

The main challenge at the beginning of this research was the limited visual information and reference such as floor plans and sectional drawings to help understand the spatial position and architectural structure of the demolished Dennys Lascelles Austin Bow Truss Wool store. Absence of the construction documentation also means it was practically impossible to rebuild all engineering details on the computer. Therefore, it was decided to make the 3D model match as close as possible with the collected sets of textual and visual reference sources from newspaper archives and old photographs. Fortunately, some former studies around this demolished Wool store documented by architectural historian Miles Lewis [21] provided valuable insights into the construction at the time of how the giant concrete bow trusses pass through sawtooth roof structures in order to welcome abundant natural light [1988, p.18]. Some images particularly captured the key features of the building, including facades, roof panels, truss pairs, north-east entrance and the demolition photos revealing the internal structure of the building. Moreover, both the TAC (Transport Accident Commission) building at the site and the remaining adjacent heritage architecture now known as the National Wool Museum also offer useful reference to speculate dimensions for the Bow Truss Wool Store Building. The data were continuously collected, managed and analysed to be served as historical reference inputs for the iterative 3D modelling in Rhino.

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5.2 3D Modelling of the Lost Bow Truss Wool Store Building

Rhinoceros 3D (Rhino) was chosen as the modelling tool for digital reconstruction because of its precision and sophisticated control of geometric shapes during the redrawing process, which is suitable for the condition of continuously updated reference data. The main component that characterises this wool store is its massive, column less top floor which measured approximately 55.5 meter x 52 meter. By using the measuring tools in Rhino such as Snaps, Evaluate Point, Measure Distance and Angles, the spatial relationship between each chord, rod and roof line could all be accurately calculated based on the bitmap of the girder section (Figure 1). Once the modelling of the first pair of bow truss was completed, it then could be duplicated and positioned at the correct place by using the tool of Array in Rhino (Figure 2). Similarly, many other repetitive components were following this modelling strategy: the windows, roof panels, facade columns and external decoration (Figure 3). It was important to bear in mind that all different single pieces were connected with each other, if one component of the building were changed, then everything else should be updated accordingly. Therefore, all supportive lines, surfaces and geometry could be saved in one layer as back up in case earlier modelled elements were needed, and all these digital records could be considered as internal data reflecting the 3D manufacturing and testing in the process of digital reconstruction (Figure 4).

Figure 1. The photo of the interior (Left) serves as the reference to reveal the roof and ceiling structural components and represented through the digital reconstructed model (right).

Figure 2. Left: The photo of the bow truss structure above the saw-tooth roof system. Rightt: The digital reconstructed model of the bow truss roof is modelled based on the reference of the previous photo.

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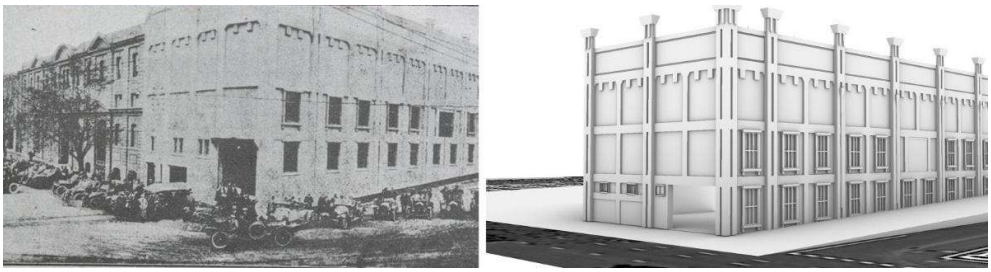

Figure 3. The photo north facade and entrance of the lost Wool Store (left) as the reference for the overall exterior features and elements of the facade (right).

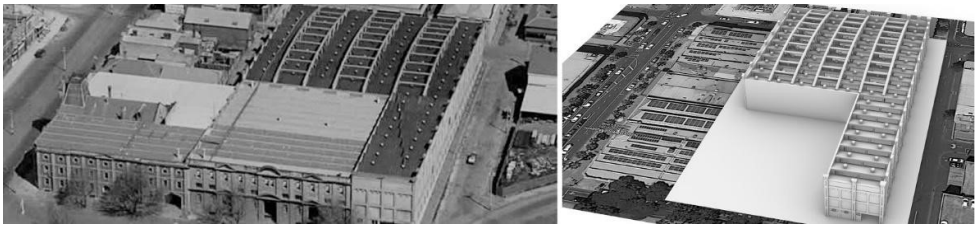

Figure 4. The bird-eye view photo (left) as the reference for the overall roof structure and facade of the digital reconstruction (right).

5.3 Representation of the Architectural Narrative

It was easy to navigate the reconstructed 3D model in Rhino, as one can zoom in, zoom out and rotate the camera at any view point to experience the Bow Truss Wool Store building (Figure 4). However, the architectural narratives were decided to be presented on a website as a virtual exhibition to the public, therefore, the interpretation of the 3D model had to take into consideration which graphic works match up to the general audience. Two 3D images were made via the initial diachronic digital model to maintain the quality of aesthetic and accessibility of the architectural narrative. One was an exploded isometric illustration of how this lost heritage building was constituted by sets of different components (Figure 5). The other one was a series of cross-sections that explained the relationship between the Bow Truss structures and the whole building (Figure 6). Some images were taken underneath the model of saw-tooth window frames and roof panels, which complemented the missing visual narratives from the historical data set. Other representational images compared the lost Wool Store Bow Truss building with the existing geometric volume of the TAC building and National Wool Museum, showing the lasting architectural legacy within the urban context (Figure 7). Figure 8 illustrates the additional information of the various isometric views that interpret from different directions to provide the comparative insight between the past and present urban context of the Wool Store.

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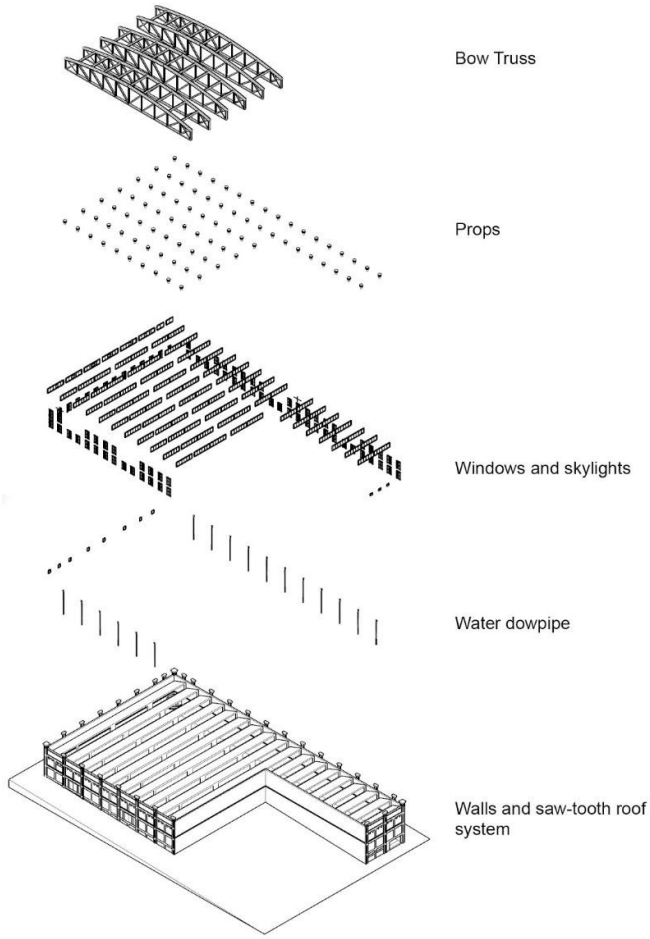

Figure 5. Exploded isometric view illustrated the various components to form the overall Bow Truss Wool Store building.

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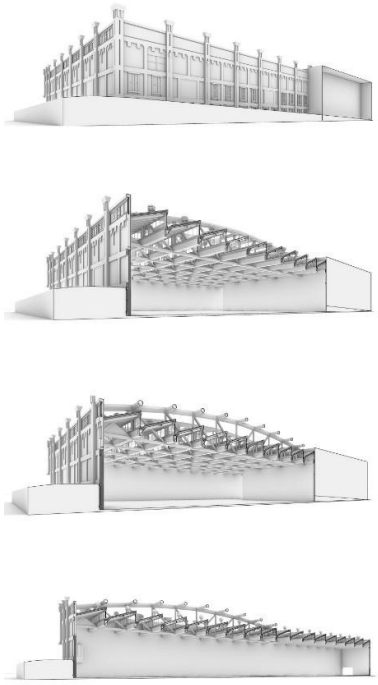

Figure 6. The sequential sectional perspectives to demonstrate the roof structure that consist of the various components include the reinforced concrete bowstring trusses and saw-tooth roof system.

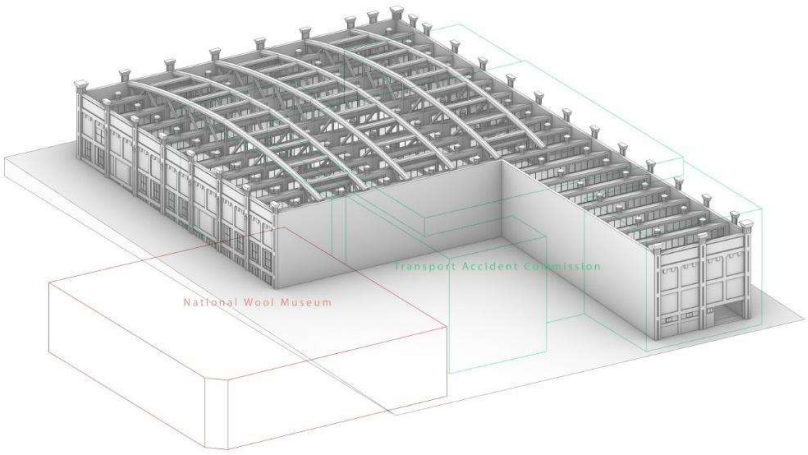

Figure 7. The 3D visual comparison of the geometric volume between the existing National Wool Museum, TAC building and the lost Bow Truss building.

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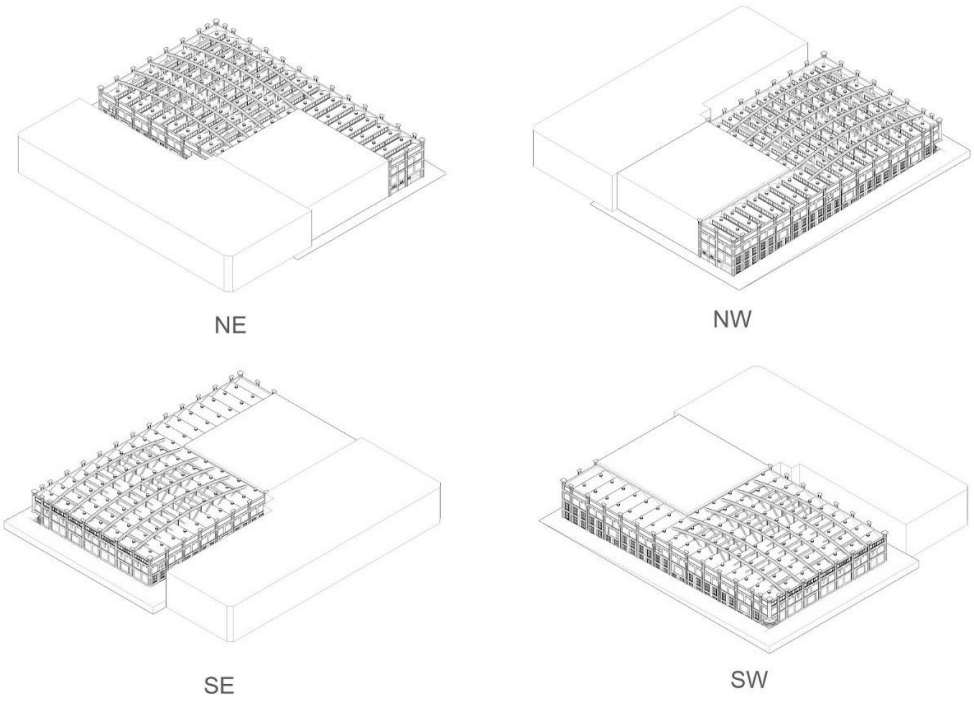

Figure 8. The various isometric views of the Bow Truss building: North east, north west, south east and south west.

6. Discussion and Going Further

The meaning of the building and associated collective memory are intrinsically embedded in the process through which the building is conceived, produced, and endure a series of socio-cultural changes [22]. Hence the history of our built heritage should be centred on the understanding of human experiences, history and narratives through historic fabric, structures and remains [23]. Being in a telescopic distance it is always difficult for present day users to immerse in the past and embody memories and meaning of a building, without participating in the performance of rituals and social acts. [24]. Buildings of the past, with its very existence, attached to collective memories of certain groups [25]. Thus architecture becomes the most tangible and durable objects of remembrance, though could be paradoxical and contested when it engages with collective memory [26].

Virtual heritage has significant implications on non-invasive restoration and preservation of the monuments. It generally provides an immersive multimedia experience through a computer-simulated environment that can simulate physical presence in places in the real world [27]. It further provides scope for an interdisciplinary research environment by developing a rich database of the digital assets for the conservators, historians and archaeologists, to restore the historical sites, as well as heritage preservation. Though for most of the cases the 3D virtual models contain accurate data and help for restoration, whether it could capture the associated meanings and memories, especially the intangibles values are a big question for an architectural historian. Thus the concept of building as 'Place' along with 3D articulation of the lost building comes in front. 'Place' through the articulation of space has been at the concern of architectural theory and practice for the last few and a widely discussed topic of architectural history and theory since long. Place can be understood in relation to space, though it is not created by mere three dimensionality of space. It is rather 'about the

practices and politics of place and identity formation – the slippery ways in which who we are becomes wrapped up with where we are.' [28]. While the assumption of 'Place', in the context of this chapter, is a meaningful interaction to a space where the user, environment, and the memory 'tell it's past…[and] contains it like the lines of a hand.' [29], the 3D model of architectural space generally addresses the metric expression of form, shape and material physicality.

Since long the discipline of history and theory of Architecture traditionally focus on the aspects of visual culture best represented by the most advanced image reproduction technique of that time [30]. Introduction of Virtual Reality (VR) and Augmented Reality (AR) certainly transformed our capacity to understand structures and resolve issues of plausible historic design that no longer exist [31]. With the incorporation of digital humanities into the mainstream research and dissemination process of Architectural History, virtual imagery would certainly dominate the entire Architectural realm. However, the question remains to what degree and how these Virtual imagery should be used to convey the meanings and memories as well as interpret them correctly particularly, due to the heavy reliance and ocular-centric nature of these technologies. While these virtual realities may allow us to investigate and recreate the lost architecture, "…they are not likely to help us experience inhabiting that place, moving through that place, or understanding the dynamic and ever-changing relationship of people and place."[32]. The reason may be the overemphasis on the fidelity of the created objects and understanding of ocular engagement in fully understanding Place. While imagery has always been considered as factual and is used to provide evidence in "… legal cases and in science, photographs operate within the modality of actuality. The photographs [the visual] are meant to allow us to discern what actually occurred" [33], however it could be misleading if we put them in the wrong context. This is no different to evidence of the historical facts. Therefore, when utilizing visual technologies such as VR and AR to portray architectural history, a Place should be understood to its fullest within the context. We know that icons and symbols provide meaning to architectural form, and these meanings are the intangible aspects of the heritage. As Pallasmaa argued, "... technological culture has ordered and separated the senses... Vision and hearing are now the privileged sociable senses, whereas the other three are considered as archaic sensory remnants with a merely private function, and they are usually suppressed by the code of culture " [34]. This suppression of other senses and the ocular facilities might provide a false sense of Place by conveying a different meaning or sometimes creating a new one. By just creating an ocular narrative of a Place through Virtual and Augmented realities we could ultimately be removing the intangible feelings, emotions and cultural memories attached to a space. Without the true encompassing narrative "…no matter how indexical, suitable, or numerous the representations of an object are, what is on the screen will always resolutely remain a representation that stands in for something else" [35]. This re-production of a space becomes its own entity and "establishes their own versions of the past" [36].

Hence in this particular project visual aspects of the reconstruction i.e. photo realization is considered as part of the narrative of the building. It is considered as just the beginning of disseminating heritage value and connecting the user rather than the end product. As discussed earlier architectural heritage is something more than the physical form. A building is a place for doing different activities in and around. To understand the architecture of this monument, mere virtual reconstruction of the three dimensional form would not be sufficient. In order to create a virtual environment embodying the essence of place is inevitable. Usually the role of 'Place' is virtual environments as a locator of objects [37]. Thus the architectural heritage in the collective memory sits intrinsically at the intersection of multiple narratives as palimpsest. Hence to recover the memories of this building, it is required to identify and examine these narratives along with the virtual

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modelling. The issue of 'Place' becomes crucial while reconstructing the past with limited resources in hand, which are fragmentary and inconspicuous in nature. The temporal distance and the lack of understanding between photo realization of the actual architecture and creating an unbiased sense of place remains at the crux of the problem.

From that aspect the digital narrative of the Bow Truss Wool Store building opened up new opportunities for the general public to communicate and interact with the state's heritage significance. The same approach with the 3D model can also be applied to bring back other damaged, unbuilt or demolished buildings. For the future work, it is planned to scale up the project to use a case study research strategy and the content of Geelong's wool industry heritage to empirically investigate how to communicate architectural buildings with different social value and collective memory (of renovated vs. demolished building) among the local community.

As this particular project had limitations due to the COVID 19 situation in terms of budget and accessibility, initial aims and objectives were amended later to frame it within the capacity of the project team.

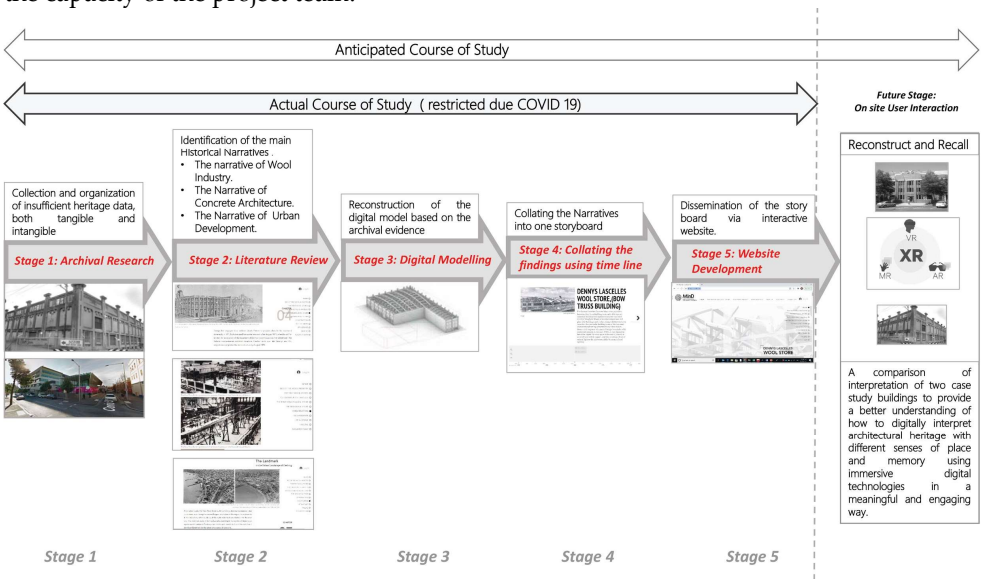

Figure 9. Flow diagram showing the anticipated and actual study of the specific five stages and the proposed future stage.

Considering the two significant changes of situation, limitation of budget and limitation of time, the research team has decided that instead of providing an onsite VR/AR experience for public interaction, the amended proposal would aim towards developing a bottom up user based framework for capturing the narrative of the building. Aligned with the changed research focus due to existing limitations of physical movements in public space, the study has explored in-depth variations of cross-media storytelling in relation to digital (on-line) place making in order to understand how different digital/virtual platforms can diversify and expand heritage experience. For this purpose the project was designed/ redesigned/ undertaken in the following way with five specific stages that illustrated in a flow diagram as Figure 9.

Stage 1: Collection and organization of insufficient heritage data, both tangible and intangible. In this stage a thorough search was made by the team into all the available digital archives in Australia. Using TROVE (an online database by Australian National Library) as starting point the team browsed through different other national, state level and local databases for images, maps, publications, newspaper articles and any other relevant information regarding the building itself, city of Geelong and the wool industry in the region). The idea is to collect any fragments of information that might have some

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kind of connection with case study building. Hence a wider and broader search was done to understand the context under which the building was incepted, constructed and eventually demolished. Since the building was demolished there is very little visual data available in different online databases. Now drawings of the building were found. Major descriptions about the buildings were mainly found in different newspaper articles bet to een 1910-1917 describing this awe inspiring building as an urban landmark. All these fragmented information were initially organized chronologically using Sutori (www.sutori.com) as an online interactive digital platform. Due to lockdown in Victoria, Australia the research team members could not meet physically and hence Sutori appears as a very good platform to interact with the information collected by different team members and edit if necessary.

Stage 2: Identification of the main historical narratives. Once the collected data were initially organized chronologically, the team focused on identifying different historical narratives associated with building. The team has identified three major historical narratives namely, the narrative of wool industry in Geelong region, the narrative of concrete architecture and the narrative of urban development in Geelong. The initial database in Sutori was then collated according to the three narratives and different research team members assigned to look into different narratives and focused on creating a storyline for dissemination.

Stage 3: Reconstruction of the digital model based on the archival evidence. Once the draft storyline of the three narratives were created and case study building was placed on the intersection of the three narratives, all the information relevant to the building and its architecture was collated and a 3D virtual model of the building and the site was made based on the available date. The detailed process of the model making based on eth fragmented resources was described in the earlier section.

Stage 4: Collating the Narratives into one storyboard. This stage involves collating all the three narratives and the virtual model of the building into one storyboard for the general user. The storyboard was designed in a simple and easily accessible way, avoiding all the research related jargons so the everyday users can easily grasp the content. However, the information that more complicated nature was linked in such a way that if anybody is interested in that , can also have access.

Stage 5: Dissemination of the story board via interactive website. The final stage of the research involved developing a bottom up user based web framework for capturing the narrative of the building, which is available at www.dennys lascelles.net (Figure 10). This website is at this moment and open for user feedback and comments as well as contribution through interactive forums. Any user who has memories associated with this building as well as any images, drawings, photographs that are relevant are encouraged to share those through the website. It is anticipated that after one year of running the website these feedback and contributions will be collated with the main story line. Hence a web portal will work in both ways.

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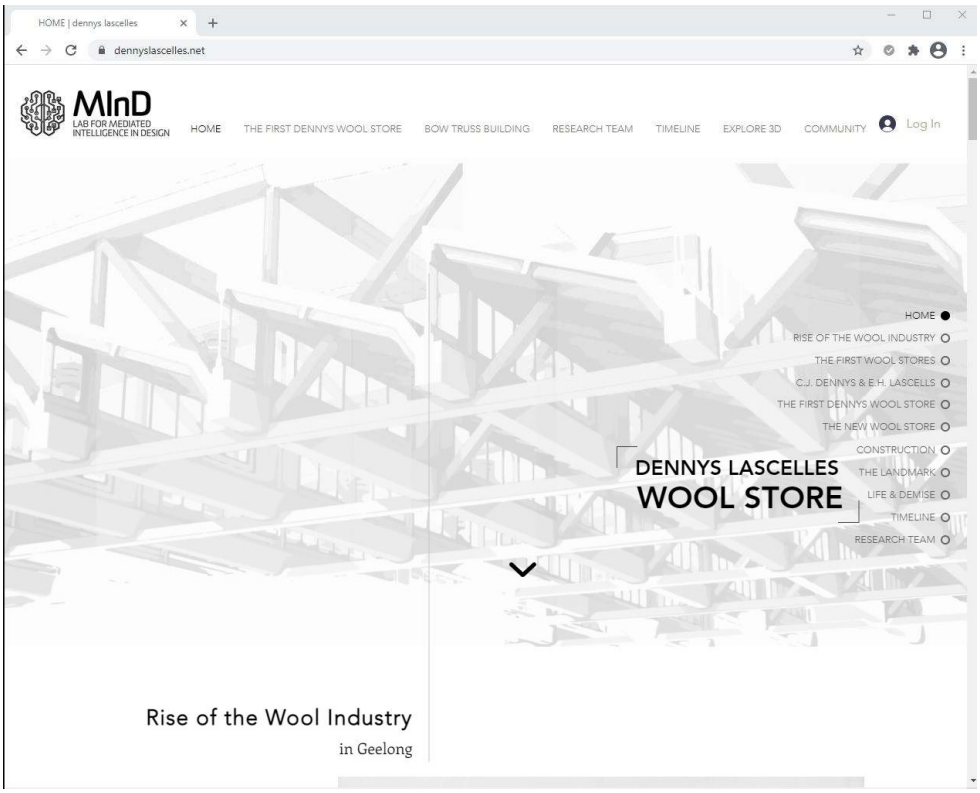

Figure 10. The bottom up user based interactive website for the project.

After the completion of the project we have learnt what it means to detach the heritage material from the physical location of origin, and consequently, how it could create a novel "digital heritage space" for the user. Throughout this process, the attempt was to understand the advantages and drawbacks of construction of "virtual" versus "physical" space in terms of representation of heritage material, and to understand how both can be utilized in a more creative and efficient way. Hence the team has focused more on developing the digital model for exploring the story board instead of a photo realization of the original building. The key idea was to initiate and demonstrate the process of understanding how digital place making can complement physical place making, and vice-versa, through utilization and reconstruction of collected heritage material. In other words, the aim was to open the discussion, omitted so far, on construction of memory when participant's experience is obtained through engagement with "virtual historical space" compared to traditional means of heritage representation related to specific physical space (traditional museums, galleries, monuments, etc.)

The learning from the project necessitates a novel digital heritage interpretation approach [38] underpinned with the architectural theory, and supported by human-centered design and participatory design processes. That could be explored in future by upscaling the project for the potential use of cutting-edge immersive Extended Reality (EX) technologies such as Virtual Reality (VR) and Augmented Reality (AR). The heritage content in XR will be relocated on a digital humanities GIS (Geographic Information System) platform providing general public and engaging experience through time and space as a 4D (3D + time) narrative. The results could be achieved through an interdisciplinary collaboration of researchers from architectural, design, heritage, and engineering areas.

In a situation where the heritage building is partially or fully lost, the project demonstrates that major interaction with the user is necessary for the experience to be

memorable for the participant, which we tried to achieve through "digital storytelling" and creating new "digital narratives." The literature and research findings from the field of memory studies show that memory of a place, and consequently place attachment and place identity, can be severely endangered and even fully erased through time when the physical artifact, including architectural edifice, was disappeared/destroyed. There are no empirical studies reports published so far how the memory construction and reconstruction happen through engagement with virtual heritage places. Whether it could be done by VR or AR application or through mixed reality is a matter to be investigated further. The finding of the project raises questions about that. As we know the VR environment and real physical environment by using AR has often very different approaches because of the different nature of experience and human-environment interaction. VR provides a total immersion, often of places that are hard to access or do not exist (anymore). Such experience can be accessed from anywhere anytime using a Head-Mounted Display (e.g. Oculus Quest). During the global COVID-19 pandemic in 2020, many museums created so-called Museums from Home experiences, including in VR, for visitors who were not able to access physical museum exhibitions [39]. AR on the other side augments physical reality by overlaying a 2D or 3D information. The image is then projected on a smartphone, tablet (e.g. PokemonGO game) or on special glasses (e.g. Hololens or MagicLeap). Current smartphones and tablets enable AR content to be accessed in situ, which is widely used in archaeology for interacting with 3D reconstructions of unpreserved heritage directly at the sites.

Despite the wide use of VR and AR in heritage field, it is not well known how those technologies can support the representation of built heritage from the recent past with regards to human engagement with a place and place experience, and particularly, how those experiences impact memory construction, place attachment, and construction of identity related to a place. Moreover, how the same technologies can aid us in a process of successful place making.

Hence as the next step, the team has planned to take two wool industry heritage buildings in Geelong CBD as case studies to compare the quality of experiences of virtual versus physical engagement: one, the current Dennys Lascelles wool store that was eventually lost through time, and the other, the renovated building of Dalgety and Co. wool store which is currently used as the School of Architecture building for Deakin University. Through the planned empirical, qualitative comparative study the two buildings, one reconstructed through various virtual technologies and the other still physically present on the location, the team will try to understand similarities and differences in human engagement between two places, and furthermore, how the memories are constructed and reproduced in relation to the each architectural structure.

7. Conclusion

The findings of this project further re-emphasize the need to explore in-depth variations of cross-media storytelling in relation to virtual (on-line) and physical (on-site) place making by application of different digital technologies in order to understand how different digital/virtual platforms can diversify and expand heritage experience. It necessitates to learn what it means to detach/ remove the heritage material from the physical location of origin, and consequently, can create a new "digital heritage space" for recalling experience of the place making and a sense of place.

In terms of disciplinary contribution, this research will provide significant contribution to recenter our position to look into Architecture, Engineering, History and Society from a different perspective as listed below,

- It will provide opportunities to revisit the ways of seeing past through software or the design of the interface.
- It will sustain the information through a Linked Open Database (LOD) for further research

- It will help us to understand the spatial aspects of the built environment through digital medium
- It will test the Multimodal forms of collecting, storing and disseminating Research Data
- It will raise new research question: Virtual Immersion presupposes another way of interrogation
- It will generate new research knowledge from a paradigm of static databases to a dynamic and interactive field using an immersive environment.

The main issues outlining the scope for recall and reconstruction, in this case investigates the potential of digital heritage narrative as a means towards place making. While exploring the new and unique capabilities provided by the digital narrative in capturing, simulating and disseminating 'lost' architectural heritage it will further imbue a sense of place by developing a sense of pride and belonging the everyday city dweller, which is not only important to understand the past but also to predict/ design the future of the city as well.

In addition to contributing significantly in academia in terms of knowledge generation, this project and the method of dissemination discussed has the potential to make significant social benefits the long-term benefits pertaining to the heritage management of these fragile sites with the use of diachronic end dimensional capturing techniques to enable this knowledge to be conveyed to both academic and the targeted audience.

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