



## PLATFORMS OF KNOWLEDGE: ARCHITECTURAL HERITAGE PRACTICE AND THE INFORMATION AGE IN SOUTH AFRICA

### *LAS PLATAFORMAS DE CONOCIMIENTO: LA EVALUACIÓN PRÁCTICA DEL PATRIMONIO ARQUITECTÓNICO Y LA ERA DE LA INFORMACIÓN EN SUDÁFRICA*

Arthur Barker\* , Johan Swart

Department of Architecture, University of Pretoria, Lynnwood Road, Pretoria 0081, South Africa. [arthur.barker@up.ac.za](mailto:arthur.barker@up.ac.za);  
[johan.swart1@up.ac.za](mailto:johan.swart1@up.ac.za)

#### Highlights:

- Heritage Assessment Practitioners (HAPs) in South Africa currently have access to limited architectural-historical knowledge, that is either born-digital or founded on analogue principles.
- Platforms in South Africa are in their infancy as they are often limited in number, coverage and size of the content.
- Concerted efforts are being made to digitise analogue archives while the establishment of newer digital-born platforms is beginning to make the work of a HAP easier.

#### Abstract:

The intellectual basis for preservation and conservation is formed by the study, record and dissemination of the works of humanity. Due to the negative impacts of exponential city growth, through densification and the impact of climate change, more considered design approaches need to be made for the reuse and adaptation of buildings in historical contexts. The fast pace of project design, and implementation, in the 21<sup>st</sup> century, has fostered the need for directly accessible architectural heritage knowledge. Therefore, architectural heritage practice demands access to curated information to ensure considered, and appropriate, design responses. This is important, not only for heritage and other related practitioners, but also for researchers and students. The advent of the Information Age initiated new methodologies for archiving knowledge. These developments provided architectural heritage practice with extended platforms of knowledge, either born-digital or founded on analogue principles. But what are these digital architectural heritage knowledge platforms in South Africa? Where are they located and how is information curated? How accessible is the information and how useful is it for heritage assessment practitioners? This article will describe the development of analogue architectural platforms and their development into digital formats. Thereafter, the nature of architectural heritage practice in South Africa will be defined through an assessment of legislation and professional practice. Then the types of information needed for architectural heritage practice to be effective will be explained. A selection of currently available architecturally related heritage platforms (with a digital bias) will be located and described, followed by a critique of their effectiveness. A number of case studies will then be highlighted to determine how the effective work of heritage assessment practitioners is. The paper will conclude by suggesting ways of adding value to current and future digital information platforms to cater for the rising needs of architectural heritage practice in South Africa.

**Keywords:** architectural heritage practice; heritage assessment practitioner; digital architectural heritage; knowledge platforms

#### Resumen:

La base intelectual para la preservación y la conservación está formada por el estudio, el registro y la difusión de las obras de la humanidad. Debido a los impactos negativos del crecimiento exponencial de la ciudad, a través de la densificación y el impacto del cambio climático, se necesitan enfoques de diseño que consideren más la reutilización y la adaptación de los edificios en contextos históricos. El rápido ritmo de diseño y ejecución de los proyectos en el siglo XXI ha fomentado la necesidad de contar directamente con conocimientos accesibles sobre el patrimonio arquitectónico. Por lo tanto, la práctica del patrimonio arquitectónico exige el acceso a información comisariada para asegurar respuestas de diseño consideradas y apropiadas. Esto es importante, no sólo para los profesionales del patrimonio y otros profesionales relacionados, sino también para los investigadores y estudiantes. El advenimiento de la Era de la Información inició nuevas metodologías para archivar el conocimiento. Estos desarrollos proporcionaron a la evaluación práctica del patrimonio arquitectónico una amplia gama de plataformas de conocimiento, ya fueran digitales o basadas en principios analógicos. Pero, ¿cuáles son estas plataformas de conocimiento del patrimonio arquitectónico digital en Sudáfrica? ¿Dónde se encuentran y cómo se comisaría la información? ¿Cuánto de accesible es la información y cuánto de útil es para los profesionales de la evaluación del patrimonio? Este artículo describirá el desarrollo de las plataformas de arquitectura analógica y su transformación en formatos digitales. Posteriormente, se definirá la naturaleza de la evaluación práctica del patrimonio arquitectónico en Sudáfrica mediante la evaluación de la legislación y la práctica profesional. A continuación se explicarán los tipos de información necesarios para que la práctica del

\*Corresponding author: Arthur Barker, [arthur.barker@up.ac.za](mailto:arthur.barker@up.ac.za)



patrimonio arquitectónico sea eficaz. Se localizará y describirá una selección de plataformas de patrimonio relacionadas con la arquitectura actualmente disponibles (con un sesgo digital), seguida de una crítica de su eficacia. A continuación se pondrán de relieve varios estudios de casos para determinar la eficacia de la labor de los profesionales de la evaluación del patrimonio. El artículo concluirá sugiriendo formas de añadir valor a las plataformas de información digital actuales y futuras para satisfacer las necesidades apremiantes de la evaluación profesional del patrimonio arquitectónico en Sudáfrica.

**Palabras clave:** evaluación práctica del patrimonio arquitectónico; profesional en evaluación del patrimonio; plataformas de datos digitales; patrimonio arquitectónico

---

## 1. Introduction

The discipline of architectural heritage practice was initiated in the late 19<sup>th</sup> century when a dialectic debate arose between restoration and anti-restoration (or conservation) movements, the former being led by Eugène Emmanuel Viollet-le-Duc (1814-1879), and the latter by John Ruskin (1819-1900) and his protégé William Morris (1834-1896). Since then, the development of heritage charters and government legislation has guided decisions about architectural changes to historical contexts. Today, these considerations together with the negative impacts of exponential city growth, through densification and possible demolition of historic fabric, and the impact of climate change (that requires a reconsideration of resource use), mean that more considered design approaches need to be made for the reuse and adaptation of buildings in historical contexts. The fast pace of project design, and implementation, in the 21<sup>st</sup> century also requires an immediacy of architectural heritage knowledge. “Along with preservation, divulgation of heritage, especially of less known items, is of major importance for both researchers and public” (Redweik, 2017, p. 23). Therefore, direct and remote access by Heritage Assessment Practitioners (HAPs) to relevant, and curated information that can describe values of buildings and sites to determine significances, is crucial to architectural heritage practice.

## 2. Methodology

This article will define architectural heritage practice in South Africa and will highlight the types of information needed for effective assessment practice (see Section 3.2). This qualitative research will be completed through desktop studies of the requirements of heritage legislation contained in Section 38 of the South African National Heritage Resources Act 25 of 1999 (NHRA) and guidelines for practice which will be analysed by using the definitions of cultural value highlighted in the Australia ICOMOS Burra Charter (Australia ICOMOS, 2000) and the 2011 South African Code of Conduct for Heritage Assessment Practitioners (<https://www.aphp.org.za/aphp-code-conduct>).

A representative desktop selection of current and publicly accessible, digital architectural heritage knowledge platforms (often referred to as repositories but hereafter referred to as platforms) in South Africa will then be made. These case studies will be described, interpreted and compared, followed by a qualitative critique. Data will be collected through desktop studies, live testing of the platform interfaces and interviews with selected platform curators at the Universities of Cape Town, Witwatersrand and Kwa-Zulu Natal. Description and analysis of a selection of case studies will be undertaken with reference to literature that relates to each of the platform types

specifically, as well as general guidelines on information platform management such as those referenced in the 2010 National Research Foundation report entitled *Managing Digital Collections: A Collaborative Initiative on the South African Framework* (Liebetrau, 2010, p. 5).

The research will not focus on technical matters related to information science approaches but rather on a qualitative understanding of the usefulness of current digital platforms and their future possibilities for improving architectural heritage practice. The study will also not focus on detailed comparisons with international platforms but is rather benchmarked against related best practice.

The article will conclude by highlighting opportunities and suggesting ways of adding value to current platforms to cater for the pressing needs of architectural heritage practice in South Africa.

## 3. Architectural heritage practice

### 3.1. General practice

Heritage practice in South Africa is regulated by Section 38 of the NHRA which stipulates that “those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities” (NHRA, 1999, p. 13). The national estate of the NHRA (Parts 1&3.(2)) includes places, buildings, historical settlements and townscapes. The NHRA is binding through its formal protections for declared heritage resources, as well as general protections such as stipulation 34(1), stating that a building over 60 years may not be altered or demolished without a permit issued by the relevant Provincial Heritage Resources Authority (PHRA) which is an executive body that gives effect to the provisions of NHRA.

The South African Heritage Resources Agency (SAHRA) is responsible for the identification and management of Grade I heritage resources while PHRA's are responsible for the identification and management of Grade II heritage resources. A local authority is responsible for the identification and management of Grade III heritage resources. All of these agencies are required to create, and populate heritage registers.

In July 2016, the South African Department of Environmental Affairs (DEA) compiled guidelines and assessment tools for protected areas which outline the importance of place and that their significance needs to be recorded and documented so that cultural identity can be protected (DEA, 2016).

The role of heritage assessment practitioners (HAP) is, in the main, to define significances by assessments of value. To do this, the HAP has to “gather and record information about the place sufficient to understand significance” (Australia ICOMOS, 2000, p.10) and draw up “[w]ritten statements of cultural significance and policy ... justified and accompanied by supporting evidence” (Australia ICOMOS, 2000, p.8) that must be “preceded by studies ... which should include analysis of physical, documentary, oral and other evidence...” (Australia ICOMOS, 2000, p.8). HAPs are required to complete Heritage Impact Assessments (before any design work is undertaken) for any proposed alterations (or possible demolition) of protected National or Provincial heritage resources. HAPs may also be required to identify artefacts of value that are not yet graded.

Professional ethics practices for HAPs in South Africa are covered by the Rule Book of Environmental Assessment Practitioners Association of South Africa ([https://www.environment.gov.za/sites/default/files/docs/eapasa\\_rulebook.pdf](https://www.environment.gov.za/sites/default/files/docs/eapasa_rulebook.pdf)) and the 2011 Code of Conduct drawn up by the Association of Professional Heritage Practitioners (APHP) (<https://www.aphp.org.za/aphp-code-conduct>).

A HAP may be an architect, related design professional or even historian (Ruiz Gil, 2017, p. 56) who has to perform a number of sequential but interlinked tasks. These can be broadly defined as operation, action and reflection. Architects can undertake all of the tasks, while historians will tend to focus on the operation which encompasses the recognition of architectural heritage, the collection of relevant information (see Section 5) that will define significance, by assessments of value, through statements of heritage significance and the possible development of design attitudes and approaches. The action involves new design through the use of architectural strategies and material and detail expression. Reflection involves assessment of value judgements and design processes by describing new attitudes, modes of expression, and redocumentation for future HAPs.

The collection of information for heritage practice forms the backbone of any successful design in a historical context as HAPs need sufficient, accurate and detailed information.

### 3.2. Assessment practice

Best practice, defined through the Code of Conduct of the South African APHP, stipulates that “[h]eritage assessment practitioners shall clearly differentiate between facts, opinions and inferences in their work” (APHP, 2011, p. 4) and that they “shall, to the best of their ability, use the best available information” (APHP, 2011, p. 5). This implies that, under ideal conditions, platforms should house architectural heritage information that is relevant, curated and critiqued. This will assist HAPs to more easily identify specific values such as “aesthetic, historic, scientific, social or spiritual” (Australia ICOMOS, 2000, p. 2) so as to define cultural significance.

Procedurally, HAPs will also have to familiarise themselves with the steps necessary for heritage assessment applications. Here, relevant provincial offices will have to be consulted. The HAP will be able

to access the various forms required for submission, lists of heritage areas and associated design guidelines.

Then, at a more detailed level, the HAP would also need to be able to identify aspects such as the timeline development of a place or building, larger historical context, artefact rarity, related personalities, important functions, and any technological or scientific relevance (Australia ICOMOS, 2000, p. 12). Here HAPs would need to, through their training and experience, identify the curation (or bias) of analogue or digital sources.

Through all of the processes mentioned, the HAP will have to make judgements about the importance of cultural significance, its aspects and relevance for specific groups over time, including past, present and future generations (Australia ICOMOS, 2000, p.19).

### 3.3. Information for value assessment

HAPs will, under normal circumstances, access information in three ways: on-site inspections and associated recording processes, analogue searches in physical repositories and desktop research on available digital platforms.

The DEA guidelines for ‘Cultural Heritage Surveys’ (DEA, 2016) suggest that where HAPs begin desktop research they should check information “from the Local Authorities, PHRA’s and SAHRA for already recorded sites, check the SAHRIS database (see Section 4.2.1.1.) [as well as finding] previous records containing information on the cultural heritage [to include] oral history, tradition, drawings, photographs, published and unpublished accounts and descriptions, and related documents pertaining to the origins and history of the Protected Area” (DEA, 2016, p. 16).

The South African Department of Environmental Affairs’ detailed ‘Assessment of Significance’ form (reinforced by the cultural significances highlighted by the NHRA and by the Burra Charter) (DEA, 2016) describes nine important values, framed around place and architecture, to be assessed. To be able to assess these values adequately, HAPs require accurate architectural-historical information.

HAPs will firstly need to gain an understanding of historical and contextual values. General historical research is necessary to position the place or building in time to determine its value within socio-political paradigms.

Then an understanding of place needs to be gained. At an intangible level, place can be a “product, result or outcome of an event<sup>1</sup>” (Department of Environment and Heritage Protection, 2013, p. 26) such as that at the 1955 Freedom Square in Kliptown<sup>2</sup> (South Africa), or, more tangibly, it may be

<sup>1</sup> This aligns with Value 1 in the DEA’s ‘Assessment of Significance’ form B (DEA, 2016, p. 20).

<sup>2</sup> The Freedom Charter was the statement of core principles of the South African Congress Alliance, which consisted of the African National Congress and its allies: the South African Indian Congress, the South African Congress of Democrats and the Coloured People’s Congress. ([https://en.wikipedia.org/wiki/Freedom\\_Charter](https://en.wikipedia.org/wiki/Freedom_Charter)).



a collection of historically significant buildings<sup>3</sup> such as those late 19<sup>th</sup> century edifices surrounding Church Square<sup>4</sup> in Pretoria. Further place significances that must be considered are “symbolic association, with an event, phase, movement, process, activity or way of life that has made a strong, noticeable or influential contribution to the evolution or pattern of development of our society or of our environment” (Department of Environment and Heritage Protection, 2013, p. 26)<sup>5</sup>. Next, the HAP will have to ascertain whether the place or building in question is already listed or graded and whether an application in this regard has already been submitted as this legally determines the possibilities of making changes to the extant artefact.

General architectural research will locate the building within the continuum of architectural paradigms (or styles) and will highlight whether it is an important and representative artefact. The building may also be a significant example of the work of an important architect such as Herbert Baker who designed the 1910 Union Buildings in Pretoria, South Africa. Functionally the building may be the first of its kind, such as the railway infrastructure of the *Nederlandsche Zuid-Afrikaansche Spoorweg-Maatschappij* [NZASM] at the end of the 19<sup>th</sup> century which stretched from Pretoria towards Maputo in Mozambique. At the more scientific end of the value scale, the building may be an important example of technological expression such as the 1914 Great Synagogue in Johannesburg ([https://www.artefacts.co.za/main/Buildings/bldgframe\\_s.php?bldgid=6428](https://www.artefacts.co.za/main/Buildings/bldgframe_s.php?bldgid=6428)), South Africa, which was covered by the first steel-reinforced concrete dome in the country.

To determine significance, value judgments need to be made about place and building. Here threshold indicators such as earliness, representativeness, regional importance, distinctiveness/exceptionality and rarity should be used (Australia ICOMOS, 2000, p. 12). At present, in South Africa, analogue platforms provide the bulk of architecturally related information, but a limited number of fledgeling digital platforms have been established since 2000.

## 4. Platforms of knowledge

### 4.1. The nature of platforms

Platforms provide “a continuous record of the achievements of society over time. They are a reminder of the past, but more importantly a source of knowledge, caution or inspiration for the future. International bodies such as the International Council on Archives (ICA) and locally legislated institutions such as The National Archives of South Africa (NASA) coordinate the management and preservation of

<sup>3</sup> This aligns with Value 5 in the South African DEA's Assessment of Significance' form.

<sup>4</sup> Church Square, originally Market Square, is the square at the historic centre of the city of Pretoria, South Africa. The founder of Pretoria, Marthinus Pretorius, determined that the square be used as a market place and church yard ([https://en.wikipedia.org/wiki/Church\\_Square,\\_Pretoria](https://en.wikipedia.org/wiki/Church_Square,_Pretoria)).

<sup>5</sup> This also aligns with Values 1 and 3 in the South African DEA's Assessment of Significance' form.

artefacts for posterity and future use” (Barker, Swart & Van Niekerk, 2016, p. 6).

Architecture is both an artefact and an archive. As argued by Kleinman (2001, p. 321) architecture is, at once, “physical and representational” through its conception, construction and change over time. The presence of the artefact tends to dominate the processes which gave life to it, but platforms balance this deficit, by providing a home for the record of antecedents and development.

#### 4.1.1. Analogue and digital beginnings

“The concept of the architectural archive or museum as a repository of knowledge and reference system must almost be old as the profession itself” (Kotze, 1998, p. 43). Building practices were handed down through generations and these traditive processes engendered a physical architectural archive in built form. “The first national museums which included architectural examples originated through the removal of antiquities from ancient sites” (Hawes, 2010, p. 17) but it was only through the professionalisation of architecture in the 18<sup>th</sup> century that private repositories were realised, later extended to architectural museums associated with universities such as the *Ecole de Beaux Artes* and Westminster (Hawes, 2010, pp. 19, 21).

“Research in architectural history depends heavily on the availability of relevant archives and (conversely) the inaccessibility of such archives-whether because of inadvertent destruction, intentional discard, dispersal, or improper triage-poses a considerable obstacle to the architectural heritage enterprise” (Willis, 1996, p. 196).

Analogue repositories have increasingly had to deal with the scale, fragility, volume and electronic existence of architectural records (Armstrong, 2006, p.12) and digital platforms, such as the Canadian Centre for Architecture (CCA) (De Vletter, 2019, p. 1) have begun to address some of these concerns.

“Digital Library Systems (DLSes) are specialised Information Systems designed to store, manage and preserve digital content over long periods of time” (Phiri & Suleman, 2015, p. 1). The advent of the World Wide Web provided the impetus for large scale, and immediate access to this type of information.

The antecedents of digital platforms were created around 1945, when Memex<sup>6</sup> (memory and index), a theoretical proto-hypertext system device, was developed by Vannevar Bush to compress and store books, records and communications.

Two challenges have guided the development of digital architectural archives. These “are the digitization of traditional objects in architectural collections and the technical obstacles in the preservation of born-digital records” (Armstrong, 2006, p.12). A number of international initiatives have been established to deal with the latter aspect. For example, GAUDI (Governance, Architecture, Urbanism, Democracy, Interaction) was a “collaborative of participating institutions focused on architectural issues, such as preservation, community

<sup>6</sup> <https://www2.archivists.org/glossary/terms/m/memex>

involvement, and contemporary design” (Pierce, 2011, p. 45). Their 2007 conference “was to share various experiences and different viewpoints in an effort to gain fluency with issues related to digital record preservation” (Pierce, 2011, p. 45).

#### 4.1.2. Digital architectural knowledge platforms in South Africa

In February 2009, a number of South African experts in the general field of digitisation<sup>7</sup> met “to find ways of accelerating the development of digital collections as well as increasing the scope and extent of digitised South African resources available on the Web” (Liebetrau, 2010, p. 2). Their research summary identified a number of international best practices documents (2004-2007) that highlighted core ideals to be considered. The documents consulted were Preserving Digital Information, OAIS (Open Archival Information System) (<http://www.oais.info/>), TDR (Trusted Digital Repository) (<https://www.crl.edu/archiving-preservation/digital-archives/metrics-assessing-and-certifying/iso1636>), TRAC (Trustworthy Repositories Audit and Certification) (<https://www.statearchivists.org/resource-center/resource-library/trustworthy-repositories-audit-and-certification-criteria-and-checklist/>), NISO (National Information Standards Organization) (<https://www.niso.org>) Good Digital Collections and Data Set of Approval (Liebetrau, 2010, p. 6).

“Although there has been some academic and intellectual engagement with the nature, composition mission and management of heritage repositories in South Africa, particularly in the 1990s and early 2000s, on the ground, the sector is in disarray, lacks adequate skills and training, is under-resourced and introspection and conscious self-reflection is largely absent” (Pickover, 2014, p. 3). Fortunately, the South African Department of Arts and Culture developed a Digitisation Policy, in 2013, which has determined access strategies, standards and best practices (NARSSA, 2013).

Unfortunately, there has been little, cohesive, effort in organising best practice for digital architectural heritage platforms in South Africa. Some architectural platforms have developed their own internal standards (which will be discussed later) while others such as the architectural collections within academic institutional repositories, are situated within the best practice standards of the broader repositories. No specific literature or guidelines have been found for architectural heritage knowledge platforms.

## 4.2. South African architectural heritage knowledge platforms

### 4.2.1. General identification/selection

Architectural heritage platforms in South Africa (Table 1) are essentially repositories of analogue information that have been digitised overtime to, not only, make information more accessible but, as with non-architectural platforms, to limit “obsolescence, data integrity, trustworthiness, escalating storage costs and neglect” (NARSSA, 2013, p. 16) while facilitating possible reproduction. The platforms range from

projects driven by individuals, the oldest being *Artefacts* which was started around 2000 to academic institutional repositories, such as the *UPSpace* which has been contributed to by the Department of Architecture at the University of Pretoria (UP) since 2002.

To assess the current state of South African architectural heritage digital knowledge, a selection of available and accessible platforms was made. The selection was made to reflect a variety of platform types across categories such as heritage management platforms, architectural databases, research repositories, heritage awareness platforms, and online archives (Table 1). The case studies represent the current status of platforms within the South African context but are also indicative of platform categories in a broader international context.

The following section provides a descriptive introduction to five case studies that are representative of the variety of developing platform types within the heritage information environment. Each platform is introduced, related to international examples, and described according to its structure and content, followed by broader interpretations relative to connecting themes across the case studies that emerged from the analysis.

#### 4.2.1.1. SAHRIS

The *South African Heritage Resource Information System (SAHRIS)* (<https://www.sahra.org.za/sahris/>) is an online heritage management platform aligned to the mandate and operations of the SAHRA who manages the platform in accordance with the NHRA of 1999. The platform represents a wider adoption of online, integrated and transparent heritage management procedures by state or municipal heritage agencies across the globe.

The platform was developed to serve as an integrated management system for heritage properties as well as museum collections. Since going online in 2012, SAHRIS has served as a digital inventory of the ‘National Estate’ as defined in the NHRA and a formal list declared heritage resources. It also acts as a case management system for heritage permit applications procedures and repository for the paper trail related to heritage management (Smuts, Mlungwana, & Wiltshire, 2016). The platform was developed with the aim of legal compliance and for access by heritage practitioners, but it contains a wealth of information such as site recordings or heritage impact assessments which can be harvested by researchers or members of the public.

#### 4.2.1.2. Artefacts

The *Artefacts* platform (<http://www.artefacts.co.za/>) is an evolving online architectural database that offers centralised information about South African architectural heritage. It is representative of the broader development of online resources for architectural-historical scholarship. In its biographical emphasis, the platform relates to international examples such as the Dictionary of Scottish Architects (<http://www.scottisharchitects.org.uk/index.php>), while in its function as a survey of buildings it is relatable to the work done on the SAH (Society of Architectural Historians) Archipedia: Classic Buildings (<https://sah-archipedia.org/>).

<sup>7</sup> That is, not specifically architectural heritage.

The *Artefacts* platform was initially based on the South African Biographical Dictionary of Architects, developed by Joanna Walker, which was transformed into a database and online platform by Prof. Roger Fisher and Frank Gaylard. Since its launch in 2000, it has been expanded to include photographs, descriptions, bibliographies and locations of over 13000 structures, among other information.

The platform is essentially a relational database, allowing users to find entries that describe architects, structures, books and towns, all of which are cross-referenced to one another. This creates a web of information that can be used to illustrate, for example, the oeuvre of a specific architect, the collection of buildings within a specific town, or the published sources that relate to a specific building.

Information contained in *Artefacts* consists mostly of text-based data entries with standardised descriptors (e.g. date of construction or building type), additional notes and interpretation by the platform curators, as well as transcribed text from published or archival sources. Entries on buildings usually include site photographs and geo-locations.

#### 4.2.1.3. UPSpace

*UPSpace* (<https://repository.up.ac.za/>) in the institutional research repository of the University of Pretoria and reflects a general shift in the academic context towards online, open-access information. It is one of a variety of open access repositories that are managed by academic institutions, and one of hundreds of signatories to the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities of 2003 (<https://openaccess.mpg.de/Berlin-Declaration>). Since its establishment (Kleyn, 2018, p. 84), the platform has been managed by the university's academic information services (AIS) but draws its content from individual researchers, departments or research units throughout the institution.

The primary focus is on academic research outputs, of which it hosted almost 25000 according to a 2018 survey (Kleyn, 2008, p. 86). But *UPSpace* also hosts a variety of material that reflects diverse agendas within the academic context such as digitised archival material, open access journals and conference proceedings. The platform is organised through the grouping of sets of content into collections that could be accessed by document type (e.g. dissertation or research paper), by faculty structure (e.g. School of the Built Environment), by publication logic (e.g. South African Journal of Art History), by project (e.g. Architecture Archives) or by collection (e.g. 1948 Pretoria Aerial Photographs).

Content, applicable to architectural heritage, includes masters and PhD dissertations in the fields of architecture or cultural history, local heritage surveys and architectural documentation (in some cases conducted by students), research papers related to specific heritage sites and digitised architectural drawings from archival collections.

#### 4.2.1.4. Heritage Portal and Heritage Register

The *Heritage Portal* (<http://www.theheritageportal.co.za>) and *Heritage Register* (<http://www.heritageregister.org.za>) are privately

managed online platforms founded by heritage enthusiast James Ball with the aim to inform the public with regard to heritage sites and heritage topics. The *Heritage Portal* functions as a platform for news and discussions, while the *Heritage Register* is a listing of Johannesburg heritage sites developed for ease of use by the public. These platforms represent the developing online presence of civic society and non-profit organisations within the heritage sphere, seen internationally in online platforms or heritage listing projects such as HistoricPlacesLA (<http://www.historicplacesla.org/>).

The *Heritage Portal* was established in 2012. It is a curated platform that gathers information and contributions from the broader South African heritage community and directs users to related information and web articles on other platforms. Entries are presented in the style of a news sequence within categories such as articles and notices and endangered heritage. Content ranges from strictly informative news items to expert opinions on current debates within heritage practice.

Addressing the shortcomings of formal (legal) inventories of heritage resources, the *Heritage Register* was established in 2017 (Ball, 2017) as a geo-located inventory of heritage buildings that could inform the public about heritage sites in their neighbourhoods as well as the heritage protection regulations that might apply to these. The platform has a metadata structure typical of heritage listings: heritage status, address, stakeholders, etc. The register is partially based on formal listings from the national and municipal registers, but also contains many entries of sites without legal heritage status. The platform currently lists close to 3000 sites in the Johannesburg area and works in close partnership with another non-profit heritage group, the *Johannesburg Heritage Foundation* (<http://joburgheritage.org.za/>) as well as the City of Johannesburg municipality.

#### 4.2.1.5. DRISA

The *Digital Railway Images of South Africa* (*DRISA*) (<http://atom.drisa.co.za/index.php/>) is an online repository that makes an extensive collection of historical photographs related to railway history in South Africa accessible to the public. The platform represents the systematic digitisation of archival collections that have manifested internationally in large scale digital archives such as the RIBA online architectural collection (<https://www.architecture.com/image-library>) or the Library of Congress map collection (<https://www.loc.gov/maps/>).

The archival photo collection hosted on *DRISA* is located at the Transnet Heritage Library and is currently being digitised and uploaded as part of a project managed by Yolanda Mayer (Transnet Heritage Library) and Johannes Haarhof (*DRISA* project leader). The project, which was launched in 2016, is part of a partnership between Transnet Freight Rail, South African Institution of Civil Engineering and volunteer groups.

The structure of the *DRISA* platform is based on the organisation and provenance of the physical archival collections, while additional metadata has allowed photographs to be accessed by place (e.g. Eastern Cape) or subject (e.g. bridges).



The collection of over 15000 photos that is currently available online, provides information about trains and railway infrastructure, including buildings, as well as South African heritage places in general, related to railway tourism. The collections on the platform are mainly photographic, but if digitisation processes continue, the documents, as well as the extensive architectural and engineering drawings of the Transnet Heritage Library, could also find their way online.

### 4.3. Interpretation

Collectively, the knowledge platform case studies provide a broad overview of the availability and condition of architectural heritage information in the South African context, but they are also representative of themes that are common to platforms internationally. The case study platforms will now be discussed comparatively, considered collectively, and interpreted according to cross-cutting themes that have emerged from the case study analysis. They will also be related to international best-practice examples and referenced to literature related to digital platforms, heritage information, research practice and architectural history. The interpretation provided here is based on the authors' own engagement with the publicly accessible interfaces of the platforms.

#### 4.3.1. Platform types

The case studies presented were classified according to the type or role that they best represent, but there are also overlaps and grey areas in terms of classification. The *Artefacts* platform could be seen as an encyclopaedia of architectural history, but it is also a geographical heritage survey with similarities to the *Heritage Register*, which in turn overlaps with the *SAHRIS* platform as a formal listing of heritage resources. [Armstrong \(2006, p.13\)](#) argues that digital technology has blurred the boundaries between definitions such as museum, archive and library. Digital archives such as *DRISA* contain digital objects with the potential to be curated according to museum logic, while platforms such as *UPSpace* are based in library traditions but also function as online repositories for archival collections or born-digital heritage content.

Other platform types in the South African context also play an important role in the collective availability of heritage knowledge. Commercial knowledge platforms such as *Sabinet* have added significantly to the availability of journals and indexes, while online publications of smaller heritage interest groups such as the *Vernacular Architecture Society of South Africa (VASSA)* (<https://www.vassa.org.za/>) contribute highly specialised and focused knowledge. There are also more informal social media content or blogs and cultural heritage platforms that provide information about other forms of heritage such as the *South African Rock Art Digital Archive (SARADA)* (<http://www.sarada.co.za/#/library/>).

#### 4.3.2. From analogue to digital

The case study platforms illustrated demonstrate a general transition from analogue to digital heritage information. In the case of *Artefacts*, what would previously have been print versions of architectural lexicons, biographical indexes, and guidebooks are now integrated into an online platform. The potential of these

types of platforms is described by [Esperdy \(2013\)](#), who suggests that the breadth of content and richness of metadata can facilitate the generation of new historical knowledge. [Esperdy](#) positions architectural-historical surveys as an intellectual pursuit that builds on earlier architectural-historical scholarship in the pre-digital era. The *Artefacts* platform can be seen in this light. It builds on earlier paper-based research but has evolved into an online platform with scholarly qualities and with the tacit knowledge of the platform curators evident in its descriptions, classifications and cross-referencing.

The *UPSpace* platform contains content that ranges and illustrates a spectrum of analogue to digital-born records. Digitised versions of hardcopy surveys are available on the platform, such as the *Plekke en Geboue van Pretoria* (Places and Buildings in Pretoria) survey, but there are also born-digital recordings such as 3D CAD recordings of buildings generated by architecture students at the institution. Online platforms can also become digital spaces that guide users back to analogue content, as with the bibliographical information on *Artefacts* that refers to texts that can be found in print libraries only, while the *Heritage Portal* regularly includes reviews of print books related to South African heritage.

Given that indexing, digitisation and full access to all paper-based architectural heritage information are not feasible, the efforts of online digital platforms should be seen in conjunction with efforts to manage physical collections. Online knowledge platforms cannot be seen in isolation of paper-based resources, as a great amount of information remains locked in journals, books and reports. In cases where digital content is not fully available, online platforms can still play a role in directing users to indexes and locations of analogue content.

"The benefits of digitizing collections and posting them on the Internet include exposing them to a broader geographic and intellectual audience, while preserving the condition of the original documents. However, as is often noted, a greater demand to view the documents may arise with a newly exposed treasure because the scholar will want to see the original" ([Armstrong, 2006, p.13](#)).

#### 4.3.3. Information networks

The case study analyses have brought to light the tendency for cross-referencing between online knowledge platforms. This is to the benefit of the individual platforms and gives HAPs access to interrelated networks of knowledge where multiple formats and perspectives build up a collective understanding of a heritage resource. The interconnectivity of knowledge platforms is in line with best-practice suggestions found in the literature. A task force report entitled *Preserving Digital Information* ([Waters & Garrett, 1996](#)) describes the context of digital objects and calls for sensible linkages and dependencies among and between information.

The *Heritage Portal*, for example, features new entries from the *Artefacts* platform in its weekly news feed, while the latter, in turn, establishes links from its building entries to related archival and research content on the *UPSpace* platform. The development of interconnectivity in line with best practice suggestions, such as the concept of context in digital platforms

introduced by the Preserving Digital Information task force report (Waters & Garrett, 1996) which describes linkages and dependencies between digital objects.

Duplication of content across platforms has also been observed. This could be seen in a positive light, as it increases availability and reduces the risk of loss of content, but it could also lead to information overload and loss of clarity. The *Heritage Register*, for example, indicates when a building is classified as a national or provincial monument, but this information can also be found on the SAHRIS database. The *UPSpace* platform hosts an open access journal with architectural and heritage content, the *South African Journal of Art History* (<https://sajah.co.za/>), but upon further inspection this journal was also found on two other platforms, the *Sabinet* reference platform as well as the official website of the journal itself.

#### 4.3.4. Curation

Digital curation can be defined as “The process of establishing, maintaining and developing long term repositories of digital assets for ongoing access” (Liebetrau, 2010, p. 51). The curators of online knowledge platforms also decide whether the information is taken onto the platform or excluded, as well as taking responsibility for the quality and applicability of the information. Institutions such as the Canadian Centre for Architecture (<https://www.cca.qc.ca/en/>) has developed scholarship related to the curation of architectural information.

Curatorial responsibility is managed differently across platforms. Large institutional platforms such as SAHRIS or *UPSpace* might not have a dedicated content specialist that control or scrutinise all content, but they rely on contributing specialists and have policies and processes in place to ensure accountability and to record the authorship of information in general. Other platforms such as *Artefacts* and the *Heritage Portal* have individuals or small teams that personally curate information based on their specific subject knowledge.

Curators often add value information by embedding specialised knowledge into the information metadata, such as the extensive architectural-historical descriptions on *Artefacts*, or grouping sets of information by subject, as is done relative to railway terminology on *DRISA*. Users build a trust relationship with platforms and curators when curation is transparent or open to scrutiny. *Artefacts* platform is trusted for being curated by a known academic expert, while the *Heritage Portal* allows users to comment publically on its content, utilising its community as a form of peer review.

#### 4.3.5. Collaborative development

Content development strategies across the various case studies are generally collaborative. In all of the case studies, content is centrally curated but generated or provided by a network of partners associated with or connected to the platform. Armstrong (2006, p.12) has described the importance of collaboration in archiving and digitisation projects, where projects are often difficult to achieve in isolation, especially given resource constraints related to architectural heritage information processes.

Content for the *Artefacts* platform is centrally uploaded, but for the images attached to entries on the platform,

the curators often utilise photographs submitted by a variety of collaborators that continuously document buildings across the various provinces of South Africa.

*UPSpace*, as is the case with other research repositories, relies on content partnerships within the academic community for its collections. The platform has partnered with university research groups to make scientific reports or conference proceedings available such as the African Perspectives Conference of 2009 (<https://repository.up.ac.za/handle/2263/59941>), or with departments that house archival collections, such as the Van der Waal historical collection (<https://repository.up.ac.za/handle/2263/52033>) of the Department of Architecture. Partnerships can also extend beyond the institution, such as the collaborative project around the ZAR DPW<sup>8</sup> (1887-1900) Drawing Collection, where the Department of Architecture at the University of Pretoria partnered with the NASA to digitise a late 19<sup>th</sup> century architectural drawing collection for online access on the *UPSpace* institutional platform (<https://repository.up.ac.za/handle/2263/32375>). The *Heritage Portal* primarily uploads content generated by its regular user community or by professionals in the field such as Herbert Prins (heritage practitioner) (<http://www.theheritageportal.co.za/article-author/herbert-prins>) or Kathy Munro (academic researcher) (<http://www.theheritageportal.co.za/reviewer/kathy-munro>) who contribute their knowledge. The *Heritage Register* draws some of its metadata from the formal registers of the City of Johannesburg.

The content on SAHRIS does relate to its mandate as heritage management platform, but its content relies indirectly on a large community of heritage practitioners that submit heritage applications and site documentation to the platform as part of their professional work.

The *DRISA* project evolved through a partnership between the *Transnet Heritage Library* and volunteer groups. The latter group is comprised of engineers and railway enthusiasts that have set up information technology capacity within the library as well as digitisation processes staffed by volunteers and interns.

Further collaboration between the various platforms should be encouraged and could lead to more efficient use of resources. Collective platforms such as the Archival Platform (<http://www.archivalplatform.org/>) can serve to connect platforms and to allow users to find various platforms from a single reference point.

#### 4.3.6. Content variety

With reference to the collection of information relative to heritage places, the Burra Charter (Australia ICOMOS, 2000, p. 12) suggests thoroughness: “... it is necessary to assess all the information relevant to an understanding of the place and its fabric”, as well as specificity: “... should be arranged to suit the place and the limitations on the task...”. Brusaporci (201, p. viii) describes the variety of document types related to architectural heritage: “Documents are composed by a

<sup>8</sup> Zuid-Afrikaansche Republiek [South African Republic] and the Departement Publieke Werken [Department of Public Works].



**Table 1:** A selection of South African digital architectural heritage platforms.

	<i>Date</i>	<i>Platform</i>	<i>Type</i>	<i>Web address</i>
<b>Heritage management platforms</b>	2012	South African Heritage Resource Information System (SAHRIS)	National heritage resources management system	<a href="http://www.sahra.org.za/sahris/">www.sahra.org.za/sahris/</a>
	2014	Environment and heritage education resources	Municipal heritage resources management information platform	<a href="http://www.capetown.gov.za/Family%20and%20home/education-and-research-materials/graphics-and-educational-material/environment-and-heritage-education-resources">www.capetown.gov.za/Family%20and%20home/education-and-research-materials/graphics-and-educational-material/environment-and-heritage-education-resources</a>
	2003	Heritage Western Cape	Provincial heritage resources management information platform	<a href="http://www.westerncape.gov.za/dept/cas/public_entities/948/11120">www.westerncape.gov.za/dept/cas/public_entities/948/11120</a>
<b>Architectural databases</b>	2000	Artefacts	Online architectural database	<a href="http://www.artefacts.co.za">www.artefacts.co.za</a>
<b>Research repositories</b>	2000	UPSpace	Academic institutional repository	<a href="https://repository.up.ac.za/">https://repository.up.ac.za/</a>
	2002	Wired Space	Academic institutional repository	<a href="http://wiredspace.wits.ac.za/">http://wiredspace.wits.ac.za/</a>
	2014	OpenUCT	Academic institutional repository	<a href="https://open.uct.ac.za/">https://open.uct.ac.za/</a>
	2008	Sabinet	Online reference and journal platform	<a href="https://reference.sabinet.co.za/">https://reference.sabinet.co.za/</a>
		Note: Various other academic institutions with architecture schools such as the University of the Free State and the University of Kwazulu Natal also house institutional repositories		
<b>Heritage awareness platforms</b>	2012	Heritage Portal	Advocacy project	<a href="http://www.theheritageportal.co.za/">http://www.theheritageportal.co.za/</a>
	2012	Heritage Register	Heritage inventory	<a href="http://www.heritageregister.org.za/">http://www.heritageregister.org.za/</a>
		VASSA	Special interest group & journal	<a href="https://www.vassa.org.za/">https://www.vassa.org.za/</a>
		Stellenbosch Heritage Foundation	Heritage organisation and heritage inventory	<a href="http://www.stellenboschheritage.co.za/stellenbosch-heritage-survey">http://www.stellenboschheritage.co.za/stellenbosch-heritage-survey</a>
	2012	Johannesburg Heritage Foundation	Heritage organisation	<a href="http://joburgheritage.org.za/">http://joburgheritage.org.za/</a>
<b>Digitised archives</b>	2016	DRISA Digital Railway Images of South Africa	Institutional repository	<a href="http://atom.drisa.co.za/index.php/">http://atom.drisa.co.za/index.php/</a>
		UCT	Online historical collections	<a href="https://digitalcollections.lib.uct.ac.za/">https://digitalcollections.lib.uct.ac.za/</a>
		Historical Papers Research Archive	Academic institutional repository	<a href="http://www.historicalpapers.wits.ac.za/?digital/U/">http://www.historicalpapers.wits.ac.za/?digital/U/</a>
		Digital Innovation South Africa (DISA)	Online historical collections	<a href="http://www.disa.ukzn.ac.za/">http://www.disa.ukzn.ac.za/</a>
<b>Other platforms</b>	2009	Archival Platform	Advocacy project and register of archives	<a href="http://www.archivalplatform.org/">http://www.archivalplatform.org/</a>
		SAJAH	Journal	<a href="https://sajah.co.za">https://sajah.co.za</a>
	2011	Architecture South Africa	Journal	<a href="https://saia.org.za/archsa-archive-2/">https://saia.org.za/archsa-archive-2/</a>
	2000	South African History online	General online historical information	<a href="https://www.sahistory.org.za/">https://www.sahistory.org.za/</a>
		National Archives	Government archives and collections inventory	<a href="http://www.national.archives.gov.za/">http://www.national.archives.gov.za/</a>
		The National Library	Government library and collections inventory	<a href="http://www.nlsa.ac.za/">http://www.nlsa.ac.za/</a>

vast and heterogeneous quantity of historical and recent data, often scattered in different archives, such as drawings, writings, paintings, photos, previous studies and surveys, etc. related to the building, to the designer, to the builders...”.

The diverse nature for information related to architectural heritage and the variety of focus areas and methodologies related to the analysis of heritage resources implies a need for a wide spectrum of content types. Upon closer inspection of content within the case studies, a great variety of content types have been observed.

There are distinctions between broader categories. An example is academic literature compared to broader surveys. Academic literature such as PhD studies provides deep theoretical interpretations of heritage resources (e.g. PhD on architect Gawie Fagan (<https://repository.up.ac.za/handle/2263/28137>), while broader mapping projects often simply identify heritage resources. There are distinctions between types of archival collections, some architectural collections contain reports or personal papers related to an architect (e.g. Gerard Moerdijk papers on *UPSpace* (<https://repository.up.ac.za/handle/2263/46311>), while other collections focus on original drawings only (e.g. Ian Ford drawings UCT (<https://digitalcollections.lib.uct.ac.za/ian-ford>)). Distinctions can be made between historical and topical content. The content found on the *Heritage Portal* mostly relate to current issues and extant places, while the historical photographs on *DRISA* are primarily archival and unrelated to specific issues in current heritage practice. Lastly, there is a distinction between unofficial heritage listings such as the majority of entries to *Artefacts* and the *Heritage Register*, as opposed to listings of formally declared heritage resources found on the *SAHRIS* platform.

There are also distinctions between content items within a specific category. For example, in the category of architectural documentation, a number of document types were found on the *UPSpace* platform. Firstly, there are broader documentation surveys such as *The Plekke en Geboue van Pretoria* (Places and Buildings of Pretoria) report, a digitised version of a broad survey of significant buildings in Pretoria's inner city, originally completed in the early 1990s (<https://repository.up.ac.za/handle/2263/11321>). Secondly, there are more detailed documentation reports of specific settlement areas, such as the Botshabelo Report, where a series of buildings within a specific heritage site were documented (<https://repository.up.ac.za/handle/2263/8031>). Lastly, there are detailed recordings of specific heritage buildings or objects such as the drawings of 18<sup>th</sup> century Cape Dutch buildings and furniture found in the Geoffrey Pearse collection (<https://repository.up.ac.za/handle/2263/152>).

The case study platforms represent a great variety of content, but there is still information missing from the spectrum, notably municipal records, historical inventories, architectural periodicals, and information specific to related disciplines such as landscape architecture, interior architecture and urban design.

#### 4.3.7. Coverage

Whether individually or collectively, knowledge platforms should ideally provide broad and consistent information

of heritage sites. Coverage should range across time periods, geographical areas and heritage types. The case study platforms have all made significant contributions to the coverage of heritage sites and the accessibility of heritage information, but they also represent focus areas and biases that are illustrative of the collective shortcomings of knowledge platforms in the South African context.

One issue is the scope and depth of content and, in this regard, the Historic American Buildings Survey (HABS) (<https://www.loc.gov/pictures/collection/hh/>) can be seen as an international benchmark. This survey project is managed by the National Park Service and the Library of Congress in partnership with the private sector. Through its consistent recording over decades, the HABS survey has achieved a wide coverage, while depth has been achieved through a consistently applied methodology that requires detailed documentation of sites across a variety of media including text, photographs and measured drawings.

Another concern is representativity, *Evans and Wilson* (2018, p. 858) make arguments for developing inclusive information practices: “Of particular interest is enabling decolonised, imagined and participatory archives built on principles for acknowledging, respecting, representing, and negotiating multiple rights in records in and through time and space.” This issue is particularly topical in the South African context of postcolonial discourse. The NHRA affirms this by stating that heritage “... has the potential to affirm our diverse cultures...” and that heritage “... contributes to redressing past inequities” (NHRA, 1999, preamble).

The *Artefacts* platform has 13000 entries of heritage sites, a remarkable achievement for a small team of curators without institutional support. The geographical distribution is broad, including many sites that are not represented on any other platform. But there could also be gaps that result from the logistical constraints related to its small pool of contributors. Sites are added, opportunistically, based on the movements and ongoing project interests of the curators. Platforms, such as *Artefacts*, fill the void left by the absence of archives at the professional architectural institutes.

In contrast to the breadth of coverage found with survey type platforms such as *Artefacts*, the academic literature found on research repositories such as *UPSpace* represents a much more limited (topical) selection of buildings, but with the depth of engagement that goes along with PhD studies or long-term research programmes. The archival content on *UPSpace* contributes to coverage by representing the work of a number of local architects, but the content is limited to the boundaries of the physical collections. One type of research product that has covered significant ground is the architectural dissertation document. In the South African context, architectural dissertation projects are mostly site-specific and contain site or context analysis chapters. About 40 new dissertation documents are uploaded to the *UPSpace* platform every year, building up a collection of accessible documents that contain descriptions of specific architectural heritage sites.

The *Heritage Portal* and *Heritage Register* represent a geographical bias. Both of the platforms are managed from Johannesburg and well connected to heritage groups in that particular environment. The *Heritage Portal* attempts to cover heritage issues on a national

scale, while the *Heritage Register* is specifically directed, for the moment at least, on Johannesburg.

Coverage on the SAHRIS platform is determined by monument registers and by development processes. The monument registers cover broad geographical areas but could be biased towards specific types of sites such as classical buildings or archaeological sites. The content generated through the heritage management system is growing significantly given the pace of development in the South African context, but it is also biased to cases where there is legal compliance and to areas where formal development is occurring.

Given the wide distribution and longstanding history of South Africa's railway network, the historical photographs of the DRISA platform cover a wide range of places and periods. The coverage is however limited by the specific railway theme, and the content could be limited by historical decisions about which collections should or should not be preserved by the railway institutions.

The case study platforms represent a growing coverage of information and are all in a constant state of evolution, but geographic and thematic biases could persist if concerted efforts are not made to expand their reach or to develop supplementary platforms managed from different geographical locations or by different interest groups. Increased clarity on the criteria by which platforms select information to make available could also be helpful so that those accessing the information are aware of specific selection biases that might exist.

#### 4.3.8. Access and interface

The knowledge platforms analysed here are all fully accessible to the public, which makes their contribution to the heritage environment all the more significant. The platforms do however present content in different ways and their ease of use varies. The SAHRIS platform could be seen as directed at HAPs, as it has a complex structure and access to its content requires some tacit knowledge of heritage procedures and terminology. The *Heritage Portal*, on the opposite end of the spectrum, considers ease of use to a wide public audience and has a simpler and more visual structure. Some platforms have deeper content structures, such as UPSPACE, where the content, such as academic dissertations or full journal edition often require the user to perform additional search activities to find information within the downloaded content. Other platforms have more shallow structures, such as the *Heritage Register*, where the information of all entries is on fully accessible at the first results level.

The platforms all have intelligent search and browse features, allowing users to customise searches or browse within specific categories. In *Artefacts*, the user can search or browse within the main categories: Towns, Books, Structures, People, Firms and Lexicon. UPSPACE allows a search or browses within specific collections. Resultant entries also provide cross-links to entries within other categories. SAHRIS is similarly searchable in categories (cases, objects, sites and heritage reports) with additional advanced search features within each category. In the *Heritage Portal*, search queries or browsing can be done related to e.g. articles, notices or book reviews, with some categories able to be filtered by location. The *Heritage Register* enables search within survey categories such as name, site type, declaration

status or address. DRISA allows for browsing within a variety of categories or place references enabled by its metadata structure.

Some of the platforms, such as SAHRIS and the *Heritage Register* are accessible on interactive maps which direct the user to geo-located content. The *Artefacts* platform has geo-located entries with map positions, but the entries are not searchable directly on the map platform. The *Heritage Portal*, UPSPACE and DRISA have metadata with geographical references such as the names of places or towns, but these are not geo-located on a mapping interface.

Although dates and periods are often referenced in the content or metadata, none of the platforms allows the user to search or filter specifically by chronological context or markers. The continued and future of access to the platforms is also a concern, especially platforms such as *Artefacts*, *Drisa* and the *Heritage Portal* that are driven and managed by the efforts of specific private individuals, while concerns about funding could be raised relative to platforms such as SAHRIS.

## 5. Heritage assessment<sup>9</sup> in practice

### 5.1. Heritage assessment process

HAPs need to recognise, collate and analyse the values of architectural heritage, through the collection of relevant information to define significance.

The HAP will, firstly, have to determine whether the place or building in question is already listed or graded and whether an application in this regard has already been submitted. HAPs are increasingly encouraged to submit their heritage applications on the SAHRIS online heritage management platform. More detail becomes available over time. Searches can be made by 'site' or by 'people' and entries highlight heritage proclamation dates and grading values and dates. The relative newness of the platform implies that some graded buildings may not have not yet had their details uploaded.

General, and often associated architectural, histories can be found through websites such as the *Archival Platform* (<http://www.archivalplatform.org>) which provides links to a range of associated repositories and SA *History* (<https://www.sahistory.org.za>) which contains about 100 specifically architectural heritage items. Other limited options are digitised journals like *Restorica* which focuses "on historical buildings amongst other cultural artefacts" (<https://repository.up.ac.za/handle/2263/46315>), "*Pretoriana*, a journal published by the Association Old Pretoria from 1951 to 2003" (<https://repository.up.ac.za/handle/2263/59717>) and the *Journal of the South African Institute of Architects* platform ([https://saia.org.za/?page\\_id=714](https://saia.org.za/?page_id=714)) which contains born-digital versions since 2011.

To form an understanding of the value of place, a very limited number of digital sources is currently available. The City of Cape Town's (CoT's) digital platform (*City of Cape Town, 2019*) contains lists of heritage areas and provides associated design guidelines. The UP Academic Digitised Books Collection includes three

<sup>9</sup> Using digital architectural knowledge platforms.



volumes of *Plekke en geboue van Pretoria* (<https://repository.up.ac.za/handle/2263/7670>) which contain written and pictorial descriptions of local buildings, their physical location, architect, current function and importance.

To complete a Statement of Heritage Significance an assessment of architectural values, through an understanding of form, function and technology must be completed. The building will, no doubt be the starting point, so a search of the most comprehensive list of buildings in South Africa, *Artefacts* could be undertaken. The platform provides an overall context for each building as it sets architecture into stylistic context while highlighting personalities involved. Each building is also listed as part of the oeuvre of an architect and although the significance of the building is not explicitly stated, it can be deduced. The platform will also direct HAPs to associated digital and physical repositories such as *UPSpace* and *WiredSpace*. The Architecture South Africa Journal (which has been made digitally available since 2011) (<https://saia.org.za/archsa-archive-2/>) also contains biographical information on architects as does the recently digitized early versions of the South African Architectural Record (<http://wiredspace.wits.ac.za/handle/10539/7333>).

The *Johannesburg Heritage Foundation* platform (<http://joburgheritage.org.za/resources.html>) and their associated Facebook page (<https://www.facebook.com/groups/112707830122/?ref=ts&fref=ts>) provide a limited, and more locally focussed, architectural knowledge base which includes a list of archived architectural drawings at Museum Africa as well as heritage buildings for Johannesburg and various townships (Munro, personal communication, September 14, 2018). Significances cannot be directly deduced as a physical visit to the museum, and access to the drawings will be necessary.

Overall formal significance through definitions of paradigms and styles can be determined generally through the *Artefacts* platform and then, if the architect is known, investigated through engaging with academic research and archival material found on institutional platforms such as *Wiredspace* (<http://wiredspace.wits.ac.za/handle/10539/7332>) and *UPSpace* (<https://repository.up.ac.za/handle/2263/72>) which house a very limited set of outputs of specific architects. *UPSpace* only has 7 specific architectural collections while *Wiredspace* has 145 singular entries at present.

Digitised journals present the most effective critiques of architects' work and Wits' attempt at scanning many of the *South African Architectural Record* journals and UP's scans of the journals *Pretoriana* and *Restorica* provide immediate access to peer-reviewed information. This can be supplemented by the limited number of born-digital journals on the South African Institute of Architects platform.

Functional significance can be determined, in a limited manner, through the *Artefacts* platform as it categorises buildings by type that can be directly searched. Technological significance is also important, but its determination is currently limited to a deeper reading on *Artefacts* as, although, there are often detailed descriptions of technology related to a specific building, the information is not directly searchable. Interestingly, a specific focus on indigenous technologies,

comprehensively researched by Franco Frescura, is housed on the *South African History Online* platform (<https://www.sahistory.org.za/franco/indigenous-southern-african-regions.html>).

## 5.2. HAP assessment examples

Three examples of nationally important South African architectural heritage, that still exist, were chosen to typically determine the amount of digital information available, as well as its accessibility and searchability. The assessment, using the five case study platforms in Section 4.2 (and, thereafter, others noted in Table 1 where necessary) start with a search for heritage status, following which architectural values are sought.

The extant artefacts are the Union Buildings in Pretoria, Park Station in Johannesburg and one of the earliest Modern Movement residences in the country, House Martienssen in Johannesburg.

### 5.2.1. Union Buildings, Herbert Baker, 1910 (government)

A search on *SAHRIS* provides 6 search results (<https://sahris.sahra.org.za/search/site/union%2520buildings>). One indicates that the building and associated lands and statues were declared a national monument in 1994. One item is a request for a service provider to install a plaque for the declaration noted in the next two search results. These indicate that the site was declared a National Heritage Site in 2014. A detailed search on the site provides its site number: 9/2/258/0067, and name: Union Buildings, Meintjieskop, Pretoria, with SiteAutoID: 26679. However, the archaeological site report provides no descriptive information or values. The only significance that can be deduced is that the site and buildings are of National importance which implies that the place and associated buildings are protected by law and that the responsible heritage agency will maintain control over any proposed changes (if any are allowed).

The *Artefacts* platform (<https://www.artefacts.co.za/main/Buildings/bldgframes.php?bldgid=312>) provides a comprehensive entry that includes a history of the project, project details such as contractors, map link, links to the Neoclassical architectural style, extensive details about the architect and his architectural philosophy, a limited number of historical and contemporary photographs, and links to analogue sources. The HAP would be able to deduce historically and place values but would find an assessment of architectural value more difficult, as drawings are not available. The technological values may be deduced from the limited descriptions in the item text and the available photographs. *UPSpace* holds a specific collection of more than 200 items related to the oeuvre of the architect (<https://repository.up.ac.za/handle/2263/2401/discover?query=herbert+baker&submit=Go>). This will provide a context for understanding his work more broadly. A search for the Union Buildings (Fig. 1a), reveals 17 specific items with seven directly related to the buildings (and precinct) with one detailed article and photographs, drawings and a political focus, as well as a few aerial photographs. A detailed search using the architect's name provides eight items, one of which is an account of the design process by the architect and another four that are peer-reviewed articles on the architect and the building. The latter will provide

sufficient values related to his larger body of work (contextual value) and the design intentions of the project will provide some architectural values. The limited number of photographs taken during construction will assist the HAP in determining technological value.

A search for “Union Buildings” through the general search tab on *Heritage Portal* (<http://www.theheritageportal.co.za/>) provides 271 results while a search under “Herbert Baker” delivers 232 results, many items containing photographs of the building which assist with the determination of architectural and historical significance. A search for “Union Building” under the section only containing articles yields two results one of which is a detailed historical account that contextualises the architecture as part of Baker’s larger contribution to the landscape of Pretoria.

### 5.2.2. Park Station, Klinkhamer, 1894-97 (Transnet SOC Ltd)

A SAHRIS search provides two results (<https://sahris.sahra.org.za/sites/nzasmrt010>), one that refers directly to the station and the other to post boxes that belonged to it. The site name is given: NZASM\_RT\_010, as well as a SiteAutoID: 105506 and a historical title: NZASM Built Heritage Structures which, for the seasoned HAP, implies a general history and functional and typology values. A brief description indicates the station’s relocation, in the 1990s, from its second site in Esselen Park in Kempton Park. There is no description of its original location but what can be deduced is that the current place in which the station exists has no value. A direct Google Maps link is provided which illustrates the immediate, but insignificant, context. A category for ‘damage types’ is also not filled in so that the state of the artefact is unknown, thus limiting an understanding of current architectural value. As no drawings or photographs are included an assessment of architectural value is not possible on this platform.

A search on *Artefacts* provides one item (<http://artefacts.co.za/main/Buildings/bldgframes.php?bldgid=12330>) which describes the building, original location and its history (briefly) while providing the building’s current location on OpenStreet Maps. The item also links to another page with details of the architect which provide values in terms of larger cultural history and associated architectural paradigm. No further digital links are provided but three analogue sources are referenced. No link to the SAHRIS platform is provided. A search on Pretoria University’s *UPSpace* platform yielded 1007 results (<https://repository.up.ac.za/handle/2263/46918>). A more detailed search using either the architect’s name or original location yielded no results. Using Johannesburg as a location, yielded 22 results which only referred to the Park station of the 1920s. Surprisingly a search for NZASM, and the name of the architect Klinkhamer, yields only one result each which indicates the limitations of resources for digitisation and uploading as the NZASM project was initiated at the Department of Architecture at UP around 2013. The platform does provide a link to a digitised article in the *Restorica* journal of April 1987 that describes the general history of the NZASM with specific references and a photograph of the altered Park Station on its

Esselen site. This provides a very limited assessment for architectural values.

The *DRISA* platform has a detailed search capability and results provide 27 photographic entries of Park Station in its original location (Fig. 1b). This extends the limited possibilities of extracting architectural and technological values but as no drawings are present and no detailed descriptions to contextualise the images, specific architectural values are difficult, if not impossible, to assess.

A search on *Archival Platform* yields no results even though it provides a general link to the *Heritage Portal*. A direct search on the latter platform (<http://www.theheritageportal.co.za/article/old-park-station-heritage-site-exceptional-significance-comes-alive-again>) provides 2017 detailed, explanatory, history of the station which is the full transcript of a speech by a conservation architect. Being a seasoned HAP, his descriptions are laden with significances that range from general history to technological significance. Although some recent and historical photographs are present, no drawings are included which further limit an assessment of architectural values.

The Resources tab on the *Johannesburg Heritage Foundation (JHF)* platform’s list of plans (<http://joburgheritage.org.za/resources.html>) physically lodged at the Museum Africa, yields one result which indicates that an 1893 blueprint is available. *Wired Space* only yields results that peripherally refer to masters in architecture dissertations in the Department of Architecture at Witwatersrand University. A search on the *JHF*’s Johannesburg Heritage List (<http://joburgheritage.org.za/docs/JHF%20Heritage%20List%20Johannesburg%20Heritage%20List%20June%202019.pdf>) reveals two entries which indicate that the original Park Station site was declared a Provisional Heritage Site on 5 April 2017 with an expiration date of April 2019 and that the relocated ‘Old Park Station’ in Newtown was also declared a Provincial Heritage Site with similar proclamation and expiration dates. This provides an understanding of the local value of the artefact and regulations which control any possible changes.

### 5.2.3. House Martienssen, Rex Martienssen, 1939 (private residence)

A search on the SAHRIS website produces no results. A search on *UPSpace* for the house, specifically, provides no results. A search under the name of the architect ([https://repository.up.ac.za/handle/2263/71/discover?rpp=10&page=3&query=%22martienssen%22&group\\_by=none&etal=0&filtertype\\_0=title&filtertype\\_1=title&filter\\_0=&filter\\_relational\\_operator\\_1=contains&filter\\_1=&filter\\_relational\\_operator\\_0=contains](https://repository.up.ac.za/handle/2263/71/discover?rpp=10&page=3&query=%22martienssen%22&group_by=none&etal=0&filtertype_0=title&filtertype_1=title&filter_0=&filter_relational_operator_1=contains&filter_1=&filter_relational_operator_0=contains)) (“Rex Martienssen”) delivers 39 results, 24 of which are peripheral sources that mention the architect in passing. There are none written on his work directly and no mention of the house in question.

A search on *Artefacts* for the architect (<https://www.artefacts.co.za/main/Buildings/archframes.php?archid=1053>) yields a detailed history of the person and links to some of his buildings including House Martienssen under which there is a very brief description (<https://www.artefacts.co.za/main/Buildings/bldgframes.php?bldgid=316>) which only highlights the architectural context.

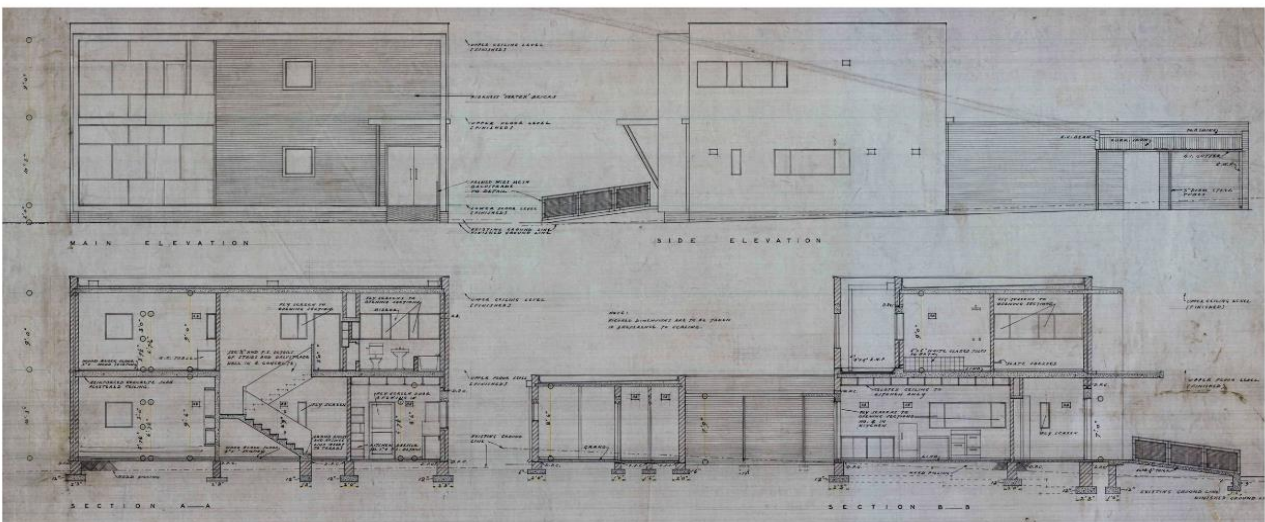




(a)



(b)



(c)

**Figure 1:** a) Aerial photograph of the Union Buildings, <https://repository.up.ac.za/handle/2263/60293>; b) Historical photograph of the Old Park Station, <http://atom.drisa.co.za/index.php/johannesburg-1895-park-station>; c) Original drawing of House Martienssen, <http://wiredspace.wits.ac.za/handle/10539/10741>.



The architect's name does not appear on the *Heritage Portal* or *Heritage Register* platforms. A *UPSpace* search in the architectural archive yields only 35 indirect results associated with the architect's surname and none which refer to the house in question ([https://repository.up.ac.za/handle/2263/72/discover?rpp=10&page=4&query=%22martienssen%22&group\\_by=none&etal=0](https://repository.up.ac.za/handle/2263/72/discover?rpp=10&page=4&query=%22martienssen%22&group_by=none&etal=0)).

A general *WiredSpace* search ([http://wiredspace.wits.ac.za/discover?scope=%2F&query=martienssen&submit=Go&filtertype\\_0=author&filter\\_0=Martienssen%2C+Rex+D&filter\\_relational\\_operator\\_0>equals](http://wiredspace.wits.ac.za/discover?scope=%2F&query=martienssen&submit=Go&filtertype_0=author&filter_0=Martienssen%2C+Rex+D&filter_relational_operator_0>equals)) using the architect's name (Martienssen), and independently the name of the house, both provide 26 results which when individually accessed do not reveal a specific item that deals with the house. They do, however, reflect a record of many of the architect's research outputs which place the house into a paradigmatic context of the times and provide a detailed understanding of the architect's philosophy. Interestingly, a Google search does, however, point to two specific *WiredSpace* (<http://wiredspace.wits.ac.za/handle/10539/10741>) links that provides two similar digitised drawings showing the plans, sections and elevations (Fig. 1c) and another (<http://wiredspace.wits.ac.za/handle/10539/10727>) which is a digitally translated Word document from a 1942 South African Architectural Record article by the architect. This item includes detail design descriptions, photographs of the exterior and interior and plans. The two *WiredSpace* items provide enough information to extract all architectural significances but the search process needs to be managed to obtain accurate and immediate results.

A detailed search under 'Martienssen' in the architecture section of *WiredSpace* provides 38 results (<http://wiredspace.wits.ac.za/handle/10539/7332/discover>) which highlight structural calculations and some working drawings of the house which provide specific technological significances.

## 6. Discussion: Assessment of current HAP practices

Notwithstanding the fact that the number of platforms with relevant architectural heritage knowledge is increasing in South Africa, their limited digital bias, location, curation, accuracy and accessibility can often frustrate, or even dilute the HPA's assessment process. It is the juncture between information availability and assessment practices that can improve the development of more accurate and timely Statements of Heritage Significance.

Procedures for heritage assessment that rely on the availability of digitally based information are covered by the DEA 2016 guidelines for 'Cultural Heritage Surveys' and the ongoing development of the SAHRIS database. Unfortunately, the SAHRIS database is still in its infancy and so HAPs only have access to limited records regarding the existing heritage status of lodged buildings.

Similarly, the DEA's suggestion that HAPs access information lodged at Local Authorities is currently limited as digital access is only available at one PHRA, namely that in the Western Cape region of South Africa. HAPs will, therefore, not be able to digitally access important information related to 'Protected Areas' for

other regions in the country. It is also unfortunate that the NHRA "does not provide for digitisation of the national estate...[and] there is no provision for preservation of the digital heritage contained within the act" (Department of Arts and Culture, 2010, p. 25). The requirement that "[h]eritage assessment practitioners shall clearly differentiate between facts, opinions and inferences in their work" (APHP, 2011, p. 4) and that they "shall, to the best of their ability, use the best available information" (APHP, 2011, p. 5) cannot, at present, be entirely undertaken with available digital platforms as these need to be supplemented by analogue information. The ability to locate appropriate platforms is the first problem that HAPs are confronted with. Certain platforms might not be widely known, while other platforms are so broad that specific information collections within them might not be directly visible. Digital resources linked to marginalised communities is also limited, although a number of museums with physical artefacts related to these communities have been constructed post-democracy in 1994.

A broader overarching platform such as the *Archival Platform* that provides links to specific platforms is, however, a move in the right direction and national heritage platforms such as SAHRIS could be developed to serve as a linking site for information resources. The further development of cross-referencing between platforms would also assist HAPs to navigate the broad network of heritage information.

Due to the complexity of heritage practice and the various attributes and values of sites that have to be considered, HAPs require access to a broad spectrum of information. HAPs currently benefit from the variety of knowledge platforms in the South African context, managed by a variety of institutions that provide a variety of content. However, the limited coverage that platforms currently offer means that comprehensive information is not always available. Current platforms with growth potential could be expanded to cover areas of missing information, or existing platform models could be duplicated by organisations in other locations or with other focus areas that do not currently manage online knowledge platforms.

In order to ensure wider representation of information, platforms should also be encouraged to develop information for remote locations (such as small towns and rural areas), for marginalised themes (such as indigenous architecture) and for the increased recognition of social histories and community values in addition to formal architectural-historical descriptions.

Fortunately, all of the online platforms, that have been discussed, are directly accessible without having to sign up or log on which eases desktop research and limits cost. This situation is, however, dependant on continuous funding and the willingness of dedicated individuals to continue maintaining and developing the knowledge platforms.

Search 'engines' are directly embedded in all of the platforms but their ability to undergo deep or selected searches varies from platform to platform. This means that often time is wasted when a search term provides either an uncontrolled number or no results. Those platforms associated with institutions fair better than those that are privately run or under-resourced, as more attention can be paid to describing metadata.

This is key for “information organization and access” (Hu, Ng, & Xia, 2018, p. 1477). Further development of intelligent search functions, GIS integration and user interface design could benefit all of the knowledge platforms introduced in this paper.

At present, the amount of digitally available content is the main limitation in HAPs being able to complete detailed and in-depth value assessments. Most of the institutional repositories are still in analogue format and resource and time issues are mitigating factors in improving digitisation. Documents and photographs constitute the major proportion of available digital information which provide enough historical and contextual information, but it is the limited number of architectural drawings that is, currently, reducing architectural assessment possibilities. This situation can be mitigated by creating better synergies between online platforms and paper-based archives and can be improved through ongoing digitisation projects connected to the various platforms.

Quality and accuracy of knowledge are affected by the curation of information, by decisions about what should be made present online and the limited number of peer-reviewed sources available. Curation could be improved if closer cooperation could be established between developing knowledge platforms and the vast groups of HAPs, heritage organisations and academic subject specialists. Feedback loops should also be encouraged where HAPs not only utilise information from knowledge platforms but also contribute the information that they discover in fieldwork to these platforms in return.

## 7. Conclusions

The fast pace of building design, and implementation, in the 21<sup>st</sup> century, has necessitated an immediacy of access to relevant, curated, architectural historical knowledge so that HAPs can adequately describe values of buildings and sites to determine architectural significances.

This article has defined architectural heritage practice in South Africa and has highlighted the types of information needed for it to be effective. A selection of currently available architectural heritage knowledge platforms (with a digital bias) was located and described, followed by a critique of their current status. An assessment of these platforms has shown that HAPs currently have access to a number of resources but that there is still limited architectural-historical knowledge available online. Platforms are currently in their infancy as they are often limited in number, coverage and size of content. Due to limited resources, curation is also hamstrung which leads to restrictions in the accessibility and interface of some platforms. These limitations frustrate and dilute the HAPs’ assessment process.

Public, or government, initiatives such as the establishment of the NHRA and the promulgation of

associated legislation has fostered the beginnings of a national register of artefacts through the SAHRIS platform. This initiative holds great promise as it can, in the future, bring together currently disparate architectural-historical digital sources. But the lack of heritage registers at the provincial and municipal level are limiting factors. Also “there is limited scope for the provision of access to the list, there is no provision for the preservation of the digital heritage contained within the act” (Department of Arts and Culture, 2010, p. 25).

It is at the institutional and private level that much of the architectural historical knowledge is being digitised, curated and made accessible. But many relevant bodies such as the various provincial architectural institutes are not represented. These bodies have large memberships who not only have access to historical-architectural knowledge but are the future ‘archives’. There is currently no museum of architecture or coordinated architectural archiving projects in South Africa and it should be incumbent on the South African Institute of Architects to consider these possibilities

Academic and other institutions are better resourced in terms of finances and staff and so it is incumbent on these bodies, particularly in the academic realm, to be more vigilant and collaborative in their operations. Private bodies and individuals have, and are, making considerable and important contributions to platforms in South Africa. But individual passion is not sustainable and a close alliance with the academies would help to limit the possible duplication of information while preventing any untimely demise of important platforms.

At present *Artefacts* is the most comprehensive digital ‘encyclopaedia’ of architectural artefacts in South Africa. Its ambit could be extended to include locations of other, related digital content housed elsewhere so that it can become the ‘go-to’ platform for architectural-historical knowledge that is connected to, and guides, the content of other, currently, available platforms.

There is much work still to be done to bring digital architectural heritage knowledge platforms in South Africa to their full potential, but the road is well paved, and the HAP is slowly being enabled to assess values and define significances in a more accessible, effective and timeous manner.

## Acknowledgements

The authors wish to thank architectural-historical platform curators at the Universities of Kwa-Zulu Natal, Cape Town and the Witwatersrand for assisting in our initial analysis of available platforms in South Africa. In particular our thanks to Prof Cathy Munro at Wits for a detailed understanding of the establishment of the Johannesburg Heritage Foundation initiative.

## References

- Armstrong, A. R. E. (2006). Architectural Archives/Archiving Architecture: The Digital ERA. *Art Documentation: Journal of the Art Libraries Society of North America*, 25(2), 12–17. Retrieved from <https://www.jstor.org/stable/27949434>
- Association of Professional Heritage Practitioners (APHP). 2011. *Code of Conduct for Heritage Assessment Practitioners*. Retrieved from <https://www.aphp.org.za/aphp-code-conduct>

- Australia ICOMOS. (2000). The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance: with associated guidelines and code on the ethics of co-existence. Burwood: Australia ICOMOS. Retrieved from <https://www.icomos.org/australia>
- Ball, J. (2017). *Joburg gets a new online heritage system!*. Retrieved from <http://www.theheritageportal.co.za/article/joburg-gets-new-online-heritage-system>
- Barker, A., Swart, J. & Van Niekerk, K. (2016). The importance of Architectural Archives. *Architecture South Africa*, 79, 6–9.
- Brusaporci, S. (2017). *Digital Innovations in Architectural Heritage Conservation: Emerging Research and Opportunities*. Hershey, PA: IGI Global. <https://doi.org/10.4018/978-1-5225-2434-2>
- City of Cape Town. (2019). *Environment and heritage education resources*. Retrieved from [www.capetown.gov.za/Family%20and%20home/education-and-research-materials/graphics-and-educational-material/environment-and-heritage-education-resources](http://www.capetown.gov.za/Family%20and%20home/education-and-research-materials/graphics-and-educational-material/environment-and-heritage-education-resources).
- Department of Arts and Culture. (2010). *National policy on the digitisation of heritage resources (draft)*. South Africa. Retrieved from [http://www.archivalplatform.org/images/resources/NATIONAL\\_POLICY\\_ON\\_DIGITISATION\\_V8.pdf](http://www.archivalplatform.org/images/resources/NATIONAL_POLICY_ON_DIGITISATION_V8.pdf)
- Department of Environmental Affairs (DEA). (2016). *Cultural heritage survey guidelines and assessment tools for protected areas in South Africa*. South Africa. Retrieved from [https://www.environment.gov.za/sites/default/files/legislations/culturalheritagesurveyguidelines\\_protectedareas2016\\_0.pdf](https://www.environment.gov.za/sites/default/files/legislations/culturalheritagesurveyguidelines_protectedareas2016_0.pdf)
- Department of Environment and Heritage Protection. (2013). *Assessing cultural heritage significance. Using the cultural heritage criteria*. Queensland, Australia. Retrieved from [https://www.qld.gov.au/\\_\\_data/assets/pdf\\_file/0030/66693/using-the-criteria.pdf](https://www.qld.gov.au/__data/assets/pdf_file/0030/66693/using-the-criteria.pdf)
- De Vletter, M. (2019). Don't Be Afraid of the Digital. *Arts*, 8(1), 6. <https://doi.org/10.3390/arts8010006>
- Esperdy, G. (2013). Building data: Field notes on the future of the past. *Places Journal*, September 2013. <https://doi.org/10.22269/130923>
- Evans, J. & Wilson, Z. (2018). Inclusive repositories and recordkeeping: towards a manifesto. *International Journal of Heritage Studies*, 24(8), 857–860. <https://doi.org/10.1080/13527258.2018.1428671>
- Hawes, S. E. (2010). Curating architecture: an investigation of the motives and practice of architectural collection and exhibition with recommendations for interpretation of the architectural study collection at Independence National Historical Park. (Masters Thesis, University of Pennsylvania, Philadelphia, USA). Retrieved from [https://repository.upenn.edu/hp\\_theses/141/](https://repository.upenn.edu/hp_theses/141/)
- Hu, X., Ng, J., & Xia, S. (2018). User-centered evaluation of metadata schema for nonmovable cultural heritage: murals and stone cave temples. *Journal of the Association for Information Science and Technology*, 69(12), 1476–1487. <https://doi.org/10.1002/asi.24065>
- Kleinman, K. (2001). Archiving. *Archival Science*, 1, 321–332. <https://doi.org/10.1007/BF0243890>
- Kleyn, L. (2018). Open access research publications and South African Institutional Repositories (IRs) in the context of intellectual property law and practices: and interdisciplinary study. (Unpublished MPhil Thesis, University of Pretoria, South Africa).
- Kotze, P. (1998). In memory of Sophia Gray: Store houses of knowledge. *S.A. Architect*, Sept/Oct, 43–47.
- Liebetau, P. (Ed). (2010). *Managing Digital Collections: A Collaborative Initiative on the South African Framework*. National Research Foundation, South Africa. Retrieved from [https://wiki.lib.sun.ac.za/images/5/51/Managing\\_Digital\\_Collections.pdf](https://wiki.lib.sun.ac.za/images/5/51/Managing_Digital_Collections.pdf)
- National Archives and Records Service of South Africa (NARSSA). (2013). Digitisation Strategy. Retrieved from <http://www.nationalarchives.gov.za/sites/default/files/National%20Archives%20Digitisation%20Strategy%20-%20approved%20November%202013.pdf>
- National Heritage Resource Act 25 of 1999 (South Africa) (NHRA). Retrieved from <http://www.dac.gov.za/sites/default/files/Legislations%20Files/a25-99.pdf>
- Phiri, L. & Suleman, H. (2013). Managing cultural heritage: information systems architecture. In I. Ruthven, G. G. Chowdhury (Eds.), *Cultural Heritage Information Access and Management* (pp. 113–134). London: Facet Publishing. Retrieved from [http://pubs.cs.uct.ac.za/archive/00001008/01/phiri\\_iresearch2013\\_architecture.pdf](http://pubs.cs.uct.ac.za/archive/00001008/01/phiri_iresearch2013_architecture.pdf)



PLATFORMS OF KNOWLEDGE: ARCHITECTURAL HERITAGE PRACTICE AND  
THE INFORMATION AGE IN SOUTH AFRICA

- Pickover, M. (2014). *Patrimony, power and politics: selecting, constructing and preserving digital heritage content in South Africa and Africa*. Paper presented at IFLA WLIC 2014, August 2014, Lyon, France. Retrieved from <http://library.ifla.org/1023/1/138-pickover-en.pdf>.
- Pierce, K. (2011). Collaborative efforts to preserve born-digital architectural records: a case study. *Art Documentation: Journal of the Art Libraries Society of North America*, 30(2), 43–48. <https://www.jstor.org/stable/41244064>
- Redweik, P., Cláudio, A., Carmo, M., Naranjo, J. & Sanjosé, J. (2017). Digital preservation of cultural and scientific heritage: involving university students to raise awareness of its importance. *Virtual Archaeology Review*, 8(16), 22–34. <https://doi.org/10.4995/var.2017.4629>
- Ruiz Gil, J. A. (2017). Digital heritage training for historians in Europe: a local proposal. *Virtual Archaeology Review*, 8(17), 56-63. <https://doi.org/10.4995/var.2017.4726>
- Smuts, K., Mlungwana, N., & Wiltshire, N. G. (2016). SAHRIS: South Africa's integrated, web-based heritage management system. *Journal of Cultural Heritage Management and Sustainable Development*, 6(2), 13–152. <https://doi.org/10.1108/JCHMSD-01-2016-0002>
- Waters, D. & Garrett, J. (1996). *Preserving Digital Information. Report of the Task Force on Archiving of Digital Information*. Washington, DC: The Commission on Preservation and Access and Research Libraries Group. Retrieved from <https://www.clir.org/pubs/reports/pub63/>
- Willis, A. (1996). The place of repositories in the universe of architectural documentation. *The American Archivist*, 59(2), 192–198. <https://americanarchivist.org/doi/pdf/10.17723/aarc.59.2.I54510w443504578>