# digital cultural heritage: FUTURE VISIONS

Edited by Kelly Greenop and Chris Landorf

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The Conference Convenors received a total of 44 abstracts. Abstracts underwent a double-blind peer review by two members of the Conference Organising Committee. Authors of accepted abstracts (32) were invited to submit a full paper. All submitted full papers (18) were again double-blind peer reviewed by two reviewers. Papers were matched as closely as possible to referees in a related field and with similar interests to the authors. Sixteen full papers were accepted for presentation at the conference and a further 6 papers were invited to present based on submitted abstracts and work-in-progress. Revised papers underwent a final post-conference review before notification of acceptance for publication in these conference proceedings.

Please note that papers displayed as abstracts only in the proceedings are currently being developed for submission to a digital cultural heritage special edition of an academic journal.



COLOPHON

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# Revitalising Ethiopia's Africa Hall: using new digital technologies in heritage practice to conserve Africa's heritage

**Abstract**

*Africa Hall is highly significant to Ethiopia, the African Union member states (52 countries) and the UN as the founding building for the UN in Africa. It played a key role during the formation of the African Union and the UN mission, which oversaw the decolonisation of Africa. A modernist architectural work (1958-1961), designed by Italian Architect Arturo Mezzedimi, it was built to be a symbol for contemporary Africa moving forward. The building is now in dire need of upgrade to remain relevant and functional. In 2014 Conrad Gargett was commissioned to lead a multidisciplinary project team. The mandate of the project was to renovate and upgrade Africa Hall's facilities to achieve modern conference standards and provide a UN visitor centre for the public and conference delegates. The project's scope included conservation works, major upgrades to conference functionality, along with technology-rich interpretative displays and experiences presenting the building's place and its role in African history to visitors. Conrad Gargett used multiple emergent digital technologies, including 3D laser scanning to generate a point cloud and video recordings, to record the building and site. The 3D BIM drafting software and presentation software were used to produce existing drawings, then design and document the project. With the project in Africa, the client and project team in four continents, various contemporary technologies enabled day-to-day communication. This paper critically examines the challenges and opportunities experienced by Conrad Gargett's team applying emergent digital technologies in heritage practice - using Africa Hall as a case study, a major heritage conservation project in Addis Ababa, Ethiopia for the United Nations (UN). Throughout this remote project's development, the team adapted to use multiple emergent technologies and with agility they upskilled quickly. This paper posits that projects such as this offer a chance to close the inventor-practitioner gap.*

**Keywords:** Africa Hall; Arturo Mezzedimi; Conrad Gargett; digital technologies; heritage practice; modern architecture.

## Introduction

This paper critically examines the challenges and opportunities experienced by Conrad Gargett's architectural team applying emergent digital technologies in heritage practice - using Africa Hall, a major heritage conservation project in Addis Ababa, Ethiopia for the United Nations (UN)[1] as a practice case study. The multiple emerging and evolving technology platforms used during this project have required education and commitment from the client, user groups and wider consultant team to develop a shared understanding of the benefits to the project, ahead of each technology's application and use. The Conrad Gargett team's adaption to multiple emergent technology use and their agility to upskill quickly, became both a necessity and an opportunity for what can arguably be described as a 'risky venture' due to the project's remote location, high profile and complexity.[2]

During the project, Conrad Gargett used Zebedee 3D laser scanning to generate a point cloud and GoPro video recordings to record the building and site. 3D BIM (building information modelling software – Autodesk Revit) drafting software and presentation software (Lumion 3d fly-throughs) were used to produce existing drawings, then design and document the project. With the project in Africa, the client and project team in four continents,[3] video conferencing (client lead technology) and information management software (Newforma) have enabled day-to-day communication.

Drawing from the research undertaken by the project team, reviewing the documentation produced, and interviewing project team members - this paper shares the team's experiences, highlights opportunities, identifies the current challenges of these emergent and evolving digital technologies to demonstrate how this high profile, remote project afforded Conrad Gargett the ability to close the inventor-practitioner gap.[4] The paper is divided into five parts: the first two sections briefly describe Africa Hall's cultural heritage significance and the project Conrad Gargett has been commissioned for. The latter three sections will critically examine the use of technology to record the existing building, to document the proposed project and lastly to facilitate the team's communication.

## Africa Hall's history

Africa Hall (Figure 1, 3 & 4) is highly significant to Ethiopia, the African Union member states (55 countries) and the UN as the founding building for the UN in Africa, a place that assumed a key role in the forming of the African Union and the UN mission, and saw the decolonisation of Africa. A modernist architectural work (1958-1961), designed by Italian Architect Arturo Mezzedimi (1922-2010),[5] it was built to be a symbol of contemporary Africa moving forward. As a venue for the African Union (the first African Parliament Building), Africa Hall's design facilitates international, political, economic

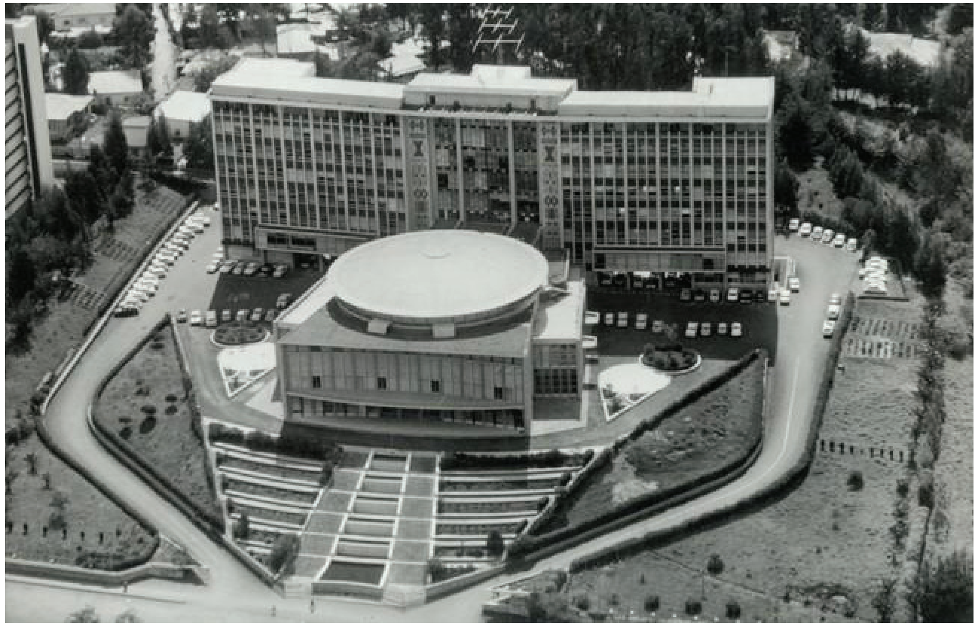

Figure 1. Africa Hall and the Office Building soon after completion. (Source: UNECA collection).



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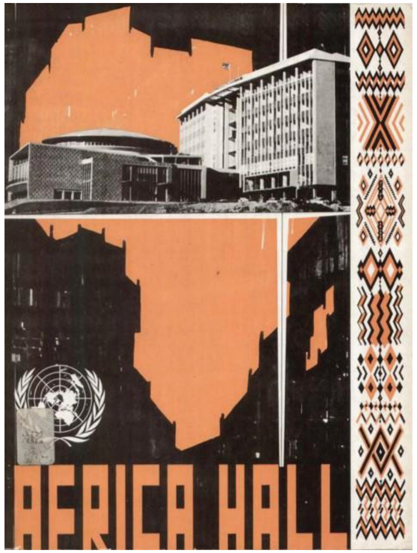


Figure 2. Front cover Commemorative booklet, 1961. (Source: UNECA collection).

and social conferences; public meetings; permanent and temporary exhibitions; and is the permanent headquarters of United Nations Economic Commission for Africa (UNECA).

UNECA was established by the Economic and Social Council (ECOSOC) of the UN in 1958. Its mandate is to promote the economic and social development of its member states, foster intra-regional integration, and promote international cooperation for Africa's development. Following the choice of Addis Ababa as the headquarters of the newly created UNECA, Ethiopia's (then) Emperor Haile Selassie 'ordered the construction of a modern and imposing building' not only to accommodate UNECA, but also to provide a 'venue for future African and international conferences' (Commemorative booklet, 1961, 58). Formally opened on 6 February 1961, the Africa Hall complex was constructed as a gift from the Ethiopian Government to UNECA (Commemorative booklet, 1961 – Figure 2).

As one of the Emperor's favourite architects (Ayala 2016), Mezzedimi planned that the project be based on the 'modernity of functional and aesthetic conceptions, with a parallel attempt to give character', (Commemorative booklet, 1961, 16) and 'symbolic representation, with the inclusion of formal elements, of the willingness of Africa Hall to receive new ideas and all peoples' (Commemorative booklet, 1961, 16). The choice of site and the location of the buildings

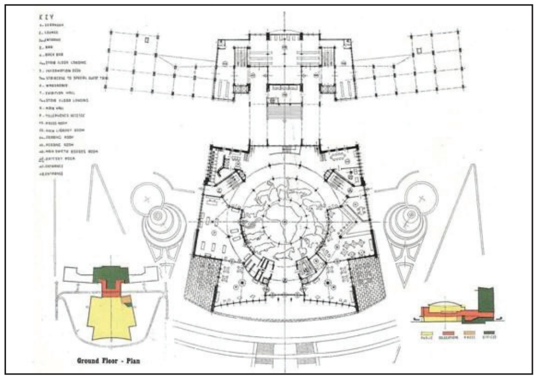


Figure 3. Drawing for the ground floor reproduced in the Commemorative booklet 1960s (Source: UNECA collection).





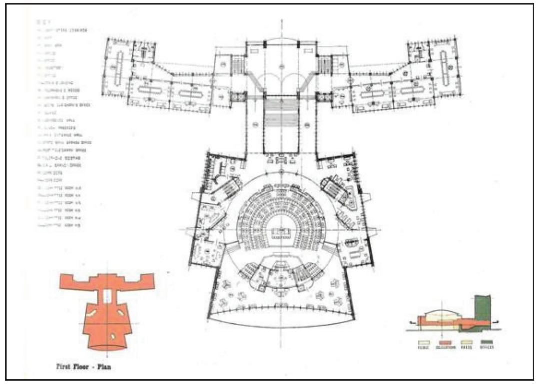


Figure 4. Drawings for the first floor reproduced in the Commemorative booklet 1960s (Source: UNECA collection).

on the site were key components in establishing the symbolic importance of the building, providing the landscape atmosphere Mezzedimi sought (Commemorative booklet 1961, 17). Unfortunately, Africa Hall is now in dire need of conservation and upgrade to remain relevant and usable.

To mark its fiftieth anniversary, UNECA, in collaboration with the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the African Union Commission (AUC), launched the current project to renovate Africa Hall in recognition of its role as a 'monument to modern African history' (UN General Assembly resolution 65/259 2011).

## Seeking to conserve and revitalise history

The mandate of the current project is to renovate and upgrade the facilities to achieve modern conference standards and a UN visitor centre for the public and conference delegates. The project's scope includes building fabric conservation and repair works, and both renovation and major upgrades to the conference facilities. The proposed project for Africa Hall – for it to continue functioning as a UN conference venue (and public conference venue) and as a major visitor centre utilising contemporary digital media

– will ensure its on-going use as a highly functional conference venue, able to tell the story of the place, and maintain links with the wider UN community (CGRAMW 2014). Without the proposed works, the building risks becoming too out-dated (with aging building/conference technologies) to continue to fulfil its intended function (Gole 2016).

The renovated and upgraded conferencing facilities will include: new conferencing fitout and infrastructure; new security infrastructure (as expected for a building used by heads of state and

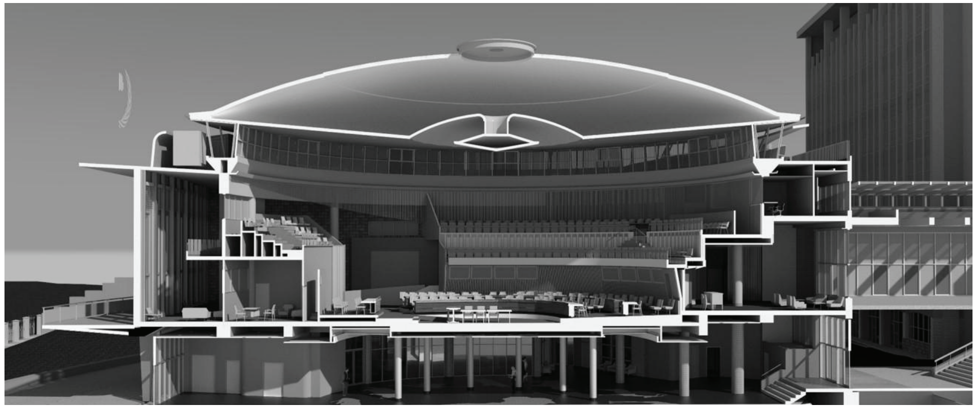

Figure 5. Perspective Section - Proposed BIM Model B & W Render (Source: CGAMW 2017).

diplomats); new digital displays for conference programmes and information; new interpretive elements throughout the building; new audio and video displays for visitors highlighting key and defining moments in the life of the building; and a new permanent exhibition using a range of media (including technology-rich interpretative displays and experiences) to present the place and its role in African History (CGRAMW 2014).

To ensure international best practice conservation methodology is undertaken, the project team has employed UNESCO and ICOMOS international protocols, including the ICOMOS Burra Charter. The





project team produced a Conservation Management Plan, measured drawings, and undertook a condition survey, to inform the design and construction documentation (Figure 5). However, different from its work in past projects, the team has utilised multiple emergent technologies as tools to do so.

## Creating the dots: using emergent technology to record the existent

Given the organic form and size of the building and its surrounding site, the complexity of the project was well recognised from the outset. Furthermore, the global nature of this project meant that the time the architects could spend onsite measuring (and the ability to return to the site frequently to 'fill in' gaps in the measurements) was limited. The use of emergent digital technology was thus seen as a necessity by Conrad Gargett to achieve a time-effective means of collecting accurate data for Africa Hall's measured drawings.

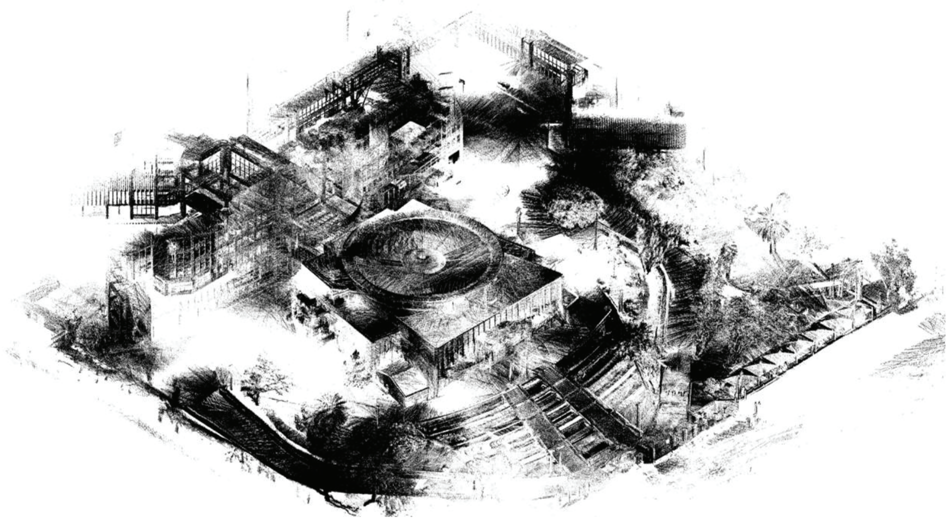

Figure 6. External Isometric–Point cloud of merged scans (Source: Conrad Gargett 2016).

Handheld 3D laser scanning equipment (Zebedee Zeb1) was used to generate a point cloud digital model of the existing buildings and site (Figure 6 & 7).[6] The scanner achieved highly efficient data capture, which meant that less checking and re-checking was required later on. The flow-on effect of early accurate information provided reassurance that the cascade of human measuring errors would not be an issue. GoPro video recordings provided at-desk vision to the design and drafting team, and enabled the whole team to 'walk through the building' remotely and as needed, expediting the whole team's detailed understanding

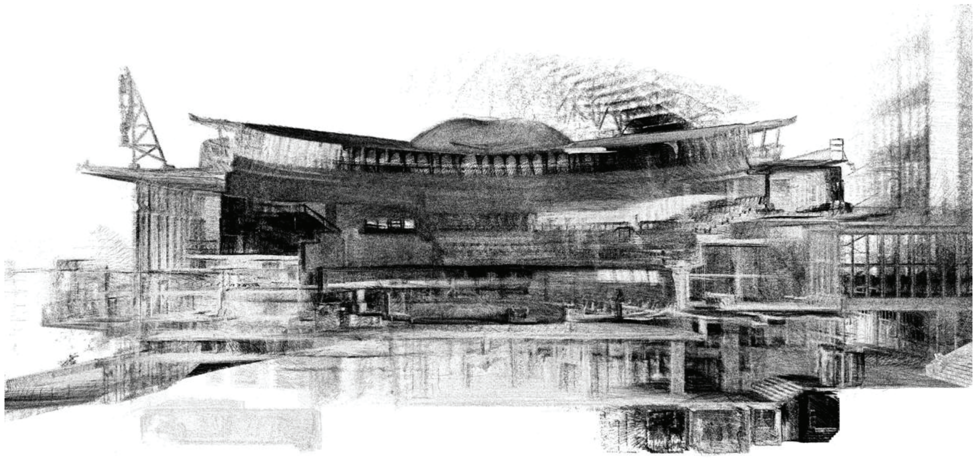

Figure 7. Perspective Section – Point cloud of merged scans (Source: Conrad Gargett 2016).

of the building[7] – a significant improvement when compared to the use of still photographic shots, which were commonplace before (Gole 2016). Because it was a complex geometric building, the combination of hand held technologies enabled the team to create 3D BIM record drawings efficiently, with greater accuracy, and to incorporate increased detail, compared with the less technology-rich project deliveries of past heritage projects.[8] The geographic reach of heritage projects that Conrad Gargett can now take on has expanded with the adoption of these new technologies.





The Zebedee scanner enabled access into areas of this building previously not recordable (heights, confined spaces) including voids, ducts and risers.[9] No ladders or scaffolding were needed. The point cloud achieved accuracy of +/- 10mm,[10] suiting 1:50 scale drawings and was considered reliable when used up to a maximum of 15 metres from scanner to building element. Hand measures were completed for detailed and significant joinery to be conserved and/or altered in the project's scope (Boundy 2016).

A 30-minute tutorial and then some practice was all the training that is required prior to using a Zebedee scanner for project work. However, being a hand-held device, it is pertinent that time is invested to map out the walking route and to think through level transitions, extent of single scan, inform building security, advise all occupants onsite on the day(s) and ensure that all doors are open in advance.[11] The person scanning then needs to be mindful of how they move and their extent of movement to ensure the required detail is obtained. 'It is interesting to watch Simon walk as he scans – there is a Zebedee walk.' (Gole 2016) When interviewed for this paper, Simon described his walk:

> You need to walk slow and deliberately, oscillate the scanner with your wrist, walk backward through door openings…corrupts if you are too fast. The scanner triangulates as you move around, so walking straight can lead to dimension errors. I have found walking in closed loops enables the software to correct itself and remove running errors. Putting an object in a featureless space, a plain corridor, provides a reference object for the scanner to triangulate.
> (Boundy 2016)[12]

Further learnings to date, from this project and others, include: the need to occasionally scan a space two or three times and then merge these scans together to have enough dots to draft from; to be mindful of reflective/mirrored surfaces that the laser cannot map; to take more scans than perceived to be needed[13] (Boundy 2016). Other hand-held technologies used onsite furthered the paperless, straight-into-

Figure 8. Main conference space – As built. (Source: Commemorative booklet 1960s. UNECA collection).

Figure 9. Main conference space – Photo (Source: Conrad Gargett 2014).

technology approach taken by the team. 'Punch lists' (Newforma) using iPads created the draft condition survey. Then there were the unexpected surprises of working overseas, which for this project included: the Zebedee scanner's cord almost being confiscated by Dubai airport security, as they initially perceived it could be used as an on-flight strangulation weapon (Gole 2016). However, 'it feels like early days still with the Zebedee . . . but the inventor feedback loop is refining this' (Gole 2016). Direct feedback from the Zebedee inventors to the team is that they are working on building a GoPro into the Zebedee (Blake, Boundy 2016). The use of the Zebedee and GoPro for Africa Hall might even suggest the team themselves became 'inventors' in the way they combined emergent technologies.

## Connecting the dots: technology to design and document

The point cloud is a sea of dots, which needs to be interpolated into building elements to create a 3D BIM model, which in turn generates the architectural drawing set. Knowledge of the building's materiality (Figure 8 & 9) coupled with construction experience is required.[14] However, with this knowledge the dots can be deciphered and traced, a significantly faster task than interpreting hand-scribed site measures.[15] Africa Hall was initially modelled (in Revit) from original drawings[16] and AutoCAD as-built 2D facilities management drawings, then after site scanning of the model was adjusted to the point cloud data.[17] The point cloud data was referenced into the Revit file. Dots were changed to a series of colours to show planes and to identify the data from individual scans, to assist interpretation (Figure 9 & 10). The 'tracing' was largely done using 2D model views. GoPro video recording was concurrently viewed, greatly aiding interpretation of the dots (Boundy & Blake 2016).

The use of point cloud and video technologies significantly reduced the numbers of errors and discrepancies encountered in past projects, including: onsite measure errors and rounding





errors, identification of out of plumb and out of square walls (and other building elements), varying wall thicknesses, uneven floor levels, ceiling height variations and void variations, differences between sourced reference drawings by others and the built building (to list just a few examples).[18] Without the point cloud, some measurements are invariably missed, leading to subsequent site visits being required. Reducing these project risks, has the potential to shift inherent project delivery complexities which can frustrate heritage conservation, renovation and adaption projects. The increased ability to identify idiosyncrasies of the construction early on – discrepancies between the as-drawn and the as-built – has, for this project, mitigated some of the issues that might have (previously) arisen when recording a building constructed in the mid-twentieth century in Africa[19] (Boundy, Blake & Pendergast 2016).

3D BIM was utilised as the drafting software from the onset of the project, firstly to create the record drawings for the existent Africa Hall. It was then used to develop design strategies in 3D for approaches to the use of space, furniture arrangements and strategies for upgrades for fire and equitable access.[20] It was also used to develop strategies in 3D for the integration of new services – in particular the modelling for new mixed-mode mechanical ventilation systems.[21] Once design development was completed with the broader consultant team, 3D BIM drafting software was used to produce the tender and construction documentation as 2D drawings and detailed schedules.[22] Engineering consultants documented the project and tested their design utilising 3D modelling software.[23]

The use of 3D BIM is now an industry standard for new buildings and many heritage conservation projects led by medium to large Australian architectural practices.[24] Where this project's delivery has varied from standard practice is in the use of emergent technology onsite - testing these technologies' commercial benefits for 'everyday' architectural and heritage conservation practice.[25] The point cloud and the video recording

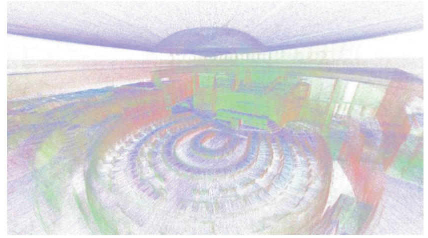

Figure 10. Main conference space – Point cloud of merged scans (Source: Conrad Gargett 2016).

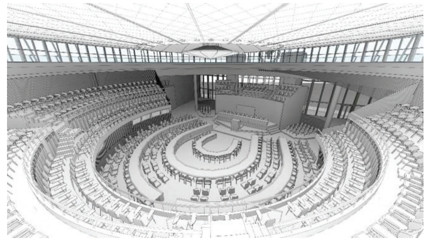

Figure 11. Main conference space – BIM Model perspective view existent space (Source: Conrad Gargett 2016).

records of the existing building have continued to be used almost on a daily basis for the documentation of Africa Hall, providing a readily available reference, resulting in highly accurate documentation, beyond that previously achievable (Gole, Pendergast, Blake & Boundy 2016). With construction scheduled from 2017, it is envisaged that point cloud and the video recordings will be referenced relatively frequently as construction progresses, with further video taken as the works progress (Pendergast 2016).

### Technology rich communication for a global project

The emergent digital technology used for this project not only gave the Conrad Gargett team the tools and confidence to do the project, but it is believed they significantly contributed to achieving and maintaining client confidence. The multiple technologies used have required the education and commitment of the architectural team, client groups and the wider consultant team to develop a shared understanding of the benefits to the project ahead of each technology's use. Time upfront was spent by the architectural team leaders explaining what and how technology could be used, how each would help the team and client, and both time and cost implications[26] (Gole 2016).

Day-to-day communication was aided by the use of technology, not emergent technologies, but tried, tested and known to be the best software available of their type. The video conferencing (client lead technology) enabled the client and consultants to get to know each other quickly and easily, compared to what would have otherwise been limited, in-person meetings or meetings with reduced team representation. The client's software choice has enabled greater connectivity than software generally utilised for other Conrad Gargett projects (Gole 2016). Newforma provided a live database for the whole of the team. This technology tracks all correspondence (incoming and outgoing, with automated tracking, thereby avoiding labour intensive transmittals); transfers large file packages of information to the global team;[27] tracks changes or mark-ups, task assignments, requests for information and 'punch lists'/defects lists (Boundy, Pendergast & Blake 2016).

Lumion software was used to prepare 3D fly-through design presentations initially to the core client stakeholders, highlighting the key aspects of the building upgrade and it was also used to secure funding approval from the UN General Assembly. A 3-minute presentation enabled all client stakeholders to understand the project quickly, surpassing 2D presentation formats of past projects.[28] The use of 3D presentation software was considered to be the most compelling way to illustrate a complex project and is believed to have been fundamental to the project's receiving full funding with approval from UN member states (Gole 2016). The presentation was prepared as a single video using fly-throughs of the 3D BIM model combined with sourced early imagery, recent photos and embedded pop-up text to explain the design intent; an architect from Conrad Gargett was not needed to personally present the video, as the text succinctly explained what would have been relayed in person [view video at https://www.youtube.com/watch?time_continue=2&v=clZHiGByEbI]. Lumion is an easy to use and relatively fast 'real time rendering' presentation software package, run by a gaming engine, linked to Revit.[29] The retained link to Revit enables all design updates to be readily viewed in the presentation without the need to re-work the presentation, which is common to other software packages. The graphics are not photorealistic or glammed-up,[30] but this suited the project and still enabled an accessible and considered presentation to the clients, imparting the details of the changes proposed and how these changes were going to be done in a sensitive and sympathetic way (Gole, Pendergast & Blake 2016).

### Conclusion

To conclude each interview, we asked the Conrad Gargett heritage team what might be the future for documenting renovation and adaptive-reuse projects.[31] This interview question elicited a return question from interviewees: 'Is there a way of making

2D documentation even easier and quicker for others to read? Maybe the future is documentation by video... using video and point cloud in combination and lessening reliance on the 2D' (Gole 2016). Imagine using video technology to communicate through all project stages - from site recording, design, documentation, construction, visitor interruptive displays and then facilities management – we are currently at three out of six.

Hearing the Conrad Gargett project team share their experiences, it is apparent they hope this project will provide inspiration for the conservation and adaptive re-use of other notable modernist architectural buildings within Australia and abroad. It is with this aspiration, and the team's focus on both best practice heritage conservation methodology and progressive technologies, that they chose to upskill and take up the challenge of using emergent and evolving digital technologies for Africa Hall. The project's remote location and high-profile client, beckoned the use of these emergent digital technologies to reduce a variety of risks (some too often perceived as inherent to heritage conservation projects) and to ensure the confidence of the client was captured, maintained and rewarded.

The project's unique set of circumstances allowed the inventor-practitioner gap to be closed. Conrad Gargett cleverly combined different technologies to work remotely and work on a complex building varying from the original architect's drawings. Through this paper it is hoped the experiences shared might give those developing scanning/drafting/ facilities management technologies increased understanding of what is required in contemporary heritage practice, and might offer ideas for how the digital world can further improve the work process from start to end.





## Notes

1. This paper has been prepared as a practice case study. Theoretical case studies and literature reviews of other papers discussing the use of scanning in academic and architectural practice have not been covered in detail. Publication alongside the other *digital cultural heritage: FUTURE VISIONS* papers provides some theoretical context for this paper.
2. 'Remote location' defined as remote to Conrad Gargett in Brisbane.
3. Client facilities management and consultants in Addis Ababa, Ethiopia; Client (leads and funding) in New York, USA; Conrad Gargett and consultants in Brisbane, Sydney and Perth, Australia; and consultants in Valence, France.
4. For this paper, 'gap' is defined as the lag time from invention to use in everyday practice.
5. Mezzedimi was to undertake numerous projects in Addis Ababa, other parts of Ethiopia and in neighbouring Eritrea (Mezzedimi 1992), while working with Emperor Haile Selassie (1892-1975) for approximately 23 years (Magada 2016). 1624 buildings are attributed to this working relationship, with Africa Hall a highlight. (Albrecht, Galli 2014).
6. Zebedee Zeb1 was shown to Conrad Gargett's heritage team by CSIRO and UQ late 2013. Conrad Gargett then hired (from 3d Laser Mapping Rental) a Zebedee, project by project, for about 18 months, before purchasing in 2016 (from Geoslam) after frequent use and the desire to have it on hand to use at short notice (Blake 2016).
7. Conrad Gargett purchased a GoPro in 2013. Africa Hall was the first project it was used for. (Blake, Gole 2016). Long battery life, wide angle, media type, file size, equipment size and cost to achieve a 'good enough' quality made this type of video equipment more suited to project work then older technology video recorders (Boundy, Blake 2016). Videos were taken during the onsite work (including condition survey work and walk throughs, attached on-architect), not as a separate task. Videos were taken in shorter takes, to enable filing by individual spaces etc., making it easier to find later (Pendergast 2016).
8. For this project (13,800m$^2$ useable floor area) one architect took 6 days onsite to scan. Each scan was transferred to the Brisbane office overnight for back-up and for a Brisbane team member to check the files. Ethiopian internet speed (limited broadband

width) and dropouts did slow this down, unfortunately necessitating regular checking during the night to ensure the connection was still working. Corrupted scans were redone within the same 6 days. This timeframe was tight for the project's size. Prior site measures by Conrad Gargett (and formerly Riddel Architecture) were done using a point to point laser device (Leica) plans annotated/drawn onsite by hand and still photography taken. For Africa Hall the low-tech approach is estimated at 2 staff members for several weeks, plus time to recheck and collect missing measurements (Boundy 2016).

9. Africa Hall has an accessible/walkable roof.

10 It is understood that a fixed scanner is +/- 1mm. This was observed by the team when a fixed scanner was used for a 2011 project.

11. 15 minutes is needed at the beginning of each day to plan walking routes. It then took approximately half the time of a scan to pre-walk the route, opening doors, advising occupants (a third of the time on site).

12. It is understood that the next version needs less human movement – the operator does not have to use their wrists to oscillate the scanner. Objects were placed every 5-metres in featureless corridors (Boundy 2016).

13 The current user interface is limited to 3 LED lights (red, green and yellow) and data needs to be uploaded post-scan to obtain point cloud data, so it is not clear if the data has been corrupted until data is returned. Currently done through the scanner's supplier (Geoslam), as part of their ongoing customer service. This has also been a beneficial feedback loop. Software has recently been made available to do this in house. The ability to see the quality of scan data while scanning would be a welcomed future improvement to the user interface.

14 The construction knowledge and experience of the architect/technician is still important -to know what the dots might represent–for example, to recognise dots as a skirting and draw as a Revit wall sweep–and cannot be replaced by the point cloud.

15 Hard to estimate, as a greater level of details was drawn, but 10 percent faster is thought to be the time improvement (Blake, Boundy 2016). The Revit model took approximately 4 weeks to draw (Boundy 2017)

16 Sourced records include an extensive drawing collection (architectural, structural and service drawings) held by UNECA. A commemorative booklet published by the Ministry of Information of the Imperial Ethiopian Government provides a valuable record of the building including detailed descriptions, drawings, photographs and testimonials (Commemorative booklet, 1961).

17 A detail and contour survey was commissioned and was needed as it picked up information not duplicated by the point cloud (e.g. n ground services).

18. Assumptions that had been made from the original drawings included: column sizes, wall thicknesses and beam locations – the point cloud enabled these to be accurately and quickly picked up and the 3D BIM modelling adjusted.

19. Varying local construction methods, consultant and trade contractor skill base, compared to what the team is more familiar with in Australian buildings.

20. Level of detail 200. (Blake 2016) The consulting engineers model their own existing and new works in line with them, taking responsibility for their own discipline's scope (Gole 2016).

21. Navisworks was used by the team for clash detection and as a design checker/improver (Blake, Boundy 2016).

22. All 2D design and documentation drawings present information contained in the 3D BIM model. The 3D model was used by the Quantity Surveyor The architectural specification was prepared using separate word processing software. Fabric conservation/repair documentation is still largely dependent on 2D drafting.

23. For example, the mechanical engineers tested air flows and the electrical engineers tested lighting levels using 3D modelling - presenting these as 3D imagery in their design reports.

24. Riddel Architecture (merged with Conrad Gargett late 2012) have used this software for heritage conservation and adaptive re-use projects from 2006. The first documented project with the consultants modelling in 3D BIM software was completed by the office in 2009-2010, with the first built project documented with this software completed in 2012 (Boundy, Blake 2016).

25. Conrad Gargett is aware of others using point clouds to record sites, lasers from fixed stations, drones and robots to record the current status of listed sites, and archaeologists using point clouds to forensically investigate change. The team is aware of smaller practices using the consultancy service of the UQ School of Architecture, to obtain point cloud surveys and of

one other local (Brisbane) architectural practice offering point cloud scans as an in-house service.

26. Actual time spent was similar to that for past projects.
27. Postage took up to 8 weeks for one of the mailed documents (Pendergast 2016). Conrad Gargett is one of a number of larger Australian architectural now using this software.
28. A lot of non-construction industry people do not understand 2D drawings and for those that do, significantly more time (than 3-minutes) is typically needed to explain equivalent design content and obtain approval for complex projects with multiple client stakeholders (Gole 2016).
29. Lumion was first used by Conrad Gargett in 2012 (Blake 2016). 'Real time rendering' refers to the retained link to the Revit BIM 3D model. Lumion outputs stills, movie and panorama.
30. Not marketing imagery quality typically now used for selling real-estate or in design completion entries. Lumion does not have shadows and lighting effects, but Conrad Gargett can do all production in-house (Pendergast, Blake 2016).
31. L. Daunt interviewing Blake, Boundy, Gole & Pendergast. Conrad Gargett is currently testing: iPhone Google cardboard to create virtual reality; Oculus to show local clients their project as virtually walk throughs; and a 360-degree camera (Boundy 2016). "Quick and Dirty" design work can be (and is being) done from a point cloud, but this is limited (to concept or preliminary master-planning studies). For costing, coordination with engineers and to enable architectural documentation, a 3D BIM measured drawing set of the existing building is needed (Gole 2016).



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## References


Albrecht, B. and J. Galli. 2014. "African Modernities." Text from the catalogue of the exhibition *Africa Big Change - Big Chance, Triennale di Milano, 2* https://www.academia.edu/8820024/African_Modernitites

Arturo Mezzedimi Architectetto.Accessed May, 2014. http://www.arturomezzedimi.it/en/home.htm

Australia ICOMOS. 2013. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance.* http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf

Blake, L. 2016. Interview of L Blake, interview by L. Daunt, November 17, at Conrad Gargett's Brisbane office.

Boundy, S. 2016. Interview of S Boundy, interview by L. Daunt, November 14, at Conrad Gargett's Brisbane office.

Cantone, H. 2016. "Italy-Africa: A Contradictory Inventory of Modernity." *'The Africa-Italy Connection' Critical Interventions, Journal of African Art History and Visual Culture.* 10 (1). http://www.tandfonline.com/doi/full/10.1080/19301944.2016.1180921

Conrad Gargett Riddel Ancher Mortlock Woolley (unpublished) Prepared for The United Nations Economic Commission for Africa: 2014. *Africa Hall refurbishment: Return Brief;* 2014. *Africa Hall: Condition Report*; 2014. *Africa Hall: Concept Design Report*; 2014. *Africa Hall: Conservation Management Strategy; Africa Hall: Developed Design Report.*

CSIRO, 2016. http://www.csiro.au/en/Research/D61/Areas/Robotics-and-autonomous-systems/Sensing-and-mapping-our-environment/Zebedee Accessed October 28, 2016.

Gole, D. 2016. Interview of David Gole, interview by L.Daunt, November 15, transcript, at Conrad Gargett's Brisbane office.

Gole, D, L. Pendergast, and S. Boundy. 2016. interviewed as a group by L. Daunt, November 11, at Conrad Gargett's Brisbane office.

Kerr, J S. 2013.*The Conservation Plan: a guide to the preparation of conservation plans for the places of European cultural significance.* 7th edition. Australia ICOMOS. http://australia.icomos.org/publications/the-conservation-plan/

Levin, A. 2016. "Haile Selassie's Imperial Modernity: Expatriate Architects and the Shaping of Addis Ababa." *Journal of the Society of Architectural Historians* 75, no. 4: 447–468.

Magda, D. 2016. "A Modern Capital in the Making: The 1960s architectural legacy of Addis Ababa." *Selamta: The Magazine of Ethiopian Airlines.* Jan-Feb. http://www.selamtamagazine.com/stories/a-modern-capital-in-the-making

Marquis-Kyle, P. and M. Walker. 2004. *The Illustrated Burra Charter, Good Practice for Heritage Places.* Australia ICOMOS Ltd.

Mezzedimi, A. 1992. *Hailé Selassié: a testimony for reappraisal.* Rome. April. http://www.arturomezzedimi.it/en/pubblicazione_pdf.pdf

"Modern Africa Tropical Architecture". (2013/1). *Docomomo Journal* 48

"Modern Heritage in Africa". (2003/1). *Docomomo Journal* 38

Pendergast, L.2016. Interview of L Pendergast, interviewed by L. Daunt, 11 November , at Conrad Gargett's Brisbane office.

UNECA Commemorative booklet. 1961. *Africa Hall, Addis Ababa.* 1960s. The Ministry of Information of the Imperial Ethiopian Government.

UNECA Commemorative booklet. 2013. *Celebrating Success: Africa's voice over 50 years (1963-2013).*

UN ECOSOC. 1978. *The twenty-first anniversary of the Economic Commission for Africa.* 1 September.

UNESCO. 1972. *Convention concerning the Protection of the World Cultural and Natural Heritage.* http://portal.unesco.org/en/ev.php-URL_ID=13055&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO. 1972. *The General Conference of the United Nations Educational, Scientific and Cultural Organization meeting in Paris from 17 October to 21 November 1972, at its seventeenth session*; adopted 16 November 1972 (ratified by Ethiopia in 1977).

UNESCO. 2011. *Recommendation on the Historic Urban Landscape, including a glossary of definitions.*10 November. http://portal.unesco.org/en/ev.php-URL_ID=48857&URL_ DO=DO_TOPIC&URL_SECTION=201.html

United Nations, Economic Commission of Africa. 2016. www.uneca.org/

World Heritage Convention UNESCO. 2016. ". http://whc.unesco.org/en/criteria