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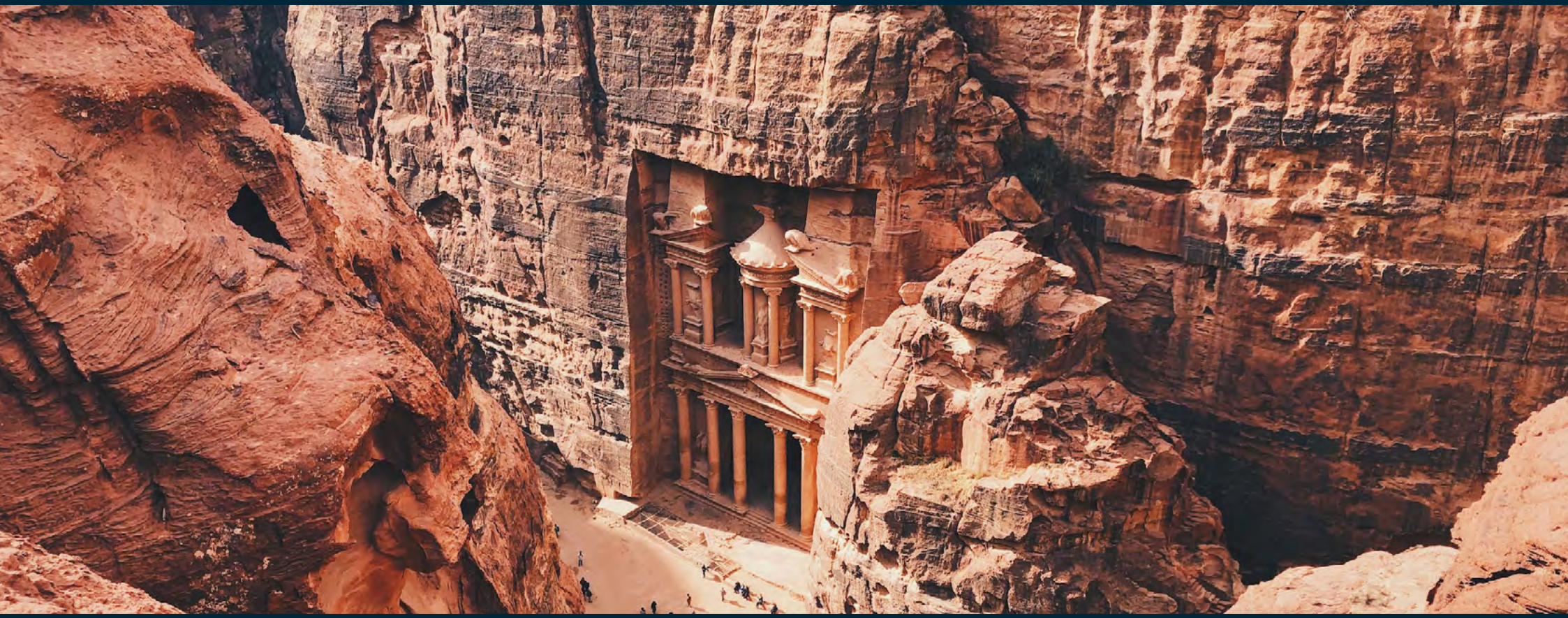

Royal Academy of Engineering

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IT AND CONSERVATION OF TRADITIONAL ARCHITECTURE AND HERITAGE

Lead partner: Professor Rania Aburamadan, Applied Science Private University, Jordan

THE CHALLENGE

Jordan is a country with a rich and diverse architectural heritage buildings dating back thousands of years that can be seen today in sites such as Petra, Um Arassas, and Wadi Rum. Heritage buildings are buildings that have architectural significance and considered important to preserve as they give a sense of identity for communities, help us understand culture and are of irreplaceable value. The unique traditional architecture of Jordan's heritage buildings attracts tourists from around the world and has made tourism important to the country's economy. In 2019, Jordan's tourism sector contributed to the employment of 54,000 people.[1]

Jordan's heritage buildings face pressures from climate change effects rapid urbanisation and abandonment. For instance, increased temperatures can accelerate the deterioration of materials such as brick, stone and wood. Jordan is making strides to conserve its traditional architecture through physical documentation such as drawings and photographs of its heritage buildings. Documentation is important to record the construction and architectural features of Jordan's heritage buildings. However, considering the possibility that drawings and photographs may be fragmented and ultimately lost, technology can be used to create digital records of Jordanian architecture and support the preservation of heritage buildings.

THE PEOPLE

Professor Rania Aburamadan, Applied Science Private University

Dr Claudio Trillo, University of Bradford

Dr Khaled Tarazi, University of Petra

Dr Ali Maqussi, University of Petra

Dr Udeaja Chika, Salford University

Dr Gyau Kwasi, Salford University

Justin Abu Anza,Jordan Tourist Board

Tom Bentley, Bentley

THE PROJECT

With funding from the Royal Academy of Engineering, Professor Rania Aburamadan of the Applied Science Private University, Jordan and Dr Claudio Trillo of the University of Bradford embarked on the 'IT and conservation of traditional architecture and heritage' project. The project's aim was to develop a set of virtual 3D models and building information modelling (BIM) objects to support the construction sector and preservation of Jordan's traditional architecture.[2] The BIM objects would be digital representations of elements of Jordanian traditional architecture such as walls and doors suitable. They provide 3D models that could be used by engineers and architects in the development of built environments such as buildings as most construction in Jordan is based on 2D representation. The creation of a library of 3D models of architecture buildings in Jordan would support the digital preservation of Jordan's traditional architecture and promote tourism in the country. The project focused on creating 3D models of two of Jordan's historic houses; House of Art in Amman and Qaqish House in the city of As-Salt.

This women-led project was carried out in partnership with the University of Salford, the University of Petra, then Middle East University, the

1 International Monetary Fund. Engine of Growth? Tourism in Jordan's economy.(2022). Available from: https://www.elibrary.imf.org/view/journals/002/2022/222/article-A002-en.xml

2 Project IAPP18-19\244: Application

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Jordan Tourist Board, Greater Amman Municipality, and As-Salt Municipality. The industry partner, Bentley, supported the project with software resources and access to training materials.

As part of the collaboration, the project team conducted field observations and a digital survey of the Qaqish House to produce BIM objects by identifying relevant architectural elements inside and outside the house, such as doors, windows, arches, stairs, façade decorative features. **Stakeholder engagement** was central to the development of the methodology and design of the research. The project team **engaged stakeholders in government, academia and local communities** in the city of Amman and As-Salt through a workshop to learn more about the historical sites and discuss how to protect them.

Discussions with local stakeholders enabled the project team to gather some baseline data and led to the co-identification of two architecturally significant houses in the cities of Amman and As-Salt. The houses were examples of Jordanian architecture that BIM could be used to create digital models of. The project team interviewed the owners of the houses and conducted workshops with the Greater Amman Municipality to learn more about the history of the two houses.[3]

> *"At the end of the day, houses are full of memories, full of emotion. That's why we met the owner of this house, the House of Art, which gives us a very comprehensive understanding about this house"*
>
> Professor Rania Aburamadan

IMPACTS

The project's major outcome was the production of **30 BIM models, which form part of a library of 3D models that can be used to promote Jordan's heritage** through virtual tours.[4] Of these models, 18 were developed for Qaqish house in As-Salt and 12 for the House of Arts in Amman. This is the **first library of historical elements of Jordanian built heritage** and sets a precedent for further documentation and heritage conservation of traditional cities in Jordan, Middle Eastern and North African countries, and internationally. The library of the 3D models can be downloaded on the Herit-IT Jordan website.

While the 3D library of BIM objects from the project has not yet been widely used, it has potential applications in Jordan's tourism sector. For instance, a 3D tour of the Qaqeesh house is available on the Herit-IT Jordan website and could help increase awareness of As-Salt's heritage and promote tourism in Jordan. The 3D library of BIM objects could potentially serve as a shared platform for digital data that can be used by engineers to create 3D models of architecturally significantly buildings in Jordan. These 3D models can then be used in planning intervention efforts such as the restoration and rehabilitation of heritage buildings in Jordan.

3 Aburamadan, R., Trillo, C., Cotella, V. A., Di Perna, E., Ncube, C., Moustaka, A., Udeaja, C., & Awuah, K. G. (2022). Developing a heritage BIM shared library for two case studies in Jordan's heritage: The House of Art in Amman and the Qaqish House in the World Heritage City of As-Salt. Heritage Science, 10(1), 1-21. https://doi.org/10.1186/s40494-022-00836-w

4 Industry Academia Partnership Programme final project report (June – December, 2021)

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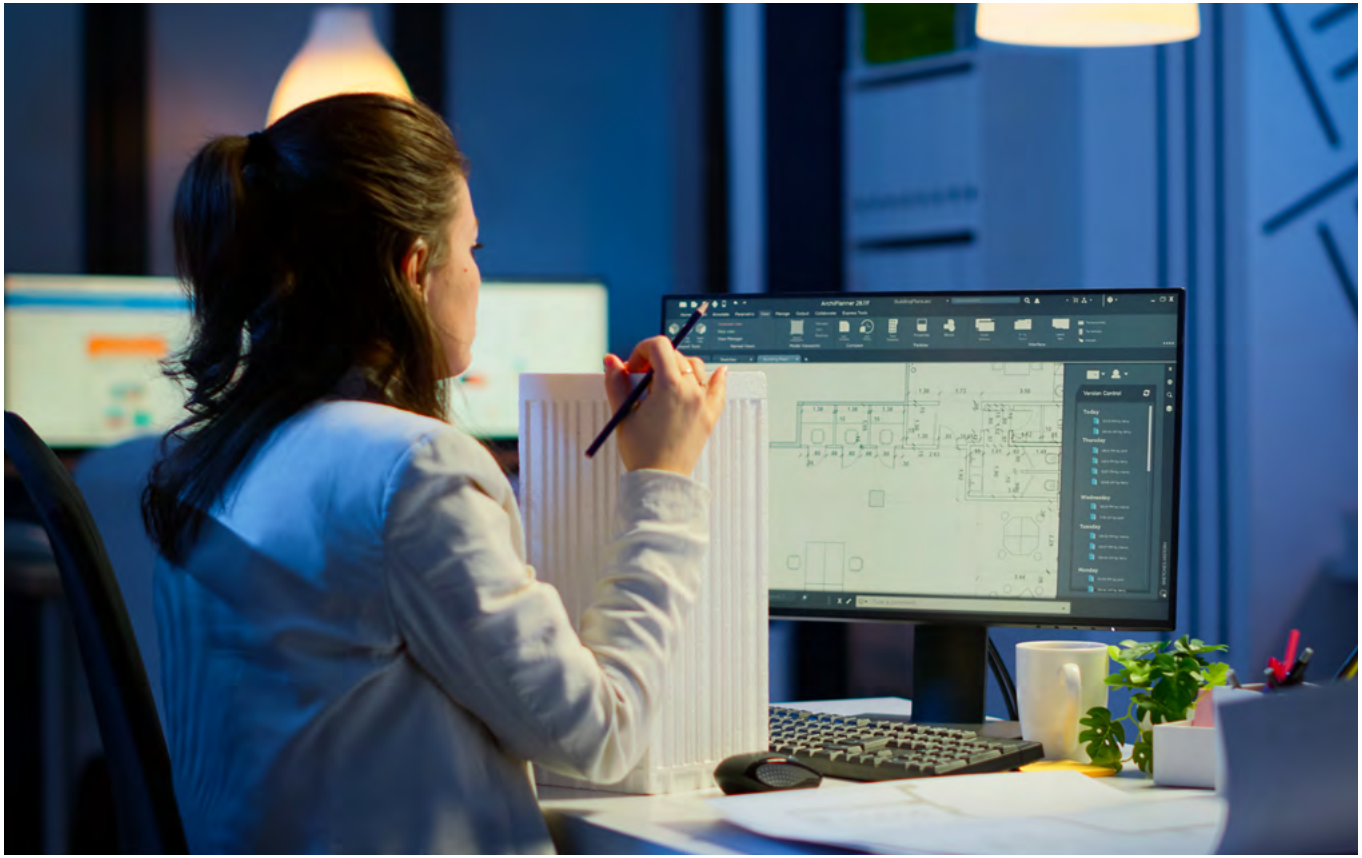
During the course of this collaborative project, the team formed **new partnerships** with organisations including Surveying Technologies and Services Company Ltd, Greater Amman Municipality and the National Committee of the Ministry of Tourism. The project has produced **three articles** and Dr Claudia Trillo (UK, PI) presented the paper "Towards Smart Planning Conservation of Heritage Cities: Digital Technologies and Heritage Conservation Planning" as Part of the 23rd HCI International Conference, HCII 2021, Virtual Event. The presentation received the **best paper award at the 9th International Conference on Culture and Computing in 2021**.



THE FUTURE

Sadly, Dr Trillo, passed away in October 2022. Professor Aburamadan wishes to keep her name alive in the scientific work they conducted together to continue her legacy. Before her passing, Dr Trillo and Dr Aburamadan worked on exploring opportunities to cover over 100 historical budlings in Jordan using accurate digital surveying and digital modelling. The project team also had plans for a centre of excellence that will conserve Jordan's architectural buildings.

The pair collaborated on other projects funded by the Academy. In 2020, the pair started another TSP project that developed a new portal for city information modelling. The project was built on the collaborations and activities from the IT heritage and conservation project.

SOURCES

This impact case study was prepared using information from an interview with the Professor Aburamadan, the application forms, online resources and the project reports. After this project, Professor Aburamadan moved to the Applied Science Private University and Dr Trillo moved to the University of Bradford.

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