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INTRODUCTION

Under the supervision of Professor Ahmed Hamad. Built Heritage is not just an important symbol of national cultural identity but also a great source of knowledge for science and humanity, directly influencing the psyche and economic wellbeing of communities. Much of this Heritage is inhabited, so its long term sustainability is constrained by a particularly wide range of social, political and economic factors. Thus effective future planning depends on gathering and analysing data from a very diverse range of resources, some of which are only now becoming available in Egypt. The key aim of this researcher links workshop is to research how to: bring together that data, include the Internet of Things, Remote Sensed, and Big Data; enable Visual Analytics of Built Cultural Heritage for: quality of life; social welfare and economic impact; a treasure map of potential in Egypt to meet the challenges of responsible retrofit including renewable energy; establishing enhanced education training via a longer-term research community on the web. This workshop is under the supervision of Professor Ahmed Hamad.
Dr. Gehan Ahmed Nagy Radwan is currently Assistant professor of architecture in The British University in Egypt "BUE". Dr Nagy is experienced in the impacts of the built environment on people, (including health and human bioenergy), ecosystems, and passive technologies in local heritage. In a multidisciplinary team she researched the bio and psychological impacts of the built environment during her PhD. Her research has been published in international journals. She has experience of managing and organizing local and international workshops and events, ie leading researcher and Coordinator of the funded DAAD winter school with HTI, ASU, SI, Stuttgart, “El Fayoum Eco Architecture Local experiences and future technologies” 2013. She organized: a student international competition with Cardiff University and MSA University Egypt 2010; the architectural event on the History and Architecture of Khedivien Cairo; and a photographic exhibition on Heritage of Islamic architecture at Diwan book store 2007; a seminar on sustainability, during the UK National Science week funded by Cardiff university 2010. Dr Nagy has worked on research projects and taught on architectural courses in a number of Egyptian and Uk schools of architecture. In 2012 she helped develop the curriculum and establish the architectural department at one of these HE institutions. Dr Gehan taught the vertical design studio at the Welsh School of Architecture, Cardiff in 2010, and taught at Cardiff Metropolitan University during an Erasmus Staff Exchange in 2012. She was the manager of the Rotary funded project of renovation and upgrading slums in Manshiet Naser during 2013. Dr. Nagy was coordinator of the successful researcher links work shop Funded by the British council & STDF and held at Luxor 2014 with the title of "Trends in Heritage focused Building Information Modelling and Collaboration for Sustainability". In addition Dr. Nagy is a Co-PI in the on-going institutional links grant project titled “Heritage Building Information Modelling and Smart Heritage Building Performance Measurement for Sustainability".

Mr. John Counsell is currently Principal Lecturer / Head of Masters Studies in Cardiff School of Art and Design, Cardiff Metropolitan University. John Counsell has specialised in sustainability, and conservation, with publications in both fields. He has significant experience of CAD and BIM in architectural and conservation practice and 20 years’ experience of research into BIM / GIS and Web based collaborative tools, leading to over 40 publications. He led the EU funded FP5 Valhalla heritage project, leading to a 2005 Book Chapter on ‘An approach to adding value while recording historic gardens and landscapes’. For 4 years from 1990 he was the lead consultant implementing a pioneering BIM process for Westbury Homes for building and site design, costing, and management. He led the team for 3D digital modelling of Bristol’s successful millenium bid in 1995. He advised Historic Royal Palaces on 3D digital modelling related to asset management and maintenance. He led the team for the digital 3D modelling of the Tower of London Enviorns Scheme in 1997, resulting in best paper of the year in Structural Survey Journal 2001, and a research focus on ICT for Information Management of Heritage. He is currently Director of Studies/Supervisor of 9 PhD students in: technology for building pathology; digital building performance simulation; Sustainability, Urban and Building effects on people. He was organiser of the International ArchiCad Users Conferences in Cardiff 2013, 2014. He has on-going consultancy with: CADW (Welsh Heritage) focussed on monitoring Heritage Performance; & with Cardiff City re sustainable retrofit of Heritage buildings in Cardiff (funded Welsh Govt. & Technology Strategy Board).
Professor Ebad Banissi is currently a full research professor at London South Bank University - Head of the Big Data & informatics Research Group in the School of Engineering & Director of the Visualisation & Graphics Research Group. Dr Banissi has been engaged with university research and enterprise activities and was the winner of the university enterprise prize for 2009. Projects that relate to the theme of this researcher-links include: London Underground image Surveillance project with Telent Plc., The City Model project with an architectural company, GMJ Design Ltd, short listed nationally for the most enterprising DTI project. A Project with Foley Cooke Associates on use of 3D for building design refurbishments. All these projects were supported by DTI. The BASS award for 3D Space Design and Web Presence for online virtual business environment. A Research Scholarship award for Built Environment Visualisation for visualising the temporal effect on buildings. Doctoral student research on the study of Design Language (use of Geometric design as applied to design in cultural and heritage buildings).

He is one of the original members of the Information Visualisation (IV) forum in Europe and Computer Graphics, Imaging and Visualisation (CGiv) Forum in Asia. He facilitates regular PhD workshops for research students both internally and externally. He has been the coordinator and one of the founding members of BuiltVis - International Conference Visualisation in Built and Rural Environments, for last nine years. He is a professional member of IEEE Computer Science and ACM SIGGRAPGH. He has published over 60 research papers in addition to a number of edited conference proceedings and edited books on Information & Knowledge Visualisation. He has given a number of invited talks at the international conferences. He has been on the editorial board of Information Visualisation Journal. He is member of the EPSERC reviewing committee.
Dr Mahtab Akhavan Farshchi is currently a Senior Lecturer in the Faculty of Science, Engineering and Computing at Kingston University. Over the past four years, Dr Farshchi has been researching into the field of energy demand, vernacular architecture, and communities of energy in Nigeria, Iran and UK. These ongoing research projects have shown the urgency of energy design and planning in buildings in the context of developed and developing economies. With her expertise in economics and architecture she is motivated to explore the ways that technology may impact the lives of so many people who suffer from poverty and lack of access to basic amenities. In addition over the past 25 years she has been involved in many other research projects which have addressed research questions in the fields of construction and design, knowledge management, technology, innovation, globalisation, cities and urban regeneration. Her CPDT (Clients' Project Definition Tool, EPSRC funded) project offered a systematic approach to capturing design brief and proposed a tested methodology for capturing building user requirements. This study was conducted for airports in the UK which was then replicated in Japan by colleagues at Nagoya Institute of Technology. In another project she explored the application of knowledge management philosophy and methods in organisations in pursuit of the goals of sustainability.

Professor Khaled Dewidar is currently Vice Dean for Teaching and Learning, in the British University In Egypt BUE. Professor Dewidar is a Professor of History and Theories of Architecture in the British University of Cairo. Prior to 2009, Prof. Dewidar was a Professor at Ain Shams University where he led research teams documenting heritage and analysing historic buildings. He has supervised 12 PhD Degrees as well as 49 masters’ theses in this domain. Architecture, heritage documentation, ICT in Architectural practice. In 2004, Prof. Dewidar conducted research into architecture in the era of Information Technologies at the University of Pennsylvania, where he was awarded a research and teaching grant. Prof. Dewidar has contributed to, managed and organized several conferences, e.g. the organizing committee of Ain Shams University international conference series ARUP1 & ARUP2: and the BUE sustainability Conference 2010. He is experienced in managing workshops: now running the series of funded annual workshops between BUE and Bergen Academy of Arts Norway. He has been a keynote speaker for several conferences. He has published more than 49 papers in international journals, and conferences. He is the principal investigator on a current institutional links project.

Professor Yehia Bahei-El-Din is currently Vice President for Research and Postgraduate Studies in the British University In Egypt BUE. Professor Bahei-El-Din’s research experience and interest is in the area of renewable energies for sustainability. He has a vast experience in strategic planning and policy implementation. His previous positions include: The Director, Centre for Advanced Materials, The director of Centre for Advanced Materials, Professor of Structural Engineering; Assistant Professor (1981-85) at North Carolina State University, Raleigh, NC, USA (2001-2003): Visiting Professor, Mechanical & Aerospace Engineering. National Academy of Sciences, USA (2003-2004): Senior Research Associate. He was principal investigator of a major research grant in wind energy funded by Egypt Science & Technology Development Fund and European Commission. He was previously: senior investigator in the International Institute on Multifunctional Materials for Energy Conversion sponsored by US National Science Foundation, Consortium leader in the Texas A&M University; and Co-and Principal investigator in many research projects sponsored by NSF and NASA in the USA, and STDF and RDI in Egypt. He has Recognition (Egypt): Presidential Science & Arts Medal of the First Class (2014); State Awards of Appreciation (2013) and Excellence (2007) in Advanced Technological Sciences; Presidential Badge of Distinction (1995); State Incentive Award in Engineering Sciences (1993). USA Certificate of Recognition, NASA, USA (1983).
Ayman Othman is a professor of Construction and Project Management & Head of the Architectural Engineering Department, BUE. He obtained his B.Sc. in Architectural Engineering from Assiut University, Egypt in 1991. He earned his M.Sc. in “Human Resources Management in Construction” and Ph.D. in “Value and Risk Management in Construction” from Heriot-Watt University and Loughborough University, UK in 1999 and 2004 respectively. He publishes widely in international conferences and academic journals. To date he published 6 books, 2 book chapters, 30 journal papers, 64 conference papers and graduated 67 Ph.D., M.Sc. and Honours students. Moreover he is an assistant Editor of the Journal of Construction, registered reviewer & member of the Advisory Board of a number of international journals. Othman is also a member of national and international Professional Bodies (Egyptian Engineering Syndicate, Egypt, Project Management Institute, USA. Society of American Value Engineers (SAVE), USA, Arab Society for Computer Aided Architectural Design (ASCAAD) and a member of the Council of the Association of Schools of Construction in Southern Africa (ASOCSA).

Professor Lobna Sherif received her B.Sc. in Architecture from Ain Shams University, Egypt in 1979; her Master of Architecture from Washington University, USA in 1981; and her Doctorate in Architecture from University of Michigan, USA in 1988. Dr. Sherif is currently a Professor of Architecture and Dean of Education Affairs at the Arab Academy for Science and Technology and Maritime Transport – Cairo Campus. She teaches and publishes in architecture design, history, theories and criticism of architecture.
Prof. Sohier Hawas is a professor of architecture Cairo university . She is the former chair of the Research Studies & Politics Department at NOUH, (http://www.urbanharmony.org). She is a leading heritage researcher & has supervised 65 PhD and masters theses. She is responsible for listing and documenting “Valuable Buildings” in Cairo according to law 144, 2006. She was the Lead Supervisor for the EU Funded joint master program with universities of Cottbus - Germany, Alexandria - Egypt and Halab - Syria. Prof Hawas is the author of the Encyclopaedia On: ‘Khedivial Cairo Identification and Documentation of Urban-Architecture in Downtown Cairo’ 2002 and the author of the Book “Urban Conservation- Regeneration of Heritage Areas in Egypt, Aga Khan Darb Al-Ahmar Project Model” 2013. Prof Hawas also has a number of applied projects such as: documenting and analysing the heritage buildings affected by earthquakes 1992; developing engineering education EEDB, 1998; the impacts of social, psychological and health factors on housing settlements STDF 2002. She has 6 published books and also more than 50 published papers in national and international journals.

Dr. Hassan graduated his B.Sc. in Structural Engineering in 1983 from Ain-Shams University, followed by M.Sc. in 1988 from the same school in Structural Dynamics. He graduated his Ph.D. in 1992 from the University of Maryland at College Park, USA, in Structural Reliability. He worked in several research projects and taught several engineering courses during his doctoral studies. He then joined one of the private higher education institutions, in Egypt, where he helped develop the curriculum of the civil engineering department currently. He is The dean of engineering at British university in Egypt.

Professor, Hisham Elkadi : Head of the School of the Built Environment (SoBE) at Salford University, His PhD is from the University of Liverpool in 1989. He has established a sound research network on both national and international levels. He is also an Honorary Fellow at the University College London, an Honorary Fellow of the Royal Institute of Chartered Surveyors, a Member of Institute of Egyptian Architects, Affiliate of the Royal Institute of British Architects, and a Fellow of the Australia Institute of Buildings. I have 5 books, more than 100 refereed publications and graduated 18 PhD students. I am a Member of the Australian Association of Heads of Schools of Architecture (AASA), Member of the Association of the Australian Deans of the Built Environment (ADBED) and Member of the Board of Examiners, ARB-Victoria.

Yasser Mansour is a professor of Architecture and the Head of the Architectural Engineering Department in Ain Shams University, Egypt. He received his B.Sc. in Architectural Engineering from Ain-Shams University, Egypt in 1980. He earned his M.Sc. in Architectural Design from Kansas University, USA in 1985 and Ph.D. from Michigan University, USA in 1990. He is an active researcher and publishes widely in international conferences and academic journals. To date he has published more than 50 scientific researches, 3 books and many articles. Throughout his academic career, he has participated in the development of many educational and scientific curriculums and has supervised 10’s of M.Sc. and Ph.D. degrees. He is an active member in the International Union of Architects (UIA), The International Association for the Study of Traditional Environments (IASTE), Association of Collegiate Schools of Architecture (ACSA), and an honorable member in the Association of Writers and Writing Program (AWP). He also participated in the development and project management of major projects in Egypt, USA and UAE. He is a Former member of the Egyptian Architectural Association and a current member in the board of trustees of the Remal Association for Architectural Development. He is the founding and board member of the Architectural Development Alliance Company 5+, as well as Founder and CEO of CONCEPT, Engineering Consulting Office for Architecture and Urban Planning.
Sherif El-Fiki is the Head of the Department of Architectural Engineering and Environmental Design at the Arab Academy for Science and Technology in Cairo. In 2003 he obtained his PhD in Architecture from Edinburgh College of Art, Heriot Watt University in the UK. His research interests encompass architectural education, social behavior and environmental studies. His research-work is published in several reputable journals and international conferences in Egypt, Japan and the UK. He is a licensed practicing architect and a partner in a private bureau. His professional practice involved the design and construction of residential, healthcare, office and educational buildings.

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ABSTRACTS
AN IDM BASED INTEROPERABILITY SPECIFICATION FOR CROSS ORGANISATIONAL BUSINESS PROCESSES IN BUILDING DESIGN

Building Information Modelling (BIM) has become a standard practice in the AEC industry. However, with this wide embrace from the industry, new problems and challenges are appearing. Issues such as interoperability represent a barrier for BIM adoption through the whole lifecycle of building projects. Currently, the interoperability in BIM is low, and the focus is on the 3D coordination through Industry Foundation Class (IFC) data model. Nonetheless, new uses for BIM models such as energy efficient design and performance simulation highlight areas where it is necessary to improve the interoperability. The early collaboration in design is discouraged and the performance analysis and simulation is carried out as late as possible to minimize the number of information exchanged. However, this approach makes difficult and costly to introduce changes in a design solution that is almost completed.

Addressing the interoperability issues at early design by providing information exchange guidance between various BIM tools used by designers. Development of a cross organisational business processes and further specification detailing for early design is carried out with IDM that prescribes the information exchange required for each stakeholder at different stages in the design process for early collaboration for energy efficient concept design and performance analysis.

Development of the interoperability specification can guide the BIM users and vendors to improve their BIM tools for better interoperability. The findings from the research shows that the design process is increased with flexibility in collaborative design review such as development of the design alternatives and addressing the building performance challenges at early design. For example, having the performance data early in the design process helps the client and the architects to take better design decisions considering lifecycle cost and building performance in its use.

BIG DATA ANALYTIC BY USING Knowledge Management Systems to Support Knowledge Sharing and Decision Making Processes in Multinational Corporations

In the current fluid environment, the challenge for society and organisational decision makers is how to accumulate and share knowledge that stems from big data, and maximise value generated from all available data. For this purpose, they use Knowledge Management Systems (KMSs) to share, utilise, and integrate knowledge as well as to support organisational decision makers. Knowledge are captured through a variety of devices, this knowledge is often processed by KMSs, which support (or drive) decisions. There is little focus to date, however, on how KMSs might play a role in organisational data and knowledge sharing to support organisational decision makers. Based on 42 semi-structured interviews, issues associated with Knowledge Management Systems Usage, Knowledge Sharing Practices, Cultures and Decision-making Processes arise, suggesting improving KMS tools through organisational culture by meeting employees’ wants and needs and incorporating the latest common technologies and sociotechnical media in their KMSs, such as the social networking tools that they use in their daily lives. This study proposes a conceptual framework that would help individual and organisational decision makers to identify ways of big data analysis, leveraging and sharing knowledge by using KMSs.

COMMUNITY ENGAGEMENT AS AN APPROACH FOR ENHANCING THE HERITAGE CONSERVATION PROCESS: A COMMUNICATION MANAGEMENT PERSPECTIVE

Egypt is well known for its rich cultural and architectural heritage. However, when it comes to preserving this heritage, many problems appear that hinders the process and results in the gradual loss of this valuable heritage. One of the main problems is directly related to the community that either lives
In the last decade, several manual tradition measurement techniques were used to document the heritage buildings around the world; however, some of these techniques take a long time, often lack completeness, and may sometimes give unreliable information. In contrast, terrestrial laser scanning "TLS" surveys and Photogrammetry have already been undertaken in several heritage sites in the United Kingdom and other countries of Europe as a new method of documenting heritage buildings. Moreover, the integration of heritage recording and Building Information Modelling (BIM) has been introduced as Heritage BIM (HBIM) and is now a method to document and manage these buildings. This presentation focuses on using the TLS and Photogrammetry methods to use as data acquisition in HBIM.

DATA ACQUISITION IN HERITAGE BIM
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DATA CAPTURE - 3D IMAGERY AND ITS POTENTIAL APPLICATION FOR SMART PHONE TECHNOLOGY
Point cloud reference points can enable accurate mapping which can be digitally stored for future access. Interactive 3D images are developed from this and can be downloaded to a smart phone for use with a headset to give the visitor a real life experience of a historic site. Imagine witnessing the eruption of Vesuvius while visiting Pompeii.

DIGITAL DOCUMENTATION AS AN INTERACTIVE TOOL IN THE ARAB WORLD's HERITAGE
The Arab countries are full of rich heritage sites and historical monuments that known worldwide as a result of a 7000 years civilization. Some of these monuments had lost and damaged due to the negligence of documenting them. Accordingly, some of the Egyptian and Syrian heritage in the last few years are damaged due to the political situations in these countries. Historical buildings and sites are on their way to being lost. Here came the importance of the digital documentation that allows users to feel and live the experience that was at that time even if it does not exist anymore.

Although the increasing of digital documentation applications, some companies are trying to preserve those monuments not from being damaged as much as from being lost. Though, digital documentation process has spread widely through the last two decades. Applications as 3D laser scanning, 3D photogrammetry, and virtual reality have been the gate to this documentation. Such applications allow users to be part of the documentation process. Though, experts are trying to expand the users' interactions, senses, and feelings inside the show to be part of the context and live the experience of the presented era.

This paper provides an analysis of some VR and 3D scanning applications in our Middle East. It highlights the users' engagement in such a process that increases the interactivity and allows using more senses. Additionally, it discusses the effects of using the digital documentation on users. Finally, it presents some projects that deal with our Arabian countries with different digital documentation.
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SUSTAINABLE BUILT HERITAGE

PROF. DR. MOHAMED MARZOUK

DOCUMENTING EGYPTIAN HERITAGE USING LASERSCANNING

A lot of advancements and developments have been made in the field of spatial technology with a speed and accuracy that exceed all perception. The sustainability of the Egyptian heritage environments along with its architecture and urban contents should be considered as a main objective on the national level. Therefore, it is important to document and record parameters of heritage in a database to determine the degree of criticality problems, considering the age of heritage and their condition. The created database can be used as a decision making tool that aids in the process of maintaining the Egyptian heritage. Examples of scanned Egyptian heritage are presented.

ENG. OMAR NAGATI

DOWNTOWN TANGIBLE HERITAGE: CRITICAL MAPPING AND CREATIVE INTERVENTIONS

Over the past few decades, downtown Cairo has been undergoing a process of slow but systematic decay of its buildings and infrastructure, due to both institutional mechanisms, including rent control and lack of investment, resulting in a gradual deterioration of the physical elements of heritage value, as well as derelict or underutilized public spaces. This presentation offers an overview of CLUSTER’s mapping and design projects Downtown, such as web platforms, maps, tours, and public events, in addition to previous and ongoing pilot design interventions in passageways and rooftops. Altogether, they offer an alternative preservation approach through revitalization and urban regeneration.

ARCH. MOHAMED ALI

FRAMEWORK FOR HBIM APPLICATION IN EGYPTIAN HERITAGE

Building Information Modelling (BIM) radically changed the design and documentation processes in AEC industries. BIM coupled with 3D laser scanning (LiDAR) technologies revolutionized the built environment documentation methods. Many efforts were directed toward utilizing these technologies in the documentation and restoration of heritage buildings, adopting Heritage Building Information Modelling (HBIM). This paper presents a framework for HBIM application in Egyptian Heritage. The framework considers 3D laser scanning to document heritage buildings. A new approach of utilizing processed and segmented point clouds is proposed for heritage information to be utilized as a standalone platform which suffice a range of stakeholders needs. The proposed approach is capable to utilize processed point clouds to create different purpose BIM models with different level of development to suite different heritage documentation needs.

GIS-BASED PAVEMENT MAINTENANCE MODEL

Roads represent a major long-term infrastructure investment. A maintained road is therefore fundamental to the safety and availability of the road network as a whole. In carrying out pavement maintenance functions, Local Road Authorities face growing pressures arising from inadequate budgets and greater accountability, when many of the existing roads have reached the upper limits of their design life spans while being subjected to increasing traffic. There are many factors that influence the decision making process in pavement maintenance management, including road surface conditions, safety, traffic loading, cost, funding and prioritisation decisions, hence an efficient approach is vital to ensure optimisation and a satisfactory trade-off between conflicting factors.

A Multi-criteria Decision Making (MCDM) approach is used to handle the trade-off between conflicting factors. It is processed in the Analytical Hierarchy Process (AHP) using GIS in order to allow ease of query, analysis and visualisation of results. The main key output of this research will be the development of a GIS-based pavement maintenance management model to support decision making in pavement maintenance management.

The most important factors influencing decision making in pavement maintenance management are established through a nationwide questionnaire survey, which is undertaken among the UK Local Authorities’ pavement maintenance experts. A case study approach was adopted, based for developing and testing the GIS-based decision support model. The output model was validated through interviews with experts in pavement maintenance as target end-users, and the model was judged as a rational, simple and usable appropriate tool for network analysis as GIS.

PROF. DR. EMAD ALFAR

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GREEN HERITAGE “CHANGE-CHANCE-CHALLENGE”
Heritage and environmental heritage either construction or architecture for the past time considered in forming experience, buildings, tales, and traditions beside the techniques influenced by communities produced different civilizations and successive that had reached us. All heritage and civilization that reached us considered as sustainable heritage while all that did not reach us, is the disappeared heritage that has a story could be said but could not be restored by its original image. However, it could be cloned with a new vision and a potential of innovation. Architecture known as the oldest and most important building sustainable proved for mankind is the Great Pyramid of Egypt; therefore Egypt has taken the pyramid as the title of a system of environmental assessment of buildings in Egypt. However the concept of the green heritage has been recently metaphorically known as a new concept.

The concept of green heritage are a system parallel and integrated with green societies concepts of green building, green energy and green economy, as evidence for planning and enlightened to sustain and ensure awareness with the pursuit of efficiency and open diverse opportunities for future generations, without draining the capabilities and create the environment to accept what can be planned at all levels for a quantum leap for the quality of life for the collective conscience of all parties. Always taking is easy but what about the application and understanding there to be a culture commensurate with the ambitions and not be those slogans or calls for a seasonal fashion impact and payback.

HERITAGE D-LIGHT: SUSTAINING LOCAL IDENTITIES WITH DAYLIGHT
In many parts of the world, many heritage buildings were converted to museums, art galleries, cultural and community centres. Keeping and reusing historic buildings is often seen as a way not only to preserve the physical building fabric “as a tangible link with the past”, but also as an opportunity to preserve the intangible heritage such as traditional skills and craftsmanship. Often, the intention is to provide new accommodations where these skills can be maintained and where valuable artefacts can be exhibited. The identity of many of these buildings and their contexts is often limited to their aesthetic characteristics, such as period characteristics (geometry, size, colour, form, and shape), materials and construction. Daylight is one of these visual elements that have contributed to the distinctiveness of many historical buildings and their contexts. Yet when construction preservation schemes of historical sites are planned, daylight is rarely considered as one of the components that shape the character of buildings. Maintaining the “daylit appearance” of a building interior can be particularly problematic if the building is to be adapted into a museum or gallery facility due to artefact conservation requirements. On the other hand, a successful utilisation of daylight can also create a better visitor experience and sustain the identity of its site to the local residents.

This presentation discusses the relationship between daylight, visual identity, and the reuse of historical buildings using digital technology. The work presents a methodology for the integration of daylight as key component in renovating heritage sites in order to sustain their original identities and meet the visual requirements of the proposed new use in different locals.

LASER POWER IN HERITAGE REVIVAL
A generic definition of a laser scanner, taken from Böhler and Marbs is: “any device that collects 3D co-ordinates of a given region of an object’s surface automatically and in a systematic pattern at a high rate (hundreds or thousands of points per second) achieving the results (ie three-dimensional co-ordinates) in (near) real time.” Laser technology has been running fast for the last few years in all conservation and data capture fields. Recently Photogrammetry and laser 3D scanning could be used to provide a greater number of measurements for capturing detailed architectural data for the sake of heritage conservation and renovation which interferes GIS and BIM processes.

This presentation provides a quick tour around 3D Scanning technology, its’ kinds, advantages, disadvantage, and
SUSTAINABLE BUILT HERITAGE

LIFE CYCLE APPROACH FOR GREEN HERITAGE ASSESSMENT AND BENCHMARKING

Preservation and sustainability should go hand in hand to unify development targets and objectives. Hence, cultural heritage areas require their own tailor-made indicators of sustainability. These should attempt to achieve a balance between the three triple bottom line objectives of sustainable development. Nevertheless, it cannot be considered an easy task particularly with the existence of many trade-offs and compromises. This calls for the urgent need of developing a robust mean of assessing and benchmarking green heritage to be able to draw sustainable rehabilitation scenarios. Hence, this study attempts to provide a review of international efforts in this research area. It shows that recent research efforts show directions for implementing life cycle approach to guide decisions regarding environmental and economic performance. Other directions call for developing green rating systems for cultural heritage areas to provide multicriteria assessment and benchmarking methods. The result shows that developing a concise and robust indicator for green heritage buildings shall enable better preservation of these valuable yet vulnerable heritage areas. This can be done through developing green heritage rating system based on life cycle approach. This method should incorporate standard criteria that would enable comparing building performance, as well as contextualized criteria that would consider the effect of the surrounding environment. The results should contribute to the existing body of knowledge towards applying sustainable preservation scenarios for cultural heritage areas.

LINKABLE OPEN SOURCE HERITAGE DATA AND CROWD-SOURCED DATASETS - SOME EVIDENCE TO DATE

The presentation addresses a range of available open data and crowd-sourced datasets (e.g. open street map) and their potential to leverage other datasets. It focuses on issues of the diversity of standards, and the need for a (federated) framework that supports conventional (map-based) data and also 3D data. It describes some of the experience and potential of 3D open street map data, and compares this with other emerging standards such as CityGML. It looks at the potential for analysis of opportunities to upgrade and enhance individual properties, referring to the exemplary analysis of renewable energy opportunities in the Google US trial project “sunroof”. It examines how governmental and national datasets can be complemented or replaced by crowd-sourced and volunteered geo-information approaches, and examines how can data resulting from crowd-sourced approaches be: reliable? enhanced by an open-standard open-source approach? maintained into the future without the costs of re-entry? It also examines some current open-source initiatives to create frameworks and portals, and potential approaches that motivate voluntary and community engagement.

LOW ENERGY RETROFIT OF HISTORIC TIMBER FRAMED BUILDINGS IN THE UK

Heritage buildings have often been considered off-limits when considering energy refurbishment projects, however rising energy prices, stricter legislation and increasing expectations of thermal comfort mean that they can no longer be ignored. In the case of historic and heritage properties, refurbishment is a complex issue, involving aesthetic considerations in addition to technical issue. The hygrothermal behaviour of wall build-ups in buildings of traditional materials must be fully understood in order to avoid problems of interstitial moisture, long term decay and overheating. Research to date has focused on solid-walled masonry construction, with little work being conducted.
on timber-framed construction. My current research therefore explores this previously under-researched area. The number of historic timber-frame buildings in the UK has been quantified and geographically located, in addition to research into their historical development and current significance. The potential for the retrofit of these buildings has been studied with the use of in situ monitoring of case study buildings and digital simulation at both building and detail scale. The construction and monitoring of physical test panels is now being developed as part of this ongoing research programme. It is hoped that this research will lead to the development of best practice, allowing these buildings, some of which have stood for over 500 years, to survive and continue to be inhabited and enjoyed for centuries to come.

**MYTHICAL ASPECTS INTERPRETATION OF THE PTOLEMAIC ARCHITECTURE, THE TEMPLE OF HORUS AT EDFU**

When Alexander the great entered Egypt in 332BC, he was hailed as the savior from the hated Persians marking the beginning of the Greek period in Egyptian history. After the founding of the Hellenistic Ptolemaic ruling family (305 BC); the Ptolemies resumed the pious construction of temples as a method to legitimize their rule. Even though they followed the styles of the temples established in the proceeding period, the spatial arrangements and the construction elements changed. The Temple of Horus in Edfu (237 to 57 BC) is the second largest Egyptian temple after Karnak, the largest best-preserved ancient temple in the antique world. It houses one of the largest collections of hieroglyphic texts providing the information of how and when it was constructed, as well as it features scenes of the traditional festivals and rituals. This unique temple provides a clear reflection of the Cultural Heritage of its era; and rarely expressed as Intangible and Tangible.

The paper aims at investigating the Ptolemaic architecture through shedding more light on the different aspects of The Temple of Horus at Edfu. Efficient results that will participate in improving the building skin overall performance.

**PLACE MAKING AND CULTURAL IDENTITY IN CAIRO**

The cultural identity of Cairo is unmistakable. The city’s identity is apparent in its heritage, not only in its built environment but in the people, the activities, and in the stories, the traditions that populate it. Preservation of heritage generally proceeds by documentation to create a knowledge base. This process is completed by understanding in context the value, relevance and meaning (historical, cultural and social) of heritage to the people. In an attempt to appreciate the rich cultural heritage of Cairo and preserve the places that define the unique identity of the city, this research of the built environment - with an eye on cultural significance - investigates events and places that form cultural heritage in historical Cairo. The research explores the sense of place in historic Cairo; it focuses on the vicinity of the iconic mosques of al-Husayn and al-Sayeda Zaynab during the mawlid events.

The research documents through observation and description the space in its abstract form and its transformation to place by people actions and activities during religious festival of the mawlid. The observations are then analyzed through maps and sketches and discussed in relation to theories of place. This research tells the story of valued places, artifacts, customs, and traditions that define the collective identity of the people, and represent the culture heritage of Cairo.

**POST OCCUPANCY EVALUATION FOR OCCUPIED HERITAGE BUILDINGS**

Post-occupancy evaluation (POE) is a platform for the systematic study of buildings once occupied, so that lessons may be learned that will improve their current conditions. As the result of climate change over the years, the original design of occupied heritage buildings is no longer considered the design that best fits the current condition. This presentation introduces POE as a tool for evaluating occupied heritage buildings in order to understand the requirements for retrofitting. The similarities and differences are explored in both the aims and the methods between post-occupancy evaluations and field
studies of thermal comfort in buildings. The interpretations of the field study results are explored, especially the ways the results differ from laboratory experiments. Particular attention is drawn to the dynamic nature of the interaction between buildings and their occupants. Answers to questions of the type used in post-occupancy evaluations are compared with results from field studies of thermal comfort, and the implications of these findings for the evaluation of buildings and the conduct of post-occupancy evaluation are explored. Field studies of thermal comfort have shown that the way in which occupants evaluate the indoor thermal environment is context-dependent and varies with time. In using occupants as part of the means of measuring buildings, post-occupancy evaluations should be understood as reflecting the changing nature of the relationship between people, the climate and buildings. Surveys are therefore measuring a moving target, and close comparisons based on such surveys need to take this into account. Based on the results of the POE process, major problems are identified and analysed for retrofitting design proposals to best sustain and enhance the heritage building performance.

PREDICTIVE PRACTICES FOR HERITAGE ASSET CONSERVATION BETWEEN VIRTUAL AND PHYSICAL

Numerous previous research/applications in applying BIM to Heritage have focused on the physical or geometric reporting of assets. This typically involves laser scanning for creating as-built models and recording asset components, for operations and maintenance. However to efficiently identify/record general asset and component requirements to help predict future best practices for renovation and conservation, different methodologies can be investigated. These include standardised classification systems to categorise different components, their characteristics, attributes, and maintenance requirements. However current database, knowledge and classification systems available for new builds might not be suitable to categorise components in historical buildings, which differ according to historical eras and architectural periods, hence might render their restoration process inefficient. Furthermore many researchers and practitioners rely on virtual simulation techniques of spaces to decide on renovation or restoration activities. However the fidelity of representation of spaces using these techniques are questionable. There is currently scarce research dedicated towards investigating appropriate classification systems to be used for heritage buildings and also the fidelity virtual simulations in representing spaces. This presentation will highlight the research initiatives undertaken to enhance physical asset information and virtual space representation using innovative technologies, expert systems and cognitive system components for better prediction of best practices for heritage asset conservation.

PRESERVATION OF CULTURAL HERITAGE: THE DESIGN OF LOW-ENERGY ARCHIVAL STORAGE

The preservation of historical and cultural artefacts provides a direct, tangible connection to cultural heritage for future generations. Archival storage facilities are designed for the function of mitigating the physical deterioration of their collections, as well as providing some safeguards to fire, theft and deliberate acts of damage. These collections are mostly irreplaceable, as well as potentially having significant financial value, and their damage or destruction may represent a permanent loss to the appreciation and understanding of our human history.

Until recently the design of mechanical services for archival storage has generally followed a paradigm of “close control” of internal conditions using energy-intensive Heating, Ventilation and Air-Conditioning (HVAC) systems. However, the most recent revision of PD5454 “Guide for the storage and exhibition of archival materials” (published in 2012 by the British Standards Institution) permits gradual fluctuation of temperature and relative humidity (RH) within archives where this is considered safe for the collections. This aims to reduce energy use for the conditioning of archives to lessen the impact on the environment as well as cutting down operational costs.

Whilst PD5454: 2012 refers to the importance of maintaining stable temperature and RH conditions in archives, it falls short...
of recommending measurable criteria for assessing design or operational performance. These performance metrics are relevant to both new facilities and also historic buildings, where collections are often held, and are readily assessed using thermal modelling software. Application of these metrics enables designers to assess potential risks to the archive collections and provides an objective means of comparing alternative passive design options. They can also be used by facilities managers to identify potential cost savings.

**PUBLIC PRIVATE PARTNERSHIP: A NOVEL APPROACH FOR DEVELOPING SUSTAINABLE HERITAGE COMMUNITIES IN DEVELOPING COUNTRIES**

Historical sites are unique, varied and constitute the world’s heritage. They include for example the Pyramids of Egypt, the Great Barrier Reef in Australia and the Baroque cathedrals of Latin America. These sites belong to all people in spite of their territory on which they are located. In spite of the national and international efforts towards sustaining heritage sites such as buildings and cities, little attention has been paid towards developing surrounding communities which results in deterioration of the developed physical heritage as a natural response of ignorance. Governments in developing countries encounter significant challenges such as lack of funding, personnel, skills, and resources required to achieve their development goals. In spite of the role of Governments as the primary guardian of heritage community development, the pressure to fulfil other public demands called for the involvement of multiple actors from across the public, private, and nongovernment sectors, not only to initiate and carry out community development but also to sustain the heritage place after the intervention. This paper aims to investigate the role of Public Private Partnership (PPP) as a novel approach for developing sustainable heritage communities in developing countries.

Secondly, case studies will represent the role of PPP towards sustainable heritage communities’ development. Finally, outlining research conclusions and recommendations useful to government and private sector.

**SAFETY, COMFORT AND SUSTAINABILITY WITHIN HISTORIC BUILDINGS: “Quo Vadimus?”**

Sustainability became a very important aspect to be considered and adequately addressed in our buildings, both new and existing ones. Within this context, the main goal of sustainability is to avoid and/or limit the impact(s) from building works on the environment. This should be pursued by: (i) Avoiding/Limiting toxic releases into air, water and soil; (ii) Lower overall carbon emissions and (iii) Optimizing the use of natural resources. For supporting this, some sustainability rating methods have been developed, such as Estidama, LEED (Leadership in Energy and Environmental Design) and BREEAM (BRE Environmental Assessment Method, where BRE stands for Building Research Establishment in the UK). These methods take also into account Health & Wellbeing. For example, factors such as Safety and Comfort are assessed by these methods. For instance, the building occupants profile can be classified taking into consideration many aspects, namely: (i) non-familiarity with the built environment as the likelihood of them being in the building for the first time as visitors is very high; (ii) cultural differences which can impact, directly and indirectly, people’s perception on several aspects: society’s heritage, historical building usage, what sustainability is etc.; perception of what comfort (i.e., acoustic, lighting and thermal) is; perception of safety, including fire safety; (iii) language barriers etc. This talk aims to promote a discussion on how we are currently aiming to address sustainability in buildings, taking as reference Historic Buildings. Some of the question we are proposing for a discussion are: How sustainable is a sustainable building? How are we currently addressing sustainability in regards to the wellbeing aspect? How can we integrate safety, comfort and sustainability? It is expected that this talk can bring some useful insights, focusing on the end user, i.e., the building occupant.
SMART READINGS FOR HERITAGE BUILDINGS

Information era have brought out different dimensions of dealing with cultural and archeological heritage, starting from documentation technologies, presentation technologies in addition to various dissemination techniques and technologies that connect the public with the heritage buildings and spaces. Never the less, HBIM (heritage building information modeling) technologies have provided more depth in dealing with heritage buildings in the scope of efficiency, retrofitting and management. All the previous smart technologies have dealt with the tangible aspect of heritage providing a physical reading for buildings and spaces. This paper argues about the necessity of smart cultural heritage reading about intangible aspects of heritage along with the use of technology in recording and documenting archaeological heritage buildings. It argues that “Smart cultural heritage, indeed, can be conceived as the identity of places through the implementation of smart technologies, knowledge and social inclusion, for total participation in the promotion of cultural heritage.”

THE FUTURE OF BUILT ENVIRONMENT PROFESSIONALS IN THE AGE OF DIGITAL TECHNOLOGY

The architecture, engineering and surveying professions are facing a challenging future. With the advent of mobile and digital technologies, BIM, virtual reality, artificial intelligence and robotics, many are fearing a big shake up in their traditional roles. This assumption may not yet be well founded but it is not hard to imagine that the repetitive aspects of such professions would be the first to be affected. The value that built environment professionals can offer to the design and construction processes are manifold and include an important aspect which is currently the most difficult to be automated, namely professional judgement. This is the result of formal education, experience, and exposure to varied and different types of projects. Professional judgment can benefit from accessing quality information at the appropriate time. Within the heritage sector the traditional skills of surveyors in measuring and recording have already been threatened by such technologies as laser scanning while at the same time opportunities for the creation of new competencies have also emerged. The idea of more accurate, timely, well documented and real time information on a project is likely to be well received by clients. The potential benefits of information and communication technologies to heritage conservation, for example, could include accessing local, historical, technical, legislative and planning information to enable establishing the significance or value of the given asset to its custodians in the present time.

This changing scenery offers challenges to the education sector in considering how to future proof competencies of the built environment professionals. My initial thoughts on how the new technologies may impact the education sector in redesigning their curriculum. It may be that there is a need for closer collaboration between educators and the innovative sectors to identify the competencies that are acutely needed.

THE USE OF MODERN BUILDING RECORDING TECHNIQUES IN THE ASSESSMENT OF INDUSTRIAL ARCHAEOLOGY

Social sustainability is often cited as one of the “Three Pillars of Sustainability” and “cultural sustainability” has been put forward as a fourth. The need to attribute value to historic assets, so that the most appropriate examples are passed on to future generations, has become a key conservation principle. Modern society and much of 21st century western culture can be argued to be largely attributable to the growth of technology since the industrial revolution. The origins of the industrial revolution of the 18th & 19th century in the United Kingdom is an area often overlooked by historians and archaeologists. The assessment of the significance of buildings places and artefacts associated with these events and developments is similarly under considered. This presentation reviews a number of current projects related to pumping water including Water Wheels, Steam Engines and Grottoes, where a variety of techniques have been used to record
the remaining structures, assess the significance and considers how these can be utilised to enhance both preservation and presentation for future generations.

TOWARDS AN AUTOMATED APPROACH FOR PROGRESS MONITORING

Controlling construction site operations is one of the crucial overriding concerns for the clients and contractors, as the majority of the construction delays tend to occur in the construction phase. It is not surprising to see interest in deploying advanced technologies such as Building Information Modelling (BIM) to help in addressing such concerns.

The purpose of this paper is to investigate how to integrate BIM with the daily construction activities to increase the effectiveness of construction operational activities and address customers and clients concerns and requirements.

The study adopted the qualitative approach to collect the data from different construction sites. Clients and numerous members of the supply chain were involved in the data collection, which covered projects, in United Arab Emirates (UAE), such as real estate building, infrastructure (e.g. water and waste water) and road projects.

The study concluded that, integrating BIM in the reoccurring daily construction operations highly assisted the construction industry to overcome several persisting and challenging problems related to the traditional disputes and mistrust among the supply chain players. These disputes resulted from the inaccurate data collection that leads to the absence of crucial actions, in addition to the huge time consumed to prepare reports. The results of the study suggest that, the integration of BIM with the construction operational activities have improved productivity and enhanced the trust among the project teams.

Furthermore, the automation of the construction site activities using BIM avoided loss of information, enabled contractors to recognize their weaknesses, enabled immediate update of the progress reports and the program of works and the easy production of the payment statement.

TRANSFORMING HERITAGE DISTRICTS TO SMART DESTINATIONS VIA INTERNET OF THINGS CONCEPT

Kevin Ashton introduced the early stage of smart destinations infra structure idea in term “internet of things” to connect everything to anything via network to identify or locate and manage smart objects which proposed to be used in a city, this idea intend to be introduced in order to transform the heritage districts to be a smart destination, this is an interactive relation between the government, organizations and community, tourists.

The term Smart connect to a city when it has an economic growth and good level of stake holders participation in addition to a good quality of locals life inside the destinations of the city itself, the approach will depend on the three pillars of the smartness: human capital, infrastructure and info-structure in a dynamic operation between all of them, the research will use cohen indicators which are:

1. Smart governorate and city administration
2. Smart environment which is related to energy sustainable management
3. Smart mobility and the ability of modern transportation systems
4. Smart economy based in digital technology
5. Smart human resources
6. Smart quality of life levels

As People can deal with multidimensional data of the heritage destination through their smart devices, the historic sites itself can act as Smart destination, and include even commercial and city services. Many of indicators can be connected to heritage site itself if we will deal with site as a smart one.
UK HBIM – DATA CAPTURE FOR THERMAL PERFORMANCE AND RETROFITTING EFFICACY STUDIES
Quantitative data is key for the analysis of thermal performance in buildings, and even more so in heritage ones, where the lack of recorded information often makes it difficult to predict retrofitting efficacy, or even make confident statements about thermal behaviour.
To tackle this issue, we install cloud-connected Wireless Sensor Networks in select heritage buildings in the UK; consisting of a number of smart sensors that connect to a wireless mesh-network of extenders and relay points, to deliver live data to a central internet-connected hub device.

USING CHOOSING BY ADVANTAGES TO MAKE MORE SUSTAINABLE BUILDING PRODUCT SELECTIONS RELATED TO CONSERVATION AND CLIMATE CHANGE
To achieve sustainable building solutions appropriate maintenance decisions need to be made at product, facility and urban levels. The products that are selected to be incorporated into heritage buildings design need to meet the challenges and mitigate the impact of climate change. Effective product or asset selection is a fundamental factor in determining a heritage buildings ongoing lifecycle. This presentation considers how using climate change criteria and building product and system information more robust decisions can be made about ongoing maintenance decisions. Choosing by advantages is illustrated as a process to facilitate better maintenance choices. Through this process it is possible to analyses more options and therefore potential achieve better choices. This paper investigates using design science the development of a Climate Change CBA prototype.

VIRTUAL REALITY CONSERVING THE IMAGE OF THE CITY
No question, transportation facilities are envisaged; as the milestone on which cities growths are grounded. Henceforth, this has been the springboard for the manoeuvre embarked by the industrial revolution, extending those cities to be in an imperative request to put the variant information technology manifestations in action for human communication purposes; since it is the reign of technology.
The principal objective of this presentation is to display the aptitude of deciphering graphical user’s interfaces for the normal user to communicate with others; putting the illiterate in concern, as it is irrational to infringe the right of this wide category, to stand paralyzed before these interfaces for their aforementioned incompetence. Graphical User Interfaces (GUI) are like real-time driven platforms; such as, electronic mass multiplayer online role playing games, fructifying a better world.
Cities were either bounded, or isolated relying on transportation. However, nowadays the world is but a small village, using the information communication technology applications. Thus, such technology is admitted to manage social activities, work, health and educational issues.
It is either attained by creating a digital 3D clones of the city or by utilizing 4D clones over disparate timelines to grant the user the chance of coming across this experience.
In conclusion, the objective of this presentation is to demonstrate the capability of using visual architecture and virtual architecture concepts to achieve a social communication, equal opportunities and ideas, helping users to get more comforted, when it comes to working at home; for instance. Additionally, that is to reach a more sustainable environment rich in power resources and fuel for the upcoming generations while conserving the image of the city.

ARCH. MARIANNE NABIL GUIRGUIS
PROF. DR. KHALED DEWIDAR
WELL-BEING, ECONOMIC SUSTAINABILITY

Siwa architecture heritage has been based on climate, Topography, available materials, and cultural beliefs. The main concern of this research is to show the impact of development on society and the built environment, the conflict between man: his traditions, needs and expectations, and his surrounding environment that has become typical of today's life.

The research presents lessons learnt from the environmentally friendly buildings in Siwa, and give some suggestions to save desert vernacular architecture. The objective of this research is to investigate the development of Siwa. Main problems and constraints in this research is facing the future development of both are highlighted. The research goes on to provide recommendations to ensure the sustainability of architectural development and its initiatives in Siwa and conclude the need for an integrated and comprehensive action plan in the field of cultural heritage preservation and socioeconomic development.

Bellepoque Cairo Museum Itineraries: Engaging Students with a Forgotten Heritage

The concept of “Bellepoque Cairo Museums Itinerary” (BECAMI) has been developed in this UK-AHRC/ Egypt-STDF funded project as an innovative way to reconnect fragments of history of eleven Cairo Belle epoque era museums into a comprehensive open-air book that is more legible, visible, accessible and engaging. Working closely with university students, the project engages them with eleven museums through the production of a physical and virtual itinerary, linking, for the first time, these museums into closed loops and clusters. The physical itinerary is practical due to the museums location in Cairo within walking distance from three metro stations and a total walking journey of 3.6km. These museums represent three types of Egyptian cultural heritage: their tangible architectural heritage of high historical significance; their tangible exhibited content; and their intangible heritage linked to socio-economic, cultural and political conditions of the Arab renaissance era. They also illustrate a neglected side of the memory of the Egyptian nation as depositories of the history of iconic figures, articulated in politics, music and literature, that have shaped the identity of the nation.

HERITAGE ASSESSMENT MODEL

‘Heritage’ is a complex concept. This model has four main components. First stage is to design a data collection system that can take many different formats such as Questionnaire, interview, sensors, IoT and Crowd sourcing. The second stage is defining constructors that embodies all aspect of the Heritage such as Evidential, Historical, Aesthetic, Communal value. These constructors are context dependent. Therefore, the assessment hypothesis will be influenced with theses conceptual factors social class, distance and so on. The third stage is Statistical analysis of data. There are numerous techniques to use but the key point at this stage to derived a value that demonstrate strength or weaknesses of these constructors as function of context. Finally, the fourth stage is design a visual model that give a visual view of this complex concept. It will demonstrate for example relative values from different contextual prospective. It will reveal what aspect of heritage is undervalued and need to be addressed by heritage policies and guidance principles documents.

This model aimed to be generic. Therefore, it can be used for different categories of Heritage sites. It can be used to manage...
Inform changes - Change the function, conservation, recognition of heritage value(s) of place, Fabrics (the material substance that place is formed, including geology, archaeological deposits, and built environment, and flora).

Understanding BIM Through A Professionalism Lens

Building Information Modelling (BIM)-enabled design is examined within the context of interdisciplinary architectural practices from a professionalism perspective. A substantial part of the literature on BIM focuses on its implementation or effect on communication and collaboration. Less research has investigated the role of the architectural profession in shaping the implementation of BIM in interdisciplinary architectural practices. We argue that the effective transition to BIM-enabled design will be subject to its role in shaping the architectural profession's norms. BIM is problematized as a new logic that is changing the design process as well as the identities and structures of the architectural profession. The professionalism lens contests the dominant prevailing technical perspective that is dominating the literature. Case study work conducted in interdisciplinary architectural firms using BIM-enabled design in the UK and USA is presented. The research shows aspects of both traditional and new professionalism.

Design Optimization of Hospital Patient's Room Light Redirecting System for Visual Comfort Under Desert Clear Skies

Adequate daylight is crucial in a hospital patient’s room; for the sake of rapid patient’s recovery, provision of visual comfort and reduction of building’s energy usage. Under desert clear skies conditions, discomfort glare occurs frequently due to direct solar exposure as well as sufficient daylight, do not always reach deep inside the patient’s room; Such an indication for a required daylight enhanced control system that incorporate both light-shelf and sun-breaker technologies. The dilemma of providing well-lit environment in a hospital patient’s room requires specific daylight redirecting system through optimized configuration that enhances a more sustainable approach. This combined configuration of a light control shelf system is essential to provide a daylight balance that enhances the year-round visual comfort in the patient’s room. In this paper the Optimization of the daylight redirecting system is parametrically configured by utilizing the Grasshopper and Diva software to simulate the practical solutions that enhance visual comfort. The light redirecting system consists of fixed inner and outer window flanges, configured with multiple cases varying in elevation, horizontal projection and rotational angle of each of the two flanges independently of the other. The effect of each simulated configuration is evaluated through both the Spatial Daylight Autonomy (SDA) and Annual Sunlight Exposure (ASE). Varying the horizontal projection and the rotation angle of both flanges of the redirecting system independently; showed that the SDA and ASE improved percentages reach appealing results that apply to LEED v.4 requirements (USGBC, 2014). The combined system proves to be more efficient in redirecting the sunlight inside the Patient’s room.

For further studies a combined study encompassing both the daylight performance and the thermal performance in tandem on the patient’s room will provide more integrated energy efficient results that will participate in improving the building skin overall performance.
Clever travel was established in 1989 to contribute to the quality of travel services and event management in Egypt. Experience in the travel business domain spanning more than two decades diversified the essential requirements of our clients. We strongly believe what makes a difference is the personalized and highly competitive service offered by an exceptionally qualified service team. This has always Clever Travel’s Main objective.