

An approach to the communication potential of HBIM models in the public use of heritage

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Heritage Building Information Modeling (HBIM) is the term that has been used recently for the application of BIM to heritage buildings. HBIM allows all the agents involved throughout the life cycle of built heritage to centralize, share in real time and effectively manage information.

The most recent studies on HBIM focus on: 1) Data capture and visualization for documentation and intervention, 2) Performance and sustainability of the building via monitoring and simulation, 3) Facility Management (FM) in terms of Preventive Conservation and 4) Dissemination to the end user in combination with new VR and AR technologies. The latest studies show how important it also is to record intangible heritage values using HBIM, and they highlight the active participation of the community in the conservation and management of local heritage.

Many historic buildings are destined for public use in order to spread knowledge of their heritage value to society and raise awareness as to its conservation. For this reason, public use is an essential social tool for ensuring the conservation of historic buildings. Managing the public use of heritage requires: 1. Interpreting and disseminating heritage values throughout society and 2. Managing public visits to ensure the public has a satisfactory experience and the heritage is conserved.

A review of the scientific literature that was performed in previous studies has led us to conclude that the application of HBIM to the management of public visits continues to be an underexplored field of study. Nor have specific studies been carried out on how work processes are implemented by agents involved in the interpretation, management of public visits and dissemination of heritage with HBIM: cultural managers, conservators of the monument, guide-interpreter, graphic designers, etc. Lastly, it is worth pointing out that The Council on Training in Architectural Conservation (COTAC) does not specifically include the management phase of the public use of heritage in the HBIM Cyclical Diagram.

The aim of this study is therefore to learn the socio-technical aspects of the agents involved in public use management and to identify the advantages and limitations of the HBIM methodology for these applications, for the purpose of integrating them into the HBIM Cyclical Diagram. Its incorporation will have far-reaching consequences, such as improving how the significance of the patrimony is transmitted to society and increasing appreciation for heritage conservation.

The methodology for the research has been set out following the qualitative paradigm and the inductive process. The research was designed to be open and non-experimental. The research procedures consisted of: data collection and analysis, and presentation of results. The data has been collected through semi-structured interviews with experts conducted by the research team. First, the experts were contacted in order to explain the research topic and the purpose of the interview. The consent form and the open questions for the interview were then sent out. The audio of the interviews was recorded and then transcribed. The data gathered were analyzed with the help of Nvivo computer software, and the results presented as a narrative.

The professional profiles of those interviewed are the object of study and they have extensive experience in the sector. The participants were: two culture managers with

expertise in the study of carrying capacity and the study of visitor touring patterns, a highly-recognized infographic designer, a specialist in designing informational materials about world heritage, two museum conservators and an expert in preventive conservation.

As a result of the research, the culture managers suggest that HBIM could be very useful for:

1. Recording the data collection necessary for studies on carrying capacity.
2. Visualizing a carrying capacity analysis spatially and representing problems in visitor accumulation.
3. Making decisions about the public use of a heritage building.
4. Designing proposals for accessible tourism (adapted itineraries) and analyzing how to combine several different itineraries in space and time.
5. Managing visitor touring patterns at the monument. Acquiring data via video monitoring about the visitors' behavior and use of space as related to the HBIM model and its subsequent analysis. This makes it easier to take decisions regarding visitor experience and preventive conservation.

The museum conservators state that HBIM can be a very useful tool for:

6. Unifying the discourse of all the guides-interpreters of the same building and keeping them informed in real time of any temporary modifications to the visit itinerary and to the discourse, in order to transmit the history in a more rigorous and effective way.

The infographic designer believes that:

7. Reusing the HBIM model for educational purposes would reduce time and costs for the development of informational material and would increase the quality and rigor of the infographics presented to visitors.
8. Providing the infographic designers with access to information from other disciplines would cut down on any erroneous infographics.
9. Three-dimensional visualization of HBIM models makes it easier for the general public to quickly understand the spaces that no longer exist and the constructive evolution of the building.

The expert in preventive conservation affirms that:

10. Recording the environmental conditions, emergency and security systems via sensors or automatic detectors and synchronizing them with an HBIM model would facilitate risk assessment, protocol monitoring and the scheduling of preventive conservation actions.
11. Synchronizing the wide variety of information from the various different agents involved in preventive conservation would facilitate decision making.
12. The HBIM tool for preventive conservation should be structured through levels of information and have a user-friendly interface.

Given the above, it can be concluded that applying HBIM to data collecting, visualization, monitoring, FM and disseminating can be highly useful for interpreting, managing public visits and disseminating heritage and thus improve the visitors' experience and raise awareness about the conservation of architectural heritage.

As a future line of research, we propose a definition be made for an effective way to integrate the interpretation, visit management and dissemination of heritage into the HBIM Cyclical Diagram.

Keywords: *HBIM, cultural heritage, heritage communication, heritage interpretation, tourism, awareness, recreational carrying capacity, visitors touring pattern, public visit management.*