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Claudine Houbart, Pierre Hallot

May Digital Tools Help Preserve the Material and Evocative Value of Fragments?
The Case of Victor Horta's Hôtel Aubecq in Brussels

From Art Noveau Masterpiece to an Abbandoned Collection of Stones

Built between 1900 and 1904, the Hôtel Aubecq in Brussels is considered one of the masterpieces of Art Nouveau architect Victor Horta. Located along the very chic Avenue Louise, it took advantage of a double plot of land to provide views towards the Bois de la Cambre from a bow window projecting from the corner. (Fig. 1) Its layout, organised around a vast stairwell illuminated by a large stained-glass canopy (Fig. 2), and its custom-designed furniture made the Hôtel Aubecq a synthesis of Horta's work and an exceptional "total work of art". (Fig. 3)

But when it was sold in 1948, Art Nouveau was still far from obtaining the recognition it enjoys today and the protests of a few defenders, led by one of Horta's last collaborators, Jean Delhaye, had only a very limited effect. They could not prevent the replacement of the Hôtel, but a credit issued by the Ministry of Public Works allowed the dismantling of the facade overlooking the Avenue Louise and on the corner. A third of the building's skin was thus temporarily saved,

Fig. 1
View of the Hôtel Aubecq in 1948. A billboard announces its imminent replacement by a "high class building", photo: KIK-IRPA (A080780)

while the rest was reduced to rubble and the furniture was dispersed.[1] After being stored in the great hall of the Musée du Cinquantenaire, the stones were moved several times in the Brussels region, before being inventoried for the first time in 1985. The remains were then moved to the site of a former barracks in Namur, where an architectural office was commissioned to make a kind of "flat anastylosis" on a bed of sand.

During the 1990s, several facade reconstruction projects were planned in Brussels, none of which were successful.[2] However, as illustrated by a series of opinions collected in 1997, following a parliamentary inquiry on the fate of the remains, the debate was then limited to two options: an

◁ Fig. 2

The stairwell of the Hôtel Aubecq, covered by a large stained-glass canopy, photo: right before the demolition in 1950, photo: KIK-IRPA (M102384)

▽ Fig. 3

One of the interiors of Hôtel Aubecq, showing pieces of custom-designed furniture, photo: right before the demolition works in 1950, photo: KIK-IRPA (cliche B011473)

Fig. 4

Flat anastylosis of the façade of the Hôtel Aubecq on a wooden structure for the 2011 exhibition in Brussels. Preserved window frames are present in the background, photo: 2011, Claudine Houbart

Fig. 5

An elevated cantilevered footbridge allowed the visitors of the 2011 exhibition to better perceive the overall design of the façade, photo: 2011, Claudine Houbart

identical reconstruction of the building as a whole, or a reassembly of the facade as an isolated element, either in the urban context or in a museum.[3]

The transition to the twenty-first century, with the inclusion of four private houses by Victor Horta on the World Heritage List in 2000, and the transfer of ownership of the remains from the Belgian State to the Brussels Region, constituted a new departure for reflection on their valorisation. In 2011,

after an architectural study involving, among other things, a 3D digital survey,[4] the stones of the facade, together with its window frames and ironwork rediscovered in 1997 in a Brussels warehouse, were once again exhibited in a "flat anastylosis", laid on a wooden structure. (Fig. 4) The scenography, designed by the architectural office V+, allowed the visitors to walk close to the stones, but also enjoy the overall effect of the facade from an elevated cantilevered footbridge. (Fig. 5)
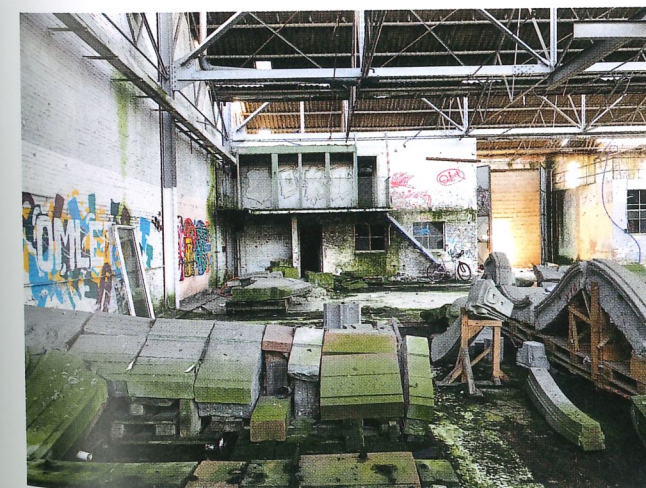
Figs. 6, 7

Between 2011 and 2016, the remains of the facade were damaged by acts of vandalism and lack of weather protection due to the degradation of the warehouse where they were stored (left). Some stones were tagged, especially this large opening with a pink granite frame (right), photos: 2019, Claudine Houbart

But once again, what was supposed to be the impetus for a more sustainable valorisation turned out to be a new impasse. Forgotten once again by the changing political power, the vestiges, which had remained in the warehouse where the exhibition was held, were the object of acts of vandalism by communities of squatters, not to mention the damage caused by the state of the shed itself, which no longer effectively protected the elements from bad weather and humidity. (Fig. 6)

The extent of the damage was revealed during a police inspection in July 2016. Although few stones had been stolen (around ten as a later inventory showed), some had been broken when the wooden structure supporting them had been removed to be used as firewood. Furthermore, several stones were tagged (Fig. 7) and, irreversibly, part of the window frames had been burnt and the ironwork had disappeared – probably sold for the price of the metal.

It is in this context that a new exhibition was organised by the CIVA Foundation, with the support of the Monuments and Sites Directorate of the Brussels Capital Region from September 2018 to May 2019 at the newly created contemporary art centre KANAL in Brussels. This time, however,

only sixteen stones were displayed, accompanied by two watercolours by the artist Armelle Caron (Fig. 8) and, in a showcase, opinion letters gathered following the 1997 consultation.[5] This exhibition was an invitation to broaden the range of possibilities for the fragments' valorisation. For the first time, the stones, positioned on an orthogonal grid on the ground, were presented as separate art objects, as a sort of subjective contemporary interpretation, without the goal of a better understanding of the lost building. (Fig. 9) At the same time, three evening debates focused on the history of the remains and valorisation scenarios proposed by artists and architects.[6]

Despite all these initiatives, the future of the vestiges today remains uncertain. Still the property of the Brussels Capital Region, the collection of stones is handled by the Department of Movable and Immaterial Heritage of urban.brussels. The fact that it has been inscribed in the inventory of movable heritage, the purpose of which is primarily to raise public awareness, does not guarantee its conservation in the long term. While in view of the heavy material constraints, a definitive integration of the collection within KANAL seems less and less likely, no scenarios for reconstruction, reassem-

Fig. 9
Some stones displayed at the 2018–2019 exhibition at the KANAL, photo: CIVA

◁ Fig. 8
Armelle Caron, Façade rangée (Hôtel Aubecq, Victor Horta), Brussels (Coll. CIVA)

bly or any other type of valorisation have so far been able to achieve unanimous agreement.

The impasse in which the remains of the Hôtel Aubecq now find themselves is mainly linked to two factors: the scale of the resources needed to safeguard and valorise them, and the lack of consensus on the scenario to be implemented, ranging from the identical reconstruction of the Hôtel in its entirety to the prosaic reuse of materials, with many intermediate solutions. If all these scenarios, supported by actors who recognise very different values in the remains, can be justified by more or less valid arguments, one thing is certain: they exclude each other and cannot co-exist neither in space nor in time.

Our working hypothesis is that digital tools may be useful to reconcile, or at least bring closer together, divergent scenarios, and therefore safeguard and transmit a wider range of values. Our reflection will be developed in three steps:

1) objectify the values underlying the choice of a valorisation scenario;
2) represent the variation of a certain value according to a range of theoretical scenarios;
3) assess the potential role of digital tools in the preservation and transmission of each type of value in relation to each scenario.

Beautiful, Evocative or Interesting?

To objectify the arguments underlying the proposed scenarios, we will consider the values recognised in the remains of the Hôtel Aubecq based on three complementary sources: the letters written in 1997 – mainly by experts in the field – in response to the parliamentary inquiry,[7] the comments left by the public in the visitors' book of the 2011 exhibition[8] and finally, the debates organised in 2018–2019 in the context of the exhibition at KANAL.[9] When relevant, they will be supplemented by interviews conducted by our students during a workshop on this topic in March 2019.[10]

In order to categorise these values, we have chosen to work based on the framework proposed in 2016 by L. Harald Fredheim and Manal Khalaf in their article "The significance of values: heritage value typologies re-examined".[11] The originality of this framework is to propose three successive stages in the evaluation process, aimed respectively at identifying what the heritage in question is, the reasons why it is valuable and, finally, at qualifying the values (how?). This framework, which is both inclusive and concise, seemed to us to be particularly appropriate in the context of this article since it limits the categories of values while being very comprehensive.

The first stage, in which the "features of significance" are identified, is borrowed from Stephenson's "cultural value model", developed in the context of landscapes, and takes into account not only the material elements (forms) but also the relationships and practices inscribed in these landscapes.[12] With regard to the remains of the Hôtel Aubecq, orphaned from any context or associated practices for decades, we will limit ourselves to examining the material elements, in relation with the existing historical documentation. But what are they exactly?

In 2011, when the first digital survey of the stones was carried out as part of the architectural study,[13] there were six hundred and thirty-four stones, most of them identified as original. On the entire facade, covering an area of more than one hundred and eighty square metres, only fifteen stones were missing, and a few that had been cut for the Namur exhibition were clearly identifiable. The window frames were all present, although in average condition, as was the ironwork, of which only certain details were missing.[14] Today, aside from a few highly damaged window frames, only the stones remain, and they will be the subject of our analysis.

It is essential to understand that these are not cladding stones, but elements with a load-bearing function, which is why they are so massive; the architects responsible for the horizontal reassembly in 2011 described the building works as "pharaonic".[15] In addition, many of the elements, made of two kinds of blue stone and different types of granite, are also extremely elaborate in terms of cutting and stereotomy.[16] So the heritage we are talking about today is not, as we can sometimes read, "the facade of the Hôtel Aubecq", but rather a collection of massive remarkable stones that once formed part of this facade.

Why is this collection valuable today? Departing from the long lists of value typologies as produced by administrations or organisations in charge of heritage, Fredheim and Khalaf propose to limit the framework to four "aspects": associative, sensory, evidentiary and functional. A study of the sources as mentioned above, focusing on explicit and implicit assessments produced by the experts and the public, reveals that associative and sensory aspects are much more evoked than the evidentiary one. The functional aspect is only relevant for a heritage "in use", thus we won't address it in our analysis; as Fredheim and Khalaf underscore, "functional aspects of value should not (…) be conflated with benefits of use derived from other aspects of value".[17] In our case, the potential educational use noted by a few visitors and experts is clearly derived from the three other aspects, as we will see below.
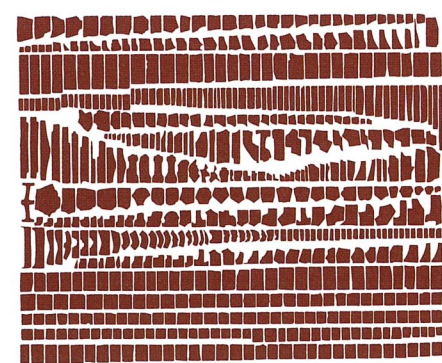
Under the term "associative aspects", Fredheim and Khalaf group all "those that express significant connections" with people, events, places, traditions, objects, etc., including fictional ones.[18] As far as the collection of stones collection is concerned, this aspect is very much evoked by visitors as well as by experts. Not surprisingly, the remains are seen as an important testimony to Art Nouveau, to Horta's "greatness", "genius", and "revolutionary character". But the the vestiges are even more seen as a "touching" or "moving" testimony to the fate of heritage at a time when it was largely sacrificed on the altar of real estate development in Brussels. The negative actions of "corrupt politicians" who did nothing to avoid the destruction are pointed to by the public, as well as the current difficulties in finding material means to provide a sustainable and long-term valorisation solution.[19]

The "sensory aspects of value" are "sources of pleasure",[20] and unlike the previous ones, do not require mediation to be perceived. There is no doubt that many visitors at the 2011 exhibition sensorily enjoyed the experience. Words like "beautiful", "magnificent", "exceptional", "admirable", "superb", "masterpiece", come up again and again in the guestbook. Not a single comment suggests that the fragmented aspect of the work is detrimental to its beauty. Whether in 1997 or 2019, all the experts interviewed are less insistent on this aspect, perhaps not to express themselves in a way that could be considered subjective. However, one important exception should be noted: in 1997, Françoise Dierkens-Aubry, curator of the Horta Museum, was one of the few to take a stand against any form of reconstruction: "These stones and ironworks (…) no longer belong to the field of architecture: they have become objects of art whose great beauty must be able to be appreciated by the public". Consequently, "the solution that seems most appropriate (…) would be to reassemble the elements preserved in a park or museum. The fragment of the facade would then have the status of sculpture, its architectural quality having now faded away".[21]

Evidentiary aspects of values – meaning "those that provide evidence for conducting and communicating research"[22] – are much less evoked. Two visitors mention the fact that the vestiges allow discovering other aspects of Horta's work, while another – an architect – emphasizes their interest in gaining a better understanding of stonework at the time of construction. The remains are also seen as evidentiary by some experts, like the architect Barbara van der Wee; therefore, the facade should be rebuilt in a museum environment "so that the whole can be seen and possibly controlled by various specialists (e.g. sculptors, stonecutters, art historians, architects, students, interested parties …)".[23]

From Fragments of Architecture to Autonomous Artistic Objects

When viewed chronologically, a gradual broadening of the range of scenarios proposed for the valorisation of the remains can be observed. Until the 1990s, the projects proposed by Jean Delhaye or by groups of students at the La Cambre School of Architecture in Brussels, under the direction of Maurice Culot[24], almost unanimously envisaged the vertical reassembly of the facade as part of a building to be constructed or transformed. The facade was to play its role as an interface between an interior and an exterior, most often in public space.

A first broadening took place during the 1997 consultation, which was the consequence of several facts: the proposal to integrate the facade into one of the courtyards of the Musée du Cinquantenaire in Brussels, [25] the organisation of a major Horta retrospective as part of the Europalia festival, where an entire section was reserved for vanished buildings, and the fortuitous rediscovery of the window frames and ironwork. Only two scenarios were submitted for the experts' opinion. The first one, already described above, considered the façade as "a testimony to the living and attractive heritage". On the other hand, the second one proposed to include it, being "a fragment of an architecture impossible to reconstitute in its globality", "in a museographic context to constitute a historical testimony and an object of study".[26]

Among the fourteen experts who sent an opinion, a majority were in favour of the second option, but some of them also proposed other alternatives. The architectural historian Francis Strauven was the only one to be in favour of a full reconstruction of the building, based on the existing documentation and integrating the preserved pieces of furniture.[27] Jos Vandenbreeden and Françoise Aubry, both Horta specialists and curators of the Europalia exhibition, also envisaged displaying the facade outside as an independent entity.[28] Vandenbreeden even suggested that the stones could be displayed separately in various museums, as "masterworks of stonecutting and Horta's genius".[29]

Following this consultation, the integration of the facade into a museum setting became the dominant scenario, and there were even talks for a time of making it the central element of an "Art Nouveau Interpretation Centre" to be designed.[30] The 2018–19 exhibition marked the ultimate broadening of the questioning, proposing to look at each fragment as a work of art in its own right and at the stones more as a collection than as constructive elements of a facade.

The debates that accompanied the exhibition and the interviews we conducted in 2019 show that today, all these successive scenarios coexist in the minds of the public and experts alike. For our study, we will consider four scenarios between the two extremes of a complete reconstruction of the Hôtel Aubecq as a whole (#1), and the prosaic recycling of materials (#6):
– the integration of the reassembled and completed facade as the façade of an existing building or one to be built (#2);
– the integration of the reassembled facade into a museum (#3);
– the exhibition of the collection in the form of a flat anastylosis (#4); and finally,
– the storage of the collection and the exhibition of a selection of stones (#5).

In the following paragraphs, we will examine the variation of each aspect of values previously identified according to the various scenarios, from the ones emphasising the value of the whole to the ones favouring the value of the fragments. The two extreme scenarios will be left out of the debate from the outset, one (#1) having been almost unanimously considered infeasible due to a lack of sufficient documentation, and the other (#6) not falling within the scope of a heritage type debate and having been raised only out of pure provocation.

The first graph (Fig. 10.1) shows the variation of associated aspects, i.e. the links to the figure of Victor Horta and the Art Nouveau movement, and the testimony of the building's destruction. As shown in the graph, it is impossible, even limiting oneself to this aspect alone, to combine the two types of association in the same scenario. While a complete reconstruction would undoubtedly be the best way to evoke Horta's greatness and genius, it would, at the same time, erase all memory of the destruction of the building. Between these two extremes, the intermediate scenarios show an inverse evolution, since it can be considered that the more complete the reconstruction is, the more clearly it testifies to Horta's creative genius and Art Nouveau characteristics, but less to the destruction of the building.

The second graph (Fig. 10.2) illustrates the sensory aspects, expressed by a large number of visitors to the 2011 exhibition. As already mentioned, the fragmentary nature of the work on display does not seem to have prevented visitors from appreciating it from this point of view. However, it can
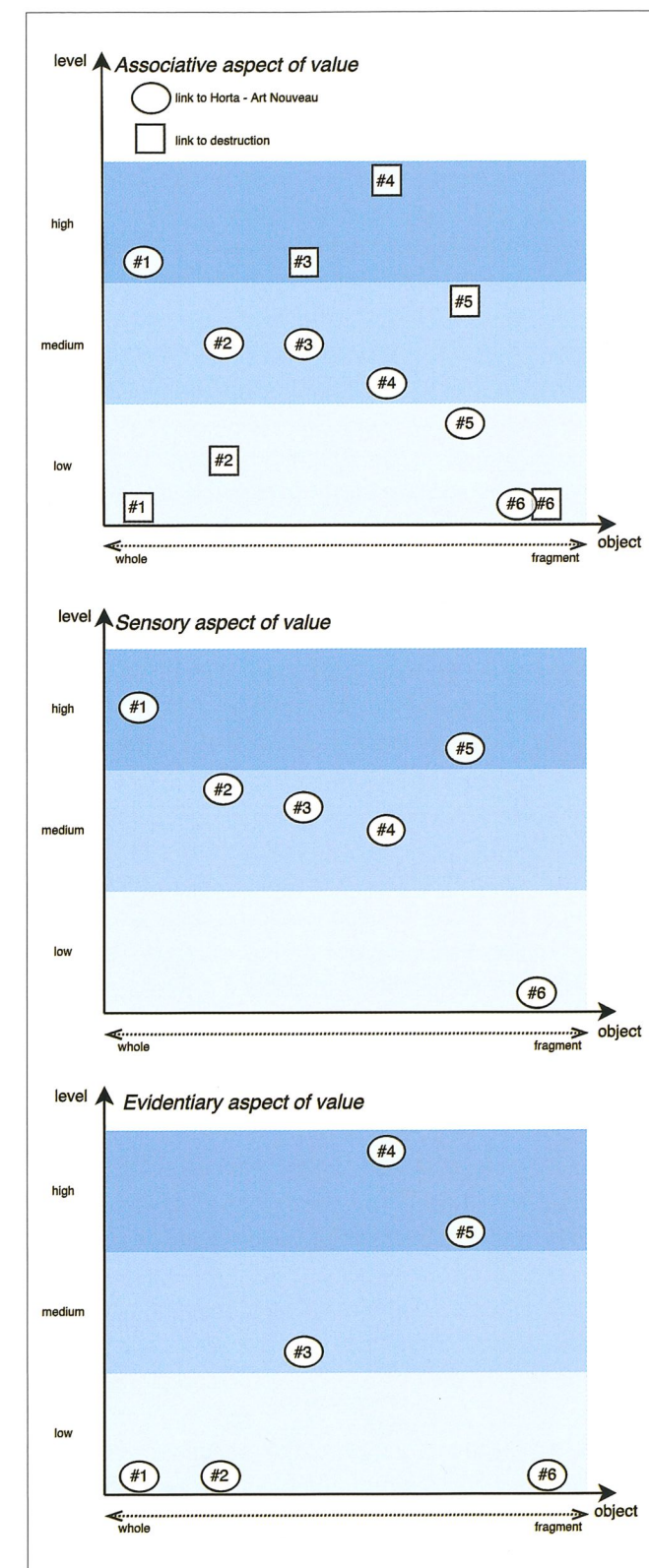

Fig. 10
Graphs showing the variation in transmission of associative, sensory and evidentiary aspects of value of the collection of stones depending on the chosen valorisation scenario: 2020, Hallot & Houbart

be assumed that reassembly or reconstruction, in particular by restoring the continuity of the lines, the interplay of full and empty areas and, in the case of an outdoor reassembly, the play of natural light, would be likely to reinforce this aspect.

The graph depicting the evidentiary aspect of value (fig. 10.3) shows an inverse evolution in comparison to the previous one. From the evidentiary point of view – in the sense of a source for the history of construction – the reassembly, especially if its purpose is to restore the facade to its original function, would obscure many testimonials of ancient craftsmanship. On the contrary, maintaining the work in a fragmentary state would leave these traces visible and accessible to researchers and the public.

If we now look at the graphs from the point of view of each scenario, we see that none of them is entirely satisfactory regarding the three aspects of value and that, with the exception of scenario #6 in which all aspects are reduced to zero, they score differently depending on the aspects observed.[31]
Scenario #1 is where the most significant differences are observed. Theoretically – since in practice this is not feasible on the basis of the available documentation – a total reconstruction of the Hôtel Aubecq would be quite effective in evoking Art Nouveau and the genius of Horta. However, it could only be completely successful if it were located in its original location, as Jos Vandenbreeden pointed out in 1997.[32] From a sensory point of view, a well-made reconstruction would undoubtedly be a source of pleasure for visitors, who would be able to perceive all the subtleties of the ensemble in terms of design. On the other hand, the evidentiary aspect would be quite weak, since the result would be to a great extent a replica of the building and all the information communicated by the original fragments would be lost or at least concealed as a result of the reconstruction. In addition, the component of the associative aspect linked to the memory of the destruction would completely disappear.
Scenario #2 – the integration of the facade as a façade of an existing building or one to be built – would suffer from the same weaknesses, even if, to an attentive observer, the fact that the facade is attached to a different building would reveal, if not the destruction, at least the existence of an event in the life of the building. But it would also be less satisfactory from a sensory point of view since it would be less complete, and, in the absence of the link between the facade and the interior volumes, it would only be an incomplete evocation of the genius of Horta and Art Nouveau.

Scenario #3, which considers the rebuilding of the facade in a museum, has comparable scores from the sensory and associative points of views, at least as far as Horta's genius and Art Nouveau are concerned. As an evocation of the destruction process, it would function much better, as the rebuilding process cannot be ignored by the visitors. From the evidentiary point of view, it would also potentially be more efficient, because depending on the scenography, it could, for example, allow the public to come close to the stones or see the reverse side of the reconstruction. Out of the four scenarios we discussed so far, it appears to be the most balanced with regard to the aspects of values, which perhaps explains why it received a majority of support from the experts questioned in 1997.
Scenarios #4 and #5 are quite different in the sense that they retain the fragmentary nature of the remains. It makes sense that they score much better with regard to the evidentiary aspect and are quite direct evocations of the demolition process. With regard to this aspect, however, the horizontal display of the facade (#4) would be more effective, in that a stone completely decontextualized from the collection (#5), could no longer be understood as having once been part of a whole without appropriate mediation. As the visitor's book shows, the flat anastylosis scenario is effective both from the association with Horta's genius and Art Nouveau and from the sensory point of view.
It is, however, undoubtedly at least a little less effective than the scenarios involving the re-assembly of the facade. Paradoxically, the exhibition of single stones could score much better from that point of view, as it was experienced by many visitors at the 2018–19 exhibition at KANAL, where the sculptural qualities of the stones were emphasised.

Digital Application as a Reconciliation Tool

Today, digitisation has become an essential step in many heritage conservation and restoration projects. Geometric descriptions are carried out using acquisition tools that allow the collection of a large amount of information in a reduced time. From these datasets (which can sometimes be colossal) two categories of representations or productions can be derived: either plans, sections, and elevations as classically used in architecture practice, or digital representations and physical productions used as mediation tools.

For this paper, although digitisation of the stones was carried out in 2010 by the surveyor's office O'Point,[33] we will consider, as a first step, an ideal situation in which new data acquisition

is envisaged without any technical or financial limitations. There are many ways to use digital heritage information: applications range from the development of virtual reality environments (VR) to the tangible 3D production of physical copies of scanned items. Between these two extremes, each digital technique brings an advantage in terms of visualisation, functionalities, the quantity of information transmitted, and finally, cost.
Eslam Nofal, in the framework of a research on communication tools for built heritage, proposed a classification of those working with digital data.[34] The interest of this classification is that it is not based on the type of source data (and therefore on the modes of acquisition), but the characteristics of the ways of communication. As represented in Fig. 11, the expression of a digitally derived technique is based on the intersection of its physical or digital aspect and its situated or non-situated aspect.
The first aspect accounts for the fact that the information remains in the state of digital representation or that it materialises physically on or in a medium. Eslam Nofal talks about the "physical affordance" to denote "how the physical form demonstrates the possibility of an action on an object or on the environment"[35] for a person. The variation along the physical affordance helps to position technologies from digital to physical properties.[36] For example, a 3D printed artefact out of a digital replica is considered physical. The other aspect is the level of "situatedness" which defines how the information relies on the "physical context" to be understood.[37] There exist various degrees of situatedness, ranging from non-situated objects which are typically shown on museum walls or displays and thus require textual labels or captions to be understood, to fully situated objects like ruins and statues, of which the value can only be comprehended by experiencing and interpreting the surrounding context.[38]

The particular object of this research does not allow us to consider all the heritage communication techniques described in the literature and even in Nofal's proposal,[39] and we have selected a subset of six techniques:
1) A web environment hosting the representation of information, entirely digital and non-situated. Its advantage is to associate historical and contextual information with a 3D representation easily; its disadvantage is to be physically disconnected from the object it represents.
2) The development of an immersive VR environment, which has the advantage of immersing the spectator in the context of the elements represented; notions of scale, sensitivity and light are more prominent than when viewing the same information on a web platform.

3) Augmented reality applications (AR), which have the advantage to place the information communicated in a much greater context. These applications consist of superimposing information onto an existing environment. Depending on the type of application developed, they make it possible, for example, to highlight the characteristics of an element or to completely reconstruct a historical context.
4) The use of Bluetooth devices, i.e. transmitters attached to an object and communicating targeted information, which allows the enhancement of a localised element by providing information through video, text, image, etc.[40] This information is transmitted to the user through a smartphone, tablet or other device.[41]
5) Projection mapping, a well-known technique often used in artistic production settings during sound and light shows, but which is also in vogue as a mediation tool in historic sites where a light projection makes it possible to superimpose a past state directly on remains or to highlight salient elements in the history of the site.[42]
6) Production of artefacts from digital data, not only printed in 3D but also obtained using digital carving (3D printing is an additive technique that consists mainly in depositing molten plastic into a desired shape; dig-
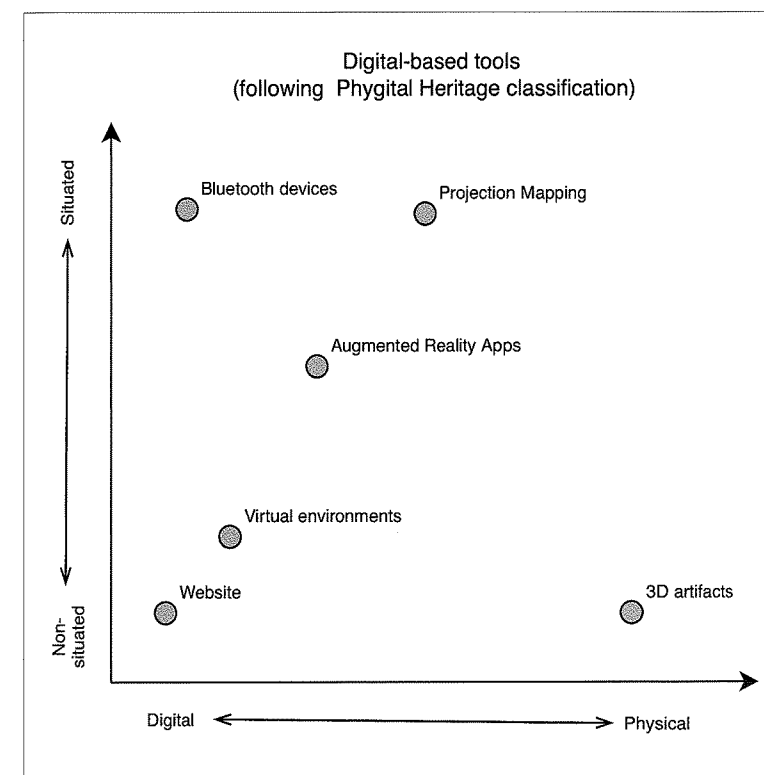

Fig. 11
Classification of digital-based tools following the Phygital heritage classification established by E. Nofal: 2017, Hallot 2020

Digital reconciliation for scenario #2

Associative aspect of value

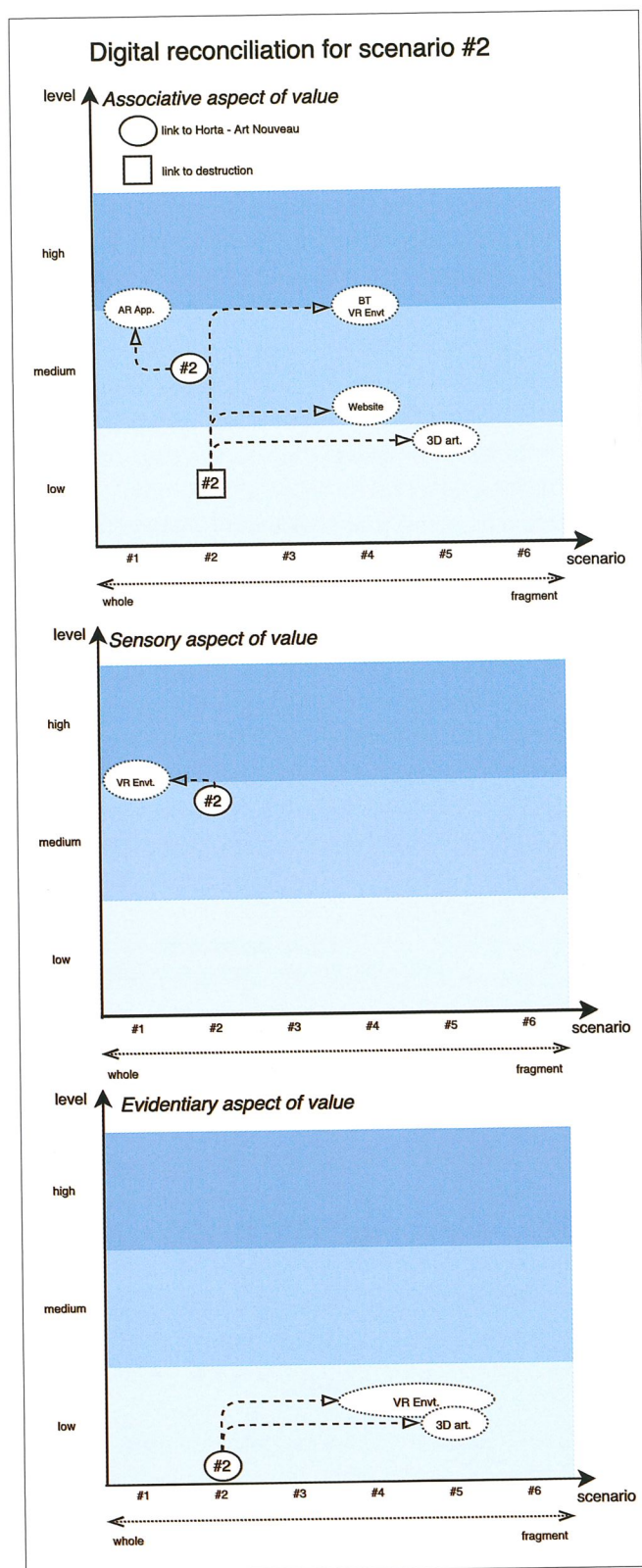*Sensory aspect of value*

Evidentiary aspect of value

Fig. 12
Possible contributions of digital-based tools for improving transmission of aspects of value in the case of scenario #2, involving the reconstruction of the facade as a facade of an existing or new building: 2020, Hallot & Houbart

ital carving techniques are a subtractive process that involves removing material from a block of stone, wood, etc., … to obtain a shape as modelled. The latter is much more suitable for reproducing imposing elements such as the stones of a facade). Today, the technical level of this type of production makes it possible to achieve a level of detail very close to reality.

We postulate that the combination of appropriate digital tools with each of the four scenarios we defined between the two extremes could improve, in each case, the performance of the scenario in terms of preserving and transmitting aspects of the value of the vestiges, and bring together, in some cases, the advantages of scenarios impossible to combine outside the digital space. We have tried to limit the subjectivity of our analysis by basing our analysis on the values identified by the different audiences – and not by ourselves – and by working solely on the basis of the remains, and documentation materially available. Thus, for example, the construction of a virtual reality environment representing the whole Hôtel Aubecq with a high level of detail, scenery, light, etc. (which would be a colossal work, by the way), is not envisaged because it is not feasible in the current state of knowledge.
We also postulate that in each case, the proposed tools are sufficiently well-developed to allow the fullest possible transmission of information when in reality, this quality criterion would be a determining factor in the performance of the tools we address.

Scenario #2 can be supported by several digital heritage communication techniques, each of which can contribute to improving the perception of the associative, sensory and/or evidentiary aspects of value. (Fig. 12) The incomplete and decontextualized nature of the inclusion of the fragments as the façade of a new building could be partially rebalanced by AR and VR tools. On the one hand, an AR application would make it possible to superimpose missing architectural or contextual elements onto the building: for example, to simulate the original volume and spaces, or the initial views from the inside towards the outside, or to add furniture. This would reinforce the associative aspect of value linked to Art Nouveau and Horta. On the other hand, VR communication techniques could be of great help in rendering these aspects of value related to the destruction of the building. But in order to be accessible for the largest number of people and not to be missed, the representation should be available from the vicinity of the building itself and thus, an application initiated from a Bluetooth device would be the most effective. This tool would in some way reconcile sce-

nario #1 with scenario #4 and, to a lesser extent, scenario #5 by giving access to a virtual reality environment recalling the state of conservation of the remains before reconstruction, or (less effective), to a website. Another possibility would be the reproduction of a number of stones using printing or digital milling techniques in order to create 3D artefacts that could be exhibited in or around the building or, in a more commercial vein, artefacts sold in a shop, like a "rebuild your own Aubecq facade" puzzle. (Fig. 12.1) Of course, the latter solutions could in no way replace the experience currently offered in the warehouse where the stones are stored.
The sensory aspect of value could be a little improved by the above mentioned VR application that would reproduce the entire building in its context. Doubt can still be expressed regarding the ability of a virtual reality environment to generate sensory pleasure; but recent developments in these techniques and significant work in computer graphics rendering may bring us closer to this vision, as recent exhibitions have shown.[43] (Fig. 12.2)

The evidentiary aspect of value (in the sense of heritage being a trustworthy source for research), is very low in this scenario. In order to improve it, the success of digital tools is closely related to the ability of a digitisation technique to create a copy so reliable that it can replace an original source and play its role as a study object.
Although this prospect remains a myth today, very high-resolution digitisation is approaching it. It can therefore be considered that very precise digitisation of a fragment could reproduce a part of this aspect of value, but it would never replace the original (for example, from the materials point of view). This digitisation could be exploited either in the form of a virtual environment in which the researcher could easily (virtually) manipulate the objects in order to study them, or as a source to reproduce them (considering that the production technique would not introduce any additional bias between the model and the original piece). In both cases, these techniques would only contribute to a small improvement of this aspect of value. (Fig. 12.3)

Scenario #3, which considers the reassembly of the façade in a museum environment, occupies a central place in the analysis because it may require a rendering of the state of both the complete building in its context and of the destroyed state – even if this scenario would leave little doubt about a fragmentary intermediate state of the facade. The museum environment offers greater opportunities for mediation associated with material artefacts in a more controlled setting than an in-situ presentation. Therefore, both AR applications and the development of VR environments can be envisaged
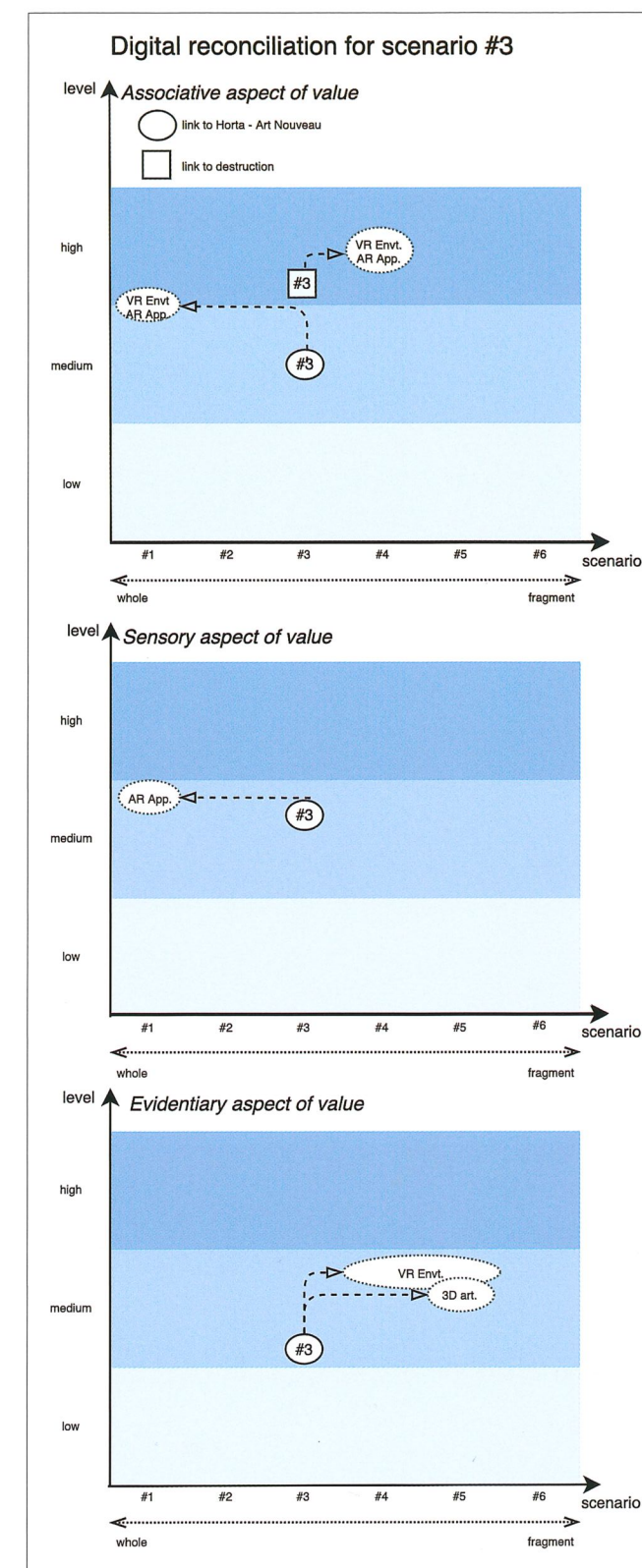

Digital reconciliation for scenario #3

Associative aspect of value

Sensory aspect of value

Evidentiary aspect of value

Fig. 13
Possible contributions of digital-based tools for improving transmission of aspects of value in the case of scenario #3, involving the reconstruction of the facade in a museum context: 2020, Hallot & Houbart
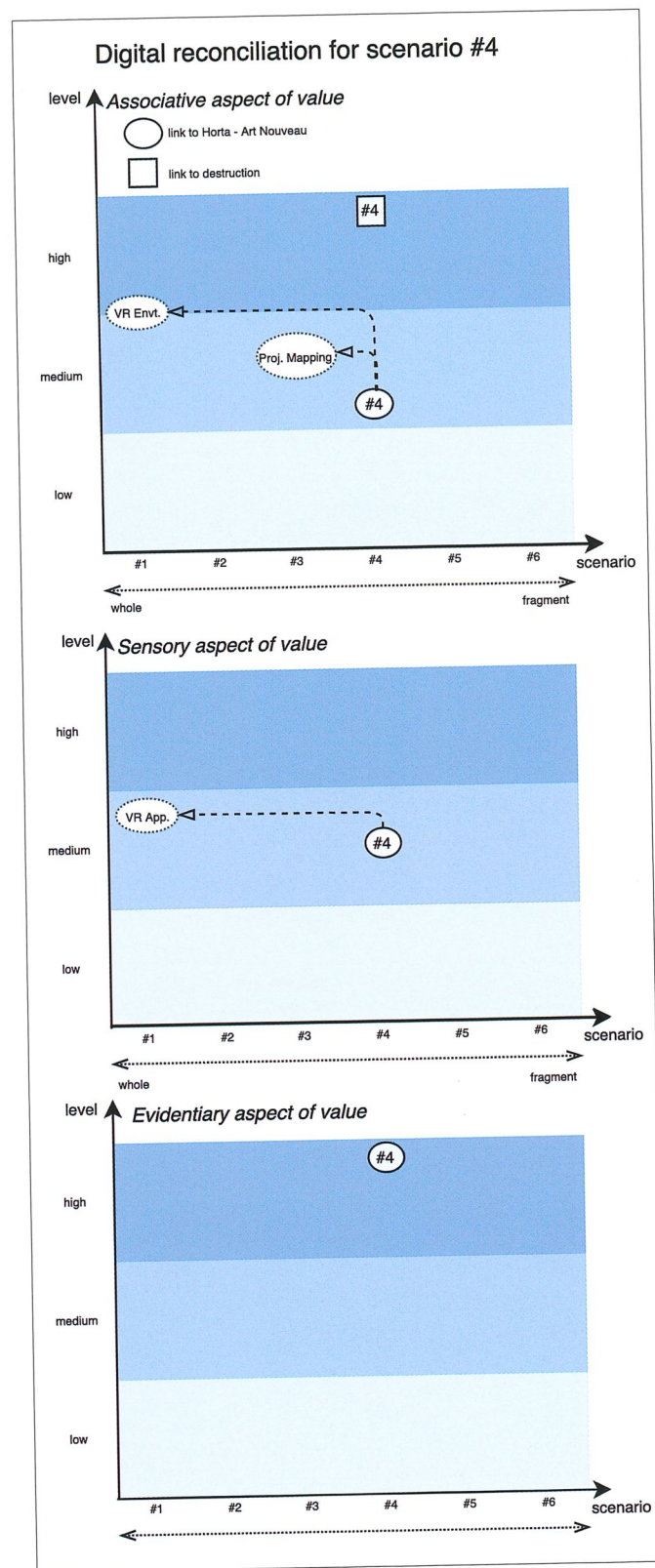
Digital reconciliation for scenario #4

Associative aspect of value

Sensory aspect of value

Evidentiary aspect of value

Fig. 14
Possible contributions of digital-based tools for improving
transmission of aspects of value in the case of scenario #4,
involving a flat anastylosis of the façade: 2020, Hallot & Houbart

to complement both associative aspects of value, linked on the one hand to Art Nouveau and Horta's work and on the other hand to the memory of the building's destruction. (Fig. 13.1) An AR application could – with the same reservations as for the previous scenario – partly reproduce the sensory aspect of value from a display device that could be of high-quality thanks to its location in a museum (Fig. 13.2) (which would not be possible in a public space like in scenario #2). As in the other scenarios, the evidentiary aspect of value could be slightly improved through the use of VR applications or the production of 3D artefacts; as the initial level of the aspect is higher, the final result combined with the applications would be accordingly higher. From that point of view, this process brings scenario #3 closer to the next two scenarios (#4 and #5), which are the strongest from the evidentiary point of view. (Fig. 13.3) The conservation of the high-quality evidentiary models by a museum would also ensure their greater reliability and longevity.

Scenario #4 involves a flat anastylosis of the facade. The associative value linked to the destruction of the building is undeniable and does not require a digital complement. However, the flat display of an architectural element that was designed to be vertical disrupts the perception of what the facade was meant to be. A projection mapping technique of the facade in the exhibition space would create an obvious link to the original work. This technique has the advantage of communicating notions of scale and size that are often lost in VR environments (modelling tricks, such as adding elements of known size, must be implemented to help the viewer become aware of it). (Fig. 14.1) The sensory value could not be rendered as in scenario #3, because the flat installation would not allow augmenting what is seen by the visitor in order to render the context. (Fig. 14.2) An important element of augmented reality is that the visitor is immersed in a context modified by his or her own position: in this case, it would not be possible for him or her to move around. The solution of a VR environment seems, therefore, more adequate. However, the level obtained would be slightly lower than in the previous case, as the link with the initial object would be less direct. As the evidentiary aspect of value is already very high, adding digital tools is not really necessary. (Fig. 14.3)

The last scenario (#5) differs greatly from the previous ones because it physically disconnects the fragments from the whole and, therefore requires significant mediation actions in order to communicate the fact that the remains once belonged to a building that bore witness to an artistic trend, and then was demolished. The digital communication of

both associative aspects of value can be envisaged in a way that is similar to all previous scenarios. (Fig. 15.1) A projection mapping would probably be the most interesting solution in a museum environment, although the development and visualisation of a VR environment would also work. In our view, this tool would be more relevant to communicate about the context and the environment associated with the initial building. If we refer to the display of sixteen stones at KANAL, which is the existing event closest to this scenario #5, it is not easy to imagine the effect of, for example, an AR tool on the sensory aspect of their value. (Fig. 15.2) As in the previous scenario, it could help to recreate in the virtual space the sensory perception of the building, but it might at the same time harm the stones' capacity to directly communicate this aspect in another register (that of the fragments) by themselves. It is in order to point out this danger that the graph shows a decrease in this aspect of value, at the same time as its passage into another register, that of scenario #1. As far as the evidentiary aspect of value is concerned, a VR environment could allow perceiving the relation of each stone with the other elements of the collections, by coming closer to scenario #4.

The last scenario (#6), which reduces the remains to rubble to be reused for construction, is not explicitly represented because it falls beyond the scope of this paper. But in that case, of course, all types of digital tools could be useful to document what once existed and communicate to various extents the three aspects of value that would be completely lost in reality. Thus, the digital communication of heritage would no longer act as a tool to reconcile scenarios but would be the only remaining support of aspects of values, together with other types of historical documentation.

As we have tried to show through the discussion of these scenarios, the addition of digital heritage communication tools could help to reconcile several avenues for valorising the remains of the Hôtel Aubecq and ensure better mediation of the aspects of the collection's value.

Generally speaking, the sensory and evidentiary aspects of value appear to be the most constraining to render with the help of digital tools. On the other hand, associative aspects offer the possibility of being processed by numerous tools, with each one linking to more general information (historical context, artistic movement, person, event, etc.). Sensory aspects require a high level of interface development in order to sufficiently immerse the spectator in a very realistic environment. The rate of realism and the possibility to "forget" the technological tool are indispensable factors in the
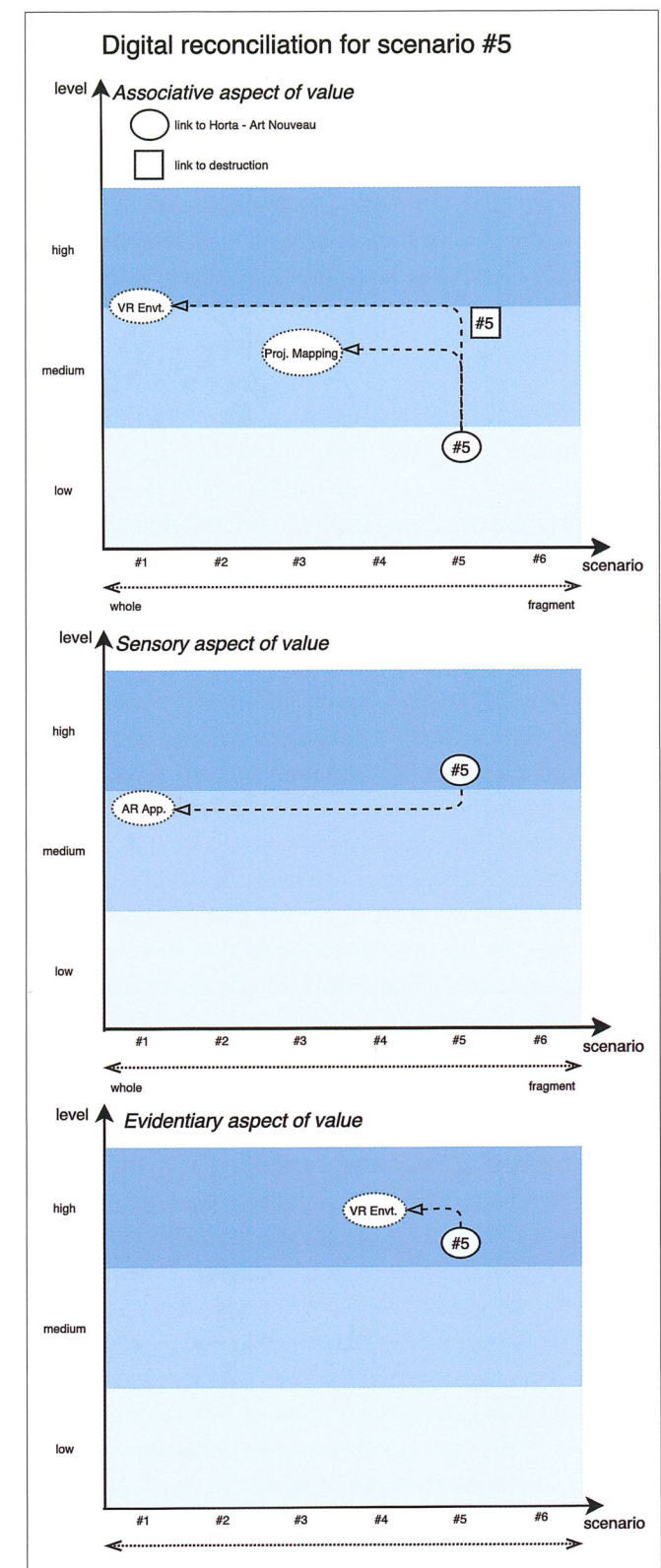

Digital reconciliation for scenario #5

Associative aspect of value

Sensory aspect of value

Evidentiary aspect of value

Fig. 15
Possible contributions of digital-based tools for improving
transmission of aspects of value in the case of scenario #5,
involving storage of the stone collection and display of a
few pieces: 2020, Hallot & Houbart

feeling of sensations, but numerous studies on the use of video games in this field show that it can work.[44] As far as the evidentiary aspect of value is concerned, an acquisition of very high quality is required, to allow the rendering in a digital environment identical (by its characteristics) to the real object. A great deal of research is currently being carried out in this direction,[45] and in parallel, rapid technological development has recently led to a clear qualitative improvement in this area.

The Limits of Digital Heritage Communication Techniques

Digital heritage mediation techniques have great potential as a complement to heritage valorisation scenarios. But that does not mean they are miracle solutions. It is important to be aware that each proposed mediation tool requires a different data collection, even on a single element. The acquisition of geometric information to document a stone should not be carried out in the same way if the final objective is, for example, a projection mapping or a 3D printing. The reflection on the valorisation of the elements must, therefore, be carried out prior to any digitisation and this aspect needs to be included in order to obtain adequate information for the intended application. Too often, the availability of data, their format, quality and definition is not adapted to the communication objective, and that affects the final result greatly. For example, if a project plans to use a VR environment in order to communicate sensory or evidentiary aspects of value, a low level of modelling and a poor quality of rendering will be fully uneffective. In the case of 3D productions, the result will be very dependent on the quality (granularity, precision, accuracy) of the initial acquired data. Thus a good prior knowledge of the possibilities of all available digital tools is a necessary prerequisite for extracting their best potential in relation to various scenarios important to involve these scenarios from the beginning of the reflections on valorisation.

In our case, the digitisation of the stones carried out by O'Point in 2010 resulted in the creation of a large data set which is very difficult to use efficiently today.[46] Although excessively large in size (several gigabytes), the data are not sufficiently faithful to reality to be used for a wide range of scenarios. Among other things, this information acquired from a structured light scanner does not contain texture information that would be necessary to render sensory or evidentiary aspects of value or to be the support for the creation of precise 3D artefacts. But the data set could, for example, support a projection mapping, as it suggests the

limits of rendering the size and architectural design of each individual stone of the façade.

The limits of digital technologies as support for reconciling valorisation scenarios are twofold:
– On the one hand, they are strongly dependent on the accessibility of the heritage object(s) and the existence of sufficient and reliable documentation allowing all kinds of reconstruction or modelling. For example, as far as the stones the Hôtel Aubecq are concerned, it is very unlikely that the conditions which allowed the digital survey in 2010 (possibility to manipulate the stones one by one) will ever exist again.
– On the other hand, they are much affected by the rapid obsolescence of both the data acquired and its modes of visualisation. Any intervention on heritage is intended to be stable over time and not to be considered outdated or obsolete in a short interval of time. As soon as digital heritage communication tools are used to support the rendering of aspects of value associated with this heritage, as we propose, they must meet the same standards. Yet the rapid evolution of methods for acquiring and rendering digital information leads to a fast obsolescence of any documentation produced.

From a data acquisition point of view, obsolescence is mostly a question of increase in the definition and quality of the information that is acquired during digitisation. For several years, this information has remained more or less the same, i.e. vector information, mesh models or point clouds, while the quality of the textures has evolved and has been supplemented by visually based scans in multispectral wavelength ranges. These changes have a limited impact on the tool used for communicating digital heritage information. Indeed, as long as there is no major update of the visualisation technique or the arrival of an acquisition tool that fundamentally changes the perception of the acquired object, there is no reason to modify the initial data set.

In the case of certain proposed scenarios (#1, #2 in particular, #3 to a certain extent), access to the fragments would become impossible due to their reuse in a reconstruction project. In this case, it would therefore be essential to carry out complete and controlled documentation in order to ensure the greatest possible longevity of the data set, because it would not be possible to acquire it anew in the future.
The question of obsolescence is even more problematic as to digital information visualisation devices. Indeed, if at present we manage to produce rendering devices that come

close to a real perception, it is interesting to note that the discourse was the same five or ten years ago. Yet, the realistic representations of that time undoubtedly appear today as old-fashioned. An update must therefore be ensured in order to allow the display device to fulfil its function of rendering the aspects of value (especially in the case of sensory aspects).

It is obvious that all these constraints have a cost that should not be overlooked. But if we consider digital tools involved in a heritage valorisation project as an extension of heritage itself (because they carry aspects of its value), it is necessary to provide for a (preventive) conservation of these tools as we (should) do for heritage objects or buildings.

Conclusion

The approach we created for this paper, for the particular case of the Hôtel Aubecq, could be a starting point for the design of a decision-support tool enabling a decision-making body to assess the potential digital complements to heritage valorisation scenarios in view of the best possible transmission of all aspects of value involved. Additional techniques could be taken into account, as well as types of features of significance (relationships, practices) or aspects of value (functional) that we didn't address in this paper, due to the specific nature of our case-study.
With all the reservations that we have been able to formulate on the limits of these techniques, it seems to us that the more reliable and durable they become over time, the more they will be able to play an active role not only as a design or mediation tool but also as an integral component of conservation, restoration or valorisation operations. To make this possible, we have to include these reflections from the very beginning of the decision-making process, in order to obtain pertinent data for each purpose in the service of the best possible projects involving material and digital operations in a complementary way.

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Endnotes

1 Some of the furniture has been part of the collections of the Musée d'Orsay in Paris since 1980.
2 Conde-Reis 2011, p.17–19.
3 Correspondence conserved at the Documentation Centre of the Department of Monuments and Sites of urban.brussels (hereafter DOC), box MOB01/0.
4 Angelo et al. 2011.
5 www.civa.brussels/en/exhibitions-events/facade-hotel-aubecq.
6 CIVA Talks 2018 a–b–c.
7 Of the twenty-seven experts contacted, only fourteen expressed an opinion (DOC, box MOB01/0). The respondents were museum curators – Françoise Aubry (Horta Museum), Anne Cahen-Delhaye (Royal Museums of Art and History) –, authors of monographs or chapters on Horta – Gian Franco Borsi, Maurizio Cohen, François Loyer, Francis Strauven, Jos Vandenbreeden –, architectural critics or historians – Roland Matthu, Jacques Grégoire Wathelet –, Anne Van Loo and Lydia Deveen-de-Pauw, respectively secretary and president of the Royal Commission of Monuments and Sites, Cécile Dulière, scientific editor of Horta's memoirs, Charles Herfurth, one of the architects in charge of the "flat anastylosis" in Namur in 1990, and Barbara van der Wee, architect in charge of the restoration of Horta's Hôtel Van Eetvelde and private house and studio.
8 The guestbook is conserved at the DOC. We would like to thank Pascale Ingelaere, Head of Cultural Heritage, Movable Heritage Department of urban.brussels, for providing us with a copy.
9 See endnote 7.
10 Eisazadeh Otaghsaraei et al., in press. interviewed were: Pascale Ingelaere (see endnote 7), Yves Goldstein (director of KANAL Foundation), Cédric Libert (Head of Contemporary Architecture Department of CIVA), Nicolas Créplet (architect in charge of the 2011 anastylosis), Benoît Vandenbulcke (Professor at ULiège) and Werner Adriaanssens (Curator of the twentieth-century collections at the Royal Museum of Art and History).
11 Fredheim, Khalaf 2016.
12 Stephenson 2008.
13 Angelo et al. 2011.
14 Conde-Reis 2011, p.123–124.
15 Idem.
16 Ibid., p.65.
17 Fredheim, Khalaf 2016, p.474.
18 Ibid., p.473.

19 The highlighting of these aspects by the public may have been partly induced by the mediation accompanying the visit of the exhibition, with many visitors emphasizing the quality of the guided tours.

20 Fredheim, Khalaf 2016, p. 473.

21 Dierkens-Aubry 1997, translated from French by the authors.

22 Fredheim, Khalaf 2016, p. 474.

23 van der Wee 1997, translated from Dutch by the authors.

24 These projects were published in Culot 1979.

25 This proposal was formulated by Anne Cahen-Delhaye, daughter of Jean Delhaye and curator of the archeological department of the museum.

26 DOC, box MOB01/0.

27 Strauven 1997.

28 Dierkens-Aubry 1997; Vandenbreeden 1997.

29 Vandenbreeden 1997.

30 Karbon et al. 2013.

31 At this stage of the demonstration, we do not take any kind of mediation into account.

32 Vandenbreeden 1997.

33 Angelo et al. 2011.

34 Nofal et al. 2017.

35 Ibid, p. 5.

36 Dragicevic, Jansen sd.

37 Rekimoto et al. 1998.

38 Nofal et al. 2017, p. 224.

39 The techniques of embodied sensors, shape-changing interfaces, TUIs, and audio-guides will not be taken into consideration in this research.

40 Not, Petrelli 2019.

41 This technique refers to active beacon (Bluetooth) or passive device (QR code, RFID tag) placed on listed buildings to provide structured information about them. See https://humanrights.ca/visit/tours where active beacon devices are implemented.

42 Nice examples of this technique are visible at Vianden Castle, Luxemburg (https://castle-vianden.lu/fr/besucherzentrum/, accessed October 2020) or at Roman Domus at Palazzo Valentini in Rome (Del Signore 2016).

43 www.imarabe.org/fr/expositions/cites-millenaires.

44 Pallavicini et al. 2019.

45 Remondino 2011.

46 Angelo et al. 2011. It must be noted that the preservation of this data was only ensured to a limited extent (on DVD-ROM media) and could have disappeared quickly.

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