INTRODUCTION

City planning becomes data structure design, construction costs become computational costs, accessibility becomes transmissibility, proximity is measured in numbers of required links and available bandwidth. Everything changes, but architecture remains.

Research and protection of historic architecture stands presently at a turning point. On the one hand, it still relies on methods and procedures that belong to the analogue era (for example traditional architectonic documentation), on the other, new tools that belong to digital times are implemented into research and protection. Similarly, modern ways of perception and presentation in cultural heritage (with reference to the needs of presentation-popularization) are twofold – traditional in situ presentations of architecture are still functioning, as are...
new-media methods, such as augmented reality (acronym AR) or body immersion. In addition, characteristic for the post-modern society is the so called iconic turn, also described as visual turn and pictorial turn. It is indicated by the fact that modern culture is more and more often expressed through images of various origin, including digital images generated on the basis of digital technology, created with different aims and to different effects.

The starting point in discussing the topic indicated in the title is the conviction of the usefulness of new technologies, conditioned by a constant control, analysis and tracking of results achieved with their help, especially such results that have been unexpected and unforeseen. This will allow, for example, to eliminate undesirable outcomes and to notice new possibilities for the protection and research of cultural heritage, as well as for its perception, evaluation and experiencing. This text is intended to provide ideas for the ongoing discussion and to provide a description of chosen positive and negative, aspects of the implementation of digital technologies in research and popularization of cultural heritage – historic architecture. This article is a result and a continuation of hitherto conducted research and scientific inquiries, with references to Polish literature of this subject; oftentimes, it does not provide clear solutions, but sets directions for research.


with the aim of reflecting about processes and phenomena from the crossroads of historic architecture and new technologies. The reason for driving inquiries into the above described direction lies in the need to describe and analyze factors which are not a continuation of hitherto prevailing activities. This attitude is based on the conviction that new technologies are not a typical, fluent transition to another stage of research, documentation, designing and presenting cultural heritage. They provide access to a new quality, which we, at its initial stages, try to define and understand within traditional, know to us terms. This is, however, impossible and we are forced to develop new methods of understanding modern phenomena.

In the analysis of phenomena that relate to receivers, users – not creators, of digital environments, replicas and models of heritage objects, focus will be on those aspects of modern technologies that have become widespread and commonly accessible and which are characterized by, among others, participation through the interface of a computer or mobile device. Phenomena connected with CAVE (Cave Automatic Virtual Environment) or full body-immersion will be placed in the background, as a more detailed description of them is too wide to be contained within this article.

**Digitization of cultural heritage – new technologies and historic architecture**

Architecture today must be a media suite\(^9\)

Contact with historic architecture is currently experienced at least twofold. On the one hand we experience space, surrounding and surface of objects with our senses, through our bodies, in a static and active way, including movement and change of positions. On the other hand, we experience it with the use of various tools that serve as extensions of our bodies. The experience of shape, surface and the newly emerging environment is transmitted by more and more numerous electronic devices, both permanently connected with objects and mobile, used by us on a daily basis. Today, a new meaning is added to the statement that architecture should be experienced actively\(^10\), whereby active cognition goes far beyond the physical, natural body and senses. Knowledge acquired through images, text and transmission is in the era of digital technologies enriched by data and experiences, the emergence of which we combine with digital models and replicas of objects, with their reconstructions (with regard to heritage objects) or, finally, with techniques that allow us to submerge in virtual reality (acronym VR) – the so called body immersion. This altered method of establishing connection with objects is not without meaning in the process of perception and interpretation of heritage,

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which differs from traditional cognition\textsuperscript{11}. Consulting the texts mentioned earlier in this article, we notice a differentiation between participation in and experience of material and intangible (virtual) architectonic spaces. It can be illustrated with research results that point out the difference in participating in and experiencing space in virtual reality. Those results show (1) contrasts in the definition of spatial organization of a building perceived (a) through a virtual model and (b) in reality, (2) discrepancies in the evaluation of time and intensity of experience as well as (3) the loss of meaning of such notions as “proximity” and “distance”.\textsuperscript{12} This leads to the conclusion that intangibility of virtual spaces, according to researchers, strongly weakens the perception of the organization of the form\textsuperscript{13}. Thus, augmented and virtual reality do not add new objects to the existing world, but rather introduce new ways of spatial orientation, changing sequences of events that apply in the world of material architecture.

Once we realize the existence of the above described differences\textsuperscript{14}, we can see the meaning of digital relation to objects in an entirely new light. Actions carried out through VR cease to be identical with activities in the real world. This forces us to eliminate certain activities that represent real experiences – evoked by contact with material objects. In the context of the above analyzed circumstances and examples (more information about which will follow), the implementation of, for example, \textit{augmented reality}, in public consultations raises the question about the role and meaning of analysis and evaluation conducted by the public (recipients of simulations and models) with the use of such means.\textsuperscript{15} What is the subject of such consultations and, thus, what leads to the choice of a certain concept – a set of new media experiences that are not identical with the experience of real space?

Digitization (understood broadly – for example as a process of creating digital replicas of objects, digital visualizing and modelling etc.) is currently perceived as a necessity of contemporary times\textsuperscript{16}. It has also been accepted and approved in processes connected with historic architecture. We document, investigate but


\textsuperscript{12} Asanowicz, Aleksander. „Systemy rzeczywistości wirtualnej w architekturze”, \textit{ARCHITECTURAE et ARTIBUS}, No. 4, 2012, pp. 5-12.


\textsuperscript{14} Although those two situations are often treated similarly, basing on and arguing with slogans like: „Modern technologies are tools just as a hammers is – they merely increase our abilities”, after http://www.focus.pl/technika/technologia-uczlowiecz-9874?strona=2


\textsuperscript{16} For example, new rules or standards for documentation emerge and „force” us to implement new technologies“.
also present and provide access to heritage in digital form. This could be the shortest description of phenomena that have dominated several of our activities for the past years. This change has brought upon usually positive manifestations in the protection and popularization of heritage. It has, however, also a different side that is connected with a shift in our attitude towards heritage objects as such. What is interesting are thus experiences and ways in which we interact with objects that emerged through the introduction of new technologies into our everyday investigations and cognitive processes, rather than the process and the product – a digital replica or a virtual model.

Historic architecture, preserved in various shapes, has gained in the last decades new tools for measurement and documentation, for analysis and diagnosis and for presentation. Those are, for example, terrestrial laser scanning, geodata and VR, AR, mixed reality (acronym MR). This assemblage of tools has been providing for several years now a basis for new methods of research, modelling and reconstruction, especially in the case of destroyed objects. Contemporary documentation and research practice introduces digital technologies more and more often already at initial stages, leading, unavoidably, to the generation of data that is of primary importance for further research. This situation gradually “accustoms” us to working with a digital, not analogous, set of data and with the necessity of using electronic tools. This change is seemingly unimportant. However, if we consider the numerous, earlier mentioned examples of research results, this change introduces a new quality, incomparable to the previous one, into our relations with objects. Simulations and animations designed on the basis of digital data create cognitively-analytic sequences that could not be obtained by any analogue methods.

In the modern world architects and conservators are equipped with new media devices. As part of their professional activities, they should also stimulate recipients and encourage them to act. The act of visiting or touring is performed in accordance with rules set by technology and the author, for example, virtually. Models and virtual replicas enforce particular, also interactive, activities that go beyond the traditional way of learning about heritage objects and require from users competence in new media. A characteristic trait of our culture is a multidimensional relation with an object during which the sequence structure of materiality is rejected. Virtualization introduces a new category of space – experienced space17, filled, for instance, with quality information developed in a virtual environment or at the boarder of real and virtual environments. The currently dominating visual perspective – the perspective of a visualized shape and surface, in the context of the widespread multimedia devices, usually allows to relate to an object visually, more rarely engages hearing and still less often other senses. It should be added that movement – kinesthesia – takes a specific shape, different from the natural, because although it is included into virtual projects, it happens through a simulation of movement rather than physical movement as such.

Literature turns our attention also to a different, negative result of implementing new technologies into the workshop of an architect – it can lead to emotions of future clients being influenced in a sometimes dishonest way\textsuperscript{18}. A similar perspective is seen in the context of spatial planning\textsuperscript{19}. Reconstruction and visualization of historic architecture can be also perceived from this perspective; the decision-maker, investor in the process of reconstruction (revitalization) is (or may be) influenced through the use of new technologies. The choice of a particular frame, a relativity of shape conditioned by the point of view etc. are elements that allow to influence the recipient – investor. According to Barbara Świt-Jakowska, visualization should be a guide book to the form and function of an object\textsuperscript{20}; yet, evidence gathered through various case studies allows to state that, oftentimes, the addressee of spatial concepts is being manipulated.

If we agree with Piotr Zawojski that cyberspace defines to a high degree the logic in which real space is functioning, then cyberarchitecture, including digital replicas of heritage objects, defines to a high degree the logic in which physical objects are functioning\textsuperscript{21}. The digital model, learned and “visited” first, determines the trajectory of learning about and experiencing monuments. It shapes the imagination about the space of a building and its qualities. Such a hierarchy of events in the cognition of objects is a natural consequence of the attitude we have developed towards investigated and visited monuments. A tourist precedes preparations, including reading, with consulting a guide-book or map and, nowadays, also a digital model available online. The so created new-media set of experiences\textsuperscript{22}, combined with a confrontation between the recipient and a real object, shapes in the recipient a new-media (and also a mixed) experience, which is a result of participation in the material and in the intangible reality\textsuperscript{23}.

The imagery generated with the use of new technologies is disclosed in heritage architecture also in the form of interventions – images projected on façades of buildings, called architectonic mapping, which inscribe an activity into a space\textsuperscript{24}. Another example of inscribing actions into phenomena of contemporary

\textsuperscript{18} Świt-Jankowska, Barbara. „Współczesne narzędzia pracy architekta, a jakość nowo projektowanej przestrzeni mieszkalnej”, ARCHITECTURE et ARTIBUS, No 2, 2010, pp. 79-85.
\textsuperscript{19} Konopacki, Jacek. „Rozszerzona rzeczywistość…”; Konopacki, Jacek. “The Technology of Augmented Reality…”.
\textsuperscript{20} Świt-Jankowska, Barbara. op. cit., p. 84.
\textsuperscript{23} For example, the description of experience and gathered information has a different character. We write about cities and objects that we have experienced through a sensual and practical effort of mind and a modified (electronic/digital) kinesthetic effort. After: Rewers, Ewa. POST-POLIS. Wstęp do filozofii ponowoczesnego miasta. Kraków: UNIVERSITAS. 2005, p. 14.
culture connected with images is the omnipresent and common visualization (in a city, museum or private space), based on new media. It is a specific complementation of visual aspects of cities and objects. This three-dimensional image is set in the message transmitted from interfaces of permanent devices, connected with buildings, and of mobile devices. The iconosphere of cities is built of digital images. A pattern emerges in the light of the above deliberations, which characterizes some contemporary phenomena connected with historic architecture (that has a digital dimension) – (1) we image, then we (2) relate with images thanks to which we (3) develop an understanding and recognition of buildings. New media become a basis to develop a new sensitivity to historic architecture and to break the link between the traditional engagement of human body movement. Another trait of contemporary culture is the possibility to create and include into objects’ visualizations/models images that have been previously invisible, such as thermal images. Also potential functional effects in a city space can be visualized in media presentations – viewing corridors, sun exposure or temperature distribution, to name only some examples.

Limits to our relation with space and to the possibility of acquiring knowledge about real world through new media are set by the designer-author, technology, the amount of accessible data or the kind of access available for a particular user. An example is the Google Earth software, which enables a birds-eye view and a street-view of cities, excluding, however, from the street-view numerous places that have not been documented. This is an example of digital exclusion of places and objects or of a process of fragmentation. They lead to a new valorization of places, city space and heritage objects. Certain phenomena are marginalized; this is an effect of the impossibility of virtualizing-digitizing particular objects. A separate issue that should be mentioned here is digital exclusion. It affects this part of society that does not own the required electronic devices. In this way a differentiation of participation in the world is created – two worlds develop – (1) one recognized and experienced in the mixed way and (2) a world based on direct participation.

Other phenomena that belong to the negative sides of implementing new technologies are temporariness, passing and elusiveness. Numerous digital events and products pass as quickly as they appear. This has direct influence on the intangibility and on the analysis of certain phenomena from the perspective of science and history of culture. The possibility to analyze the influence of technology on people is lost. Literature turns our attention also to issues that incline us to think about certain practices and actions enforced on us by digitization of historic objects. According to Andrea Jelić:

28 Kalitko, Krzysztof. op. cit., p. 125.
perception is always embodied and enactive, meaning that it is intrinsically multi-modal and inseparable from movement, and since as Steven Holl claims, the only real test of architecture is the enmeshed experience – the body moving through space (…archical experience and architecture on the whole is always a multi-sensory event\textsuperscript{29}.

Thus, limiting relations with objects only to their digital forms, which is a trait of changing tourism (\textit{e-turism}, \textit{post-tourism}\textsuperscript{30}), can lead to many misunderstandings and to an impoverishment of experience.

**Conclusions**

To sum up the above presented analysis and to underline the importance of new technologies, I would like to quote Lev Manovich, who wrote that:

\begin{quote}
Intellectually, architectural discourse came to be dominated by concepts and terms which parallel (or directly come from) the design elements (splines, NURB surfaces, particle systems) and operations offered by the software (working with flexible geometry, morphing, physically-based modelling and simulation, parametric design, particle systems, simulation of natural phenomena, AL, etc)\textsuperscript{31}
\end{quote}

The fact that our practice is determined by new technology – the so called soft determinism\textsuperscript{32} – is an example of how a designer’s (who is a user of new technologies) thinking process is conditioned by the way in which authors of software solved the problem of presenting physical space\textsuperscript{33}. The technological determination of our actions and practices also concerns historic architecture because, through digitizing, modelling and creating digital images, we experience it in a new way. Thus, we can say that new technologies modernize our actions, offering new possibilities for modelling and designing, but at the same time, they force us to adopt a course of \textit{e-action} imposed by the technological environment.

Today, in order to become acquainted with historic architecture, knowledge of new media is indispensable, as are mobile devices, without which we are excluded

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\textsuperscript{30} Characteristic traits of post-tourism reconstructed by Ritzer are: the ability to „visit” a tourist attraction by way of Internet, television or virtual reality, without leaving home - Podemski, Krzysztof. \textit{Socjologia podróży}. Poznań: Wydawnictwo Naukowe UAM. 2005, p. 95.


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from the cognitive processes offered by makers of digital worlds. Today, to learn about objects, it is not enough to be in them – it is, among other, interactivity that defines the cognitive process. The perception of objects is made easier, according to Steen E. Rassmusen, or shaped by any knowledge about those objects which we acquire on the basis of digital experiences. Today, visualizations and 3D models have to be considered as a kind of predetermination of the perception and understanding of objects, which is fulfilled in the contact with the real object. This contact is preceded by a digital relation – a cyber-experience that does affect the general perception of buildings and spaces. In the world of information technology (IT), not only body movement but also interaction intermediated by devices introduces into architectonic space a new sequence of events. Traditionally: “the movement of bodies and objects introduces into each space a sequence of events,” yet today this situation is more and more often complemented by practices emerging from body-immersion, AR etc.

Among further research questions let us name two most important: (1) continued efforts leading towards investigating the meaning, effects and possibilities of implementing new technologies in the protection and popularization of historic architecture and (2) analysis of the above discusses phenomena on the basis of case studies. The most significant demand connected with studying cultural heritage in the context of new technologies is to firmly establish within the scientific and popularization discourse the cognitive and participatory differences between the two diverse, or mixed, worlds. This should allow to make users of new technologies aware of the effects caused by the diverse ways of perception and experiencing heritage.

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34 Rewers, Ewa. op. cit., p. 95.
35 ibidem.