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Development of e-service virtual museum tours in Poland during the SARS-CoV-2 pandemic

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Abstract

Dynamically developing ICT technologies have become a tool to accelerate the creation of information societies around the world. Thanks to it, many traditional services have found a new digital space to function and thus achieve a global dimension. One example can be virtual museums, which provide access to their resources for every interested person having Internet connection. There is no doubt that the most spectacular and effective representation of digital museums are virtual walks, bringing, apart from cognitive aspects and good entertainment. In the era of the pandemic caused by the SARS-CoV-2 coronavirus and international quarantine which limits mobility, e-services gave humanity the opportunity and a substitute for normal existence. The interest in e-services has increased, which has been directly translated into increased informational awareness. Favourable conditions as well as relatively low costs and technical complexity of creating virtual walks have led the authors to adopt the following hypothesis: during the period of the quarantine caused by the SARS-CoV-2 coronavirus pandemic, museums are actively and dynamically developing virtual walks services. In the presented article, on the basis of research and analysis, the authors will test the hypothesis, as well as asses the level of virtual walks around monuments and museum centres in Poland.

Keywords: e-services; virtual museums; virtual tours, mobility.

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1. Introduction

The world is undergoing significant transformation and evolution. One of the main consequences of the SARS-CoV-2 pandemic is the need to change lifestyles including mobility, especially during the quarantine period. However, not all of the consequences of this situation have negative connotations. The literature states that the modern society is a society in motion and mobility gives the chance to perceive the contemporary world [1]. That is why, when the mobility is limited, in some areas, ICT technologies have created conditions in the form of necessary tools and virtual space (e.g. the Internet) to meet people's needs [2]. Depending on a person's priorities, some digital services are almost substitutable for the traditional ones [3], especially in the era of high popularity and availability of hardware (VR glasses) and software that gives the possibility to exist in virtual reality. For example, virtual museum tours can be used as an interesting tool to promote culture and propagate knowledge.

Museum collections should be treated as the heritage of humanity. As new technologies evolve, every person with a computer (or its substitute) and access to the Internet is enabled to explore these resources [4]. Museums should take up the challenge of spreading knowledge in virtual space and treat it as a mission in which the reward is to build identity and educate communities not only in the region but worldwide.

The benefits associated with the development of virtual walks and museum tours, however, are greater and multidimensional. For example, they concern marketing, financial and social aspects. These e-services are also characterized by relatively low production costs and preparation time. From the technical point of view, it is not a very complicated process, and there are currently many companies on the market providing services for creating such applications. Taking into account the above, as well as the fact that the quarantine time fosters increased interest in e-services, remote work and electronic entertainment [5, 6], the authors formulated the following hypothesis: during the period of the quarantine caused by the SARS-CoV-2 coronavirus pandemic, museums are actively and dynamically developing virtual walks services.

Verification of the veracity of this hypothesis will be carried out by comparing the results of research conducted in August 2019 and April 2020 on the development of services involving virtual walks around monuments and museum centers located in Poland. The authors will also present an evaluation model verified by the Delphic method, as well as the results of the analyses carried out, which will enable the identification of the level at which the studied phenomena are currently located. On this basis, recommendations and instructions will be formulated for museums, indicating how to effectively stimulate development and create attractive virtual presentations of their resources.

2. E-services during the SARS-CoV-2 pandemic

Global ICT markets, as well as other economic sectors, have slowed down considerably due to the expansion of the SARS-CoV-2 coronavirus. It is forecasted that after a sharp decline in the first half of 2020, there will be a significant recovery in the second half of the year. The situation is different for the Internet services. In this area a dynamic increase in the number of users has been observed [7]. This is good information because it shows respect for quarantine rules including the rule of spending time at home. It also means that many people resign from travelling as their mobility (intended spatial movement with the usage of different modes of transport) is also limited by government [8]. The education related to the rules of conduct during the epidemiological threat caused the society to start looking en masse for digital alternatives to traditional services, understanding that: "e-management and e-services can save people's health and possibly their lives" [9].

E-learning has become the focus of attention while adopting at the same time all applications and systems for efficient communication and remote transfer of knowledge. Companies have mostly switched to remote mode of operation, increasing the percentage of teleworkers. Officials, similarly to companies, started to use the Internet tools on a mass scale, enabling the petitioners to handle matters using e-Government. The number of e-commerce transactions has increased and there has been a move away from the traditional cash payment method to e-banking. The quarantine time also caused a massive increase in the consumption of e-services related to culture and entertainment in the broad sense, what happened in all age groups [10].

3. Evaluation model

In August 2019, the first research on the virtual tours of Polish museums was conducted. At that time, 112 digital tours were analyzed, 102 of which were successfully launched. An evaluation model consisting of eight sub-indexes has been used and it will be referred to in this research paper as the "assessment model": MODEL A (Figure 1). The obtained results are presented in a scientific article entitled: "The development of virtual museums in Poland" [11].
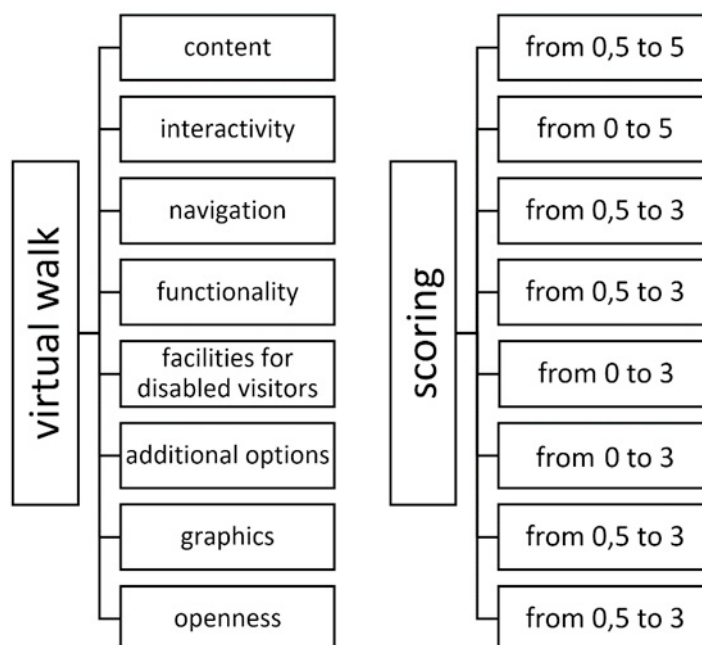

Fig. 1. MODEL A.

In order to increase the functionality and level of objectivity, MODEL A was subjected to expert verification (Delphic study), that was based on assigning individual sub-indexes to three groups of factors: very important, medium and insignificant. For very important factors, the point range from 0 to 8 was adopted, for medium significant factors, the range from 0 to 5, while the factors classified as insignificant were removed from the model. The initial number of identified sub-indexes was 13, of which 11 were used in the final form of an analytical tool. The final list is presented in Table 1.

Table 1. The assignment of sub-indexes to three groups of factors based on the Delphic study.

Very important factors (point range from 0 to 8)	Medium significant factors (point range from 0 to 5)	Insignificant factors (removed from model)
Content Facilities for disabled visitors Development	Navigation	Dedicated software for various devices
	Interactivity	Originality of the solutions
	Functionality	
	Additional options	
	Graphics	
	Openness	
	Intuitiveness	
	Multi-language facilities	

At the same time, experts considered content of information in a virtual walk to be a key sub-index. With this in mind, and in order to eliminate the possibility of creating paradoxical situations (e.g. a very highly rated service with many extensive functionalities and low digital content at the same time), a security has been introduced to disqualify all e-services which received 0 or 1 point in this respect (regardless of the number of points they achieved in relation to other factors). The final form of the model is shown in Figure 2 and in this article will be referred to as MODEL B.
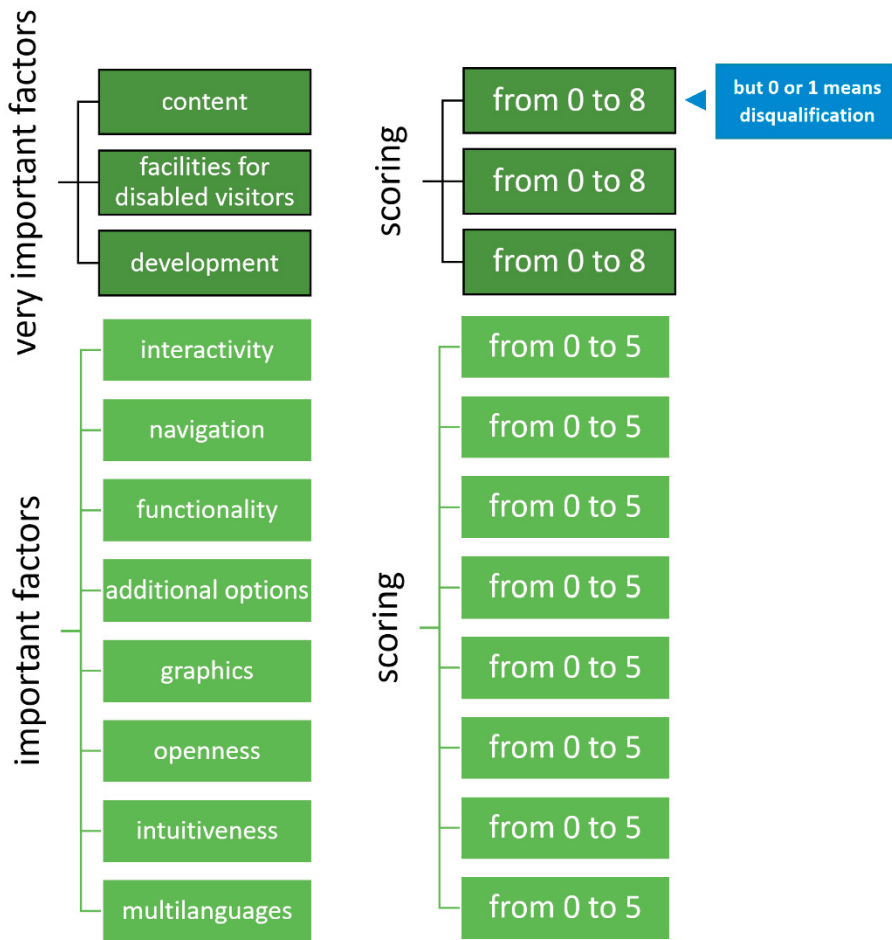
Fig. 2. MODEL B.

The authors interpreted the sub-indexes used as:

- Content - electronic content included in the service and covering all kinds of materials: panoramas, photos of objects, 3d photos, descriptions, etc. (from 0 to 8 points, with the value of 0 and 1 automatically disqualifying the subject from further evaluation);
- Facilities for disabled visitors - especially for visually impaired and hearing impaired, e.g. a lector, narration, voice control, possibility to include subtitles or change the font size (from 0 to 8 points);
- Development - increasing the quantity and quality of digital content, introducing additional options, etc. This parameter was measured by comparing the results obtained in 2019 and 2020 (from 0 to 8 points);
- Interactivity - possibility to perform actions in virtual space (from 0 to 5 points);

- Navigation - functionality that allows visitors to move around during a virtual walk (from 0 to 5 points);
- Functionality - smooth and trouble-free operation of the application, speed of movement between locations and quick content loading (from 0 to 5 points);
- Additional options - additional sounds, music, postcard creation, VR option, etc. (from 0 to 5 points);
- Graphics - quality and graphic attractiveness. Possibility to adjust resolution (from 0 to 5 points);
- Openness - level of freedom of movement in the virtual space (from 0 to 5 points);
- Intuitiveness - the default application handling (from 0 to 5 points);
- Multi-language facilities - the ability to choose a foreign language and the level of its use in various functionalities, options and digital content (from 0 to 5 points).

4. The study results

All virtual walks were verified in similar conditions - one type of equipment was used, the tests were carried out in fixed hours, on working days and with monitored and similar Internet access parameters. All evaluations were made in the period from 6 to 19 April 2020. If a given museum object had several virtual representations, the one with the best quality was assessed (an example is The Museum of Pieskowa Skała Castle, for which as many as four versions of virtual tours were found on the Internet).

In total, 136 virtual services were analyzed, e.g. 34 more than in 2019. This difference is not due to the increase the number of e-services in Poland but to the smaller statistical population in the first study. The location of museums whose e-walks have been audited is shown on the map in Figure 3.

Fig. 3. Location of museums whose e-walks have been studied.

The maximum number of points available was 64, which gives an average of 32 points. The best obtained result was 29 points. The arithmetic mean of the study was 12.5 points and the median was 12 points. Due to too low a score in the sub-index "content" (0 or 1 point), 17 entities were eventually disqualified (so 117 items remained in the final statement). The minimum value of the disqualified service was only 2 points, while among the qualified services the value was 7. Among the rejected e-tours in Polish museums the highest score was given to The Amber

Museum in Krakow. The museum got as many as 16 points. Eventually, after the disqualification, the arithmetic mean increased to 13.5 points and the median reached 13 points. The top 10 best results are presented in Table 2.

Table 2. Top 10 of the best virtual walks in Poland in 2020, according to the evaluation using MODEL B.

No.	Museum	Content (2-8)	Facilities for disabled visitors (0-8)	Development (0-8)	Navigation (0-5)	Interactivity (0-5)	Functionality (0-5)	Additional options (0-5)	Graphics (0-5)	Openness (0-5)	Intuitiveness (0-5)	Multi-language facilities facilities (0-5)	Sum
1	The Museum of Pieskowa Skała Castle	5	1	0	2	1	3	4	4	2	3	4	**29**
2	The Chateau Museum in Pszczyna	4	0	0	4	0	3	2	4	2	3	4	**26**
3	The Auschwitz-Birkenau State Museum in Oświęcim	3	1	0	4	0	3	3	5	2	3	1	**25**
4	The Museum of Folk Architecture in Sanok	3	1	2	3	0	2	4	4	2	3	0	**24**
5	Polish Aviation Museum in Cracow	3	2	2	3	0	2	3	3	1	2	2	**23**
6	The Wawel Castle Museum National Collection of Arts	3	2	0	4	0	2	3	3	2	2	1	**22**
7	The Westerplatte and War Museum 1939 in Gdansk	4	1	0	2	1	2	3	5	2	2	0	**22**
8	The Museum of the Lubuskie Land in Zielona Góra	4	1	0	2	2	3	2	3	1	2	0	**20**
9	The Książ Castle	3	2	0	3	1	2	2	3	1	2	1	**20**
10	The Walim Drifts Museum	3	2	0	3	0	3	3	3	1	2	0	**20**

The influence of individual sub-indexes on the final result was strongly differentiated. This has been presented in detail in Figure 4.
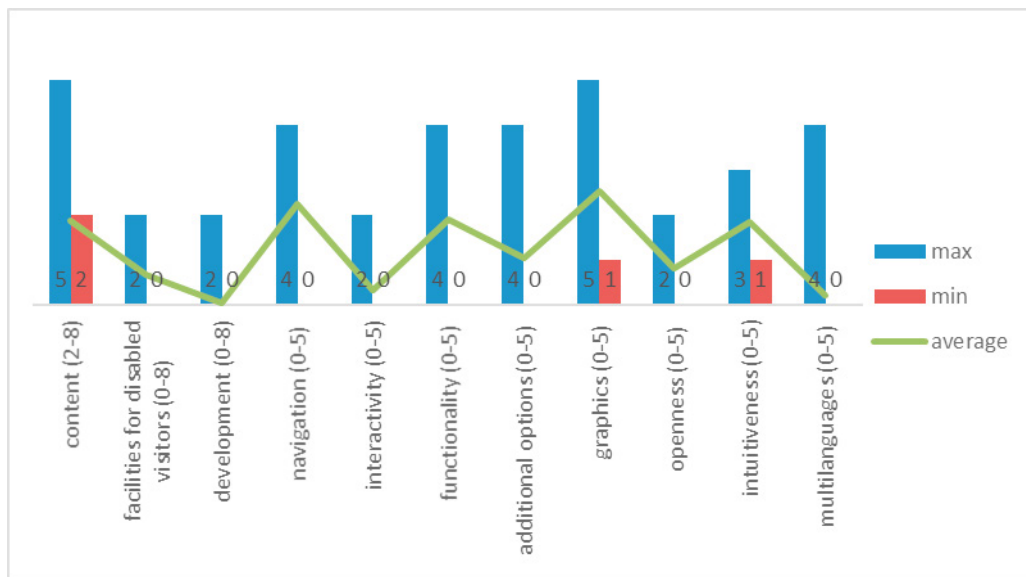

Fig. 4. Values obtained for individual sub-indexes (maximum, minimum, average).

The sub-indexes that obtained the highest values were: content and graphics - 5 points each (with the maximum possible score for graphics). The next places were ex aequo: navigation, functionality, additional options and multi-language facilities (4 points each). The worst results (0) occurred in 8 cases. The average of the results obtained in Figure 4 is an indication of which sub-indexes e-walks scored the highest notes. It emerges that the highest value in this respect was achieved by the graphic design. On the other hand, development and multi-language facilities scored relatively poorly. According to the results, only 17 out of 134 surveyed e-walks had the option of choosing a language other than Polish. It is particularly worth pointing out to the fact, that in two cases: The Museum of Pieskowa Skała Castle and The Chateau Museum in Pszczyna, the website creators prepared the option of choosing one of as many as five foreign languages, thanks to which, in relation to this sub-index, these two museums obtained the highest values in the entire analysis (4 points each), while taking the first two positions in the general ranking.

5. Summary and conclusions

The adoption of the Lisbon Strategy by the EU in 2000 [12] was aimed at accelerating the development of the information societies. One of their basic elements is e-services in the broad sense, which at a dizzying pace penetrate even critical areas of human existence, an example of which is remote surgery. Stimulating the development of e-services is primarily aimed at achieving measurable economic and social benefits. However, there are certain risks. One of them is delay in the implementation and adoption of digital technologies and services. In the modern international community, such information exclusion increasingly often means social exclusion [11].

One of the e-services are digital museums, whose most spectacular element is a virtual tour. Undoubtedly, this service deserves to be called a promoter of culture, that turns to be especially effective during international quarantine and orders to spend time at home. In this regard, it is important that the virtualization of museum resources could be constantly monitored and supported, not only financially, but also, for example, by carrying out analyses and pointing out areas that require special attention.

In the world of ubiquitous information domination, the role and tasks of museums have expanded, as previously unavailable possibilities of registering, archiving and promoting collections in digitized versions have emerged. Moreover, it has also been observed: "...creative activity - creation of culture, reality, sometimes art realized in the digital virtual area"[13]. The implementation of ICT in the museum sector has made the monuments and exhibits a tourist attraction accessible to all [14].

There are multiple benefits of virtual museum tours. The most important ones from the economic and social point of view are [15]:

- Dissemination of new technologies, creation of new goods and services as well as support for creativity;
- International branding and increased territorial attractiveness;
- Economic diversification, new jobs and revenues through the development of cultural and creative quarters.
- Better quality of life;
- Higher level of social capital;
- Knowledge development and upskilling;
- Higher number of culturally aware and open communities;
- Diffusion of creativity;
- Role of a partner in education process.

The research, whose final results are presented in this study, shows that there were significant differences in the rankings of 2019 and 2020. However, the differences in positioning of the same museums did not result from the change of the services themselves, but rather from the use of different research tools (MODEL A in 2019 and MODEL B in 2020). Additionally, the research sample has been increased (up to 136 items), which also influenced the final results.

It was observed that between August 2019 and April 2020, 3 virtual tours were removed (or stopped working) from the Internet, and in further 17 ones, some features and options were damaged. This shows a lack of consistency in the IT operation and digital "maintenance" of the applications. Museums, in most cases, were located in the southern and central part of Poland, and the largest concentration of entities was observed in the city of Krakow.

It should be underlined that the final score is very much influenced by the "IT engine" on the basis of which the service operates. Some of the applied IT solutions are widely known and popular all over the world, e.g. Street View, while others are either specially dedicated or are a commercial tool developed for a group of recipients. Depending on a given tool, a certain digital tour can have almost "automatic" functionalities built into the application (such as a reader or the possibility of verifying the font in descriptions), which directly translates into a higher score. However, it is often the authors and creators of the service that decide whether or not to use the possibilities offered by such software and to what extent to fill it with content.

In Poland, the authors have observed an interesting phenomenon consisting in the regionalization of used "IT engines". Such a phenomenon appeared so often that one can be sure that there is a strong connection between the region and the application used. The authors presume that the reason may be the collective financing from one project or regional exchange of information and experience in this area. Another very common practice is to "include" the museum in a virtual tour of the whole village. This mainly concerns small and medium-sized towns. Most often, in such cases, a virtual museum tour is limited to a small number of digital panoramas and can be considered as not very attractive.

In view of the available results and analyses and considerations carried out, unfortunately, the hypothesis presented in this study must be rejected. The fact that the hypothesis cannot be accepted is mostly evidenced by the fact that out of 134 services, only 3 museums extended the e-tour with new digital content. At the same time, in the period between 2 researches (from August 2019 to April 2020) only 2 new services were identified.

When making a final assessment of the level of development of virtual museum tours in Poland, it should be noted that it is at a very low level. This is most evident from the fact that the best score obtained (The Museum of Pieskowa Skała Castle) was only 29 points, which is 3 points lower than the average score possible to obtain. Additionally, taking into account both the results before and after the disqualification, in both cases the medians were lower than the arithmetic averages, which clearly proves that the services with poor scores dominated in the study.

6. Recommendations

1. EU development funds should be used more often and more effectively [16].
2. The level of informational skills and awareness among museum staff should be increased.
3. Museums should apply the principle of "good practice" and not be modelled on poor quality services provided by other institutions in the region.
4. The percentage of remote employees during a pandemic should be increased.
5. Cooperation with the social sector should be extended, e.g. by building digital communities gathered around the museum, its collections and history [17]. This will allow to obtain interesting ideas, to support IT work on a voluntary basis, and to obtain more collections (e.g. in digital version) from local collectors.
6. The service should have permanent IT, content and management support, which will ensure its proper functioning, expansion, and attractive advertising of the museum (the success of the service can only be achieved through interdisciplinary cooperation [18]).
7. Museums should treat the development of e-services related to virtualization as a great opportunity [19].
8. The approach to creating virtual walks shouldn't be 'one-size-fits-all' - it should be original and innovative.
9. The lack of a collection can be compensated for by other functions like a more detailed presentation, adding the possibility of visiting the building from the inside and outside, adding the option of a walk at different times of year and day, etc.
10. The virtual walk should be constructed in a way that gives the visitor the impression of the greatest possible freedom and openness as well as a large number of different types of interactions [20] - only then it can be competitive with other services giving access to the virtual space (such as computer games).
11. The potential and resources of museums should be fully used. One service should combine content in different forms like for example panoramas, photos of 3D objects, films, sounds, music.
12. The creative tools of the application, by means of which the virtual walks function, should be fully used.
13. The accessibility to the service should be improved by translating the content into at least English and also the number of facilities for disabled visitors should be increased.

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