Digital Transformation: A Study of the Actions Taken by Museums During the Pandemic

Rodolfo Menezes, June Marques Fernandes, André Luis Silva and Luciana Paula Reis
Federal University of Ouro Preto, Brazil

rodolfo.menezes@aluno.ufop.edu.br
june@ufop.edu.br
andre.silva@ufop.edu.br
lucianapaula@ufop.edu.br

Abstract: The Covid-19 pandemic impacted the world economies. Among the most affected sectors is the service sector, with the tourism segment standing out. Museums, parks, theatres, and tourist monuments had a great challenge with the period of social detachment. Digital transformation was the way adopted by companies to connect with their audiences and, consequently, contribute to the different segments of the value chain such as accommodation, transport and leisure and recreation. Thus, the managers of tourist attractions bet on entrepreneurial actions supported by digital transformation to change the business model in the face of the new pandemic scenario. The literature is still scarce to explore these actions adopted by museums worldwide. Thus, the research aims to identify the actions related to digital transformation adopted by museums in Ouro Preto during the pandemic period and compare them with the actions adopted by other museums around the world. Ouro Preto is a historical city of Brazil, conferred by Unesco. These museums are one of the main attractions of the city, whose economy is anchored in this segment of the service sector. This research comprises a Systematic Literature Review, using the PRISMA method. The literature served as a basis for the preparation of the protocol for collecting information from museums in Ouro Preto, guiding the comparative study of the actions practiced by them and compared with actions in the world. The study identifies the digital presence of museums on social platforms and verifies the reaction of these organisations to the pandemic. The information was collected in 12 museums. The protocol was answered through secondary data published on Facebook, Twitter, Instagram and digital platforms used by the museums. The results show differences between the strategies of Ouro Preto museums and other museums. It was observed that Ouro Preto museums adopted a more passive strategy when compared to the strategies adopted by other museums in the world. This result demonstrates the lack of an improvement agenda of adopting advanced technologies to increase the added value of museums.

Keywords: Museums, Digital transformation, Covid-19, Tourism, World heritage

1. Introduction

COVID-19 affected the tourism sector due to the limitations of social isolation, supply chain supply, accumulated demand problems and idleness of installed capacity on certain dates (Morse *et al*., 2022; Ahmed, 2021; Agostino *et al*., 2020b). Tourist attraction organisations such as museums, parks, theatres, and tourist monuments, have a social commitment, and due to the lockdown, there was a need for these organisations to innovate, carrying out a digital transformation movement in the sector (Agostino *et al.*, 2020b).

Digitalization was relevant to maintain a relationship with its audience, allowing the execution of its mission and, consequently, to generate a more favourable post-pandemic scenario. Museums were one of the organisations in the tourism ecosystem that invested in digital transformation to maintain the interest of tourists and create competitive differentials for regions where the economy is based on tourism (Morse *et al.*2022; King *et al.*, 2021; Tan e Tan, 2021; Wang *et al.*, 2021).

The studies presented in this systematic review address the digitalization of museums in a pandemic period in a theoretical way (Jenny Kidd *et al.,* 2022; Carlos de las Heras-Pedrosa *et al.,* 2022; Giannini e Bowen, 2022; Wang *et al.,* 2021) other empirical (Morse *et al.,*2022; King *et al.*, 2021; Tan e Tan, 2021; Agostino *et al.*, 2020a; Agostino *et al.*, 2020b; Uo, 2020).

Most empirical studies address the context of countries in specific regions. Only one study compares actions of four developed countries (Morse *et al.*, 2022). However, it was not found any comparative study of actions that makes contrast with Brazil. Thus, the aim of this research is to analyze the digitalization actions adopted by museums in Ouro Preto (Brazil) during the pandemic period and compare them with the actions adopted by other museums around the world. The museums of Ouro Preto (Brazil) are recognised by UNESCO as World Cultural Heritage. To this end, the PRISMA method was used to conduct the Systematic Literature Review (SLR). Articles that pointed to digitalisation actions developed in the context of museums were searched for. The articles were searched in the databases "Scopus" e "Web of Science", in the period from 2020 to April 2023, with the following search word: "museum, Covid 19, tourism and digital migration". From the SLR, a protocol was

developed to collect information from 12 museums in Ouro Preto, to compare them with the activities carried out by museums around the world.

As a result, a comparative spreadsheet of the digitalisation actions adopted by museums in Ouro Preto in relation to other museums in different countries was prepared. Through the collected data, it was possible to analyse the effect of the pandemic on tourist attraction organisations. These results become relevant because some regions are economically dependent on the income from tourism.

This paper presents a literature review on museum digitisation, following the explanation of the research methodology supported by the PRISMA method. Subsequently, it expands to analyse the results of the protocol applied in the museums of Ouro Preto (Brazil) and the data collected by SLR that compares the achievements of museums in the world, during the pandemic period. To present the conclusion that synthesises the main findings of the research and provides recommendations for future actions in the context of digitalisation of museums.

2. Digitalisation of Museums

The pandemic has highlighted the importance of digital transformation for organisations and how digital technologies have impacted the market and customer consumption habits (Hanelt *et al.*, 2021; King *et al.*, 2021; Tan e Tan,2021; Wang *et al.*, 2021). Digital transformation is an organisational axis based on people and processes, driven by digital technologies (Wagner e Wäger, 2019).

Digital technologies stimulate change and are present in several digital transformation studies. These technologies can be grouped into Social, Mobile, Analytics, Cloud, and Internet of Things (SMACIT) and blockchain, robotics, artificial intelligence, and quantum cognitive computing (BRAICQ) (Morse *et al.,* 2022; Hanelt *et al.*, 2021; Van Veldhoven e Vanthienenen, 2021; Wang *et al.*, 2021). The adoption of these digital technologies allowed museums to adapt to new social demands, which was intensified by the pandemic (Morse *et al.,* 2022).

To identify the digitisation actions mentioned by the five analyses studies (Morse *et al.,*2022; King *et al.*, 2021; Tan e Tan, 2021; Agostino *et al.*, 2020a; Agostino *et al.*, 2020b; Uo, 2020) and compare them with the data collected in Ouro Preto, Table 1 was elaborated.

Table 1: Digitisation Actions Carried out by Museums

Digitisation actions	Authors (source)							
	Agostino *et al.* (2020a) (Italy)	Ou (2020) (China)	King *et al.* (2021) (England)	Tan and Tan (2021) (Singapore)	Morse *et al.* (2022) (Luxembourg)	Morse *et al.* (2022) (USA)	Morse *et al.* (2022) (France)	Morse *et al.* (2022) (Japan)
Social media (Twitter, Instagram and Facebook).	X	X	X	X	X	X	X	X
Social media content management.	X	X	X	X	X	X	X	X
Increase in social media posts.	X	X	X	X	X	X	X	X
Informative posts about the exhibited works.	X	X	X	X	X	X	X	X
Advertising by public bodies.	X							
Virtual visits.	X	X	X	X	X	X	X	X
Synchronous operations.	X	X	X	X		X	X	X
Asynchronous operations.	X	X	X	X	X	X	X	X
Partnership with other museums.		X	X			X	X	

Digitisation actions	Authors (source)							
	Agostino *et al.* (2020a) (Italy)	Ou (2020) (China)	King *et al.* (2021) (England)	Tan and Tan (2021) (Singapore)	Morse *et al.* (2022) (Luxembourg)	Morse *et al.* (2022) (USA)	Morse *et al.* (2022) (France)	Morse *et al.* (2022) (Japan)
Gamification of attractions and exhibitions.	X	X	X		X		X	
Thematic exhibitions.		X	X	X				
Themed online lectures.		X		X				
Online courses.		X	X	X		X		
Live broadcasts of scientific experiments.		X				X	X	
Adoption of innovative technologies or platforms.		X	X		X	X	X	X

Source: Developed by the author

The Chinese Museum (Ou, 2020) was the one that most developed actions in a clear and specific way when compared to the other studies. All museums' digitisation actions regardless of nationality focused on connecting with customers (Morse, *et al.*2022; Tan e Tan, 2021; Agostino *et al.* 2020a; Uo, 2020). To do so, they have adopted social media, which is one of the pillars of Social, Mobile, Analytics, Cloud and Internet of Things technologies (SMACIT) (Ou, 2020). Only in the digitisation study of the Italian museums that there was a record of government publicity in the actions developed by the entities (Agostino *et al.*, 2020a).

3. Methodology

To guide the research, museums' practices in relation to the pandemic were checked in the databases "Scopus" e "Web of Science". The PRISMA method was applied for the development of the Systematic Literature Review (Page, 2021; Prisma, 2020). The following terms were searched "museum, Covid 19, tourism and digital migration". Subsequently, the works were restricted to the year 2020 until April 2023. Thus, 144 scientific papers were found and after automatic restriction, 104 articles were excluded for not being in English, or being duplicates or not being found in the full version. Thus, forty articles were analysed, which underwent a critical analysis to make a full text review .

After this review, 9 articles were selected that presented the theme digital transformation applied to museums and were aligned with the scope of this study. Of these articles, 4 address the theme in a theoretical way (Jenny Kidd *et al.,* 2022; Carlos de las Heras-Pedrosa *et al.,* 2022; Giannini e Bowen, 2022; Wang *et al.,* 2021) and 5 papers present an empirical approach (Morse *et al.,*2022; King *et al.*, 2021; Tan e Tan, 2021; Agostino *et al.*, 2020a; Agostino *et al.*, 2020b; Uo, 2020). For this study, only articles with an empirical approach were taken into consideration to then proceed with the comparison with the data collected in the museums of Ouro Preto.

From the SRL a protocol for data collection was elaborated, which was essentially based on questionnaires that were applied by the research team at the museums of the historical city of Ouro Preto (Minas Gerais, Brazil). From the questionnaires it was possible to characterize the form of operation, activities, exhibitions, virtual programming and rules for providing services at a distance. In addition, the researchers resorted to the analysis of documents and reports, from which it was sought to identify the administrative decisions taken and services provided through digital channels. Only after this step was it possible to perform an analysis of decisions made by museums about the digitalisation actions adopted by the 12 museums in the city of Ouro Preto during the Covid-19 pandemic. As a source of secondary data, data collection from these institutions was carried out in their official digital pages (website, Facebook, Twitter, Instagram, and digital platforms). Thus, it was possible to

monitor and gather information to compare the actions of these museums with other museums in the world analyzed by international studies.

Thus, for data analysis a comparative table of the actions adopted by Ouro Preto museums and the museums portrayed by the researched literature was prepared, since the literature presents realities of museums from different countries.

4. Analysis of Results

The presentation of the results was divided into two parts: i) characterization of Ouro Preto museums, ii) comparative study of Ouro Preto museums with museums analyzed from the literature.

4.1 Characterization of Ouro Preto Museums

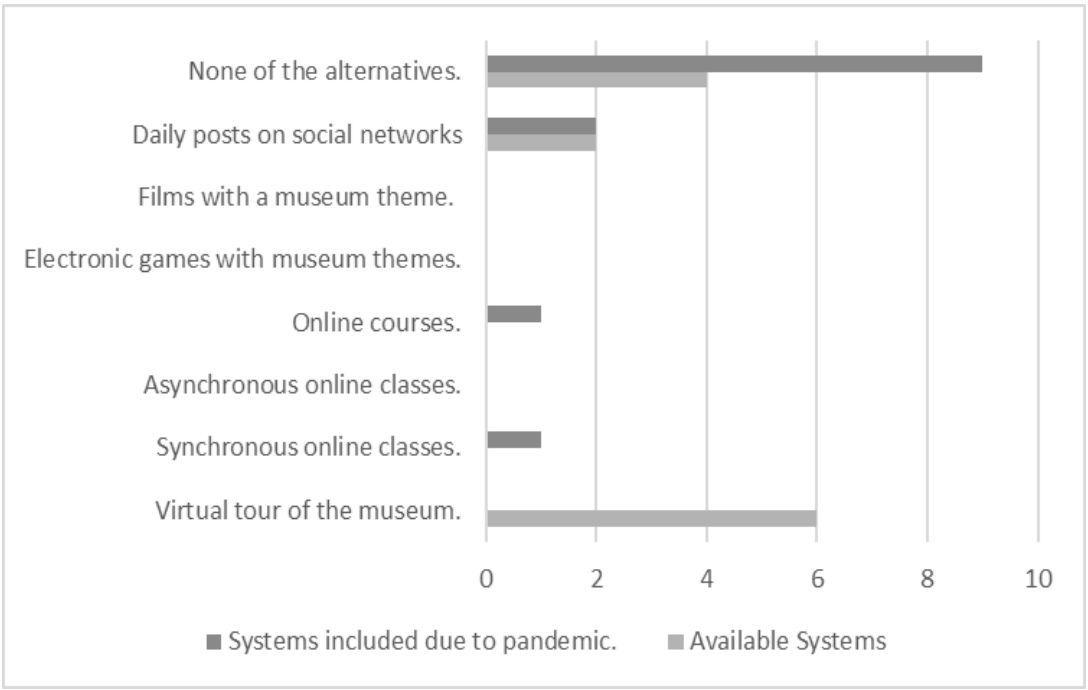
All museums in Ouro Preto, paused their in-person activities on March 16, 2020 and started to work remotely, although 42% of Ouro Preto museums have not digitalized their activities. In the first studies published in 2020 the Italian (Agostino *et al.*, 2020a), records the closure of face-to-face activities on 8 March 2020. In China, museums stopped face-to-face activities on 25 January 2020 (Ou, 2020). The other studies in table 1 do not report the period of confinement, as the pandemic hit each nation differently, creating distinct scenarios.

The data collected in Ouro Preto show that not all museums used the same strategy with specific activities due to the pandemic. The numbers also reveal that some institutions had already made changes in their business models with the use of tools SMACIT, fundamental to the transition to the digital world, prior to the Covid-19 outbreak. The data collected by this research reveal that 58% of the museums in the city of Ouro Preto were operating at a distance, using virtual resources to stay in business.

Of the twelve museums in Ouro Preto, only two (16.7%) did not have websites, however, 75% of the museums interviewed have some kind of social network, in which 58% have at least Facebook as a mobile channel of relationship with visitors, and 50% have Instagram. There are 17% of museums that work with blogs.

However, social media does not mean posting frequency and customer relationship, because if they are not fed with educational or advertising content they do not allow the creation of an audience and the effectiveness of their strategic mission. 58% of the organizations in Ouro Preto are on the social networks Instagram and Facebook, and 17% of the museums have a content calendar with at least 8 posts per month.

The digitalization actions implemented by Ouro Preto museums in their business models, especially during the pandemic, are represented in Figure 1.



Source: developed by the author

Figure 1: Digital Strategies Developed by Ouro Preto Museums

The response shows that 50% of the interviewed museums already had a virtual visitation system before the pandemic, indicating that museums in Ouro Preto were already planning to adapt to digital transformation and its technologies.

This data shows a concordance of services provided and not a differentiated competitiveness tactic according to their organizational perspective. Another indication is that 75% of the museums have not developed any strategy or change due to the pandemic. Therefore, technological advances in Ouro Preto museums were not stimulated by the impediment imposed by the covid-19 pandemic.

4.2 Comparative Study of Ouro Preto Museums With Analysed Museums From the Literature

After analyzing the data collected in the museums of Ouro Preto (Brazil), it was possible to compare the strategies used by the studied museums. Table 2 presents the structure of the digitalization actions of the museums analyzed in this research, which will guide the discussion of the results.

Table 2: Digitisation Actions Carried out by Museums (Comparative)

Digitisation actions	Authors (source)								
	Agostino *et al.* (2020a) (Italy)	Ou (2020) (China)	King *et al.* (2021) (England)	Tan and Tan (2021) (Singapore)	Morse *et al.* (2022) (Luxembourg)	Morse *et al.* (2022) (USA)	Morse *et al.* (2022) (France)	Morse *et al.* (2022) (Japan)	Results for Ouro Preto (Brazil)
Social media (Twitter, Instagram and Facebook).	X	X	X	X	X	X	X	X	X
Social media content management.	X	X	X	X	X	X	X	X	X
Increase in social media posts.	X	X	X	X	X	X	X	X	X
Informative posts about the exhibited works.	X	X	X	X	X	X	X	X	X
Advertising by public bodies.	X								
Virtual visits.	X	X	X	X	X	X	X	X	X
Synchronous operations.	X	X	X	X		X	X	X	X
Asynchronous operations.	X	X	X	X	X	X	X	X	X
Partnership with other museums.		X	X			X	X		
Gamification of attractions and exhibitions.	X	X	X		X		X		
Thematic exhibitions.		X	X	X					
Themed online lectures.		X		X					
Online courses.		X	X	X		X			
Live broadcasts of scientific experiments.		X				X	X		
Adoption of innovative technologies or platforms.		X	X		X		X		

Source: Developed by the author

In all the studies on museums, the intensive use of digitalisation through social networks (Facebook, Twitter and Instagram) was observed, which is in line with the strategies adopted in Ouro Preto and demonstrates a new consumption behaviour by users, since the institutions have adopted this practice.

Agostino *et al.* (2020a) show the growth of the museums' posts, which went from twenty to forty monthly posts on Facebook and from 15 to 33 on Instagram. In Brazil, the average number of posts was 8 per month on Instagram and Facebook. Unlike China and Italy, where Twitter was the most used social network (going from 32 to 60 posts per month), in the studies on the United States, France, Luxembourg and Japan a 300% increase in social network activities was reported, while in the studies on England and Singapore twice as many posts were reported compared to before the pandemic.

The Chinese museum, unlike Brazil and Italy, has tested new tools such as Tencent Video, CCTV News e Yangshipin for conferences and online courses, which tuned in a total of 427,796 viewers (Ou, 2020). In France and the United States, simulations in augmented and virtual reality have been included in some attractions (Morse *et al. 2*022).

Museums have experimented with different approaches to engage the public, from video games in the US and France to book clubs in Luxembourg and even a virtual gala parade developed by the Metropolitan Museum of Art, (Morse, C. *et al. 2*022). The National Gallery in England created a meditation exercise on YouTube that included breathing exercises while viewing artworks (King e*t al*. 2021; Morse *et al. 2*022). The same YouTube meditation technique strategy has been reported in Singapore museums (Tan and Tan, 2021).

Museums in Italy have made use of the media networks to publicise their collection: with (unpublished) data on works of art, interviews with experts, guided tours by the museum director, treasure hunts in exhibitions (Agostino *et al.* 2020a). The Chinese museum hosted 7 live and online lectures, focusing on topics such as virology, public health, epidemic prevention, physics, zoology, psychology and Big Data (OU, 2020).

In Ouro Preto (Brazil) there was no record of lives or specific events, the strategy used was similar to the Italian museums in the dissemination of their collection. Some exhibitions were converted into virtual visits, with online classes for students and live broadcasts of scientific experiments, besides rewards for quizzes, guessing games and other activities. (Ou, 2020). On the other hand, virtual tours in Ouro Preto already existed before the Covid-19 pandemic. In all the studies analyzed at least one museum in the study already had virtual tour availability.

China set a record with the virtual exhibition "The New PK - Fighting the new coronavirus", which received 5 million virtual visitors in just one month (Ou, 2020). As noticeable, the tactics showed a significant difference, but the Chinese museums stand out in the virtualization process for generating value in its online activities compared to the other museums studied, as it was the pioneer, being the first to close and rethink the activities, since the outbreak of covid 19 started in China.

The financing of the museums' actions was compared, so museums in Ouro Preto had help (public or private) that allowed them to access technologies. 58.7% of the museums had help from partners such as universities, banks, petrochemical companies, foundations, etc. In the texts from Agostino *et al.* (2020a) and Ou (2020), government aid is noted. In China, there is no record of private partnerships. In Italy, on the other hand, some museums are private. In the study of (King e*t al*. 2021; Morse *et al. 2*022) investment aspects and source of funds are not reported.

5. Discussion

Based on the comparisons between the application of questionnaires in Chinese and Italian museums, which were pioneers and compared with other studies on the subject after 2020, until 2023, Ouro Preto museums have developed fewer actions and activities in relation to the actions described in Agostino *et al*. (2020a), Uo (2020), King *et al*. (2021), Tan and Tan (2021), and Morse *et al*. (2022).

Ouro Preto (Brazil) is a historical city, title given by Unesco. Thus, it is classified with exhibits that show the history of the country in its region. This way, its public is quite restricted and, when compared to other museums in the world that have published studies on its activities in pandemic period. The greatest similarity of Ouro Preto actions is with Italian museums, which, for the most part, are historical museums as well, therefore, they have greater similarity in performance (Agostino *et al*., 2020a; Agostino *et al*., 2020b).

The studies of King *et al*. (2021) which focus on museums in England have a relevant base of historical museums, but, like those in Morse *et al*. (2022) which included thematic, science and arts museums in its research, this makes the adoption of technologies and actions greater. As is the case in China portrayed by Uo (2020) which focuses its research mainly on activities of the China Science and Technology Museum (CSTM).

Thus, this study demonstrates the need to continue to investigate museums worldwide, but creating specific research on museums of a specific category, because the strategies of action are different, when comparing the

studies and the strategic actions adopted of historical museums, with the thematic museums and science museums.

It is noticeable that museums, according to the exhibition type classification, adopt more technologies and thus innovate. However, studies are relevant to direct these actions, so that all museums are up to date, without distinction of categories and thus can continue with their mission.

The Chinese museums of Uo (2020) and Singapore Tan and Tan (2021) are with more developed actions, as they are studies in science museums, and, regarding research in England, as pointed out by King *et al*. (2021), along with the studies of Morse *et al*. (2022) of Luxembourg, France, Japan and the United States, have their bases mixed with museums of all categories, so the number of shares adopted by the museums delayed in this article are higher.

Ouro Preto museums increased their postings by 75% on social media, when comparing with the studies of (King *et al.*, 2021; Tan and Tan 2021) which reports a 200% increase in posts in England and Singapore. And the studies of (Morse *et al*. 2022) that reports an average increase of 250% in social network activities in the countries studied.

This study highlights that all museums have tried to get closer to their customers digitally through social media, and content generation (Morse *et al.,*2022; King *et al.*, 2021; Tan e Tan, 2021; Agostino *et al.*, 2020a; Agostino *et al.*, 2020b; Uo, 2020). Given that the adoption of digital technologies such as augmented and virtual reality, and video gamification strategies in thematic and scientific museums (Morse *et al.,*2022; King *et al.*, 2021; Tan and Tan, 2021; Uo, 2020).

Thus, we realise that the actions of digitisation of museums are more linked to the type of museums, rather than their nationality and funding policies, which contributes, but was not the focus of the studies researched by this SLR.

In this way, the study demonstrates distinct strategies and different paths of each museum institution, but most museums sought to approach customers through social networks. In this way, it is evidenced the need for museums to digitize themselves to make available new technologies, which allow the involvement of the public.

By analyzing the actions and strategies of all the museums studied, it is possible to note a more cautious and traditional posture of Ouro Preto museums in the midst of the Covid-19 pandemic. This research shows that Ouro Preto museums did not have a plan to change their business model, during the pandemic, but were already developing some actions for digitization. The other studies show that thematic and science museums are more prepared for technology inclusion and accelerated in the digital transformation process when compared to history museums.

Thus the present article has allowed us to gather and identify that the number of studies on the digitisation of museums has increased, and that several authors have contributed to the process, but also allowed us to identify that the data collected and portrayed are different and based on the classification of museums studied.

Thus, it would help the academic community in future studies, research more segmented by the type of museums and their actions, to have a fairer comparison. At the same time, in which several studies analyse the digitalisation actions of museums regardless of segment, the need for updating by all museums increases.

6. Conclusion

The pandemic caused by Covid-19 had a major impact on the tourism sector. As this research shows, museums were one of the main tourist spaces that invested the most in digitalization to maintain the interest of visitors and the creation of competitive differentials for the regions.

Thus, this study evaluated the adaptations of Ouro Preto museums, identifying the process of digitalization of the business model, comparing the actions of different museums.

From the comparisons made by the application of the protocol based on the research of Chinese and Italian museums, which were selected for being pioneers and compared with other studies on the subject after, 2020 to 2023, it can be seen that the museums of Ouro Preto have developed fewer actions and activities if compared to the actions described in the articles of Agostino *et al.* (2020a), Uo (2020), King *et al.* (2021), Tan and Tan (2021), and Morse *et al.* (2022).

The migration of the museums analysed in this study to the digital medium was marked by new SMACIT technologies and customer relationship strategies arising from the social distancing measures imposed by SARS-CoV-2.

The pandemic affected all museums, but the way each one adapted to the innovative technologies and changed its business structure was different. Although in Ouro Preto few new technologies are adopted, virtual tourism actions and the institution's official website were already practiced by the organizations before the pandemic.

It is also observed that museums are in the initial phase of digitization, since they only applied SMACITS technologies, and even with studies being carried out, BRAICQ technologies were not included in the tourist attractions.

This research enabled the mapping of technologies and actions for physical-digital migration in the museum sector, comparing the deficits presented with those of other countries and enabling new partnerships for Ouro Preto museums, keeping the museums' visibility active in adverse times.

For future researches it is indicated the investigation in researches about public policies that improve and encourage the operation and maintenance of museums, because the reviewed articles do not point directions on the government support essential to stimulate the sustainable growth of tourism. This type of research has contributed so that museums can carry out the adoption of modern technologies such as BRAICQ and evolving in their digital transformation journeys.

With this study, we realise that digitalisation is a relevant topic, and has several paths to be taken, but interaction with the public is essential and social media is the chosen path, so we must improve the strategies and ways of creating content for this new context in which the market is inserted.

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