

Working paper: Italian Museums drive or are driven by the digital transformation? An empirical analysis

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ABSTRACT

Digital transformation describes a business change that may be revolutionary to an organization or industry, but only few studies have investigated how cultural organizations relate to it. Specifically, focusing on museums, mostly a case study approach is used to explain factors linked to the introduction of a single solution. Moreover, marketing studies mostly consider visitors' experience avoiding the museum management perspective.

This research investigates digital transformation in Italian museums to understand how they face the challenge. A quantitative approach is adopted through the online distribution of a questionnaire to Italian museums. A model is designed and tested in order to (1) map the digital transformation with the objective of finding similarities and differences between clusters; (2) show the degree of adoption of digital innovations by detecting dynamically how they are positioned along the adoption life cycle; (3) measure museums' willingness to further adopt digital innovations; (4) identify reasons of non-adoption.

Keywords: digital transformation, museums, Italy, innovation process, stakeholders

1. Introduction

Digital revolution has shaped every industry and the adoption of technological innovations has demonstrated to be essential for firms to remain at the cutting edge of the competition (Sundbo and Darmer 2008). The profound transformations generated by the introduction of new technologies have been at the basis of the paradigm shift in the cultural and creative industries affecting now also museums (Leoni and Cristofaro 2021, Nuccio and Bertacchini 2022).

There is a widespread awareness that cultural organizations can benefit in many ways from the adoption of digital technologies (Cori and Fraticelli 2018, Mason 2022) however it requires careful management and resource planning (Guarino, Di Palma et al. 2020). The technology range itself is vast and technologies can be used in museums in many ways (Damala, Ruthven et al. 2019) both 'in situ' and online (Guccio, Martorana et al. 2022, Yuce 2022).

Thanks to the adoption of these technologies, museums have progressed from being considered a place in which objects of cultural interest are collected, preserved, stored, and exhibited to a place in which visitors are emotionally stimulated and can live memorable experiences (Leoni and Cristofaro 2021, Khalil, Kallmuenzer et al. 2023) overcoming physical limitations (Pett 2022). In fact, in Prague, on 24 August 2022, the Extraordinary General Assembly of ICOM has approved the proposal for the new museum definition as follows: *"A museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. Open to the public, accessible and inclusive, museums foster diversity and sustainability. They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing"* (ICOM website).

In more recent years, immersive technologies such as Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) have garnered significant interest in the museum sector (Barrile, Bernardo et al. 2022), presenting new opportunities for enhancing visitor experiences and cultural valorization (Fan, Jiang et al. 2022, Tom Dieck, Han et al. 2022). These technologies enable visitors to explore museums' content in a more comprehensive and captivating manner (Lee, Jung et al. 2020, Li, Wider et al. 2023). However, the adoption of these technologies is not without challenges and requires a deep understanding of both the advantages and limitations within cultural contexts (Colamatteo, Sansone et al. 2024).

Curatorship literature has already demonstrated how technologies in museums are beneficial for increasing their accessibility, engagement and attraction (Davies 2001, Wong and Chiu 2023).

A common tenet is that digitization affects the scope and the mission of museums and impact transversally on their activities (Fernández-Blanco and Prieto-Rodríguez 2020). Furthermore, the adoption of technological innovation in museums and its effects are likely to depend on their specific features, such as size (Camarero, Garrido et al. 2011), governance and degree of autonomy (Bertacchini and Morando 2013, Leva, Menicucci et al. 2019).

Looking at museums, Italy represents a valuable case study with respect to digitalization effects. In fact, the major Italian museums are currently engaged in choices regarding the adoption of digital technologies. However, evidence suggests that these choices are not always the result of a clear perception and of a careful reflection about opportunities and limitations linked to their adoption (Cori and Fraticelli 2018, Finnis and Kennedy 2022).

Developing appropriate evaluation standards, benchmarks, guidelines, and frameworks to more successfully design, deploy, and maximize the impact of the digital would be a welcome step forward (Damala, Ruthven et al. 2019).

The literature on innovation adoption identifies different dimensions that may affect the decision-making process. First, the literature on regional and urban studies has long agreed that the spatial distribution of innovation is uneven and follows patterns of agglomeration and hierarchy (Brown and Cox 1971, Bokányi, Novák et al. 2022). Second, adoption rate is affected by intangibles resources like human capital and skills which favor the rise of complementarities across different organizational elements (Gómez and Vargas 2012). More recently Cirillo et al. (2023) confirm that more educated and less flexible workers positively influence the probability and intensity of adoption of new technology in a sample of Italian firms. Finally, organizational studies also stress the role of leadership in pushing technological change (Damanpour and Schneider 2006) and accelerating or abandoning the process of adoption. Building on Rogers' model (1962), we can distinguish the phase of pre-adoption, when organizations evaluate opportunities and costs according to their structure and capabilities, and the phase of implementation, when the technology is selected and integrated more or less effectively into the routines.

The paper aims at drawing an overall evaluation of the degree of adoption of digital technologies in Italian museums, also considering

- i) the type of technology;
- ii) the internal and external (context) characteristics of the museum;
- iii) the stakeholders that mainly benefit from the adoption.

2. Methodology

The research focus is digital transformation in museums. A quantitative approach is adopted by distributing a survey through the ICOM (Italian Council of Museums) network to Italian museums.

The questionnaire is made of different sections as follows:

- The first one includes control variables to properly profile each museum as: localization, number of employees, category, etc.;
- The approach to digitalization;
- The level of adoption of each technology;
- The willingness to adopt;
- The main limits to adoption.

To properly evaluate the collected data, a question allows to profile the respondent in terms of role in the museum management.

The considered digital technologies are divided in macro groups starting from the existing literature as shown in table 1.

Table 1: Considered Digital Technologies

Grouped digital technologies	Main references
Official website	(Guarino, Di Palma et al. 2020, Guccio, Martorana et al. 2022; ICOM 2023)
Social media	
Collection digitalization (documents, catalogues, databases, archives, etc.)	
Online services (booking, ticketing, etc.)	(Guarino, Di Palma et al. 2020; Guccio, Martorana et al. 2022; Colamatteo, Sansone et al. 2024)
Augmented reality/Virtual reality	
Artificial intelligence	
Mobile Apps	(Guarino, Di Palma et al. 2020, Guccio, Martorana et al. 2022; ICOM 2023)
Technologies into the museum's journey	

Following the approach of Bakhshi and Throsby (2009) we distinguish technologies according to their main function: to build a relationship with visitors, to support collection management, to support museum operations, and to support the visit. We asked museums professionals to evaluate the state of adoption of the former technologies using a modified Rogers' evaluation steps (1962):

1. We have not considered this technology yet.
2. We are considering its usefulness, but it is not adopted.
3. We have just adopted the technology and allocated resources for its use.
4. We have adopted the technology and figured out how to leverage it for regular use.
5. The technology has become an integrated routine within the museum.

Adding also the option in case it had been adopted but then abandoned.

The questionnaire investigates six macro-factors that facilitate the propensity to adopt new technologies: context features, use features, capability features, technology features, organizational features and performance features. We further investigate the typologies of sources that impact the adoption of digital technologies (financial, competencies, staff and administration) and the level of commitment and investment made by the museum in digitalization.

The empirical analysis tests the hypothesis that the probability, state and intensity of adoption depend on the above mentioned factors controlling for the characteristics of the museum and its environment.

Building on Bakhshi & Throsby (2009) and Rogers (1962), in the second part of the empirical analysis we designed a framework of digital transformation in museums and created two indicators (see Figure 1).

The **STATIC MUSEUM OVERVIEW** provides insight into the different categories of stakeholders involved in a museum's digital initiatives. By assessing the orientation towards various stakeholder groups such as museums' management, visitors, and content producers, this indicator helps in understanding how digital technologies are adopted and utilized to engage these stakeholders. This evaluation can shed light on the balance between the different categories of stakeholders and how technology is impacting their interactions within the museum ecosystem.

On the other hand, the **DYNAMIC MUSEUM OVERVIEW** focuses on evaluating the stage of technology adoption among museums. This indicator helps in assessing the pace and extent of digital transformation within museums by looking at the adoption rates of different technologies according to specific museums characteristics. Understanding the stage of technology adoption can provide valuable insights into trends, challenges, and opportunities that museums face in integrating digital tools into their operations and offerings.

The two indicators are provided in the light of the museum context made of several organizational features respectively grouped in individual (attitude towards change, investment in new skills, etc.), internal (size, complexity, etc.) and external ones (openness, type of stakeholders, etc.) (Rogers 1962). Furthermore, a general evaluation is provided suggesting how to proceed in the next phases of introduction/development of digital technologies.

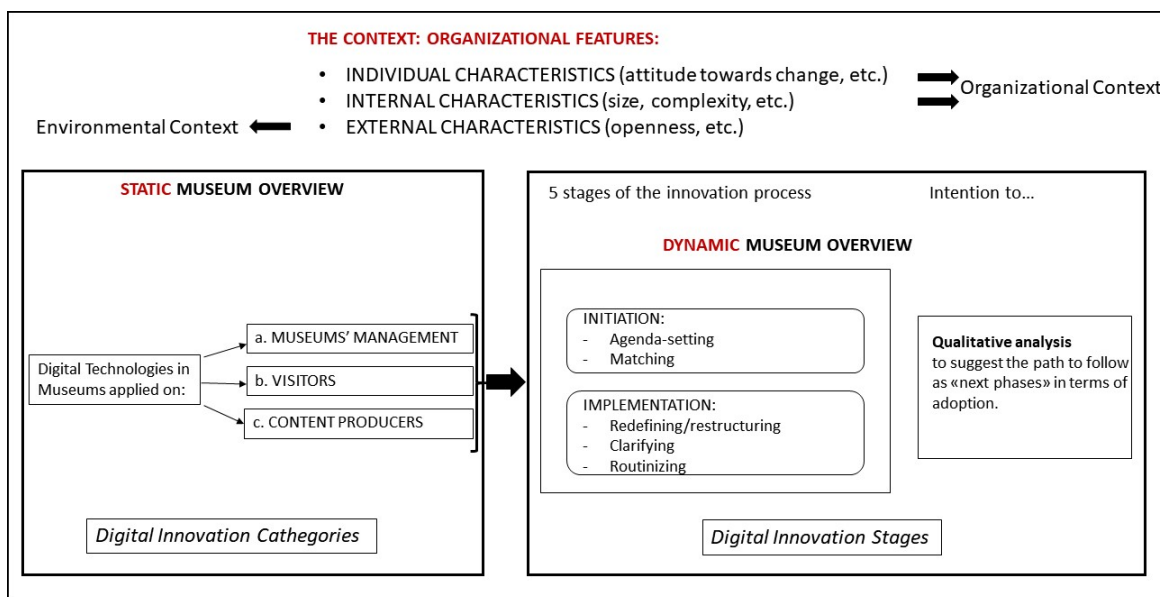


Figure 1: The research framework. Authors' elaboration

Takeaway and results

Following, primary results on our data are presented.

The sample

The data collection was started in spring 2024. By now, 87 valid answers have been registered. Considering respondents profiles, 34% are museums directors or people working for them, 21% employers in administration and logistics, 18% in reception and relations with visitors, 14% in culture promotion and 13% in collection research, care and management. We can reasonably believe the given answers are reliable since all the questionnaires were completed by experts.

Looking at the sample there is a good geographic distribution of museums covering north, center and south of Italy and a good distribution in terms of owner entity of the museum as shown in percentages in figure 2.

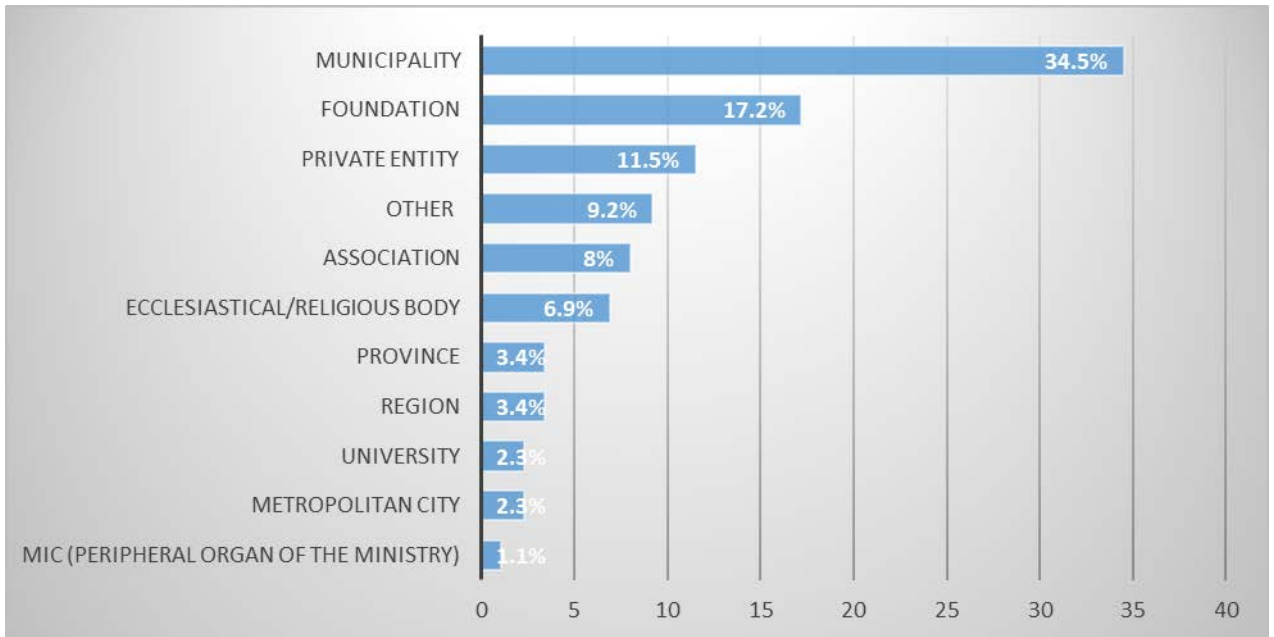


Figure 2: Percentage of museums in terms of owner entity

The museums' size and activity was in same way identified by asking the number of visitors in each museum in the last three years, which means after the COVID-19 pandemic.

The variability in terms of number of visits is high since there are museums with only a few dozens of visitors per year while others with hundreds of thousands. Relevant is the case of Museo di Verona which has registered respectively in 2021 593,400, in 2022 1,118,443 and in 2023 1,298,924 visitors showing not just to be one of the most visited museums among our sample, but also to be a museums with a growing flow rate year after year.

There are also interesting situations in which no data on visits are registered (as for example in Museo degli antichi mestieri in Valli del Pasubio -Vicenza where the entrance is free of charge) or where the number of visits is limited and seems constant over time as in Museo Lancerotto in Noale – Venice with 100 visits per year, but all guided ones.

Deepening the size topic, both the number of full-time employees and volunteers or interns was asked. In 26.4% of cases there are no full time people working in the museums, in 36.8% 1 to 5 people, in 13.8% 6 to 20 people, between 21 and 30 in 5.7%. Excluding Musei di Verona with 60 full time employees and Muse in Trento with 117 the average number is 4.04. In 17.2% of cases there are not volunteers nor interns working in the museums, in 40.2% 1 to 5 people, in 21.8% 6 to 20 people, between 21 and 30 in 3.4%. Excluding Fondazione Querini Stampalia in Venice with 100 and Muse in Trento with 179. While Musei di Verona registered one of the highest numbers of full time employees, the number of volunteers and interns decreases to 12 which is still over the average number in our sample (5.95). Our registered numbers, confirm the problematic issues about personnel in museums with the not yet resolved issues of specific professional training and the official public recognition of museum professions. Museums workers and volunteers are two pillars for enhancing Italian heritage and thus the country growth which could help to get out of the present crisis.

First look at the static and dynamic museums' situation

The very first interesting thing to understand is the static view in terms of adoption levels of the 24 considered technologies (the list was previously explained and references are included in table 1).

The following graph shown in figure 3 summarizes the collected data.

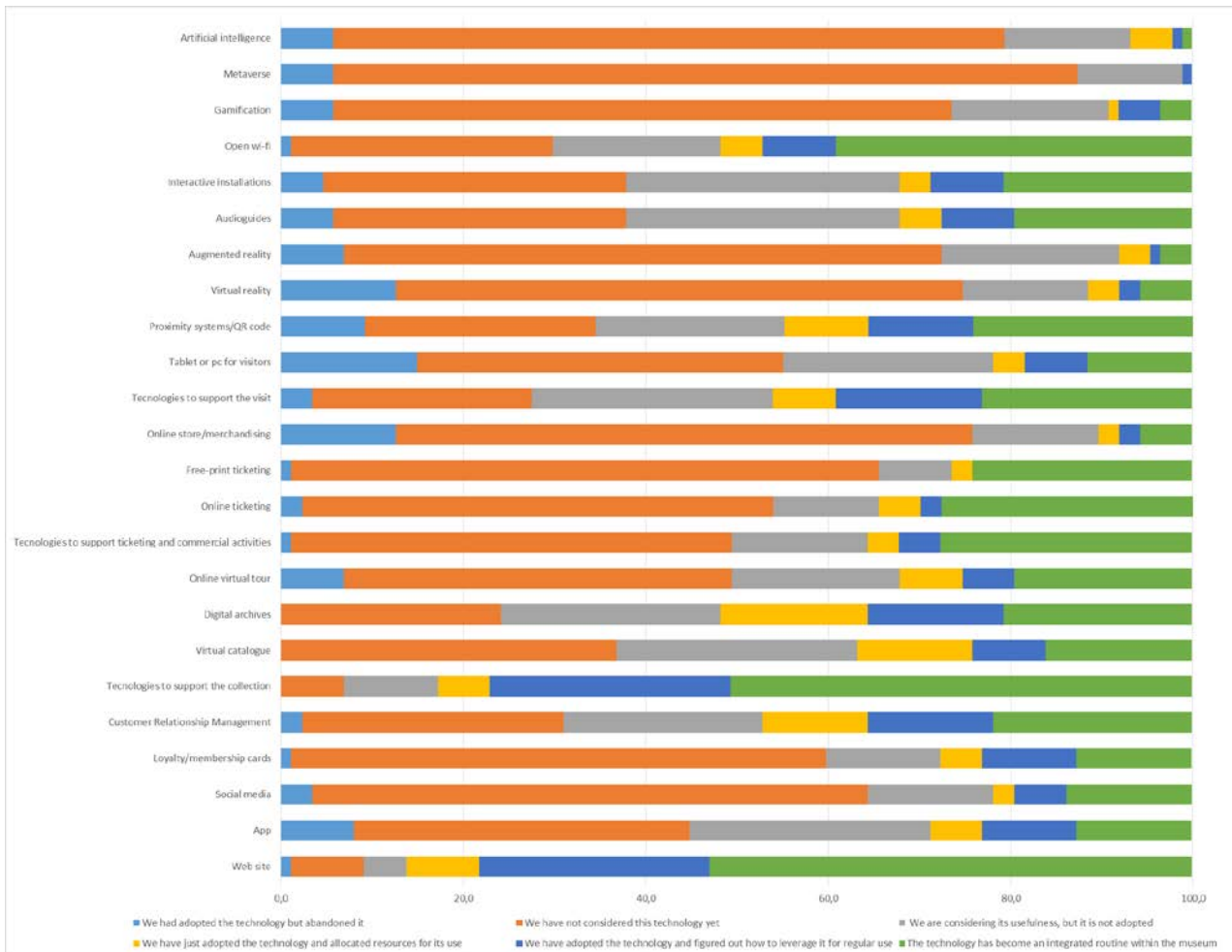


Figure 3: Adoption level per technology in percentage

It must be noted that for almost all the considered technologies there are experiences in which at least one museum has tried to introduce an innovation and then abandoned it (first part of the segments in the graph in figure 3). This is particularly true for tablets and pcs (14.9%), online stores/merchandising and virtual reality (12.6%), followed by apps (8%) and online virtual tours (6.9). The exception are digital archived, virtual catalogues and technologies to support the collection – plus in one case the website which does in fact make sense since once they solutions are introduced in would be hard not to have them anymore.

As expected, the mostly well integrated solutions (last part of the segments in the graph in figure 3) are website (52.9%), technologies to support the collection (50.6%) since it is a very broad category an open wi-fi (39%).

In order to depict the dynamic overview, Each museum was then asked the probability of adoption in the next 12 months of the solutions it does not have yet according to the just described graph. Mean values on a scale 1-5 are presented in figure 4.

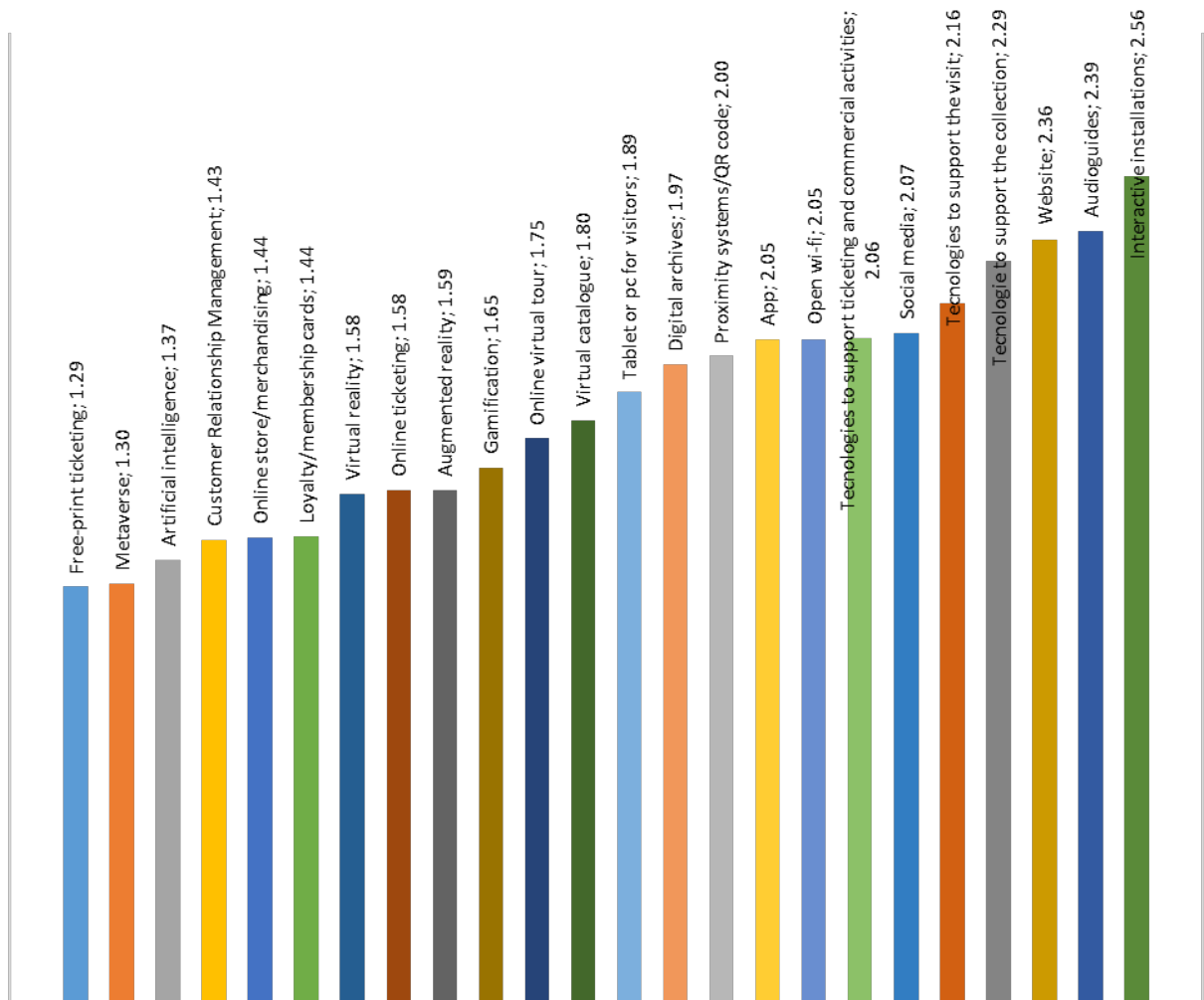


Figure 4: Intention to adopt per technology in the next 12 months on a scale 1-5

Basically, from the previous question, it seems that museums are very active in evaluating available technologies, but the probability to introduce new digital solutions in the next 12 months is not particularly strong. Museums as first plan to introduce interactive installations (2.56%), audioguides (2.39) and websites (2.36) – in fact, 13.7% of the sample has declared not to have an official website.

In order to better understand the situation, we looked at the digital strategy each museum has. Only 16% of museums declares to have a well defined written digital strategy (84% does not). In 41.1% of museums infact, there is not a responsible person for digitalization (the MuCE - Museo dei Colli Euganei in Galzignano Terme – Padua will have one in the next 6 months), 28.7% has an internal one, 11.5% an external one while another 11.5% both internal and external.

In line with this data, only 31% of the sample has a defined budget specifically allocated to digitalization while the remaining 69% does not.

This is why it is also interesting to try to understand why there are limited situation of structured area dedicated to fostering digitalization in terms of strategic perspective, budgeting and people directly involved.

Respondents were asked to state on a scale 1-5 how much a list of factors which we found in the literature that can impact on the museum's propensity to adopt a technology were relevant in their museum. Mean values are presented in figure 5.

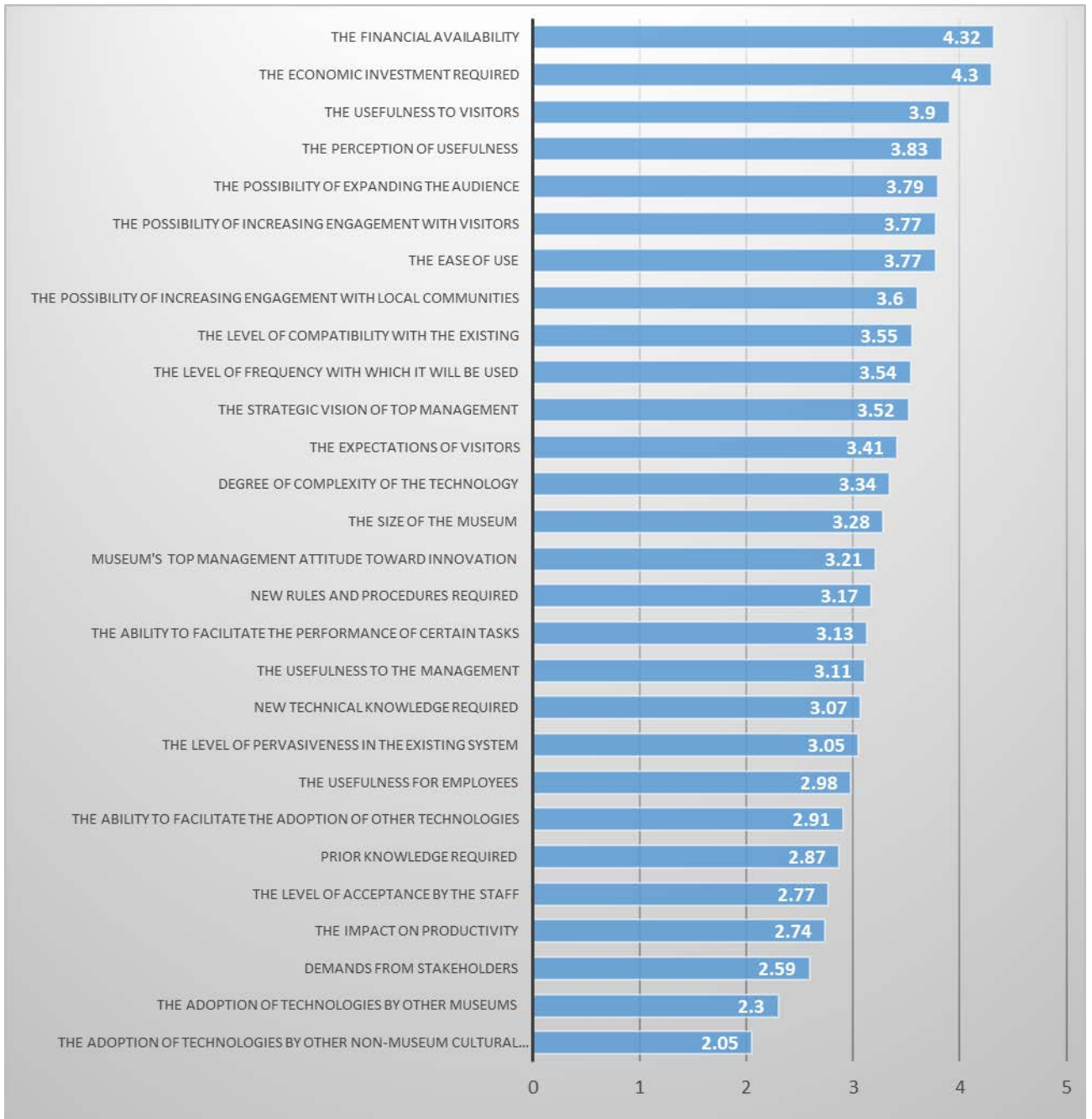


Figure 5: Factors that can impact on the museum's propensity to adopt a technology (mean values, scale 1-5)

As obvious, the main reasons are linked to financial issues as financial availability (4.32) and economic investment required (4.30). Following we find all elements linked to value creation to audiences, visitors and communities showing the adoption of a marketing perspective which looks at the benefits directly created to stakeholders.

We also asked how much a list of reasons really impacts on the museum's ability (or non ability) to equip itself with digital technologies. Mean values on a scale 1-5 are presented in figure 6.

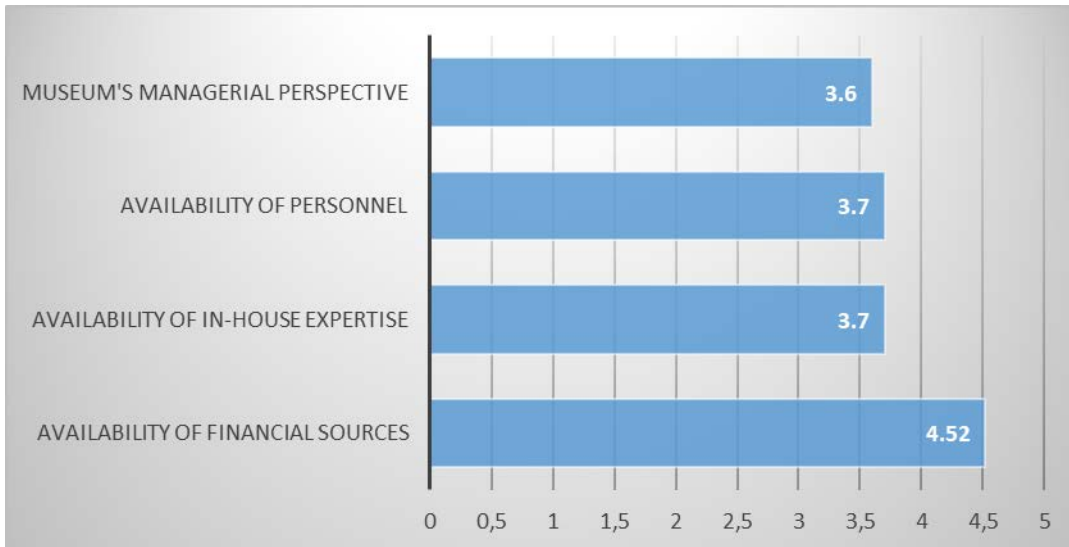


Figure 6: Impacts on the museum's ability to equip itself with digital technologies (mean values, scale 1-5)

Again, the financial aspect seems to remain the main issue registering the highest mean value (4.52).

Deepening the financial sources topic, it was asked how relevant they are in proceeding with digital projects. Mean values on a scale 1-5 are presented in figure 7.

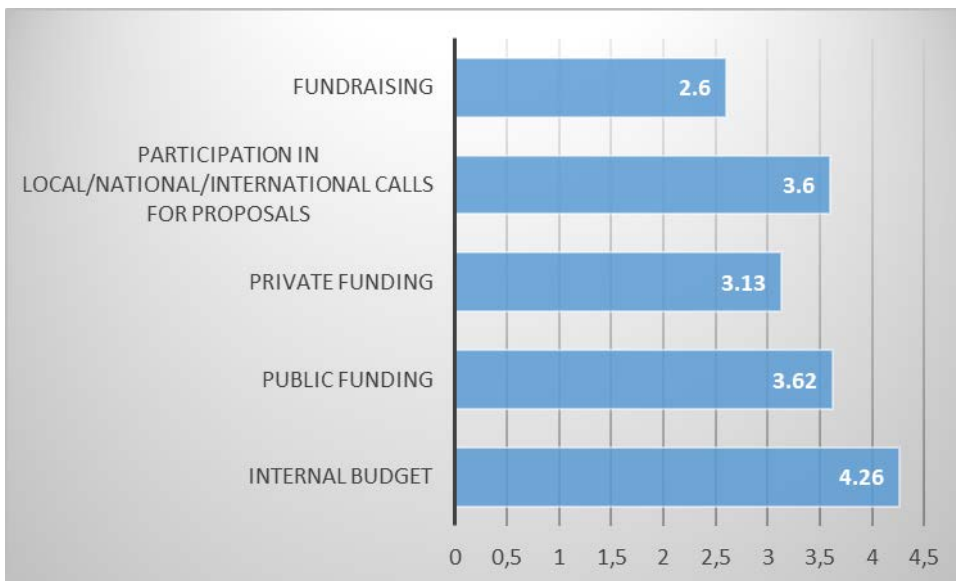


Figure 7: Impacts on the museum's ability to equip itself with digital technologies (mean values, scale 1-5)

At a widely spread national level, internal budgeting is perceived as the main aspect to be addressed with a mean value of 4.26, among the different solutions, in the Italian context fundraising represent the weakest source.

Conclusion

The data collection for this study began in spring 2024 and is still ongoing but first insights are considered reliable due to the expertise of the respondents and the fact that we managed to collect information from museums across Italy, representing different regions and ownership types. The adoption of digital technologies in museums shows a mixed picture. Many museums have tried and abandoned various technologies while the most used and integrated technologies are websites, technologies to support collections, and open Wi-Fi. Museums, despite showing to be

evaluating several available technologies, register a low probability of adopting new digital solutions in the next 12 months (only prioritizing the introduction of interactive installations, audioguides, and websites).

A significant gap exists in digital strategy, with only 16% of museums having a well-defined one and 31% having a specific budget allocated for digitalization. Financial constraints are the primary barrier to digital adoption, and internal budgeting is identified as the main financial challenge, while fundraising is the least significant source of money when dealing with digital projects.

This primary study reveals a critical need for enhanced financial support and strategic planning in the digital transformation of Italian museums. Addressing these gaps can significantly improve the adoption of innovative technologies which would bring benefits in operational efficiency and the consequent enhancement of visitors' experiences.

Once data collection will be ultimated, this full study will provide four main results: (1) it allows to map the digital transformation across Italian museums with the objective of finding similarities and differences between clusters; (2) it shows the degree of adoption of digital innovations in Italian museums by detecting dynamically how they are positioned along the adoption life cycle; (3) it allows to measure Italian museums willingness to further adopt digital innovations suggesting; (4) it allows to identify Italian museums reasons of adoption or non-adoption of digital technologies.

On one side, a contribution will be given to the literature on digital technologies and transformation, yet, scholars can better look at the enablers and inhibitors of technology adoption for meeting stakeholders' actual needs.

On the other, a contribution will be given at a managerial level. Directors and curators of museums can benefit from the identification of the most and least implemented technologies facilitating the understanding of the strengths and weaknesses of their own organization. Furthermore, they can benefit from personalized implications for practice which would include strategical advices.

In general, this research is able to shed new light on the processes of digitizing that museums are currently experiencing trying to help in reaching a better alignment between the choices in terms of technology adoption and the market orientation.

References

- Bakhshi, H. and D. Throsby (2009). "Innovation in arts and cultural organisations." *Hamburgo: NESTA*: 1-65.
- Barrile, V., E. Bernardo, A. Fotia and G. Bilotta (2022). "A combined study of cultural heritage in archaeological museums: 3D survey and mixed reality." *Heritage* **5**(3): 1330-1349.
- Bertacchini, E. and F. Morando (2013). "The future of museums in the digital age: New models for access to and use of digital collections." *International journal of arts management* **15**(2): 60-72.
- Bokányi, E., M. Novák, Á. Jakobi and B. Lengyel (2022). "Urban hierarchy and spatial diffusion over the innovation life cycle." *Royal Society Open Science* **9**(5): 211038.
- Brown, L. A. and K. R. Cox (1971). "Empirical regularities in the diffusion of innovation." *Annals of the Association of American Geographers* **61**(3): 551-559.
- Camarero, C., M. J. Garrido and E. Vicente (2011). "How cultural organizations' size and funding influence innovation and performance: the case of museums." *Journal of cultural economics* **35**: 247-266.
- Cirillo, V., L. Fanti, A. Mina and A. Ricci (2023). "The adoption of digital technologies: Investment, skills, work organisation." *Structural Change Economic Dynamics* **66**: 89-105.
- Colamatteo, A., M. Sansone, M. A. Pagnanelli and R. Bruni (2024). "The role of immersive technologies in cultural contexts: future challenges from the literature." *Italian Journal of Marketing*: 1-30.
- Cori, E. and F. Fraticelli (2018). "Digitizing cultural heritage: Evidence from Italian museums." *Recent Advances in Information Technology, Tourism, Economics, Management Agriculture* **65**.
- Damala, A., I. Ruthven and E. Hornecker (2019). "The MUSETECH model: A comprehensive evaluation framework for museum technology." *Journal on Computing Cultural Heritage* **12**(1): 1-22.
- Damanpour, F. and M. J. B. j. o. M. Schneider (2006). "Phases of the adoption of innovation in organizations: effects of environment, organization and top managers 1." **17**(3): 215-236.
- Davies, R. (2001). "Overcoming barriers to visiting: Raising awareness of, and providing

orientation and navigation to, a museum and its collections through new technologies." *Museum Management Curatorship* **19**(3): 283-295.

Fan, X., X. Jiang and N. Deng (2022). "Immersive technology: A meta-analysis of augmented/virtual reality applications and their impact on tourism experience." *Tourism Management* **91**: 104534.

Fernández-Blanco, V. and J. Prieto-Rodríguez (2020). "39. Museums." *Handbook of Cultural Economics*: 349.

Finnis, J. and A. Kennedy (2022). "The Digital Transformation Agenda and GLAMs A Quick Scan Report for Europeana. 2020." **6**.

Gómez, J. and P. Vargas (2012). "Intangible resources and technology adoption in manufacturing firms." *Research Policy* **41**(9): 1607-1619.

Guarino, M., M. A. Di Palma, T. Menini and M. Gallo (2020). "Digital transformation of cultural institutions: a statistical analysis of Italian and Campania GLAMs." *Quality Quantity* **54**: 1445-1464.

Guccio, C., M. F. Martorana, I. Mazza and G. Pignataro (2022). "Is innovation in ICT valuable for the efficiency of Italian museums?" *European Planning Studies* **30**(9): 1695-1716.

Khalil, S., A. Kallmuenzer and S. Kraus (2023). "Visiting museums via augmented reality: An experience fast-tracking the digital transformation of the tourism industry." *European Journal of Innovation Management*.

Lee, H., T. H. Jung, M. C. tom Dieck and N. Chung (2020). "Experiencing immersive virtual reality in museums." *Journal of Information Management* **57**(5): 103229.

Leoni, L. and M. Cristofaro (2021). "Technology adoption in small Italian museums: an empirical investigation." *Il Capitale Culturale* **23**: 57-87.

Leva, L., V. Menicucci, G. Roma and D. Ruggeri (2019). *Innovazioni nella governance dei musei statali e gestione del patrimonio culturale: alcune evidenze da un'indagine della Banca d'Italia, Banca d'Italia*.

Li, J., W. Wider, Y. Ochiai and M. A. Fauzi (2023). "A bibliometric analysis of immersive technology in museum exhibitions: exploring user experience." *Frontiers in Virtual Reality* **4**: 1240562.

Mason, M. (2022). "The Contribution of Design Thinking to Museum Digital Transformation in Post-Pandemic Times." *Multimodal Technologies and Interaction* **6**(9): 79.

Nuccio, M. and E. Bertacchini (2022). "Data-driven arts and cultural organizations: opportunity or chimera?" *European Planning Studies* **30**(9): 1638-1655.

Pett, D. (2022). "Transcending and expanding the walls of the museum: Digital pivot, digital by default, digital transformation."

Rogers, E. M. (1962). *Diffusion of innovations.*, New York: Free Press of Glencoe.

Sundbo, J. and P. Darmer (2008). *Creating experiences in the experience economy*, Edward Elgar Publishing.

Tom Dieck, M. C., D.-i. D. Han and Practice (2022). "The role of immersive technology in Customer Experience Management." *Journal of Marketing Theory* **30**(1): 108-119.

Wong, A. K.-k. and D. K. Chiu (2023). *Digital transformation of museum conservation practices: a value chain analysis of public museums in Hong Kong. Handbook of Research on Digitalization Solutions for Social and Economic Needs*, IGI Global: 226-242.

Yuce, A. (2022). *Digital Transformation-Oriented Innovation in Museum Settings via Digital Engagement: Virtual Reality. Handbook of Research on Museum Management in the Digital Era*, IGI Global: 248-264.