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**A DIGITAL TRANSFORMATION FRAMEWORK
FOR CULTURAL INSTITUTIONS:
THE CASE OF ITALIAN MUSEUMS**

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Abstract – English

The rise of Information and Communication Technologies (ICTs) has radically changed the business paradigms of organizations, forcing them to rebalance their strategic vision and operations for remaining competitive. This challenging environment, characterized by cultural, social and technological changes, has impacted on all sectors of the economy, included the cultural heritage one, in which digital technologies have modified the cultural production, distribution and consumption patterns, pushing institutions to reassess their traditional role away from their custodial focus and towards audiences and their experiences.

While embracing a digital transformation can help cultural institutions to further valorize their heritage and enhance the generated value, many entities are uncertain of how to do it. Indeed, literature concentrates on the contextualization of digital technologies within museums, but information regarding the strategic approach to adopt them is limited and dispersed. Since cultural institutions are a vital part of the European economy, it is important to encourage them to innovate and seize the opportunities offered by digitalization. On the basis of these considerations, the present thesis arises with the objective of supporting cultural institutions, and in particular museums, in their digital transformation path by identifying its critical success factors and, additionally, highlighting the most common challenges they should manage. In order to do so, a theoretical framework has been constructed, borrowing insights from existing digital transformation models of the industrial sector. Then, its validation has been done through a qualitative methodology, in which the theoretical model was applied to four case studies of Italian museums.

As a result, the thesis presents the levers of the digital transformation in an integrative model *ad hoc* for museums, as well as their common challenges. Additionally, deriving from the case studies analysis, four different approaches of museums towards the digital innovation have been identified. These are attractive outcomes from museum practitioners' point of view since they are tools that can help them in their decision-making process and in consciously managing the innovation. Furthermore, the present work sets future research directions for exploring the possible applications of the proposed framework and approaches on a larger group of museums, on diverse type of cultural institutions, and even beyond the Italian context.

Abstract – Italiano

L'introduzione delle tecnologie dell'informazione e della comunicazione (ICTs in inglese) ha cambiato radicalmente i modelli di business delle varie organizzazioni, obbligandole, per rimanere competitivi, a rivedere la loro visione strategica e la loro operatività. Questa nuova sfida, caratterizzata da cambiamenti culturali, sociale e tecnologici, ha coinvolto tutti i settori dell'economia, incluso quello culturale, nel quale, le tecnologie digitali hanno modificato i modelli di produzione, distribuzione e consumo dei contenuti culturali, spingendo le istituzioni a reinventare il loro ruolo al di là della custodia del patrimonio, ma verso il pubblico e le loro esperienze.

Anche se la trasformazione digitale può aiutare le istituzioni culturali a valorizzare ulteriormente il proprio patrimonio e ad aumentare il valore generato, molte entità sono incerte sul modo di affrontarla. In effetti, la letteratura si concentra sulla contestualizzazione delle tecnologie digitali all'interno dei musei, mentre le informazioni relative all'approccio strategico su come implementarle sono limitate e disperse. Poiché le istituzioni culturali sono una parte vitale dell'economia europea, è importante incoraggiarle a innovare e a cogliere le opportunità offerte dalla digitalizzazione. Sulla base di queste considerazioni, la presente tesi nasce con l'obiettivo di supportare le istituzioni culturali, e in particolare i musei, nel loro percorso di trasformazione digitale, individuando i fattori critici di successo e, inoltre, evidenziando le sfide più comuni che potrebbero dover affrontare. Per fare ciò, si è sviluppato un modello teorico, prendendo in considerazione i modelli di trasformazione digitale già esistenti, ma dedicati al settore industriale. In seguito, la sua validazione è stata fatta attraverso una metodologia qualitativa, in cui il modello teorico è stata applicato a quattro casi di studio di musei italiani.

Di conseguenza, la tesi presenta le leve della trasformazione digitale, oltre alle sue sfide più comuni, in un modello integrativo *ad hoc* per i musei. Inoltre, dall'analisi dei casi di studio, è stato possibile identificare quattro approcci diversi dei musei verso l'innovazione digitale. Questi risultati sono particolarmente fruibili dal punto di vista dei direttori dei musei poiché sono strumenti che possono aiutarli nel loro processo decisionale e nella gestione consapevole dell'innovazione. Inoltre, il presente lavoro evidenzia l'opportunità di esplorare nuove applicazioni del modello proposto su un più ampio campione di musei, su diversi tipi di istituzioni culturali e anche, fuori dal contesto italiano.

Executive summary

As presented in the International Council of Museums' Statutes (2007):

“A museum is a **non-profit**, permanent institution **in the service of society** and its development, open to the public, which **acquires, conserves, researches, communicates and exhibits** the tangible and intangible **heritage of humanity** and its environment **for the purposes of education, study and enjoyment.**”

Considering this definition, the mission of these cultural institutions can be articulated around three synergic pillars:

- *Heritage*: this pillar is the fundamental element that characterizes, and counter distinguishes cultural institutions. The focus is set on the conservation and revitalization of this large repository of knowledge.
- *Audience*: besides the preservation of heritage, museums are responsible of making it available to the public for their education, as well as for ensuring the transmission of culture among societies and across generations.
- *Network*: lastly, as museums are social institutions, they create relationships with individuals and other organizations, bonding the community and generating networks.

Up to now, museums' efforts have been largely concentrated on the *Heritage* pillar and thus, on the preservation of cultural heritage, and not on how it is conveyed and communicated to audiences and the community in general. However, the dynamic context of the 21st century is leading changes that have an impact on the entire society, including on the traditional business models of companies and institutions. In particular, four drivers of change that impact on the cultural sector can be observed (Bakhshi, & Throsby, 2009):

- Changes in patterns of demand*: customers' spending pattern in cultural activities has a declining trend (Ravanas, 2007) while, on the other hand, the expenditure on online leisure activities is every time higher. This change in customers' habits implies a great challenge for cultural institutions, which are presented a new type of audience willing to co-produce and personalize its own experiences.
- Changes in unearned revenue sources*: the increased pressure on governmental budgets and the reduction of public spending has led to a reduction of funds destined to cultural institutions and the terms on which they are given. As a result, museums are forced to operate in an even more limited cost-revenue scenario.

C) *Changes in technology*: ICTs have transformed all social aspects, as well as the way in which organizations operate. The impact, and thus opportunities, can be observed throughout the museum: in the internal organization (production), in the communication with audiences (distribution), and in the way visitors interact with the cultural organization and its heritage (consumption) (European Commission, 2016).

D) *Changing concepts of value creation*: all of the aforementioned drivers of change impact in cultural institutions' environment, affecting the way in which value is perceived and delivered (Bashkhi, & Throsby, 2009). The most relevant aspect is the emphasis that is put on what customers value and expect from museums.

Thus, the fast-moving context of the 21st century is characterized by demographic shifts, changing customer expectations and continual technological innovation (Tassini, Gu, & Aris, 2016). In this challenging environment, for museums to remain relevant to audiences and ensure their sustainability, they need to evolve according to visitors' expectations. This involves recalibrating their focus from objects to users by becoming more interactive, participatory and democratic in their relationship with visitors. As a result of this paradigm shift, the pillars *Audience* and *Network* acquire an increasing relevance, while *Heritage* still maintains as the distinctive element of cultural institutions.

In this context, digital technologies present as strategic tools to advance the organization's mission while allowing it to create a differential and valuable offering. The applications of these new technologies are numerous and can support cultural institutions along their three synergic pillars:

- Regarding *Heritage*: improving preservation methods, as well as creating digital heritage which can be valorized through different channels.
- Regarding *Audience*: increasing on-site and online user engagement, aligning the museal offering to visitors' expectations.
- Regarding *Network*: generating a museal community through active marketing and digital channels.
- Finally, considering a more transversal perspective, the employment of digital technologies can lead to the optimization of institutions' internal processes.

Thus, embracing a digital transformation, and so integrating technology and innovation at the core of their strategy, will allow institutions to further valorize their heritage and improve the value proposition for their audiences, ensuring their long-term sustainability.

Nonetheless, many entities are uncertain regarding how to approach such transformation. Indeed, the available literature on museums and their digital transformation has concentrated on the possible applications of new technologies for achieving a precise objective. In particular, the most repeated issues concern the utilization of digital communication and marketing instruments for approaching visitors; of on-site digital tools for improving the museal experience; and lastly, of digitizing technologies for the long-term preservation of artworks. Thus, there is a lack of material determining complete digital strategies specifically for museums, meaning: how to strategically approach the transformation, which are the key necessary resources, which are the most common barriers they may encounter... These are all issues which could help institutions mitigate their uncertainty on how to act, and yet this type of information is scarce and dispersed among different sources and authors. On the contrary, when referring to other industry fields (especially manufacturing), the literature on digital transformation models has proven to be extensive.

According to the European Commission (2014), cultural institutions are a vital part of the economy and thus, it is important to encourage them to innovate and seize the opportunities offered by digitalization. On the basis of these considerations, the present thesis arises with the objective of supporting cultural institutions, and in particular museums, in their digital transformation path by identifying its critical success factors and, additionally, highlighting the most common challenges they should manage. These objectives can translate into the following research questions:

RQ 1. Which are the main factors enabling museums to achieve an effective digital transformation?

RQ 2. Which factors or conditions represent obstacles for museums in their digital transformation path?

For investigating these aspects, an integrative theoretical framework has been constructed *ad hoc* for museums, extracting relevant dimensions from existent digital transformation models of the manufacturing area and making some considerations for the cultural sector. Then, in order to validate the model, it has been tested on Italian museums because of two reasons: on one side, Italy is recognized worldwide for its incalculable cultural heritage and, on the other, it is an active environment where institutions are willing to innovate and progress in the digital transformation and thus, are strengthening their efforts in that direction (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018). The methodology applied was purely

qualitative and can be defined as a multiple case studies analysis. In particular, direct semi-structured interviews have been conducted with four Italian museums of diverse characteristics to analyze their corresponding digital projects and draw empirical evidence from them.

The first result of the conducted analysis regards the validation of the *Digital Transformation Model for Cultural Institutions*, depicted in *Figure 1*.

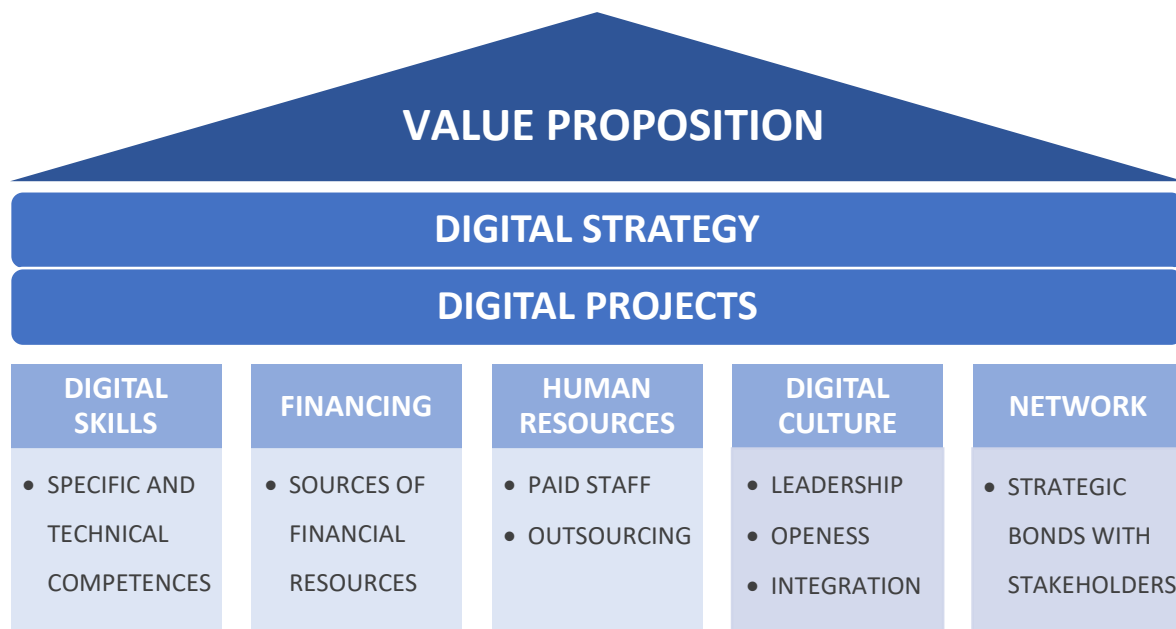


Figure 1: Digital Transformation Model for Cultural Institutions

The starting point is the *Value Proposition*, which will guide the adoption of digital technologies within the institution. The precise objectives institutions expect to achieve should be clearly defined in the *Digital Strategy* to guarantee its alignment with the organizational strategy and avoid isolated initiatives. Then, the latter is implemented through diverse *Digital Projects*, which count with five levers for their management and execution:

- 1) *Digital skills*: to derive value from digital technologies and manage internally the transformation, museums' staff members should develop an additional set of technology-related competences such as managing information resources and administering content management systems...
- 2) *Human resources*: the team who deals with the execution and development of the project is a fundamental resource. Depending on the level of in-house technological competences, museums will rely on internal employees, or otherwise, turn to outsourcing.

- 3) *Digital culture and leadership*: the top-management has the key responsibility of leading the entire institution and communicating the vision set by the digital strategy. Furthermore, advancing in the right direction will require the correct organizational culture, characterized by openness to innovation, interdisciplinary work and cooperation between departments and roles.
- 4) *Network*: the creation of a network with its surrounding ecosystem, including private and public entities, will allow museums to learn from each other's experiences and spread good practices. Furthermore, through more formal partnerships, museums can gain accessibility to knowledge and resources for the development of their projects.
- 5) *Financing*: the availability of financial resources is fundamental for the digital transformation since organizational changes do not happen without investment.

The second finding of the present thesis concerns the identification of common challenges cultural institutions may encounter in their digital transformation path, and which should be carefully managed for avoiding them compromising its outcome:

- A) *Missing skills*: 21st-century institutions need staff members who understand, not only museums' information (cultural content), but also the information technology behind it. While training staff members may be challenging due to their diverse backgrounds, the investment is necessary for managing internally the transformation and being able to make crucial technology-related decisions.
- B) *Organizational inertia*: when facing transformations, internal resistance may appear and compromise its progress (especially from older people or cultural professionals devoted to historical heritage). Since the human resources and their collaboration are fundamental for the introduction of digital technologies, institutions may approach this challenge by embracing change management practices.
- C) *Resource constraints*: the restricted resource availability of many museums may create a challenging environment for innovation. In particular, the constraints could translate in limited in-house staff time and limited funding. Thus, for ensuring the sustainability of a digital project, museum directors should assess their available resources against the expected required ones for its entire duration.
- D) *Cultural content management*:
 - i. The first issue concerns the need to create and transmit content that is enjoyable and public-friendly, but that simultaneously maintains curatorial and

educational standards. It is about mastering the digital storytelling and being able to interpret cultural content in ways that visitors can relate to.

- ii. Then, the second aspect regards the intellectual property rights of collections and thus, the publishing restrictions of their digitized versions, with which museums should comply (especially given the broad distribution and virality of the Internet).

Finally, the third result obtained from the case studies' analysis is the recognition of four different approaches to the digital transformation, which can be identified according to the "Reach" of the transformation within the institution and its "Progress driver". Additionally, as observed in *Figure 2*, each one of the approaches can be characterized with the digital enablers (except from "Digital skills" and "Human Resources" which will depend on the particular institution and thus, cannot be generalized).

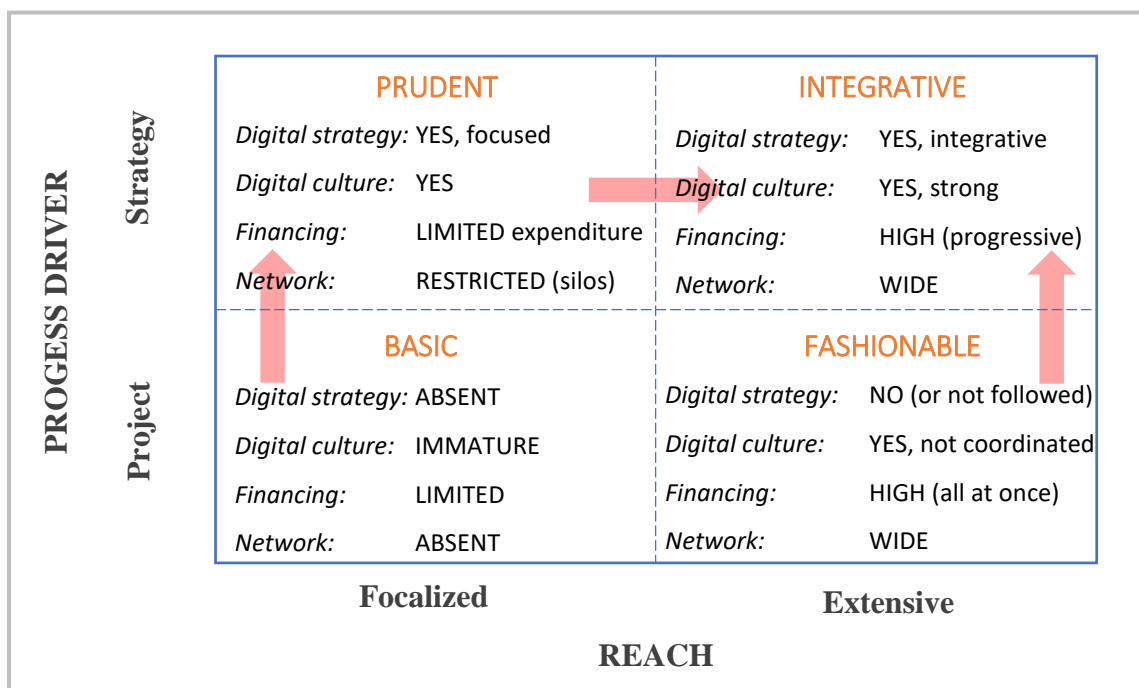


Figure 2: Approaches to the digital transformation and their respective digital enablers

Integrative approach: these museums share a strong vision and support of the digital transformation which is deployed into a series of valuable digital initiatives across its many sectors, presenting a unified front. This quadrant is aligned with the theoretical approach that identifies a strategical and linear sequence for the adoption of new technologies.

Prudent approach: the digital strategy, supported by leadership and digital culture, exists but is focalized on just few aspects of the museum. This denotes a prudent and sequential approach, which consists in testing new technologies within a certain sector and, if the results are positive, then move forward with the investment in other areas.

Fashionable approach: museums following this approach are willing to rapidly advance digital innovation within the current dynamic context and thus, implement attractive and expensive digital features in several areas, but that do not always create value collectively since they lack an integrative vision.

Basic approach: institutions in this category are unaware or skeptical of the possibilities offered by digital technologies and so, they present an immature digital culture. Without a clear vision, their approach to the digital transformation is through experimentation projects of medium-limited reach to explore how digital tools could work within the museum.

Furthermore, considering the matrix under a dynamic perspective, and setting as objective the achievement of the upper-right quadrant, it has been possible to determine the evolution path of each one of the approaches according to their characteristics (indicated with red arrows in *Figure 2*).

On the basis of the presented results and, given the lack of academic material determining complete digital strategies specifically for museums, the present Master Thesis has contributed to a part of the literature which has not been previously explored completely and with big room for development. The created digital transformation model was created *ad hoc* for museums and, furthermore, adopts an integrative approach, unlike the most usual one of treating transformation aspects singularly. Parallely, the identification of the common challenges has also been done according to museums' characteristics and their particular operating context. Finally, through the conducted case studies, the Master Thesis has made an additional contribution to the academic environment by providing empirical evidence on museums' approaches to the digital transformation.

On the other side, the present dissertation has practical implications for the museum management and practitioners. In the first place, the created framework serves as a tool which museums' directors can use for implementing digital technologies successfully. It has been created to specifically support the strategic decision-making process of digital innovation and an "Integrative" type of approach. In this way, the thesis has intended to reduce the number of institutions which approach the transformation focused on technology, rather than on strategic

objectives. Furthermore, if museum practitioners are aware of the common challenges that may present, there will be a lower probability of overseeing these factors and thus, of compromising the results of the innovation. In the second place, providing museums a guidance tool is a way to help them pursue their digital agendas, as established by the European Commission in the communication entitled “Towards an Integrated Approach to Cultural Heritage for Europe” (2014). Finally, museums can use the created framework and matrix as benchmarking tools for determining the relative position of the museum (its strengths and weaknesses) compared to other institutions, as well as for identifying good management practices to follow.

The limitations of the present thesis reside mainly in the chosen methodology. The purely qualitative analysis may have provided some results subject to the interpretation of the writer. As a result, the case study analysis in itself is unique and would be extremely difficult to replicate. Nonetheless, the authenticity and validity of the obtained results is ensured by a triangulation between the empirical data and the review of the academic literature.

In the last place, considering the findings and limitations of the Master Thesis, two directions for future research can be identified. The first regards enlarging the number of museums used for the case studies: a larger sample would have resulted in a more robust validation of the created framework, as well as of the matrix depicting the empirical approaches to the digital transformation. Then, the second direction concerns expanding the application boundaries of the created framework and matrix. This would imply testing them on museums outside of the Italian context and, even, explore if they are applicable as well for other entities of the cultural sector such as archives, theaters and libraries.

1. INTRODUCTION

1.1 Context analysis

1.1.1 Cultural heritage institutions

Cultural heritage is the legacy of physical artefacts and intangible attributes of society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations (UNESCO). The cultural heritage is a shared wealth, a legacy belonging to all humankind which represents an irreplaceable source of knowledge.

Correspondently, *cultural heritage institutions* are engaged with the acknowledged mission of preserving, studying and enhancing, and making accessible to society, for its instruction and enjoyment, the cultural property. As a result, these institutions are important actors in the transmission of culture among societies and across generations, an essential facet of human development according to UNESCO. Considering the stated mission of cultural institutions, their strategic objectives can be defined around three main synergic pillars:

- *Heritage*: this pillar is the fundamental element that characterizes, and counter distinguishes cultural institutions. Heritage is at the center of such organizations and it is their main object of analysis. In particular, the focus is set on its conservation, revitalization and physical and cultural dissemination.
- *Audience*: besides the technical aspect of conservation and maintenance of heritage, cultural institutions are responsible for making available to the public this large repository of knowledge. In order to do so, institutions promote activities that favor an active interaction and engagement of the society, and that are aimed at informing and educating citizens on associated aspects of culture, history, science and the environment.
- *Network*: finally, cultural institutions create multiple social benefits, which include customer value, community outreach, and public service (Kotler N., Kotler P., & Kotler W., 2008). As a consequence, a strategic objective is to create relationships through physical or digital networks with individuals, other institutions and the entire community.

Regarding the classification of cultural institutions, the Italian law¹ includes under such definition the following entities: museums, libraries, archives, archeological sites and parks,

¹ Italian legislative decree n.42/2004: “Codice dei beni culturali e del paesaggio”, article n.101

and monumental sites. According to the ISTAT (2016), in 2015 the Italian cultural heritage sector reached 110,4 million visitors and a total of 4.976 institutions divided as following: the majority (83,6%) was represented by museums, galleries and collections; then, 5,6% were archeological reserves; and the remaining 10.8% were monuments or monumental sites.

1.1.2 Digital transformation

In the Digital Age, the world is changing faster than ever, and society is living a moment of profound disruption. The rise of new digital technologies and its application to all aspects of everyday life is challenging the traditional business paradigms of companies and institutions while new ones are emerging. These innovative models concentrate on seamlessly integrating two fundamental factors that are people and technology, by embracing the path of digital transformation. As stated by the vice president of IBM, to succeed in such enterprise companies should focus on two complementary activities directly related to the fundamental factors previously mentioned: one is reshaping customer value propositions and the other is transforming their operations by using digital technologies for greater customer interaction and collaboration (Berman, 2012).

These changes associated with digital innovation have been steadily increasing since the beginning of the 21st century and are flowing into what can be defined as a new industrial revolution (Blanchet et al., 2014). From the first industrial revolution which allowed the mechanization through steam power, to the mass production and assembly lines using electricity in the second, the fourth industrial revolution will take what was started in the third one (“The digital revolution”) with the adoption of computers and automation and will enhance it with smart and autonomous systems fueled by data and machine learning (Marr, 2018). The Digital Revolution, in the 1970s, introduced technological breakthroughs that have revolutionized communications and the spread of information. It was in this context that the *Information and Communication Technologies* (ICTs) arose: a broad term encompassing cellular networks, satellite communication and broadcasting media, among others. Now, the further transition towards an integrated network is so compelling that its application in the manufacturing sector has led to the creation of the German concept of *Industrie 4.0* (commonly known in English as Industry 4.0). This bigger notion emphasizes the idea of consistent digitalization and linking of all the productive units in an economy to reach a fully integrated, automated and optimized flow, with greater efficiencies and changed relationships with customers – as well as between human and machine (Rüßmann et al., 2015).

Industry 4.0 and ICTs have changed forever the way information is created, managed, archived and accessed (Abd Manaf, 2007). The impact of such revolution is not only witnessed in manufacturing, but on all sectors of the economy and the cultural heritage one is no exception. Digital technology has changed the way that we engage with arts and culture, as it has with many other areas of life (Runacres, & Bakhshi, 2017), impacting on the entire value chain. It has brought changes inside the organization – production-, in the cultural heritage institution’s communication with the public – distribution-, and in the way the public interacts with the institution and its contents – consumption (European Commission, 2016). To mention just one aspect of this transformation it is possible to quote Sree Sreenivasan, Chief Digital Officer of the Metropolitan Museum of Art (Met) in New York from 2013 to 2016, who said “Our competition is Netflix and Candy Crush, not other museums” (Shu, 2015). Despite having one of the greatest art collections and being one of the most visited museums, the Met faces the same uncertainty as any other institution. This statement recognizes cultural and demographic changes generated by the digital age that represent a new operating environment for the entire cultural sector.

To remain competitive in today’s fast changing era, every organization must find new and creative ways to “stay in the game” (Abd Manaf, 2007). The correct approach is to assume an adaptive behavior to the new environment; to become relevant, resilient and responsive to digital cultural changes. Institutions that perceive digital technology as a strategic imperative, rather than simply as a tool, are more likely to take full advantage of the digital disruption and ensure their long-term sustainability (Nash et al., 2016). Turning to the Met, this museum represents an excellent case of adoption of a digital strategy through the creation of an independent digital department that permeates the entire organization, and through investments in technologies to make the museum experience more interactive.

The relevant issue is seeking innovative ways to use digital technologies as strategic tools to advance the organization’s mission and strategy (Tassini, Gu, & Aris, 2016). This means that leveraging on digital innovation, cultural institutions can further valorize their heritage and increase the value generated for individuals and the entire community. The opportunities digital technologies present are numerous as they can support and facilitate cultural institutions in reaching the three strategic pillars identified in the previous section. In particular:

- Regarding *Heritage*: Improvement of preservation methods, as well as creation and valorization of digital heritage.

Cultural institutions adopt digital preservation techniques, which focus on the means of selecting, collecting, transforming from analogue to digital, storing and organizing information in digital form and then making it available for searching, retrieval and processing via communication networks (Abd Manaf, 2007). The aim is to guarantee the conservation of the knowledge embedded within cultural heritage for future generations, as well as the creation of digital collections that can democratize the access to culture. Equally, digital technologies provide novel and improved methods for restoring physical cultural assets.

- Regarding *Audience*: Increase of on-site and online user engagement, aligning the museal offering to visitors' expectations.

Digital technologies have a positive impact in relation to audiences for they allow cultural institutions to expand: the audience breath – to reach different and more diverse audiences; the audience width – to reach a larger audience; and the audience depth – to engage more with current audiences. All in all, digital tools allow cultural institutions to become “experience providers”, rather than simple heritage guardians, and to customize such experience through a strong understanding of the visitors' needs and preferences. Digital technologies have created a paradigm shift within cultural institution from being object-centered to user-centered. Apart from the preservation of heritage, now the focus is set on its distribution and consumption. The final result is the development of a long-term relationship with the audience that extends beyond the walls of the cultural institution and the duration of an exhibition.

- Regarding *Network*: Generation of a museal community through active marketing and digital channels.

New information and communication technologies allow cultural institutions to connect with audiences, cultural professionals, similar institutions and the entire web in real time; i.e. to be in contact with the community. The benefits range from active and dedicated marketing actions, to the organization of cultural initiatives and generation of crowdfunding and fundraising platforms.

- Finally, considering a more transversal perspective, the employment of digital technologies can lead to the optimization of institutions' internal processes (Accountability & Control, Human Resources, Administration, and so on...).

As a consequence, the digital transformation is much more than publishing an appealing website, providing access to collections online or digitizing the on-site experience. To seize the opportunities that the digital revolution presents, institutions must employ the technologies throughout the organization to drive performance and efficiencies. Digital should be a leverage to increase the generated value. This includes using digital tools to analyze audience data, improve and develop delivery channels, create new content and improve operational efficiency (Tassini, Gu, & Aris, 2016).

To summarize, cultural institutions are subject to a paradigm shift in a world disrupted by the digital revolution. Facing fundamental demographic shifts, changing customer expectations and continual technological innovation (Tassini, Gu, & Aris, 2016), *transformation* is the term that better suits the cultural heritage sector in the 21st century. Embracing the digital transformation, and so integrating technology and innovation at the core of their strategy, will allow institutions to seize the numerous opportunities that come along and improve the value generated to the entire community.

1.2 Research objectives

The previous chapter has emphasized the relevance of the digital transformation within cultural heritage institutions in the fast-moving and changing environment of the 21st century. This thesis will explore the dimensions of such transformation with a concrete focus on Italian museums. The decision to delimit the research becomes inevitable in a sector comprised of a broad group of sub sectors delivering a diverse range of services and functions (Museums Association, 2008). However, the selection neither of Italy nor of museums as study objects is arbitrary.

Italy is a country recognized for its cultural heritage, both physical and intangible. Its culture is steeped in the arts, architecture and music. Home of the Roman Empire and a major center of the Renaissance, culture on the Italian peninsula has flourished for centuries (Zimmermann, 2017). The result is a country with an incalculable heritage to be preserved and diffused. In the last ISTAT survey “Indagine sui musei e le istituzioni similari” (2015), Italy has been defined as a diffused museum with a density of 1,7 museums or similar institutions every 100 km². Furthermore, it is the country with the highest number of UNESCO heritage sites in the world. Regarding the choice of focusing on museums, numbers can provide a fair justification. Of the 4.976 cultural institutions in Italy, 4.158 (83,5%) are museums and galleries while the remaining 16.5% is distributed among archeological sites and monuments (ISTAT, 2016).

Correspondently, considering the 110,4 million visits to Italian cultural institutions in 2015, more than 50% (59,2 million) were to museums. As a result, the Italian landscape and its museums seem to be a precious opportunity for conducting a research on cultural heritage.

As it was previously discussed, digital technologies can provide a large number of opportunities to cultural institutions which ultimately can result in an enhancement of the economic and social value generated. However, from case studies performed by the *Osservatorio Innovazione Digitale nei Beni e Attività Culturali* of Politecnico di Milano, it results that Italian museums are just at the beginning of their digital transformation process. There are still few cultural institutions which use the new instruments of digital information and communication in all its potential. The 2015 ISTAT survey shows how the 26% of almost five thousand Italian museums does not offer to the public any type of digital service neither of support to their *on-site* visit (app, QR code, Wi-Fi, audio guides) nor *online* (website, social media accounts, online ticketing). As shown in *Figure 3*, just 30% of the museums offer at least one digital service *on-site* and one *online*, but the percentage reduces to 11% if considered museums that provide at least two (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018). Indeed, the number of institutions in Italy which follow a concrete innovation plan is limited.

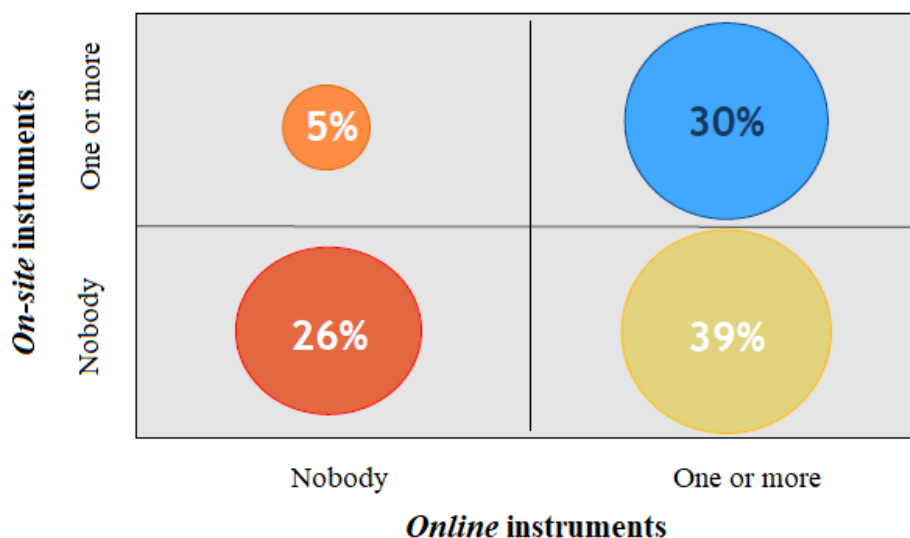


Figure 3: Segmentation of Italian museums according to the offered digital services. Total: 4.976 institutions (Osservatorio Innovazione Digitale nei Beni e Attività Culturale, 2018)

On the other hand, in the communication entitled “Towards an Integrated Approach to Cultural Heritage for Europe” (2014), the European Commission defines the cultural heritage sector as a *sector in transformation* motivated by urbanization, globalization and technological changes.

Museums are recognized as important forces in the economy which should reinvent themselves to seize the opportunities this new environment presents. Digitalization and online accessibility of cultural content shake up traditional models, transform value chains and call for new approaches to the cultural and artistic heritage (European Commission, 2014). In this context, the European Commission addresses the social and economic value of museums, claiming that technology can significantly enhance it: digitized cultural material can be used to enhance visitors' experience, develop educational content, documentaries, tourism applications and games (European Commission, 2014). Therefore, to strengthen Europe's position in the field of cultural heritage the Commission recognizes as a need to:

- encourage the modernization of the heritage sector, raising awareness and engaging new audiences,
- apply a strategic approach to research and innovation and
- seize the opportunities offered by digitalization.

However, in this particular communication the European Commission does not provide concrete guidelines addressed to cultural institutions on how to achieve the three aforementioned points and which are the resources to be employed. Indeed, analyzing the existent literature it can be observed that the large majority of it follows the same approach. The focus is set, instead, on the possible applications digital tools could have within museums. The most repeated issue refers to the utilization of digital technologies for improving visitors' satisfaction and increasing their participation. Examples include immersive on-site experiences or digital tours. In the same line, the literature tackles the use of digital tools for communicating with visitors and enlarging their number through, for example, attractive websites and social media. Another common issue to many papers concerns the utilization of digitization² technologies for long term preservation; an issue widely diffused probably considering the relevance of this action for cultural institutions.

Summarizing, literature concentrates in the contextualization of digital technologies within museums by providing concrete application examples and for achieving a particular target (such as improving customer satisfaction, enlarging the visitors' base or preserving heritage...). However, there is a lack of material addressed to cultural institutions which guides them through their digital transformation, i.e. on how the organization should strategically approach

² Digitization refers to the means of selecting, collecting, transforming from analogue to digital, storage and organization of information in digital form and the making it available for searching, retrieval and processing via communication networks (Abd Manaf, 2007).

such transformation in the first place. Information is very limited and dispersed regarding how to adopt a digital strategy, which are the key necessary resources, and which are the most common barriers museums may encounter. To engage in digital transformation, cultural institutions need a framework to guide their analysis, their strategy and their activity planning. Indeed, when analyzing other sectors in the economy, specially manufacturing, the number of theoretical frameworks and models guiding digital transformation is extensive. Considering the existent gap, the present thesis arises to support cultural heritage institutions, in particular museums, along their digital transformation path by:

- identifying the critical dimensions that drive such transformation,
- and understanding how these dimensions should be leveraged to achieve a successful transformation.

These objectives can be translated in the following research questions:

RQ 1. Which are the main factors enabling museums to achieve an effective digital transformation?

The first research question aims at identifying which are the *digital enablers* of museums. *Digital enablers* are the pillars upon which technological investments are sustained: they are the levers enabling digital strategies and digital transformation projects. In order to properly identify them, there is the need to adopt a holistic perspective that goes beyond the evident technological levers. Although IT resources are critical and foundational factors required in any digital transformation, by no means they can stand alone. For example, without skilled personal it is not possible to take advantage of what new technologies can bring (Yoo, Wysocki, & Cumberland, 2018). A digital transformation is a much more extensive issue which involves the entire organization and implies the coordination of several key elements. The matter is to clearly identify these critical success factors and determine how they should be leveraged.

RQ 2. Which factors or conditions represent obstacles for museums in their digital transformation path?

Along with the identification of the digital enablers comes, as well, the recognition of the main barriers to the adoption of digital technologies. Such factors represent important challenges for organizations which, if overlooked, could compromise the achievement of a successful digital transformation.

The presented research questions complement each other by supporting cultural institutions along their digital transformation in a distinctive way. While RQ 1 verifies the necessary resources for implementing a digital strategy, RQ 2 describes the possible challenges institutions may encounter along the way. Both aspects are relevant and represent a source of knowledge for cultural institutions, which may determine the success or the failure of their transformation. In order to deal with the research questions, a theoretical framework has been created. The following section describes in a more detailed way the methodology adopted for this thesis and how the chapters are developed.

1.3 Methodology and chapter development

To begin with, in *Chapter 2*, an analysis of the existent literature has been performed for building knowledge on the two aspects under analysis: museums and digital technologies. Initially the topics are treated separately for introducing them properly, but then they are combined for approaching the impact the digital revolution is having on museums. Following, to deal with the research questions and the literature gap, a theoretical model for cultural institutions is created. For that purpose, the last part of *Chapter 2* consists in the review of the digital transformation models available for other sectors of the economy. Some critical dimensions emerging from this analysis are included in the elaborated framework, along with other elements which belong exclusively to the heritage sector. To validate such model, interviews are carried out with four Italian museums on specific digital projects they have developed (or are developing). Italian museums can provide many insights on digital transformation and be a great setting for validating the model because of the efforts they are making to overcome their digital laggardness. In this sense, the Italian sector is an active and moving environment. The description of the selected organizations and the methodology employed for conducting the interviews is presented in *Chapter 3*. Following, *Chapter 4* presents the results of the multiple case studies, which are thus analyzed critically in *Chapter 5* for obtaining empirical evidences. Finally, *Chapter 6* concludes with the respective conclusions, which present the Master Thesis's findings, its academic and managerial implications and, finally, considering the limitations of the work, some outlooks for future research.

2. LITERATURE REVIEW

2.1 Museums

2.1.1 Definition

To begin with, a clear definition and contextualization of museums is required since they represent the object of study of the present thesis. With reference to this subject, the professional definition of *museum* most widely recognized nowadays is provided by the International Council of Museums (ICOM). The ICOM is an international, non-governmental organization made of museums and museum professionals which is committed to the research, conservation, continuation and communication to society of the world's natural and cultural heritage. In addition, it establishes professional and ethical standards for museum activities. The ICOM is an undisputed reference since it is the only global organization in the museum field: it counts with 40.000 professionals over 141 countries.

Consequently, as presented in the ICOM's Statutes of 2007:

“A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment.”

The museum is a permanent institution, meaning a physical place created by man to maintain a relationship with reality. This relationship is defined by the principal functions inherent to any museum: acquisition, conservation, research, communication and exhibition of collections. Collections can be defined as “the collected objects of a museum, acquired and preserved because of their potential value as examples, as reference material, or as objects of aesthetic or educational importance (Burcaw, 1997)” (Desvallées, & Mairesse, 2009). These objects are part of the world's natural and cultural heritage and may be of tangible or intangible character (ICOM, 2004). However, the incorporation of the intangible heritage, such as testimonies, to the current (2007) definition of museums is a novel aspect. The previous definition, dating back to 1974, has been used as a term of reference for over thirty years and did not contain any reference to intangibility.

“A museum is a non-profit making, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates

and exhibits, for purposes of study, education and enjoyment, **material evidence** of people and their environment.” (ICOM Statutes, 1974).

A possible classification of museums can be done by analyzing the character of their contents or collections. Under this category, UNESCO groups them as follows:

- a. **Fine Arts Museums:** collect and preserve aesthetic heritage of man’s creative genius, such as paintings, sculptures, architecture and engravings, among others (Goode, 1896).
- b. **Decorative Arts Museums:** contain artistic works of decorative nature.
- c. **Contemporary Art Museums:** contain art created during the 20th and 21st centuries.
- d. **Museum-House Museums:** are located in the birthplace or residence of a famous person.
- e. **Archeological Museums:** contain heritage with historical and/or artistic value from archeological excavations or discoveries.
- f. **On-site Museums:** are created by turning certain historical locations into museums.
- g. **Historical Museums:** preserve heritage associated with events in the history of individuals or nations.
- h. **Anthropological Museums:** include heritage illustrating the natural history of man, his geographical distribution, his organization in tribes and the origins of arts, industries and customs.
- i. **Natural Science Museums:** illustrate phenomena of nature – belonging to the animal, vegetable and mineral kingdoms – and whatever illustrates their origins, function and structure.
- j. **Science and technological Museums:** contain heritage that is representative of the evolution of history, science and technology.
- k. **Specialized Museums:** concentrate on a particular area of cultural heritage that is not covered in any other category.
- l. **General Museums:** can be identified by more than one of the aforementioned categories.

Physical and intangible collections are at the heart of cultural heritage institutions and are their main capital. Indeed, the value of the cultural sector lies in the quality and diversity of the collections (European Commission, 2016). However, the value is also on *how* they are disseminated and experienced by society who may be changed and transformed by them (European Commission, 2016). This statement recognizes society and the social value generated as key elements for cultural institutions. These notions are central to the any current

definition of “museum” and are at the core of their operations: “*in the service of society and its development*”. In this sense, museums are responsible for making cultural heritage, and all the knowledge embodied in it, available to the community. Without the distribution and public enjoyment of the cultural heritage it holds, part of the museum’s role would be incomplete. This is because, apart from looking after the world’s cultural property, museums interpret it to the public (ICOM, 2004). Museums have been mainly created to increase the cultural and educational level of the population (OECD, 2017); they are social institutions.

Nowadays, with the advent of digital technologies, the relationship between museums and the community is acquiring an increasing relevance. The digital has infiltrated and transformed all aspects of social life and cultural heritage institutions, as social institutions, are part of these changes (European Commission, 2016). In this context, the audience does not require from museums only an educational visit but demands an *experience*. As a result, cultural institutions are forced to re-define themselves and transform from being just heritage guardians to also experience providers. This means, becoming more interactive, participatory and democratic in their relationship with their visitors and in enhancing their public engagement agendas. In other words, museums are experiencing a paradigm shift from being object-centered to user-centered. This aspect is one of fundamental relevance to the present thesis and so will be discussed in extension further on.

2.1.2 Economic perspective

This section is dedicated to a brief economic analysis of cultural heritage institutions, with the final goal of further modelling and presenting their operating scenario.

Apart from the main role of heritage preservation, cultural institutions can focus on pursuing different objectives - some couched in artistic and creative goals, some in terms of audience engagement, and others related to their public and social impact. This multiplicity of objectives is mirrored in the heterogeneity of observed financial structures (Bakhshi, & Throsby, 2009). Such structures differ according to the source of museums’ funds, which may be from the public sector, from private sources or generated through the museum’s own activities. This last element includes additional incomes from admission charges, the gift shop, or food service, among others (ICOM, 2004). Therefore, the particular combination of the three mentioned fund sources determines the financial structure of each institution. This could result in difficulties when trying to model in a general sense the economic behavior of cultural institutions. However, as presented in the previous section, museums are by definition non-profit

institutions. As a result, it is possible to apply the basic theory of not-for-profit firms to cultural institutions when performing an economic analysis of these institutions (Throsby, 2001).

As non-profit organizations, the essential purpose of cultural institutions is not one of maximizing shareholders' value in the direct financial sense (Bakhshi, & Throsby, 2009). Instead, the value they generate serves a larger social purpose. As a matter of fact, nowadays museums are encountering a growing need to prove the value they contribute to generate and spread to the society (Bollo, 2013). However, the study of how to measure it presents several difficulties because of its multifaceted character. In order to highlight the multidimensionality of the value generated by museums, the Netherlands Museums Association has identified five values (DSP-groep, 2011) that together make up the social significance of these institutions (Bollo, 2013):

- **Collection Value:** is at the core of a museum's existence and comprises the values related to collection, conservation and exhibition activities.
- **Connecting Value:** depends on the museum's capability to act as a networker and mediator between different groups in society (giving consistency to current topics and issues through relevant and meaningful contexts) and to become a platform for communication and debates.
- **Education Value:** lies in the museum's ability to propose to audiences as a learning environment.
- **Experience Value:** is related to the museum's capacity to provide opportunities for enjoyment and experience through which people can be stimulated both physically and intellectually.
- **Economic Value:** depends on the museum's contribution to the local economy: the number of tourists they attract, the jobs they create, the capital represented by volunteers...

These five points underline how, clearly, not all of the value generated by museums can be fully captured by the economic value. There are specific characteristics of the cultural value which cannot be reduced to a monetary form (Throsby, 2001).

Analyzing the cost and revenue conditions in which the aforementioned value is generated, non-profit organizations have peculiar characteristics. Generally, they sustain high fixed costs in comparison to the variable costs, a relatively low level of demand and limited funding. This can be justified with the observed decrease of public budgets, as well as, of participation in

traditional cultural activities (European Commission, 2014). Consequently, the objective function of museums could be described as involving the joint maximization of the level of output and its quality, subject to a break-even budget constraint (Bakhshi, & Throsby, 2009). The “level of output” concerns access objectives, i.e. attracting the largest number of visitors as possible; while “quality” refers to artistic/curatorial quality standards and so offering the audience valuable collections. These objectives are pursued analyzing the trade-off with costs and so trying to achieve the required balance with the budget.

The presented model, adapted to cultural institutions from non-profit firms, represents in a general sense how museums operate financially. It is worth highlighting the financial challenges they face due to high costs and, generally, low incomes. This situation may then change according to the particular objectives of each institution and their particular contexts.

2.1.3 Museum’s value chain

In the previous section, a description of the multifaced value generated by museums was presented. Correspondently, an analysis of *how* such value is created should be performed.

The concept of *value chain* was firstly introduced by Michael E. Porter in his 1985 book “Competitive Advantage” and was described as a set of activities that an organization carries out to create value for its customers, which is the fundamental purpose of any entity. It is in these *value activities*, considered as “discrete building blocks”, that the competitive advantage of a business resides. Porter classified them into two broad types:

- **Primary activities:** are the ones involved in the physical creation of the product/service and its sale and transfer to the buyer, as well as, the after-sale assistance.
- **Support activities:** are the ones that support the primary activities by playing a specific role.

The following graphical representation shows how the traditional organizational processes are divided into the two aforementioned categories of value-generating activities.

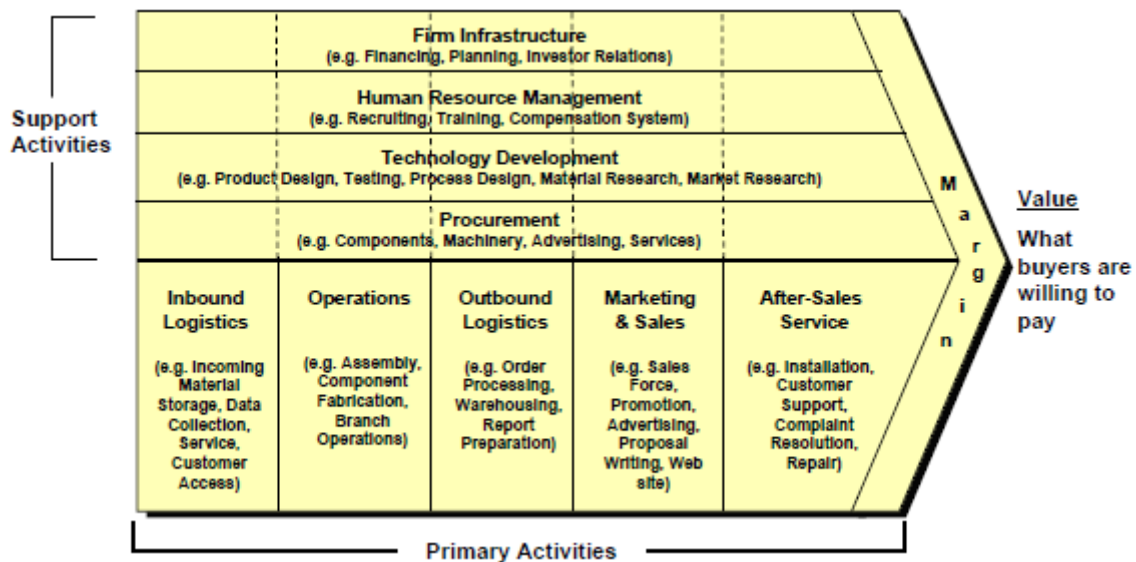


Figure 4: Porter's Value Chain (Porter, 1985)

However, some difficulties are encountered when trying to fit cultural institutions' processes within this classical value chain. In 2006, Porter himself redefined the concept of value chain for museums in a set of slides entitled "Strategy for Museums", which was presented to the American Association of Museums.

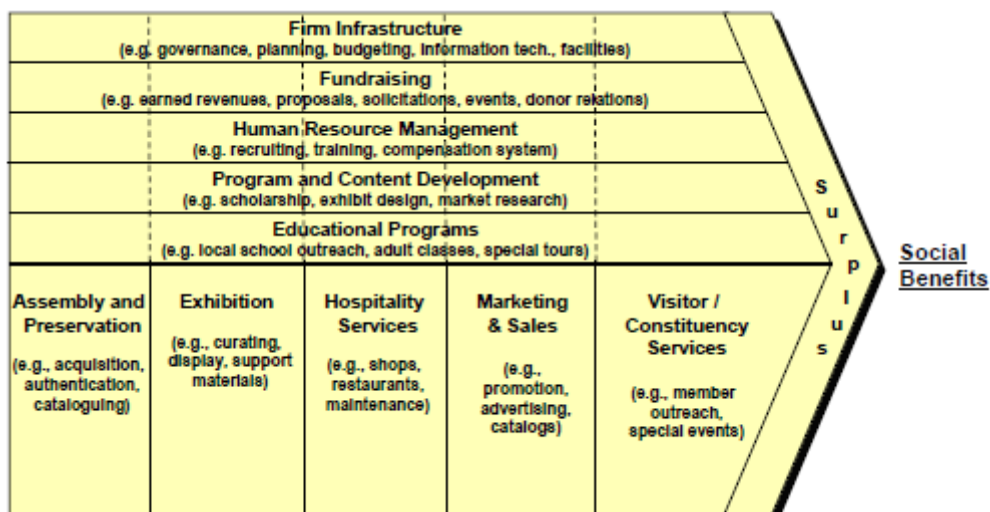


Figure 5: The Museum Value Chain (Porter, 2006)

In this framework, ten strategically important activities carried out by museums are identified, each one of them being a source of value and of cost. As observed in Figure 5, according to Porter, museums' primary activities concern the acquisition of cultural heritage for its preservation and further exhibition and communication to the community. Supporting these

activities are the firm infrastructure, the human resources, the financial aspect, the content and the educational programs.

The museum's surplus will depend on whether these activities are carried out efficiently and effectively; this last issue depending on the value museums are able to deliver to their visitors. Differing from the original model, when analyzing cultural institutions, Porter does not define the value generated in financial terms but as *social benefits*, which include customer value, community outreach, and public service (Kotler N., Kotler P., & Kotler W., 2008). This approach is consistent with the five types of value identified by the Netherlands Museums Association, and that were described in the previous section. A correct business model identifies what customers value and levers on its own activities based on it. In this way, museums will achieve excellence in the eyes of their consumers and perform effectively in the marketplace (Kotler N., Kotler P., & Kotler W., 2008), obtaining a competitive advantage.

Besides Porter, the authors Normann, & Ramirez (1993) focus on the importance of the customers as well but changing perspectives: instead of considering sequential value activities, they propose a *value-creating system* in which there are different stakeholders – suppliers, partners, customers - positioned in a constellation, co-producing value. They argue that successful companies do not just add value through their operations, but they *reinvent* it according to stakeholders' needs. Consequently, the strategic task is to reconfigure the relationship between the firm and the constellation of actors who create value by themselves from the company's various offerings. In this optic, strategy is conceived as a systematic social innovation: the continuous design and redesign of business systems. A good example is that of the Swedish brand IKEA, which became the world's largest retailer of home furnishings by proposing a new business formula. Instead of positioning to add value through a series of sequential activities, it has redefined value as one in which customers are also suppliers (of time, labor, information and transportation) and suppliers are also customers (of IKEA's business and technical services). By stressing the value of interaction and active participation, this reasoning becomes coherent with the changing role of museums as experience providers; museums' focus has shifted from collections to audiences, so visitors assume a central role in creating their own value as the main agents of change (Ferraro, 2011).

In another version of the value chain model, Bakhshi, & Throsby (2009) of Nesta ³ incorporate explicitly the presence of different actors as well. In *Figure 6*, it can be observed that beyond the cultural institution there are also the customers, the funding bodies and the artists.

Furthermore, the interactions between the several actors are presented, differentiating between production, distribution and consumption of artistic content on the one hand, and the flow of content, services and money on the other. It is worth mentioning how this presented division follows almost perfectly the operations described in ICOM’s definition of a museum as an organization that “[...] *acquires, conserves, researches, communicates and exhibits* [...]”.

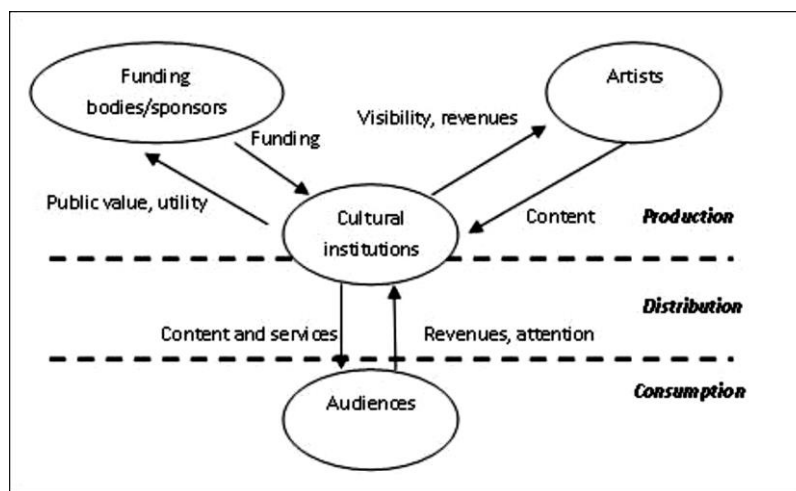


Figure 6: Nesta’s value chain for cultural institutions (Bakhshi, & Throsby, 2009)

The last presented model regarding museums’ value chain and operations is the one proposed by Ferraro in the research paper entitled “Restyling museum role and activities: European best practices towards a new strategic fit” (2011). In the developed framework, Ferraro integrates the traditional and well-established museal activities - conversation, display and service – with new directions in museum management. The latter refers to the alignment of museums’ strategy to co-production, governance and new learning and entertainment opportunities, as well as determining a shift towards being a place for multi-sensorial experiences. To successfully achieve such integration, Ferraro’s museal value system combines elements extracted from different sources and authors including: Porter’s value chain, ICOM’s standards, ICOM’s Code of Ethics and the Italian legislative decree n.112/98 (“Conferimento di funzioni e compiti amministrativi dello Stato alle regioni ed agli enti locali”), among others.

³ Nesta is a global innovation foundation, based in the UK, which supports new ideas that tackle the challenges society is currently facing. It operates in different fields, among which creative economy & culture, education, public administration and health. Furthermore, it collaborates with the UN and the European Commission.

As a result, four clusters of museum activities are identified:

- **Research and Conservation:** groups the activities related to “making and maintaining collections”, i.e. the acquisition, documentation and conservation of heritage. As so, this area concerns the most traditional museal functions.
- **Valorization and Communication:** this group represents the integrated system of museal offer, comprehending all the activities related to display management and the relationship with the public.
- **Support Activities:** includes all the strictly instrumental activities like Human Resources Management, Planning and Control, Fund Management and IT systems.
- **Networking and Governance:** this last cluster encompasses all the activities relevant for museum’s offer integration, governance and functional integration, since networking has proved to be pivotal for museums’ survival. Indeed, the integration between the museum and the territory in which they are present is a characterizing issue in the European context, where the dialogue with the community is the center of museum management.

In *Figure 7*, the detailed activities under each category can be observed. This framework integrates successfully several models and captures both traditional museum activities with new trends like customer participation and the importance of networking. As a consequence, Ferraro’s framework will be the one utilized as reference model for the present thesis.

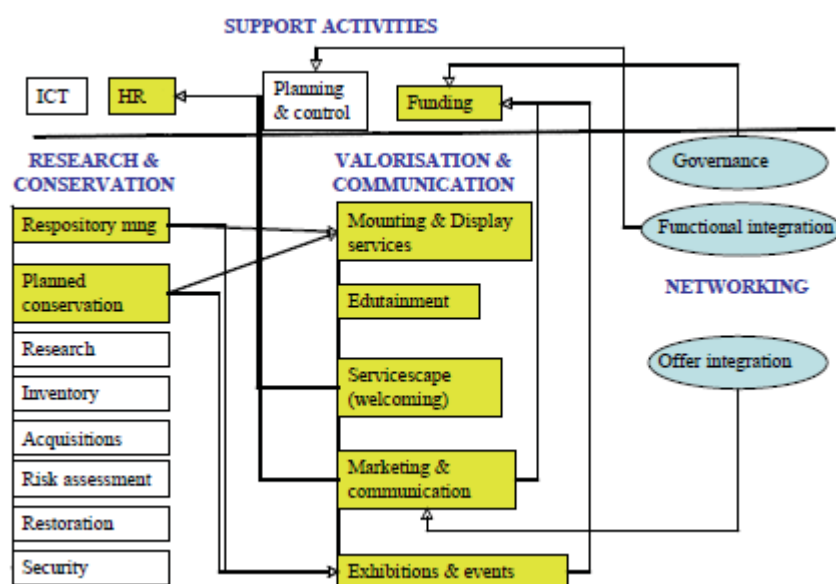


Figure 7: The adapted museum's value chain model (Ferraro, 2011)

2.1.4 A sector in transformation

Transformation is the term that better suits museums' situation nowadays (Ferraro, 2011). Cultural institutions are in a time of change, that is disrupting their traditional value chain and ways of operating. The environment they have to face is a task adverse one, represented by changes in customers behaviors and in their funding structures, as well as, challenges coming from the rise of digital technologies. In particular, the main drivers of change can be described as follows (Bakhshi, & Throsby, 2009):

A. Changing patterns of demand

Consumer behavior is dynamic and so forces institutions to constantly be aware of how their preferences and attitudes change over time. One important shift regards customers' spending pattern in cultural activities, which according to Ravanas (2007) has a declining trend. This phenomenon is evidenced, on the one hand, through the declining number of subscription renewals and season-ticket holders, that are instead moving towards more flexible packages and one-visit offerings (Ravanas, 2007). On the other hand, the expenditure on online leisure activities is every time higher. Such activities present cannibalization and substitution effects of the traditional cultural circles and consequently have become a great risk and challenge for cultural institutions. Quoting Sree Sreenivasan - Chief Digital Officer of the Metropolitan Museum of Art (Met) in New York from 2013 to 2016: "Our competition is Netflix and Candy Crush, not other museums" (Shu, 2015). Moreover, customers' habits have changed with the introduction of social media and digital platforms which allow a rapid growth of user-created content. This has generated audiences willing to personalize their own cultural experience, to co-produce and actively participate in the tailoring of their visit.

B. Changes in unearned revenue sources

In the non-profit organization theory, "unearned revenue" refers to the sources of finance that are not related to the sale of goods or services, i.e. grants, governmental subsidies, individual donations and private firm donations, among others... (Bakhshi, & Throsby, 2009). The changes observed in this area concern the increased pressure on governmental budgets and the reduction of public spending, which lead to a reduction of funds destined to cultural institutions and the terms on which they are given. As a result, museums are forced to operate in an even more limited cost-revenue scenario and adopt business strategies in search of new financial support streams. It is worth noticing that this situation may be more or less relevant depending on the financial structure of the organization and its dependence on public or private entities.

C. Changes in technology

A major driver of change for cultural institutions is represented by the ICTs revolution. The digital has transformed all social aspects (and not only) of life and museums, as social institutions, are part of these changes. The impact, and so opportunities, can be observed throughout the museum: in the internal organization (production), in the communication with audiences (distribution), and in the way visitors interact with the cultural organization and its heritage (consumption) (European Commission, 2016). A more detailed analysis of the applications of digital technologies within museums will be presented in *section 2.2.3*.

For museums to remain relevant to audiences and be sustainable in time, they need to evolve according to visitors' expectations, i.e. to follow the path of a digital transformation. This implies recalibrating their focus from objects to audiences, adopting new working practices and new ways to engage with museum visitors (European Commission, 2016). Nonetheless, successful enterprises recognize that the digital transformation is not an end by itself, but that it presents a more efficient and effective mean through which to pursue one's mission. In other words, it means acknowledging that the motivation behind the adoption of digital technologies is not its increasing trend but the wide span of opportunities they present for generating value. In this sense, it is fundamental that institutions maintain their collections and heritage at the core and analyze how to potentiate them through digital interfaces and innovative services.

Technology, as an important change driver for cultural institutions, is the fundamental pillar of the present thesis and, as such, the following section of this chapter will explore the issue in more detail.

D. Changing concepts of value creation

All of the aforementioned drivers of change impact, in one way or another, in cultural institutions' environment, affecting the way in which value is perceived and delivered (Bashkhi, & Throsby, 2009). Recalling what was said in the museums' value chain chapter, perhaps the most relevant aspect in this category of change is the emphasis that is put on what customers value. Nowadays, retaining a challenging audience share, requires museums to align their offer to visitor's expectations, i.e. to shift their focus from collections to audiences. Digital technologies, in particular, can be of great use to this scope since they allow institutions to further valorize their heritage and deliver value in novel ways.

As it can be induced from the aforementioned change drivers, cultural institutions are immersed in a challenging environment which requires them to adopt a responsive behavior and be highly competitive (Camarero, & Garrido, 2010). In most industries, including the creative sector, the key to gain a competitive advantage is innovation which, under this perspective, would represent a response to the change drivers. Consequently, it is interesting to see what *innovation* looks like in the cultural heritage sector. Referring to Bakhshi, & Throsby (2009), innovation in museums can be described through four broad categories:

a) Innovation in audience reach: this category refers to the concept of *audience development* which intends the strategic and dynamic process of extending museums' visitors (European Commission, 2014) by:

- *Audience broadening:* attracting a larger share of the population who already attends museums. The options for doing so include the offering of complementary services or activities that give the museum an additional value, as for example artistic workshops, events combining collections with music or other artistic forms, and so forth.
- *Audience deepening:* intensifying the involvement with museum's current audience measured, for example, by the number of visits per individual in a year, or by the degree of visitors' engagement with the artform. This can be achieved, for example, by offering modifications such as evening extended hours, weekend programs and interactive exhibitions; or by offering new collections and tours (Kotler N., Kotler P., & Kotler W., 2008).
- *Audience diversifying:* attracting new segments of consumers who would not otherwise attend museums. This includes the multiple efforts cultural institutions make for attracting younger visitors (and not only). For example, in 2011, the Museum of Contemporary Art of Los Angeles hold an exhibition entitled "Art in the Streets", which focused on the street art movement. The display of graffiti within the museum walls had a great success and showed the initiative of trying to conciliate street art artists with the art world.

The decision to innovate in the audience reach is strongly related to the strategic re-orientation of museums away from being product-centric towards being experience-centric institutions. Apart from specific marketing methods for presenting collections in a novel way, digital technologies are the main enabler of this type of innovation. The first instance may be that of using the Internet for providing service and product information, selling tickets and promoting new activities (Bakhshi, & Throsby, 2009). However, the most profound innovations regarding

audience development come from the far-reaching potential of the new information and communication technologies. There are in particular three ICT features that serve as drivers (Bakhshi, & Throsby, 2009):

- *Interactivity*: the possibility to maintain two-way and dynamic communication between the museum and the audience, which allows to customize offerings and provide interactive experiences.
- *Connectivity*: the power of the Internet allows direct and frequent communication among museums, as well as, with the audience. For example, social media enables visitors to share their opinions with the institution and with everybody else.
- *Convergence*: audiences can access information in any place and at any time through the appropriate devices.

These enablers combine to offer great opportunities for innovating how museums relate to their existing audience and how to reach new groups of visitors.

- b) Innovation in artform development:** also referred to as “Product Innovation”, this category is concerned with the offering of new services and activities and with improvements or variations in the displayed collections (Camarero, & Garrido, 2010). Basically, it is about innovating the product portfolio by changing the mix of presented collections or by introducing radically new works. Together with the extension of the artform, come the educational and information functions as well, which help visitors in understanding the new content.
- c) Innovation in value creation:** as described in *section 2.1.3*, cultural institutions create value in several ways and for the society overall, not only for its visitors. A possible approach to innovation is finding new possibilities to exploit cultural assets and create greater value. Furthermore, an increasingly relevant issue for museums is trying to measure the value they generate and to translate it into terms to which policymakers and investors can relate (Bakhshi, & Thorsby, 2009). This issue is particularly intensified by the tight public spending environment and the recent acceptance of cultural institutions as agents of social inclusion. An additional motivating factor is the larger public value museums generate by expanding the audience reach with digital technologies. Market value, and so economic terms, are not able to measure all of the value generated; reason for which institutions should invest in innovative valuation techniques and in systems for collecting the necessary data to utilize them.

d) Innovation in business management and governance: concerns the innovation of organizational structures, business models and administrative processes. New business models have been developed as a result of the changing environment in which cultural institutions operate. In particular, the incentive behind the innovation emerges both from the demand and the supply side (Bakhshi, & Throsby, 2009). Regarding the demand, the shift from product to customer which was mentioned earlier leads to new interpretations of value; in particular a bottom-up approach of the visitors' experience. On the other hand, concerning the supply side, the interest in changing business models has been mainly promoted by the advent of digital technologies. The result is that of representing the relationship between institutions and audiences as a *network* (Bakhshi, & Throsby, 2009). As it can be observed, in this last category of innovation there is a convergence of the three aforementioned ones.

To summarize, innovation in cultural institutions occur as a response to a challenging environment characterized by changes in technology, consumption patterns, revenue sources and value creation concepts. The digital revolution, in particular, can be identified as the main driver behind the paradigm shift of museums from collections to audiences. As a result, museums today can be described as a multi-dimensional cultural space which provide a full range of services and activities, ranging from traditional exhibition of cultural heritage to interactive experiences and commercial products... (Ferraro, 2011). In this context, visitors become the main agents of change and creators of their own experience.

2.2 Digital revolution

2.2.1 The principles

This first section of *Chapter 2* is aimed at presenting, in a wide sense, the digital age and the digital technologies that compose it.

To begin with, the Digital Age can be defined as “a period in time in which **information** has become a commodity that is quickly and widely **disseminated** and easily available through the use of **computer technology**” (Merriam-Webster dictionary). This period, which began around the 1970s with the proliferation of digital computers, represented the transition from analog to digital electronics and technologies. The relevance and impact of this transition was such as to denominate it “The Third Industrial Revolution” or even as the “Information Age”, given the key role of information within it. As a result, a knowledge-based society was created; aspect which is illustrated in the following quote:

“We are at present undergoing a fundamental transformation: from an industrial society to the information society. Information society technologies increasingly pervade all industrial and societal activities and are accelerating the globalization of economies...” - European Council, 1999.

As evidenced in the aforementioned definition of the “Digital Age”, such period was characterized by the advent of Information and Communication Technologies (ICTs), which can be described as the methods and techniques utilized in the generation and diffusion of data and digital information. In particular, ICTs combine two important components:

- *Information Technologies (IT)*: defined as an integrated set of digital components for collecting, storing and processing data and for providing information and knowledge (Encyclopedia Britannica).
- *Communication Technologies (CT)*: that are the digital elements through which information is exchanged between individuals (Merriam-Webster dictionary). For this category in particular, Internet-related technologies present a wide range of opportunities.

The backbone to both these elements is the digital infrastructure – also known as hardware -, which consists in the physical parts of the system like computers, mobile phones, wires, antennas, electronic devices, etc.... (Caperna, n.d.). Using this infrastructure, digital contents and information (websites, online publications, data bases...) can be generated, which present the advantage of being amazingly easy to access and disseminate; either it is within companies, among them, or with customers.

A step further from the Digital Age can be made if considered the 21st-century changes associated with innovation in digital technologies, both in the social and economic fields (Blanchet et al., 2014). They are leading to what can be defined as a new industrial revolution called “Industry 4.0”; concept which was developed in Germany in 2011 within the “High-Tech Strategy 2020” initiative, pointing at technological innovation leadership (Hermann, Pentek, & Otto, 2015). Industry 4.0 emphasizes the idea of steady digitalization and of connecting all the productive units of economy. In this sense, literature recognizes nine fundamental pillars at the basis of completely integrated, automated and optimized production flows (Rüßmann et al., 2015):

- *Big data and analytics*: the systematic collection and evaluation of large data sets coming from different sources to support real-time decision making.

- *Autonomous robots*: independent, flexible and cooperative robots that work alongside humans.
- *Simulation*: leverage real-time data for mirroring the physical world in a virtual one which allows testing different scenarios and thus, optimizing interconnected and complex processes.
- *Horizontal and vertical system integration*: the evolution of data-consolidation networks enables the close integration, on the one hand, between companies, suppliers and customers and, on the other, between departments, functions and capabilities.
- *Internet of Things (IoT)*: devices are enriched with embedded computing and are connected using standard technologies, which allows them to interact and exchange data among them and with more centralized controllers.
- *Cybersecurity*: with the increased use of technology and connectivity, the need to guarantee the safety and reliability of virtual data is essential.
- *The Cloud*: which allows the management and storage of large amounts of data.
- *Additive manufacturing*: describes technologies that build objects by adding layers of material, such as 3D printing, used mostly to create prototypes and test components.
- *Augmented reality*: interactive experiences of a real-world environment, augmented by computer-generated information across sensory modalities.

These technologies transform the configurations and functions of objects and people according to the main paradigm shift that everything is connected. This is possible thanks to Cyber-Physical Systems (CPS) which are networks that monitor the physical processes/objects and store data about them for further processing. Once identified the components of Industry 4.0, six design principles can be derived from them: Interoperability, Virtualization, Decentralization, Real-time capability, Service orientation and Modularity (Hermann, Pentek, & Otto, 2015).

To conclude, what emerges from the Digital Age and its further evolution into the Industry 4.0 can be described with three words: Consumers, Connected and Digital. Digital technology empowers consumers and allows their dynamic interaction with the company, even in the design phase of the products or services. Furthermore, the large amount of data that can be collected through digital and interconnected systems allows to analyze consume behaviors, needs and feedbacks to continuously innovate and create products that are highly valuable for them.

2.2.2 Digital transformation in museums

After having described and characterized the rise of digital technologies, this section is dedicated at exploring how museums should manage their transformation.

One possible approach is that of the Osservatorio Innovazione Digitale nei Beni e Attività Culturale of Politecnico Di Milano, which has ideated a roadmap for guiding cultural institutions through their digital transformation. As seen in *Figure 8*, it can be graphically represented through a spiral of continuous evolution which, starting from the cultural institution, aims at increasing the value generated by leveraging on the digital innovation. The proposed guidelines are articulated in four consecutive steps which correspond to four questions museums should pose themselves for facing the transformation:

- 1) *Measurement*: which is the starting point?
- 2) *Strategy*: where is the institution heading to?
- 3) *Projects and activities*: how to plan and decide the relevance of digital projects and activities?
- 4) *Sustainability*: are the digital projects sustainable regarding finance, time, technology and culture?

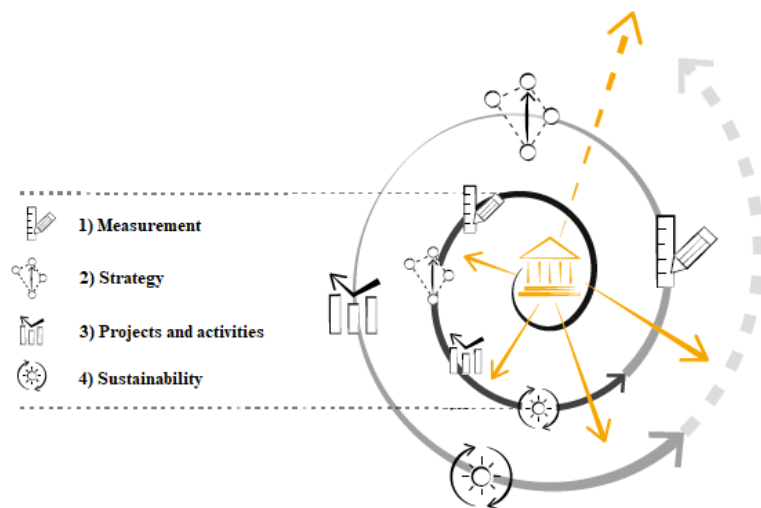


Figure 8: Roadmap of digital innovation
(Osservatorio Innovazione Digitale nei Beni e Attività Culturale, 2018)

For going into the details, each point will be analyzed separately in the following paragraphs.

1) Measurement: to plan a digital agenda, institutions need to have a clear vision of where they are starting from (Ernst & Young). This means determining the *as-is* situation: a status-quo analysis of the company capabilities and state of resources. A way to do it is by performing

a Digital Readiness⁴ Assessment, also known as Digital Maturity Assessment, which consists in assessing the level of digitalization of an institution through a series of dimensions. In particular, the assessment is performed by providing each dimension a corresponding maturity level according to the criteria and characteristics the model provides. The different levels serve as a scale for appraising the position of the institution within the digital evolution path (Becker, Knackstedt, & Pöppelbuß, 2009). The main outcome combines the maturity levels of the considered dimensions and presents a final weighted index which indicates “how digital an organization is”, assigning a final position within the maturity scale. The application of maturity models can be supported by predetermined procedures like questionnaires and surveys (Becker, Knackstedt, & Pöppelbuß, 2009) which allows, specially, consultancy firms to offer quick and online digital readiness assessments. Literature has shown that more than a hundred different models have been proposed (Becker, Knackstedt, & Pöppelbuß, 2009), yet it is not the aim of this thesis to explore them all. Just as an example, the University of St. Gallen developed alongside Crosswalk, a Swiss management consultancy firm, a digital maturity model which comprises nine dimensions: Customer Experience, Product Innovation, Strategy, Organization, Process Digitization, Collaboration, ICT Operations & Development, Culture & Expertise, and Transformation Management; and five maturity levels: Testing, Establishing, Consolidating, Structuring, Optimizing (Chaniias, & Hess, 2016).

This first step of measuring is important since, based on the results of the *as-is* analysis, institutions can understand where their strengths lie from a digital perspective and highlight the capabilities they may need to develop to further transform the organization for the future (Deloitte).

2) Strategy: following the measurement, the second step is the definition of a digital strategy. This point is of high relevance since the ability to digitalize the business is determined in large part by a clear digital strategy (Kane et al., 2015). A concept that is widely repeated throughout literature is that of technology as a means to potent ends and *not* as an end in itself. In other words, the strength of digital technologies does not lie in the technologies individually, but it derives from how organizations integrate them to innovate how they work (Kane et al., 2015). The willingness of institutions should not arise from the mere existence of digital technologies, but from acknowledging them as levers for achieving their strategic objectives. Consequently, it is fundamental that the digital strategy is conceived within the general strategy and the

⁴ “Digital Readiness” is an institution’s ability to adapt to changes and take advantages of new opportunities in the age of digital business.

strategic mission, i.e. the role that the cultural institution wants to adopt in relation to its operating environment (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018). Furthermore, the digital strategy should be translated into strategic objectives which can be utilized as a guideline in the day-by-day activities. In the case of cultural institutions, these objectives are strictly related to their three interconnected and characterizing pillars: Heritage, Audience and Network, which have been previously described in *Chapter 1*. The motivation is that the digital strategy can play a supporting role in the development of these pillars. In particular, digital technologies can (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018):

- *Simplify* (“Agevolare”): aspect which is not only relevant for back-office activities, but also for visitors in the sense that digital technologies gather information about their profiles and preferences. As a result, the museum is able to offer personalized experiences, services and activities.
- *Bring closer* (“Avvicinare”): through digital technologies visitors’ experience is extended beyond the physical limits of the museum, which enables continuous and higher engagement with audiences. Furthermore, Internet allows the creation of a wide network among institutions, companies and the entire community.
- *Amplify* (“Amplificare”): this aspect refers to the opportunity digital technologies provide for enhancing and further valorizing the cultural heritage of museums through, for example, multimedia content, digital preservation and so on...

Essentially, museums’ digital strategies may be classified according to two categories:

- *Digital customer experience*: these strategies aim at employing digital technologies for attracting visitors, enhancing their experience within the museum and maintaining the engagement even after the visit.
- *Digital operational excellence*: refer to strategies concerning the improvement of internal operations and museum’s management, mostly by reducing non-value adding activities and increasing efficiency through the application of digital technologies.

While the first category focuses on the new paradigm of museums of being user-centered, the second one recalls the fact that digital is not only for the outside, but also for the inside. Many museums may fall in the trap of considering the digital transformation as just having a flashy website or being present in the social media, when instead the organizational perspective is also of high relevance.

3) Projects and activities: after having decided the digital strategy, it is necessary to identify on which activities to act upon and how to do it. For this purpose, starting from the museum's value chain, it is possible to list the conceivable digital projects and see how they impact on the different activities. Then, it is fundamental to guarantee the alignment of the chosen technology to the strategic objectives of the museum.

Due to the extension of this analysis, the literature review on digital projects for museums and their contextualization within their value chain will be presented in the following section (2.2.3).

4) Sustainability: the roadmap concludes with the sustainability analysis of the digital projects considered in the previous step. For the sake of completeness, four different perspectives should be considered (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018):

- *Managerial sustainability:* this approach considers, on the one hand, the economic sustainability and, on the other, the one related to human resources.

Regarding the economic aspect, the correct approach is that of considering both the initial investment costs and the ones that might derive in the future (maintenance, associated investments, upgrades...). This issue acquires particular relevance if considered the limited economic-financial resources of many museums, alongside the high costs of developing innovative technologies (European Commission, 2016). Consequently, the recommendation given to museums in many pieces of literature is that of supporting the digital transformation through collaborative, interdisciplinary working, particularly with academic institutions and technology private companies (European Commission, 2016).

On the other hand, another important aspect regarding the managerial point of view is considering that a digital transformation, as any change inside an organization, requires the appropriate support of change management actions (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018). Such initiatives, usually born within the top ranges, should promote and aid the cultural change within the organization. If this aspect lacks, the sustainability of any project would be compromised.

- *Temporal sustainability:* regards the compatibility between the time required for developing and implementing digital projects, and the time needed by the museum and its visitors (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018). This element becomes critical for public museums which are usually given funds for a limited time period. As a consequence, it was observed that many projects raised issues

of sustainability as they only last for the lifetime of the funding (European Commission, 2016).

- *Technological sustainability*: covers both the suitability and the resilience of the chosen digital technology (Osservatorio Innovazione Digitale nei Beni e Attività Culturali, 2018). On one side, the suitability of a technology can be determined by the available infrastructure of the museum. For example, introducing a mobile app for the on-site experience is not suitable if the museum does not offer a WiFi network.

On the other side, the resilience of a technology is its ability to maintain its functioning through time; fundamental element considering the speed of obsolescence of modern technologies.

- *Cultural sustainability*: this category concerns the evaluation of whether the project, and its underlying strategy, is aligned with the general strategy of the institution. In other words, it is analyzing the impact that the digital project has on the museum's cultural objectives. This element is strictly related to the cultural mission the museum is trying to promote and so deserves careful attention. For example, if a museum wishes to promote sociability within its walls, the introduction of virtual reality would not be appropriate since it tends to isolate people.

2.2.3 Contextualization of digital technologies within museums

As previously introduced, this section of Chapter 2 aims at presenting the trends museums are following for the implementation of digital projects. For this purpose, different examples of technological innovation that are present in literature will be contextualized inside the museal value chain. This approach will allow to clearly identify how museums can employ novel technologies for developing their value-adding activities.

In *section 2.1.3 (Figure 7)* Ferraro's museum-adapted value chain model was presented. In it, museal activities were grouped in four categories: (1) Research & Conservation, (2) Valorization & Communication, (3) Support activities and (4) Networking. In the following paragraphs the different technological trends suitable for each one of them will be analyzed.

(1) Research & Conservation: this section focuses strictly on museums' collections and on their mission of preserving the cultural heritage, which is the irreplaceable legacy of humanity for future generations. Consequently, the activities under this category include: Conservation, Research, Inventory management, Acquisitions, Restoration, Security and Risk assessment. In this case, the use of digital technologies can be applied to improve the effectiveness and

efficiency of such activities. Analyzing the existent literature, the following trends can be observed.

Digitization and digital preservation

Digitization is the process of converting information into a digital format. This transformation from analog to digital is particularly relevant for museums when it concerns their collections. Having digital repositories allows, on one side, a better management of content and a higher audience accessibility and, on the other, the digital preservation of cultural heritage. According to the Council on Library and Information Resources, “digital preservation refers to the various methods of keeping digital materials alive into the future” (Northeast Document Conservation Center, 2000). This issue is fundamental for museums which, as cultural heritage institutions, are responsible of preserving the intellectual and cultural resources produced by all of society (Choy et al., 2016).

The digitization of cultural heritage relies on the growing quality of technical equipment, as well as on the increasingly fast processing and memory capacities of computers to the purpose of acquiring, storing, archiving and distributing technically accurate reproductions of cultural objects (Lazzaretti, & Sartori, 2016). The Rijksmuseum (Amsterdam) and the Smithsonian Institution (Washington) are the worldwide leaders in the field of digitization (Heyman, 2015). While in 2015, the Rijksmuseum counted with 25% of its collection freely available in high-resolution on its website, by 2020 it intends to digitize all one million objects in its collection. On the other side, the Smithsonian has already captured 2,2 million objects out of a collection of around 138 million, developing new and automated systems like a conveyor-belt scanner (Heyman, 2015) which can process an entire collection of 270.000 objects in three or four months. As observed, digital technologies can easily allow the creation of a wide digital heritage which can be divided into the following categories: born-digital items, digital or digitized information about the collection and lastly, digital representations (digital images or also 3D scans) of physical artefacts (Choy et al., 2016). However, having a digital heritage and digitally preserving it for future generations poses the significant challenge of ensuring its long-term accessibility; issue deriving from the quick rate of obsolescence and replacement of digital technologies. Recently, several approaches for digital preservation have been identified (Lee et al., 2002), among which the most popular ones are migration and emulation. While migration is the process of transferring data from a platform that is in risk of becoming obsolete to a new one (Granger, 2000); emulation is the creation of new programs able to understand and run the

original ones. Nonetheless, both share the objective of ensuring that information can be retrieved and processed in the future.

Another important aspect of digitization is the increased distribution and access to collections it provides to audiences: the digital access. Information and artwork of extraordinary quality can be delivered directly to the public without human intervention (Northeast Document Conservation Center, 2000) at any time through the Web. This represents an immense opportunity for museums to realize their mission of educating, promoting and disseminating culture (Deegan, & Tanner, 2006). An example is the Smithsonian Institution which publicly displays less than 1% of its overall collection of 138 million object, with most of it hidden away in storage. As exposing the entire collection would be physically impossible, its digitization presents an easier way of improving access.

Describing museums' main approach to digitization, Lazzaretti & Sartori represent it graphically as a pipeline (*Figure 9*) in which digital heritage contents are produced for collection management purposes and its following dissemination through the Web.

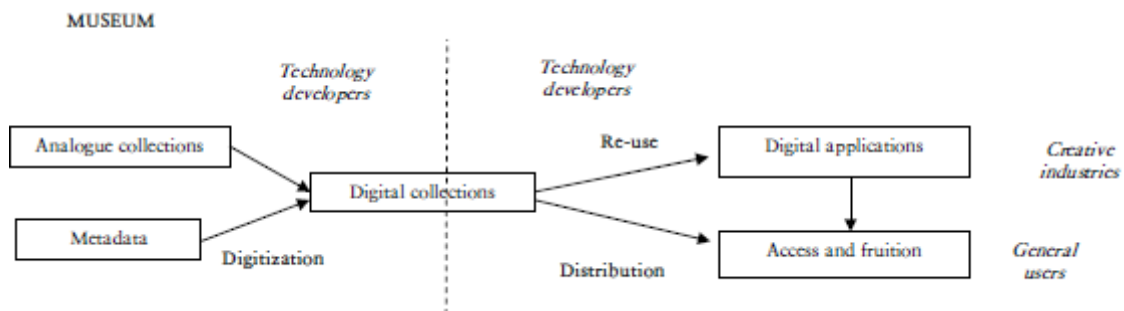


Figure 9: Museum digital pipeline (Lazzaretti, & Sartori, 2016)

Conservation - restoration techniques

The Digital Age has also allowed the introduction of new restoration-conservation techniques, focused on protecting and preserving the tangible cultural heritage. Among them, light projection and 3D scanning are the most relevant ones. In the first place, digitally-enhanced projected light can be applied for restoring faded artworks which are too fragile for traditional conservation methods. This noninvasive technique consists in a software which evaluates the different shades present in a painting against its original colors, calculating new images with corrected light levels. Then, these images are projected onto the original canvas via low-intensity light, virtually restoring inch by inch. This customized software was developed by Harvard Art Museum's conservation team in collaboration with the MIT Media Lab and the

University of Basel. On the other side, 3D scanning technology allows monitoring the deterioration of large-scale objects, task which would otherwise be extremely arduous since hundreds of surface points must be recorded, compared and analyzed. 3D scanning enables real-time feedback of object's structural changes, allowing a complete documentation that is specific to its unique decaying pattern and providing data for future comparisons. Examples of application of this technology are the Smithsonian American Art Museum on the piece "Gunboat Philadelphia" and the non-profit organization CyArk which digitally records, archives and shares world's cultural heritage like the Titanic, Pompei and the Leaning Tower of Pisa.

(2) Valorization & Communication: this category focuses on museums' visitors and their experiences within and beyond the physical boundaries of the institution. As a result, it includes the following activities: Mounting and Display, Edutainment, Welcoming, Marketing & Communication and lastly, Exhibitions & Events. It is in this section that the most diffused and well-known applications of digital technologies within museums can be found, i.e. interactive on-site devices, mobile apps, social media and so on...

Participatory experiences

A participatory cultural institution is a place where visitors can create, share and connect with each other around content (Simon, 2010). Analyzing the definition in detail:

- *Create:* visitors contribute their own ideas, objects and creative expression to the museum.
- *Share:* people discuss and redistribute what they see and what they make during their visit.
- *Connect:* visitors socialize both with staff and with other audiences during their museum experience.
- *Around content:* what visitors create, share and connect is focused on the collections and intangible cultural heritage the museum offers.

Sustaining participatory experiences is inviting people to actively engage as cultural participants and not as passive consumers (Simon, 2010). The principles behind this idea lay in the novel perspective of museums as being audience-centered institutions, where visitors generate their own cultural experiences. As a consequence, the museum no longer guarantees the consistency of visitors' experiences since each one is co-created and presents changing content. In this sense, the objective of the participatory method is to reconnect with a public

eager of active engagement and to do so in a way that furthers the mission and core values of the institution, demonstrating their value and relevance (Simon, 2010). By promoting participation, the cultural institution serves as a platform which connects different users and supports multi-directional content because it believes that users' voices can enhance the offering.

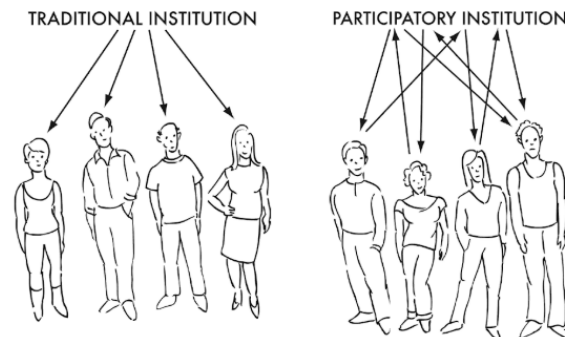


Figure 10: *The participatory museum* (Simon, 2010)

The biggest step towards the promotion of museums as participatory institutions has been made with the diffusion and adoption of digital technologies, which can be utilized by visitors as tools for creating and communicating content. For example, the Cooper Hewitt – Smithsonian Design Museum (New York) provides visitors a special pen at the entrance which allows them to collect information about objects in the gallery and create their own designs on interactive tables (Tassini, Gu, & Aris, 2016). Then, the collected information is stored in a unique web address which people can access after their visit. Apart from enhancing visitors' experience and promoting their participation, this pen also allows the museum to collect information about visitors' behaviors and interests and to maintain the engagement even after the visit. The aspect of gathering data about the visitors is a relevant aspect and will be discussed further on under the title "Data analytics".

The trend of participatory experiences has also pushed many museums to reconsider their no-phone policy. Instead, now many initiatives foster digital interaction via smartphones and social media within museum walls (Johnson et al., 2015). For example, both the Metropolitan Museum of Art (New York) and the New Museum of Contemporary Art (New York) invite visitors to personalize their experience by exploring and saving content on their phones and then sharing it in the Web (Johnson et al., 2015). These policies promote the "Bring Your Own Device (BYOD)" movement, in which museums ask visitors to use their personal phones/tablets and no longer the ones provided by the institution. This way museums can save money in purchasing, insuring and maintaining devices, while visitors can navigate the

collections on a device with which they are comfortable. However, as clusters of visitors like children or seniors may lack devices, a hybrid approach was designed called “Choose Your Own Device (CYOD)” allowing audiences to choose whether to use their own devices or loaning them from the museum. In most cases, the use of personal devices implies the development of an institutional app which visitors have to download. Parallely, these apps can be synchronized with other technologies for enabling seamless experiences. An example is the Beacon technology, a wireless Bluetooth transmitter which connects to users’ smartphones and allows to push targeted information to visitors according to their location and to collect data about their behavior (Johnson et al., 2015).

If considered the different digital technologies and structures which need to be installed for sustaining participatory experiences, it can be said that it is trend which requires large scale investments and high-capacity networks (Johnson et al., 2015). This may motivate museums to partner with technology providers and other external companies for aiding them. It is the case, for example, of the Fernbank Museum (Atlanta) which has partnered with AT&T and Cisco Networks for building a network which supports location-based services and real-time location analytics.

Social media communication and marketing

In today’s context it is impossible not to mention social media when referring to communication. The reason lays in its features of broad distribution and virality which means that a single publication can reach a huge number of users (even geographically disperse) and that it can be easily redistributed to even larger audiences. In this sense, social media can be very useful to museums for audience development, whether the aim is to strengthen the relationship with current visitors (audience deepening) or to attract new ones (audience broadening or diversifying), especially young people. Regarding the latter, with social media traditional “word of mouth” is now amplified and a simple “like” on Facebook, comment on Twitter, or photo on Instagram about a visit is a genuine endorsement for a museum which speaks to thousands of potential visitors (Johnson et al., 2015). For example, the National Gallery of Denmark increased their Instagram reach by 2.500% in only one month (from July to August 2014). Furthermore, engaging younger tech-savvy generations is considered a critical aspect for keeping museums relevant in the future (Johnson et al., 2015). On the other side, audience deepening can be achieved since social media represents an important channel for communication which extends to the before, during and after a visit, generating a seamless and continuative experience.

- *Before*: museums can incentivize the attendance through targeted social media communications and marketing. To extend their reach, museums can use diverse channels for different purposes: for example, while Instagram and YouTube are popular for publishing educational content, Facebook is favored for event promotion (Tassini, Gu, & Aris, 2017). Additionally, many museums are redesigning their websites in game-changing ways. The most popular example is the Rijksmuseum that, as previously illustrated, has decided to publish its entire collection online. Contrary to what may seem, this move aims at increasing the number of visitors to the physical museum by promoting curiosity and amazement.
- *During*: within participatory institutions, social media strategies play a strong role by encouraging visitors to share their personal photos of the museum as well as their experiences through comments and reviews.
- *After*: on one side, visitors can continue to share their personal experiences even after the visit. On the other, museum's communication on social media and websites maintains, encouraging new visits and generating a deeper engagement.

Lastly, by analyzing trends, visualizations and reactions to social media publications, museums can understand what visitors are thinking, how they are engaging with the content and what are their preferences (Johnson et al., 2015). As a consequence, online media represents not only an important communication channel, but also a source for data analytics and visitor profiling.

Edutainment

As discussed previously, with the rise of digital technologies, museums have been involved in a paradigm shift from being just holders of cultural objects to being also experience providers, fact which is evidenced through the momentum of participatory practices. However, the educating mission of museums remains, and it plays a fundamental role. Recalling the museum definition present in the ICOM's Statutes of 2007:

*“A museum is a [...] institution [...] which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment **for the purposes of education, study and enjoyment.**”*

In this context, the current trend of “edutainment” can conciliate the delivery of experiences with the educational purpose of museums. Indeed, it can be described as a practice in which entertainment is used in combination with education in order to create a motivating and successful learning environment. A particular way of edutainment is “gamification”, i.e. the

integration of gaming elements, mechanics, and frameworks into non-game scenarios for training and educational purposes (Fotaris et al., 2016). Museums are seizing the potential of integrating game-like mechanisms to transform cultural interactions into a rewarding, fun and educational experience. Besides, this practice can help institutions to align with the next generation of museum-goers. Observing the practical application of gamification, museums mostly incur in the design of quests, experience points, leader boards, milestones and badging... For example, in 2017, the Museo Archeologico Nazionale di Napoli (MANN), which holds extraordinary collections from Pompei, developed the first videogame ever produced by an archeological museum. “Father and Son” is a narrative game in 2D in which the main protagonist is a son following the traces of his father, an archeologist he never knew. By exploring the rooms of the museum, the player encounters ten different characters and lives stories disseminated in several time periods. This experience arises diverse emotions like love, fear and excitement which captivates audiences and increases engagement. Another example is the game “Secret Seekers” of the Victoria and Albert Museum in London, also developed in 2017. In it, the players encounter different characters who guide them through a treasure hunt for discovering historical facts and curiosities about the collection. As a result, the game allows audiences to interact with the museum itself for completing challenges, collecting prizes and unlocking special levels.

Augmented and virtual reality experiences

These two diverse realities leverage on similar technologies and exist to provide the user an enhanced and enriched experience. On one side, virtual reality (VR) is an artificial, computer-generated simulation of a real-life environment which generates an immersive experience (Augment, 2017). On the other, augmented reality (AR) lays computer-generated enhancements atop an existing reality to make it more meaningful and enable the interaction with it (Augment, 2017). Basically, VR creates its own reality which is completely computer driven, while AR enhances the perception of real objects or spaces by adding digital images, graphics or sensations. Consequently, the choice of one or the other will depend on the type of experience the museum wishes to offer, on the availability of elements to enhance through technology (or if they need to be completely reconstructed virtually) and on the investment the institution is willing to make. The latter point derives from the need to provide specific head-mounted or hand-held controllers for VR, while AR can be utilized directly with mobile devices such as laptops, smartphones and tablets (even with visitors’ ones, promoting BYOD or CYOD

practices). Eventually, AR could be complemented with the installation of Beacon technology, which would allow to deliver specific content to visitors according to their location.

Either way, both these technologies allow the direct interaction of the audiences with the cultural heritage and the transformation of a museum visit into a memorable experience. Virtual reality has been applied, for example, in the Franklin Institute (Philadelphia) through which visitors can dive with blue whales or soar through the solar system. Instead, augmented reality can be found in the Smithsonian's National Museum of Natural History (Washington). In the "Walk Among Dinosaurs" exhibit, visitors can experience life alongside a Tyrannosaurus Rex and other creatures thanks to augmented reality and motion-tracking (Johnson et al., 2015).

Digital storytelling

Museums are storytellers by nature (Roussou et al., 2015) since making cultural contents accessible to visitors involves inevitably providing their corresponding interpretations and descriptions. Storytelling is a narrative communication through which museums can convey the value of their collections. Nonetheless, its form and characteristics have constantly evolved since the first museums opened to the public. At the beginning, in the nineteenth century, storytelling consisted in just labeling a sequential disposition of objects. Then, in the twentieth century, exhibitions were transformed into more spatial narratives where collections were arranged thematically. Finally, in the current 21st century, the influence of digital technologies is pushing towards exploring new forms of storytelling. In particular, the practice of digital storytelling implies communicating the narration of collections and their interpretations through digital platforms/elements. Consequently, storytelling can be embedded within the initiatives previously described in this section: whether it is in participatory practices, social media communication, edutainment (gamification), AR or VR. For example, it is present in the voice-over telling a story in a virtual reality experience or in the contextualization of a game within a tale...

As the visitor is at the center of contemporary museums, digital storytelling is not just about explaining exhibits, but about making them more appealing and engaging to an increasing variety of audiences (Roussou et al., 2015). In this sense, a strong emphasis is given to the narrative part and the language museums decide to utilize. The result is a type of communication which allows an experimental approach to the interpretation of cultural content, alongside a powerful creative and emotional component. This can be observed in the previously discussed example of the "Father and Son" game (Museo Archeologico Nazionale

di Napoli) where a strong storytelling is done for presenting the background story between the characters and so recalling visitors' emotions.

(3) Support: this category encompasses the purely instrumental activities, i.e. the ones related to the museum management in all its senses. These operations which belong to the back-office include: Human Resources Management, IT systems, Planning & Control and Funding. In this context, digital technologies are mostly applied following a strategy of digital operational excellence, which aims at improving the efficiency of internal activities.

Crowdfunding

Crowdfunding is the practice of funding a project by raising many small amounts of money from a large number of people, using social media and the Internet (Prive, 2012). The broadcasting power of the Web allows institutions to share their projects with a massive number of people and to find potential contributors, who make micro-investments motivated only by their interest and belief in the cause. This technique, enabled by the power of digital technologies, represents a new source of funds for museums and may be of extreme relevance considering their generally limited budgets. Apart from financing, also other benefits can be obtained considering that people contribute because they believe in the cause and the rewards are usually non-monetary gratifications like tickets, posters or exclusive opportunities (Cornwall Museums Partnership, n.d.):

- *Validation*: the support and confidence of the community, shown by their contributions, give the project credibility and increasingly augment its relevance.
- *Funding*: people who have contributed for a particular project, can also become financiers of future plans or of the institution in general by becoming active members.
- *Advocacy*: contributors become part of the museum's journey and assume the role of ambassadors, not only of the project, but of all the institution. In this sense, they become an important part of the museum marketing.

However, generating a crowdfunding campaign is not easy and requires lots of planning, time and effort. The main challenge is achieving a compelling communication of the project, which attracts interest and convinces people. For this purpose, a unique marketing team who can tell the story in creative ways is needed. For example, Palazzo Madama in Turin (Italy) implemented a crowdfunding campaign using social media in order to raise €80.000 that would allow them to purchase an iconic collection of porcelain (Johnson et al., 2015). The conveyed message addressed in a particular way the patriotism of Italians by cataloguing the acquisition

as an “act of restitution and compensation of Italian cultural heritage”. As a result, the small museum was able to connect with over 1.500 people and raise €20.000 more than their goal, successfully making the acquisition.

Data analytics

With the application of digital technologies, large amounts of data are continuously generated. Nonetheless, for this data to generate valuable insights, it should be properly processed and analyzed. So, data analytics is the process of examining datasets to draw conclusions about the information they contain, increasingly with the aid of specialized systems and software.

In the case of museums, an important resource is the data about their visitors’ base. This is so because only after truly understanding visitors’ identity, interests and behaviors is that museums can offer a more educational and engaging experience which involves guests before, during and after their visit (Tassini, Gu, & Aris, 2017). Knowing who the visitor is allows institutions to design exhibits and make propositions that are meaningful for each one of them, ensuring the customer validation of the offerings. This analysis is primarily based on the principles of customer profiling and segmentation: customers are divided into groups based on common characteristics so that institutions can approach each one of them effectively and appropriately. As a result, data analytics can be seen as the key for unlocking customer insights and driving successful customer experiences. Examples of utilization of individual data can be the creation of personalized paths during the visit, identifying exhibits more likely to attract interest (Tassini, Gu, & Aris, 2017), or predicting what a customer will likely purchase on the gift shop, as the Normal Rockwell Museum in Massachusetts is doing (Johnson et al., 2015).

Regarding the sources of visitors’ data, museums can mainly rely on the following items:

- *Digital devices and software for on-site experience:* as described in the previous sections, museums are implementing different digital tools aimed at enhancing visitors’ experience and that, simultaneously, gather useful user information. An example are museum guides in the form of mobile apps which can provide daily reports on the number of visitors, how many works were viewed, which were the most visited collection objects, and how long a visitor remained in front of an artwork (Johnson et al., 2015). Another case is the special pen provided by the Cooper Hewitt – Smithsonian Design Museum (New York) which allows visitors to collect information about objects in the gallery and create their own designs on interactive tables. This way, the museum

can learn about customers' preferences and interests, which will represent valuable information for future exhibitions.

- *Ticket office*: it is the easiest point for museums to collect visitors' data (Tassini, Gu, & Aris, 2017) and a further improvement can be made with the transition from print to online and mobile ticketing. The valuable insights that can be obtained at this point concern mainly visitors' demographics and patterns.
- *Attendance statistics and staff-administered surveys*: which represent the traditional and most classical tools for visitors' analysis. While in some museal contexts they may be considered old-fashioned, in the smaller realities they are still useful.
- *Social media and website*: performing a close analysis to trends, visualizations and reactions to online publications, museums can understand how they are engaging with the content and what are their preferences (Johnson et al., 2015). Currently, many Web analytics tools exist for supporting this practice like Google Analytics (for clickstream analysis) and Facebook Insights (for social media analytics).

As can be observed, some innovative methods mix with more traditional ones. Even though the emergence of ubiquitous technologies has revolutionized the process of collecting data on visitors' behaviors, traditional approaches maintain, each offering complementary value (Yoshimura, Krebs, & Ratti, 2017). This fact depends also on the size of the museum and its availability of resources for data analytics. The following example illustrates the case of a big museum which counts with even more innovative and radical instruments for data collection. The Louvre Museum developed in collaboration with MIT Senseable City Lab a project called "Art Traffic at the Louvre" in which noninvasive Bluetooth sensors are utilized for understanding visitors' foot traffic. In particular, seven sensors were installed with sufficient coverage to measure visiting sequences and duration at the most important locations of the museum. As a result, the tracking system allows to monitor what galleries people visit the most, the path they take and how long they spend in front of each piece of artwork (Yoshimura, Krebs, & Ratti, 2017).

Workflow management

The application of digital technologies within the different areas of the museal value chain, may require the evolution towards digitally-managed operational activities as well. In this sense, several platforms are arising for supporting the museum management in an integrated and digital way. The benefits deriving from leveraging on these digital instruments include

improvements in the operational efficiency and a clearer and easier management of internal flows.

An example is the Italian non-profit organization Comwork whose mission is “to offer museums digital solutions for improving staff working methods”. In order to do so, they offer a workflow platform through which museums can organize their activities, collections and staff in an integrated way. Furthermore, the instrument serves as a catalogue of cultural heritage objects, which can be accessed at any time and even published online. The last function is that of supporting museum’s integration and interoperability by being able to share information and collaborate through the software with other museums and the community as well.

(4) Networking & Governance: this last category encompasses the activities related to contextualizing cultural institutions within their territories, i.e. maintaining an active relationship with their communities and promoting the collaboration with other cultural and non-cultural institutions and companies.

For this section, no new applications of digital technologies are introduced since they overlap with the ones mentioned previously. Basically, the broadcasting power of the Web has facilitated the communication exchanges between institutions, facilitating the networking and the B2B collaborations. As highlighted before, this aspect is also strengthened by the application of workflow softwares which promote museums’ interoperability. Furthermore, through social media networks and institutional websites, museums’ collections and activities can be widely diffused, reaching audiences larger than ever and enhancing the relationship with communities.

To conclude this chapter, the following table presents a summary of the contextualization of digital technologies within cultural institutions and their activities.

VALUE CHAIN CLUSTERS	MAIN ACTIVITIES	APPLICATION OF DIGITAL TECHNOLOGIES
Research & Conservation	<ul style="list-style-type: none"> - Planned conservation - Research - Inventory - Acquisitions - Restoration - Risk assessment - Security 	<ul style="list-style-type: none"> • Digitization and digital preservation • Conservation – restoration techniques
Valorization & Communication	<ul style="list-style-type: none"> - Mounting & Display - Edutainment - Welcoming - Marketing & communication - Exhibitions & events 	<ul style="list-style-type: none"> • Participatory experiences • Social media marketing & communication • Edutainment – gamification • Augmented and virtual reality experiences • Digital storytelling
Support	<ul style="list-style-type: none"> - Human resources - ICT - Planning & control - Funding 	<ul style="list-style-type: none"> • Crowdfunding • Data analytics • Workflow management
Networking & Governance	<ul style="list-style-type: none"> - Governance - Functional integration - Offer integration 	<ul style="list-style-type: none"> • Social media marketing and communication • Workflow management

Table 1: Examples of digital technologies applied within museums' value chain

2.3 Digital transformation models

The applications of digital technologies within cultural institutions are rich, diverse and present several opportunities. Nonetheless, being the digital transformation in this sector fairly recent, engaging in such path may be seen as a challenging move and, usually, institutions share high uncertainty regarding how to approach it. Analyzing the existent literature, there are several models guiding the digital transformation of for-profit companies (primarily for the manufacturing sector), while there is a considerable literature gap of models addressed particularly to cultural institutions. Consequently, the present thesis wishes to fill this gap and poses as an objective to provide cultural institutions a digital transformation framework,

specifying the digital levers (resources that drive such transformation) and how to employ them successfully.

2.3.1 Relevant dimensions

The first step in the construction of the digital transformation framework for museums consists in the literature analysis of the existent models in other industry fields, as well as the review of readings of general character regarding digitalization.

The review has been conducted by analyzing the academic literature present online, mainly accessed through platforms like Google Scholar and Scopus. For the sake of completeness, and for trying to extend the research to as many papers as possible, different search threads have been used. While they all included the keyword “digital transformation”, several variations have been created by combining it with others like: “framework”, “model”, “digital business”, “enablers”, “success factors”, “strategy”, “digital resources”, “digital enterprise”, “digital maturity”. As a result, different papers and articles dealing with digital transformation models or its relevant dimensions have been obtained, yet none of them addressed particularly to cultural institutions or museums, as previously specified. As expected, the most mentioned sector was the manufacturing one where the digital transformation and Industry 4.0 are current concerns with great popularity.

In *Table 2* the most relevant dimensions are displayed, which are considered to be critical according to their repeated appearance in literature and to the emphasis stressed by the different authors introducing them. For presenting them more clearly, they have been grouped in macro-dimensions namely: “Organization”, “Human Resources” and “Financial Resources”.

Then, in the following paragraphs each one of the parameters is described individually.

ORGANIZATION	
DIGITAL STRATEGY	Bharadwaj et al., 2013; Morrison, 2017; Matt, Hess, & Benlian, 2015; Kane et al., 2015; Westerman et al., 2011; Sanchez, 2017; Biegler et al., 2018; Berghaus, & Back, 2016; Corver, & Elkhulzen, 2014; Zangiacomì et al., 2018; Schumacher, Erol, & Sihñ, 2016; Canetta et al., 2018; Blatz et al., 2018
DIGITAL CULTURE AND LEADERSHIP	Westerman et al., 2011; Scott, 2007; Kane et al., 2015; Sanchez, 2017; Blatz et al., 2018; Berghaus, & Back, 2016; Corver, & Elkhulzen, 2014; Westerman, Bonnet, & McAfee, 2014; Biegler et al., 2018; Matt, Hess, & Benlian, 2015; Zangiacomì et al., 2018; Schumacher, Erol, & Sihñ, 2016
DATA ANALYTICS	Sanchez, 2017; Westerman et al., 2011; Westerman, Bonnet, & McAfee, 2014; Canetta et al., 2018; Rogers, 2016; Blatz et al., 2018
HUMAN RESOURCES	
DIGITAL SKILLS / COMPETENCES	Matt, Hess, & Benlian, 2015; Corver, & Elkhulzen, 2014; Zangiacomì et al., 2018; Sanchez, 2017; Biegler et al., 2018; Nylén, & Holmström, 2014; Westerman et al., 2011; Nash et al., 2016; Westerman, Bonnet, & McAfee, 2014; Scott, 2007; Schumacher, Erol, & Sihñ, 2016; Canetta et al., 2018; Berghaus, & Back, 2016; Blatz et al., 2018
HUMAN RESOURCES INVOLVED	Sanchez, 2017; Canetta et al., 2018; Blatz et al., 2018
FINANCIAL RESOURCES	
FINANCING	Matt, Hess, & Benlian, 2015; Westerman et al., 2011; Westerman, Bonnet, & McAfee, 2014; Scott, 2007
PARTNERSHIPS / COLLABORATIONS	De Carolis et al., 2017; Zangiacomì et al., 2018; Biegler et al., 2018; Corver, & Elkhulzen, 2014; Sanchez, 2017; Berghaus, & Back, 2016; Blatz et al., 2018

Table 2: Relevant digital transformation dimensions extracted from the literature review of existent models.

Digital strategy

Considered to be the operational backbone (Sanchez, 2017) of the digital transformation, the digital strategy is an “organizational strategy formulated and executed by leveraging digital resources to create differential value” (Bharadwaj et al., 2013). This definition remarks two key issues to be considered. The first one, that companies need to define a clear strategy, objectives and benefits of the digital transformation (Biegler et al., 2018). The digital strategy interplays with the corporate strategy and sets a statement of vision with objectives for the organization’s digital programs (Morrison, 2017). In this sense, it serves to integrate the entire coordination, prioritization and implementation of digital transformations (Matt, Hess, & Benlian, 2015); avoiding the erroneous approach of treating digital programs separately and in an isolated way. The second issue concerns the last part of the definition: “leveraging digital resources to create differential value”. The digital strategy acknowledges the clear need to see digital technologies as a *means* to strategically potent the business (Kane et al., 2015) and not as an end in itself. This is because the strength of digital technologies does not lay in the technology itself but on how companies integrate them to transform and improve their value proposition.

Digital culture and leadership

For a digital strategy to be successful, top management support is essential. Indeed, several models propose that an effective digital transformation is the result of a clear digital strategy combined with the appropriate culture and leadership. Top-management has the fundamental responsibility of transmitting and communicating the vision set by the digital strategy to the entire firm and ensuring that it is moving in the right direction (Westerman et al., 2011). This task could not be easy as, like any change, digital transformation may encounter organizational resistance. Consequently, considering that people can be a much bigger obstacle than any complex technology (Westerman et al., 2011), leading employees is a paramount lever for turning technology into transformation. Such leadership is about articulating and sharing a compelling vision as to persuade people to embrace and support it (Sanchez, 2017). Top-management success will be measured on its ability to change the workforce mindset and establish an organizational digital culture which is characterized by openness to innovation (Scott, 2007), by collaboration and by cooperation between different departments and roles (Sanchez, 2017).

Data analytics

The digital transformation of companies concerns the incorporation within their processes of new digital technologies which, by nature, generate huge amount of data (Sanchez, 2017). Being able to translate that data into information presents a strategic advantage (Westerman et al., 2011) the top-management should exploit since it can be used to improve products and services, obtaining a differentiation strategy (Sanchez, 2017). Indeed, Rogers (2016) defines data analytics as a “key intangible asset for value creation” and one of the domains that describe the digital transformation for businesses in the digital age. Parallely, Westerman, Bonnet, & McAfee (2014) classify it as “a strategic asset” that serves as foundation for the digital transformation.

Digital skills

Digital transformations are accompanied by changing skill sets which are not just necessary for the change in itself, but also for regular operations thereafter (Matt, Hess, & Benlian, 2015). In other words, introducing new technologies would be pointless if then employees were not able to use them (Blatz, Bulander, & Dietel, 2018). As a result, companies need to invest in training for providing employees the capabilities and knowledge on how to handle digital technologies. This is a fundamental aspect for being able to reap the benefits of digital innovation (Nylén, & Holmström, 2014). Furthermore, related to the acquisition of digital capabilities, there is the creation of new digital roles as well. They represent structural changes to the organizational setup for allocating the new digital responsibilities within the corporate structures (Matt, Hess, & Benlian, 2015) and may be found under a wide range of names including “Digital Media Manager”, “Chief Digital Outreach”, “Chief Digital Officer”, “Director of Experience and Access” and so on... (Nash et al., 2016).

Human resources involved

This dimension concerns the operational aspect of the digital programs included in the digital strategy and, in particular, refers to the human resources involved for their execution. Digital programs may be developed by the internal personnel or, given that companies may not have the required expertise to do so, they could consider turning to technology experts (Sanchez, 2017). So, the decision would be one of outsourcing against in-house development. In case the second option is chosen, the decision would also imply assessing the number of employees to allocate to the digital projects.

Financing

Transformation does not happen without investment (Westerman et al., 2011) and consequently, a lever of the digital transformation is given by the ability of the company to finance the endeavor. It is worth remarking that the relevance of this dimension depends not only on the magnitude of the investment required, and consequently on the type of digital project concerned, but also on the size and kind of company implementing it. Consequently, financial aspects are two-sided: they are both a driver and a bounding force for the transformation (Matt, Hess, & Benlian, 2015). While the final aim could be to obtain higher profits from a change in the value proposition, doing it would require financial resources in the first place, issue which could be an obstacle for several companies. Regarding the origin of these resources, the possibilities include internal funding sources, external ones (like sponsorships, crowdfunding and partnerships) or a combination of both.

Partnerships

A partnership is a relationship of collaboration between two or more entities which share financial and intellectual resources for the development of joint or complementary projects. Considering this definition, partnerships can be seen as a lever of the digital transformation due to two issues. The first one, which was already discussed, identifies partnerships as a source of financial resources; while the second one focuses on the knowledge transfer coming from the collaboration between entities. The digital journey is made of two fundamental and digital-oriented requirements: integration and interoperability, i.e. the ability of companies to communicate and collaborate between them (De Carolis et al., 2017). Getting in contact with the local ecosystem by exploiting connections (Zangiacomi et al., 2018) allows companies to learn from others' experiences and spread best practices. According to Biegler et al. (2018), companies that benefit from collaborations with external companies, industry networks, research centers and universities have far greater probability to be successful at the digital transformation.

2.3.2 A model for museums

After the identification and selection of the critical digital levers from diverse existent models, in the present section, the *Digital Transformation Model for Cultural Institutions* is constructed.

As specified, the reference models made allusion mostly to manufacturing companies and, in the general terms, to for-profit businesses. Taking into account that their characteristics are

diverse from museums', starting from the fact that they are non-profit institutions, some initial considerations are made regarding the identified dimensions:

- 1) Concerning the lever "Human Resources involved", museums count with an additional resource which could handle the execution of digital projects, apart from the paid staff and the outsourcing option: the volunteers. Leveraging volunteers offers museums the opportunity to increase their digitalization rate without the need to intensify the investment in personnel. This solution may be particularly appealing for small or public museums where budgets are usually tight (Axiell, 2017).
- 2) The dimension "Partnerships" which refers to the collaborations, integration and interoperability acquires an enhanced relevance in the case of museums, due to their own nature. Recalling the three synergic pillars which identify cultural institutions, one of them is "Network": museums generate community outreach and public service and consequently, creating relationships with individuals, other institutions and the entire community is part of their strategic objectives. Therefore, in the digital transformation framework for cultural institutions, the term "Partnership" is replaced with the broader one "Network", for expressing more clearly the strategic and stronger bonds museums have with all types of stakeholders (and not only for commercial purposes).
- 3) The "Digital Strategy" is considered to be an extremely important concept for, as described previously, it is the operational backbone of the entire digital transformation. For this reason, in the constructed framework, the "Digital Strategy" is positioned as a transversal dimension which includes and gives meaning to all the other levers.
- 4) After a careful analysis of the literature, it has been decided to not include "Data analytics" (i.e. the examination of large volumes of data) in the constructed model. The main motivation regards the consideration of this dimension as an aspect which has to be faced when developing a digital project; rather than an *enabling factor* on which institutions can count for the implementation of digital technologies. In other words, "Data analytics" is not seen as a *resource* which can collaborate (or not) to the transformation (like financial or human resources do...), but an issue to be managed after the digitalization of operations. Its challenge resides in being able to handle and analyze the large amounts of data generated by digital tools; a process which, if done correctly, can generate a competitive advantage to the entity.

Taking these four points into consideration, *Figure 11* shows the *Digital Transformation Model for Cultural Institutions*.

The starting point is the *Value Proposition* of the museum, which can be translated into their mission and strategic objectives. Then, by following the path of the digital transformation, museums can employ digital technologies to create differential value and strategically improve their value proposition. The precise objectives institutions expect to achieve should be clearly defined in the *Digital Strategy* to guarantee its alignment with the organizational strategy and avoid isolated initiatives. It is fundamental that, when creating the digital strategy, museum practitioners question themselves on what is the role that the digital transformation has for the achievement of their strategic objectives. Then, the digital strategy is implemented through diverse *Digital Projects*, which count with five levers for their management and execution: *Digital Skills, Digital Culture and Leadership, Network, Financing and Human Resources*.

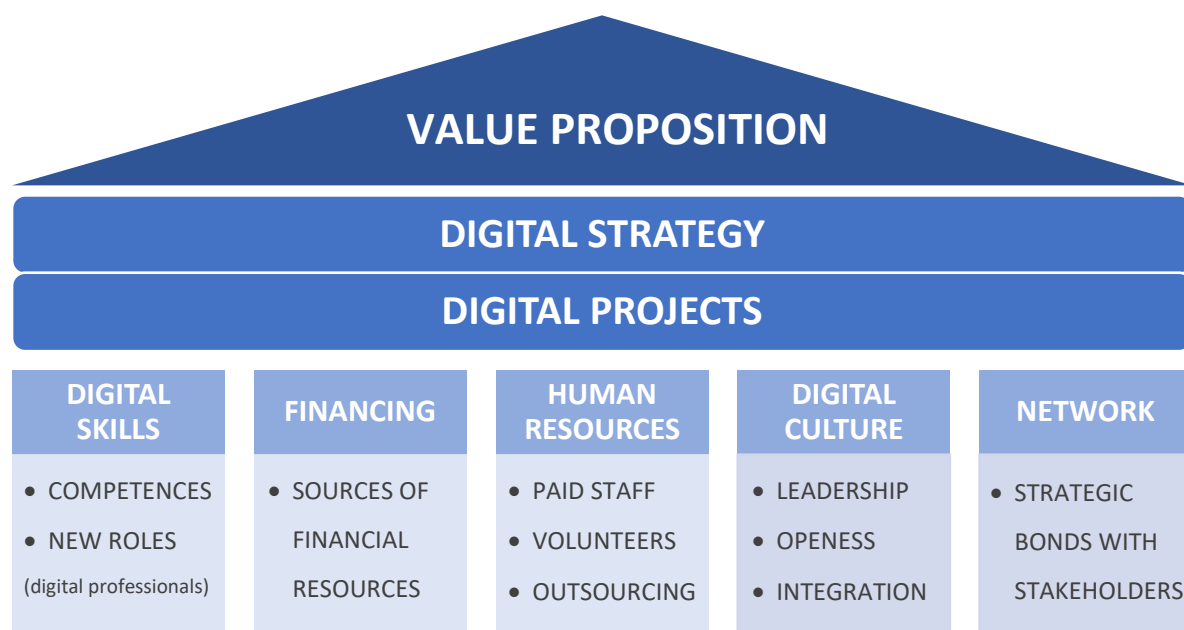


Figure 11: Theoretical Digital Transformation Model for Cultural Institutions

After having elaborated the framework, the first concern regards the applicability of its dimensions, extracted from the manufacturing or for-profit context, to cultural institutions. In particular, the main issues are whether the same levers can be utilized and if additional ones, specific to the museal environment, should be considered. Consequently, in order to address these concerns, the framework will be validated through the case study of four Italian museums and their relative digital projects.

3. METHODOLOGY

3.1 Methodology and research questions

The 21st century, characterized by continual technological innovation and changing customer expectations, is impacting on all sectors of economy. In the case of cultural institutions, digital innovation gives the opportunity to further valorize the heritage and improve the value proposition for their audiences. Recognizing the many advantages of digital transformation and understanding its importance to remain relevant, the present thesis arises to support cultural institutions in this path. An initial analysis of the literature has shown that, while there are several models in the industrial or private sector specifying digital levers and resources needed for the digital transformation, there is a lack of material addressed specifically to cultural institutions. In fact, most of heritage-related documentation concentrates in the contextualization of digital technologies within museums by providing concrete application examples and for achieving a particular target. To fill the identified literature gap, the following research questions have been posed:

- 1) Which are the main factors enabling museums to achieve an effective digital transformation?
- 2) Which factors or conditions represent a barrier for museums in their digital transformation path?

Being the cultural sector so broad and diverse, the research has been delimited to the study of Italian museums⁵. On the one hand, the Italian landscape has been chosen because of its incalculable cultural heritage, both physical and intangible. Indeed, it is the country with the highest number of UNESCO heritage sites in the world. On the other hand, the choice of focusing on museums can be justified if considered that more than 83% of the 4.158 cultural institutions in the country are museums and galleries (ISTAT, 2016). Correspondently, in 2015, these institutions were the recipients of over 50% of the 110,4 million visits in the Italian territory.

A further breakdown of the results of the 2015 ISTAT survey shows that just 30% of cultural institutions offers to the public digital services online *and* on-site. So, regarding the level of digitalization, Italian museums are just at the beginning of their digital transformation process. This same issue is confirmed by the *Osservatorio Innovazione Digitale nei Beni e Attività*

⁵ For the complete motivation behind this selection, please refer to chapter “1.2 Research objectives”.

Culturali which acknowledges that, even though the sector is currently lagging behind in the digital transformation, it is strengthening the efforts in that direction. An additional comment points out the willingness of many museums to innovate, yet not knowing where to start from. For all these precise motivations, Italian museums offer a great opportunity for validating the theoretical framework. It is in active environments where all the efforts, problems and requirements of digital innovation can be identified.

In the present thesis, the first approach to the digital transformation of cultural institutions has been made with a review of the existent academic literature, which has allowed to introduce the museal sector in general terms and contextualize its current panorama. This review explored the operations of museums and how digital technologies can be strategic tools to advance the organization's mission and strategy.

Following, for addressing the research questions, the writer has collected relevant dimensions from existing digital transformation models for the industrial sector and gathered them in a new framework for cultural institutions. Such framework, which includes possible digital transformation levers, had to be validated to analyze whether the extracted dimensions were also suitable for cultural institutions and whether new ones had to be considered.

3.2 Case studies methodology

The methodology applied for the validation of the theoretical framework was purely qualitative and can be defined as a multiple case studies analysis. In particular, direct semi-structured interviews⁶ have been conducted with four Italian museums to analyze their corresponding digital projects and draw empirical evidence from them. The final objective of these interviews was to answer to the two stated research questions and to be able to define the enabling and limiting factors of the digital transformation of museums.

For the selection of the case studies, the support offered by the *Osservatorio Innovazione Digitale nei Beni e Attività Culturali*⁷ of Politecnico di Milano has been fundamental since it allowed the writer to attend its second-edition workshop on digital innovation and thus, to establish the first contact with diverse Italian cultural institutions. The participants were cultural entities of different types, and coming from all over the country, which shared the

⁶ "Semi-structured interviews" are formal interviews in which the interviewer follows a list of questions and topics which should be covered during the conversation but is able to follow topical trajectories that may stray from the created guide (Cohen, & Crabtree, 2006).

⁷ This observatory supports cultural institutions along their digital innovation process, while offering as well as a meeting point between different actors of the cultural Italian ecosystem.

concern of embracing digital transformation. In particular, the workshop was organized in two steps: in the first one, some cultural institutions made an initial presentation of themselves and described their situations with regards to the adoption of digital technologies; then, in the second session, four cases were selected and discussed in round tables with the aim of performing a critical analysis of their problems and exchanging suggestions among the participants.

It is worth mentioning that the cases discussed in the round tables were not exactly suitable for validating the theoretical model since, apart from museums, they involved institutions of other categories (like archives) as well. Consequently, the selection of thesis's case studies from the entire list of workshop participants was a different matter, and was subject to certain considerations which can be summarized as follows:

- The present thesis, and so the validation of the model, is focused on museums, which crosses out from possible case studies all other types of cultural institutions which were present at the workshop.
- Then, some of the present museums attended only as spectators since they were just starting to consider the path of digital transformation. Their purpose was to gain insights on how other cultural institutions were approaching the digital innovation and what projects they were implementing. Museums following these characteristics could not be selected as validators for they had not experienced yet any aspect of the transformation.

Considering the limitations mentioned above, the four museums selected for the multiple case study correspond to the institutions who were willing to share their experience and receive support in their digital transformation process. A value-adding factor for the framework validation is that each one of the case studies depicts a different level of digital advancement, thus providing to the analysis diverse and enriching perspectives. Apart from the maturity level, the selected museums present varied characteristics regarding:

- *Ownership*: public or private
- *Number of visitors*: used as a proxy of the museums' size.
- *Geographical area*: North, Center, South or Islands.
- *Category*: determined according to the character of the museum's content or collections. Following UNESCO's classification, the options are: Fine Arts, Decorative

Arts, Contemporary Art, Museum-House, Archeological, On-site, Historical, Anthropological, Natural Science, Science and technological, Specialized, General.⁸

In *Table 3*, the four case studies are presented according to these dimensions. It is worth pointing out that they have been treated anonymously and so an alpha-numeric code has been assigned to each one.

CASE STUDY	OWNERSHIP	NUMBER OF VISITORS	GEOGRAPHICAL AREA	CATEGORY	INTERVIEWEE
PU1	Public - National	230.184 (total for the 12 member institutions in 2018)	Center	Archeological, Historical	<ul style="list-style-type: none"> • Head of Marketing, Communication & Web. • Site's architect.
AR6	Private	100.000 (2015)	North	Specialized	Head of Marketing, Communication & Web.
SS8	Public – but managed by private IT company	33.899 (2018)	Center	On-site	<ul style="list-style-type: none"> • Director • Head of IT • Head of Marketing • Head of Technologies
MT2	Public - Province	141.088 (2017)	North	Contemporary Art	Head of Marketing, Communication & Web.

Table 3: Case studies' presentation

The following lines present briefly each museum and their collections with the purpose of contextualizing the case studies.

⁸ The complete taxonomy can be consulted in the chapter “2.1.1 Definition”.

PU1

PU1 is a regional museal center (*Polo museale regionale*), a type of entity which has been established in Italy in 2014/2015 for the management and valorization of national cultural institutions. Consequently, the center depends directly on the *Direzione Generale Musei* of the MiBAC (*Ministero per i Beni e le Attività Culturali*), the ministry of culture of the Italian Republic. The *Polo* is composed of several cultural institutions, distributed across its territory of scope. In particular, the entities within the PU1 are twelve: four archeological sites and eight museums, with historical collections of the territory and its inhabitants. The main objective of the *Polo* is defining a common valorization strategy for the member institutions and promoting the integration of cultural-touristic circuits between the individual sites.

AR6

AR6 is an automotive brand museum of private property. It was inaugurated in 1976 close to the factory, yet it was open only to employees and visitors by reservation. After closing in 2011, due to the decommissioning of the plant, it opened again to the general public in 2015 with the re-birth of the brand. The main purpose of the institution is twofold:

- On one side, the museum is positioned within the communication strategy of the automotive company. Through the preservation and dissemination of the brand's history and meaning, the museum provides strategic support to the marque and generates an additional value to its cars. Considering this orientation, the museum serves as a meeting point for brand enthusiasts.
- On the other side, the museum is an autonomous entity which operates as any other does. Consequently, it is bonded to its territory and has the objective of intercepting a large number of visitors, even those who may not be passionate about the brand.

A real challenge for the institution is trying to conciliate both strategies, which sometimes could point towards opposite directions. Regarding the museum's collections, the vehicles are divided in three floors corresponding to three principles which represent the brand essence:

- 1) *Timeline*: exhibits, in chronological order, the models which tell the industrial brand story and continuity.
- 2) *Bellezza* (beauty): exhibits hand-made vehicles and prototypes which represent the Italian style and design.
- 3) *Velocità* (speed): the last section is dedicated to the exhibition of racing cars, summing up technology and light weight.

SS8

SS8 is a castle on the shores of the Tyrrhenian Sea which represents a cultural heritage site in itself because of its historical and architectural relevance. This monument, which has been inhabited by the local population uninterruptedly since prehistorical times, served as a place of worship, a fortress, an Etruscan city and a medieval village. With its public opening in 2017, SS8 offers the possibility to visit several places of historic relevance, as well as five different museums, all within the castle walls. The museums' collections illustrate mainly the history of the surrounding territory, its population and its evolution within the ages. Furthermore, with the motivation of extending the number of visitors, a hotel has been recently opened within the castle, offering a complete cultural experience.

The Castle is legally owned by the Region where it is located, yet it has been given to a private IT company for its management and organization. In particular, such company assists the Region with the execution of technic-administrative activities and the development of projects with a high digital load, related to different areas of public interest as culture, health, security and education among others.

MT2

MT2 is a modern and contemporary arts museum, founded in 1987 under the aegis of an Italian province in the north of the country. Currently, the institution operates in three separate sites (located in two different cities) and features both permanent and temporary exhibitions, maintaining an active relationship with other museums by frequently lending and receiving artworks. MT2 presents itself to the public as a “cultural laboratory” where the exhibitions, study and research are all closely-related activities. In this sense, the 20th and 21st centuries are narrated in displays through artwork, historical documents and personal items of artists. For this purpose, the vast internal archive plays a fundamental role within the museum's activities and exhibitions.

Continuing with the case studies' methodology, the interviews with these four museums have been conducted personally and face-to-face at the headquarters of the diverse institutions, in Italian language. As evidenced also in *Table 3*, the role of the interviewed person changed from case to case and corresponded to the different figures responsible for digital innovation. The interviews, which followed a previously-elaborated set of questions (for a complete consultation, see the *Appendix*), were structured as following:

- First, some introductory questions were asked in order to identify the museum's approach to digital transformation and their maturity level, analyzed in terms of already-implemented digital instruments. These questions included broad aspects of the innovation like strategy, roles and general organization.
- Following, the second section was dedicated to a particular digital project which, depending on the case, was either being considered or had already been implemented. The initial concern was to analyze the role that digital technology played within the museum's strategy and objectives. Then, several questions were asked about the projects' management, in order to cover the dimensions included in the *Digital Transformation Framework for Cultural Institutions*, i.e. Digital Skills, Human Resources, Financing, Digital Culture, and Networking.

Complementing the interviews, the two sessions of the workshop on digital innovation have represented a source of information as well. The contribution was not only case-study related, but the presentations of the *Osservatorio* were also very useful for the elaboration of the thesis and its results. Furthermore, some missing data which could not have been collected during the interviews (mainly numerical data like number of visitors or number of employees), has been obtained from a questionnaire on the state of digitalization of cultural institutions, prepared by the *Osservatorio* and distributed to all the workshop participants. Finally, another source of information for the thesis has been a documentary review of the different museums' websites and social accounts, which has provided institutional and publicly-available material, useful mainly for the description of the case studies and their digital projects.

After the data collection, initially, each case has been analyzed separately by combining the information coming from the different sources. Such analysis consisted in identifying the digital transformation dimensions present in the framework for cultural institutions and determining how they have been managed by each museum. Subsequently, the multiple case studies have been confronted in order to define their commonalities and peculiarities, which were, then, relevant for the discussion of results.

4. RESULTS

In the current chapter each case study will be analyzed separately according to the dimensions present in the *Digital Transformation Model for Cultural Institutions*.

4.1 PU1

As a public national entity, PU1 is responsible of following strict ministerial guidelines. The most recent indications include a section focused on the digitalization of cultural institutions (following the National digital agenda), which has led the *Polo* to start considering the opportunities and possibilities of implementing digital technologies within their operations. The first initiative in this direction was to re-elaborate the institutional website according to the provided guidelines. In the second place, PU1 thought of employing digital tools for improving the interaction and engagement with audiences, namely through a mobile app which would colligate all the member institutions and offer information of general character to the visitors. If considered the museal value chain, these ideas of digital projects can be contextualized within the “Valorization and Communication” block which comprises the activities focused on visitors and their experiences. Nonetheless, the lack of a clear digital strategy behind the selection of a mobile app has been identified. While the institution started its analysis by choosing this particular technology because of its popularity and diffusion, it disregarded the definition of its target (nationality, age...) and purpose (attract new audiences or strengthen the relationship with the existing ones?). These are fundamental issues for maintaining a user-centered approach and for designing the best possible offer/experience for the visitors. As a result, the *Polo* focused on the technology itself rather than on how it could contribute to the its value proposition and strategic objectives, failing to define a clear digital strategy.

Regarding its financial structure, the *Polo* receives funds of national origin from the MiBAC for the development of their activities. In this case, the consideration of digital technologies was particularly motivated by the inflow of financial resources, which had to be deployed within a determined date. Additionally, this path has been reinforced by the need to comply with the ministerial guidelines promoting the digitalization of cultural institutions. Considering that transformation does not happen without investment, the availability of financial resources gave PU1 an important lever on which to act upon. Nonetheless, the definition of a deadline for the investment and the urgency to act may have been the reason why the entity considered the mobile app project without the appropriate prior analysis, as stated.

The project was initiated in the Marketing & Communication area, which reflects the lack of a specialized institutional department (as well as of new roles) in charge of the development of digital technologies. Indeed, PU1 is a small entity with a limited number of employees: the twelve institutions of the *Polo* sum up a total of 158 employees of which the 70% is made of surveillance personnel. This results in 47 administrative/technical employees for the management of twelve cultural points (approximately four persons per institution), which makes of the *Polo* a reduced context with few people to dedicate to the digital transformation and to follow the related projects. In this case, the Head of Marketing, responsible of the mobile app project, shared during the interviews her struggle to divide working hours between the “usual” tasks and the innovative project. Considering that the *Polo* receives university interns, a good starting point would be to further valorize their fresh point of view and take advantage of their presence for the implementation of digital tools within the entity. Additional to the limited number of employees, the lack of digital skills⁹ for the development and installation of digital technologies has been identified. This has led the institution to rely on external companies (outsourcing) for the execution of their digital projects, as in the re-elaboration of their website.

On the other hand, another important aspect of the interview concerned the willingness of certain employees to implement digital tools within exhibitions, yet the difficulty to gain acceptance from the top-management. This situation depicts the absence of a digital organizational culture and digital leadership, due in large part to the age of the executives (from 60 years-old on) and to a conservative attitude; factors which represent a barrier to change.

Lastly, regarding the “Network” dimension, it acquires a different form in this case study given that the *Polo* gathers several cultural institutions of the territory under the strategic objective of promoting integration and collaboration among them. In other words, PU1 is a network of cultural institutions. Compared to the traditional institutions, museal centers carry the additional challenge of having to integrate entities which are diverse, both from a geographical and a managerial point of view.

⁹ The “digital skills” refer, in each case study, to the competences needed for the execution of the specific digital project under analysis.

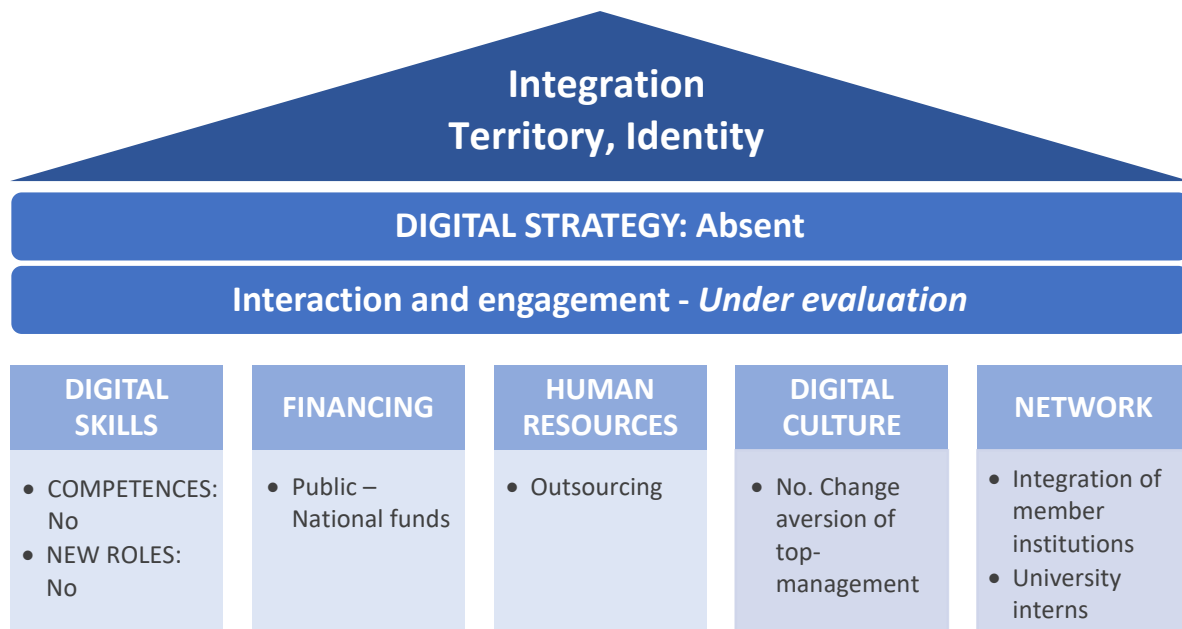


Figure 12: Application of the model to case study PUI

4.2 SS8

This case study presents a peculiarity regarding the ownership and management of the cultural institution¹⁰ in it described. The Castle is legally owned by the Region where it is located, yet it has been given to a private IT company (*Società per Azioni S.p.A.* or stock corporation) for its management and organization. Such entity specializes in the ideation and development of projects of high digital load for the public administration and combines the knowledge on ICTs with the managerial expertise.

Even though the company has full responsibility over the cultural site and its related decisions, the overall direction of its operations is determined by the Region. The most recent indications incentivize the promotion of a governance model for cultural institutions with a strong technological and innovative component for the achievement of two strategic objectives: the first one is the valorization of the cultural, touristic and historic/artistic heritage and the second one is the promotion and growth of the territory. These two points define the digital strategy of the entity, which is clearly defined and even formalized and published in the institutional website. Following these indications, the managing company has created a digital project entitled “Innovation Lab”, which promotes the application of new-generation technologies within the Castle. This initiative has a strong emphasis on the creation of a network of public

¹⁰ Also referred to as the “Castle”.

and private partners among whom to share know-how and best practices regarding the development of digital technologies in the cultural sector. As a result, the Innovation Lab was created with the collaboration of Volkswagen Group Italia and of the Region. Such approach acknowledges the value of favoring the collaboration and communication between professionals of different backgrounds and expertise for the success of the digital transformation process.

The first two developed technologies have been an Augmented Reality app and a Virtual Reality experience, which are aimed at providing a different and high-impact museal visit. On the one hand, after downloading the institutional mobile app, visitors can explore the Castle and different cultural sites within it through a guided tour enriched with augmented reality elements. This experience allows audiences to see the Castle from different perspectives and virtually encounter historical characters who share their testimonies. On the other hand, virtual reality provides a completely immersive experience in which, through a pair of glasses, visitors are transported on board an Etruscan ship arriving to the Castle's port; reviving and *living* the history of the site. In the development of both these technologies a strong emphasis has been placed on *storytelling* (digital storytelling actually): the practice of sharing a story in a narrative way as part of a persuasive communication strategy. The result has been a type of communication which allows an experimental approach to the interpretation of cultural content, alongside a powerful creative and emotional component. This element is very important for cultural institutions of the 21st century because of their user-centeredness. Finally, considering that the augmented and virtual realities concern the institutional activities related to display management and the relationship with the public, such digital projects can be placed within the "Valorization and Communication" section of the museal value chain.

A relevant characteristic of the SS8 case study is the availability of internal digital skills, which are furthermore complemented with project management ones. This has allowed the company to completely develop in-house the augmented reality app, process which includes its ideation, design, creation and installation (buying just the hardware from external providers). Then, regarding the virtual reality experience, while the project was ideated and managed in-house, its development and execution were done with the collaboration of external partners. A valuable initiative present in this case study is the willingness to train employees in new-generation technologies, enlarging their knowledge and capabilities. Indeed, the Innovation Lab includes a series of educational courses with the Assinter Academy on methods for supporting and managing digital innovation within public administration organizations. The

top-management’s investment on employees’ digital capabilities reflects the presence of a digital leadership within the company: executives acknowledge digital technologies as a tool for achieving their strategic objectives and push the organization in that direction. Their success is depicted in the digital culture that can be observed within the employees, who feel motivated and willing to work on innovative projects.

Regarding the financial aspect of the digital projects, the implemented technologies (augmented and virtual reality) are expensive solutions which, additionally, require complex developments. Furthermore, considering that the company is willing to implement additional technologies like drones and beacon devices, it is possible to conclude that the availability of financial resources is not a limitation in this case study. Being a stock corporation, the funds utilized for the organization of the Castle are of private source and belong to the inflows they receive for their service provision.

Finally, even though the digital project has already been implemented, the organization is taking a step backwards and considering whether the chosen technologies are actually the most suitable ones for the achievement of their strategic objectives. The identified problem is that, after the first visit to the Castle and having used the augmented reality app and virtual reality glasses, visitors do not return for the same experiences. This has led the company to approach its inability to change content from visit to visit and reconsider their approach to digital technologies, which resulted being technology-driven rather than strategy-driven.

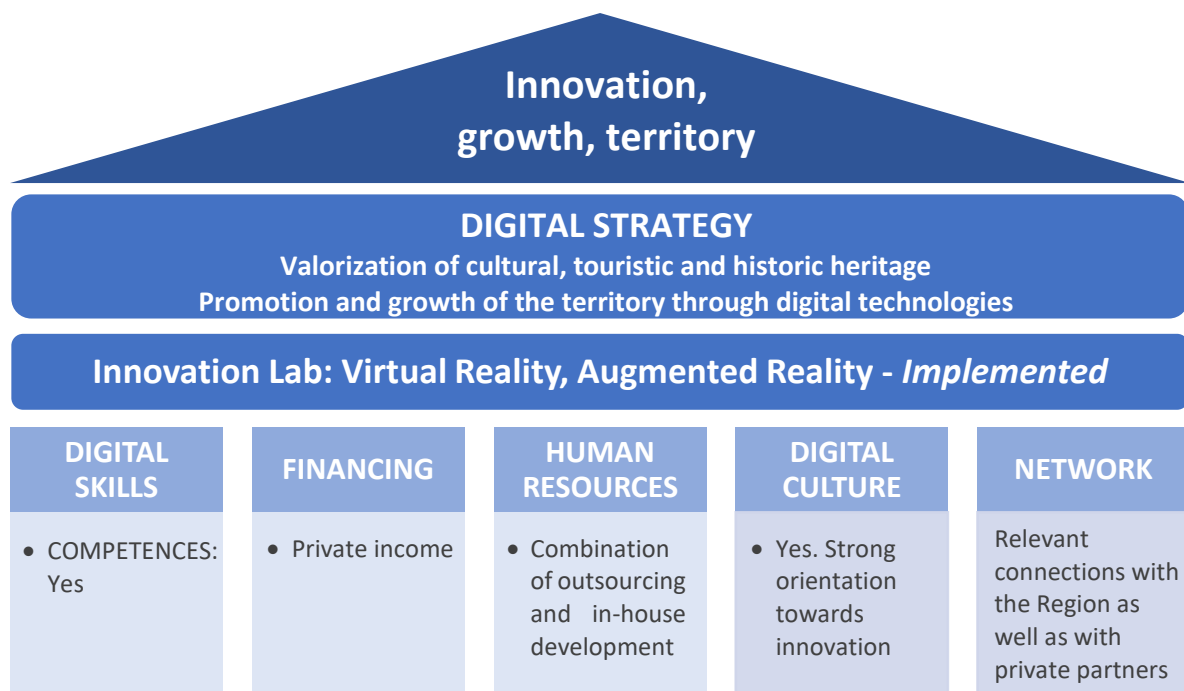


Figure 13: Application of the model to case study SS8

4.3 AR6

This brand museum of private property is positioned within the communication strategy of the automotive company which gave birth to it. As a consequence, its strategic objectives regard the preservation and dissemination of the brand's history and meaning, providing simultaneously a strategic support to the marque and its products. In this way, the museum shares the brand essence with a large number of visitors, whether it is for enhancing the passion of enthusiasts or intercepting new possible customers. Following such value proposition, the institution has approached the transformation with a clearly defined, yet not formalized, digital strategy which supports the investment in digital communication. This case study depicts an entity which has succeeded in properly acknowledging digital technologies as a way to achieve their strategic objectives, and not as an end in itself. Deriving from this digital strategy, the museum has initiated the digital project of creating a complete and interactive institutional website, as well as accounts on social media like Facebook and Instagram, which are updated on a daily basis. This task is held by the Head of Marketing & Communication and due to its focus on visitors and their experiences can be categorized under the "Valorization and Communication" block of the museal value chain.

This first approach of the brand museum to the social media has found a good response from the audiences, reaching a total of 24.200 followers on Instagram in two years and 56.862 on Facebook in three years.¹¹ During the interviews, the Head of Marketing mentioned two relevant challenges encountered during the maintenance and update of social media accounts which relate to the nature of cultural heritage institutions and their collections. These same issues were also discussed in the meetings with MT2 and PU1 cases and so are worth remarking. The first aspect concerns the difficulty of translating museums' artistic and historical content into attractive web posts, which will amuse audiences and motivate their visit to the physical museum. This concern originates by the difference in vocabulary and approaches between the museal environment and the online community. As a consequence, succeeding in the digital transformation, where the main actor is the user, will require cultural institutions to adapt their content in a way to approach the 21st-century audience. On the other hand, the second issue regards the boundaries of diffusion of cultural heritage content (especially artworks and photography) due to its copyright. The authors' protection acquires

¹¹ As a comparative example, the Facebook page of *Museo Ferrari* (the museum of the well-known automotive brand Ferrari) reached 195.820 followers in seven years. Even though the yearly number of followers (27.974 versus 18.954 approximately) is higher in the case of Ferrari, the size of the company and its marketing efforts are also superior with regards to the ones of the case study.

particular relevance when the content is digitized and so becomes easily accessible. This occurs in the case of cultural institutions which decide to digitize their archives as part of their approach to the digital transformation. Consequently, digital content subject to intellectual property rights has to be carefully managed and becomes a challenge for museums willing to share their heritage online.

The strategy of investing in digital communication has been promoted effectively within the entity due to an internal culture characterized by openness to innovation. This may be motivated by the nature of the museum and its belonging to a major automotive company, which promotes innovation and technology as fundamental aspects of its re-birth. Considering that the cultural entity counts with no more than five employees, it is not suitable to talk about a “digital leadership” in the sense of the top-management guiding and transmitting a vision to its staff. As a result, it is possible to establish that, in this case study, the digital leadership is dictated by the museums’ owning private company.

The reduced organizational chart of AR6 defines one person per each function (like Marketing, Maintenance, Finance...) and does not count with any role dedicated solely to the digital technologies, which reflects the lack of internal technical digital skills. As a consequence, the elaboration of certain technological tools present within the museum, such as audio and video displays complementing the exhibitions and a 4D cinema were elaborated in outsourcing, as well as the institutional website. Nonetheless, employees *do* count with the necessary skills for the creation and maintenance of social media accounts (which of course present less complexity than the aforementioned technologies), important part of the digital project. Regarding the museum’s network, it is composed of private partners, who are responsible for the execution of digitally complex projects, as well as of other cultural institutions with which the museum interacts: for example, during one weekend of the year, the museum AR6 participates in the event “Giornate di primavera” organized by the FAI (Fondo Ambiente Italiano) for bringing people closer to the wide Italian cultural heritage while raising funds for the renovation and repair of famous monuments, historical buildings and artistic masterpieces.

Finally, in this case study, financial resources for the digital transformation (as for the normal operations of the museum) do not represent a constraint. Indeed, apart from the inflows of funds coming from the owning company, the museum presents self-financing options such as admission charges (the cost of the full entrance ticket is 12€), gift shop and food services. This gives the museum freedom to act and the possibility to invest in digital tools for communicating the innovativeness of the brand. As an example, when the museum created a questionnaire for

profiling its visitors, people were motivated to complete it by receiving brand gadgets in exchange; a practice which surely could not viable for all type of museums.

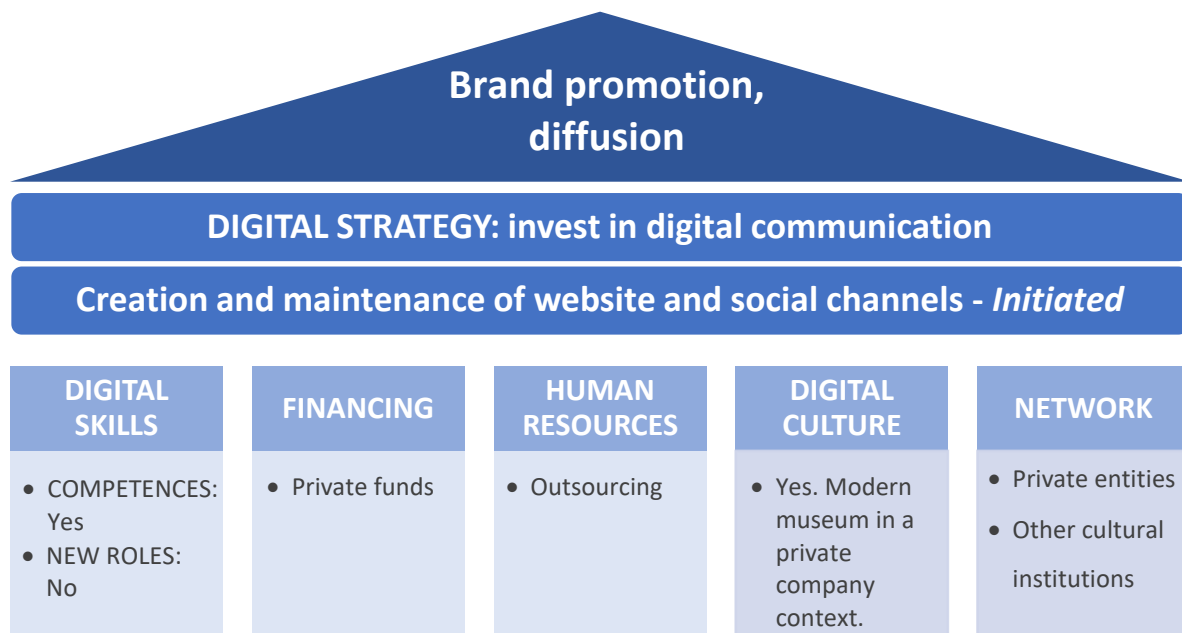


Figure 14: Application of the model to case study AR6

4.4 MT2

MT2 presents itself more as a “cultural hub” than a traditional museum since, in addition to producing exhibitions, it hosts artists, curators, companies as well as local and international events, serving as a welcoming and accessible destination. In this sense, the museum wishes to be a place of dialogue for the surrounding territory and a cultural entity for the public, artists, collectors, businesses and local communities. The value proposition of MT2 is furtherly presented through this quote of the museum’s Director:

“Our challenge is to become a platform for modern and contemporary art in a territory larger than the literal perimeter of the museum, and this territory includes those virtual spaces where debate and enquiry are generated, where culture itself reverberates and expands.”

As can be observed, the development of a *virtual space* is a fundamental part of the strategic objectives of this cultural institution. The entity firmly believes that nowadays promoting culture means making collections available even to visitors who cannot be physically present at the museum, enabling them to share content and their points of view, becoming part of a dynamic community. This makes of the museum a space for participatory experiences, a

fundamental practice for the user-centered institutions of the 21st century. The museum acknowledges that the implementation of digital technologies can be the key for achieving their goals of being an accessible, participative and collaborative space. Thus, in this case study, the digital strategy is well defined, formalized and even consolidated within the general institutional strategy. Such digital strategy can be summarized into two points, which target the main issues included in the entity's value proposition:

- 1) Promotion of digital communication and storytelling: for fostering the dialogue with visitors and the community.
- 2) Valorization of the heritage through specialized digital platforms: for sharing the knowledge embedded in the cultural heritage and expanding the boundaries of the museum, increasing its accessibility.

Then, following each one of the points, a series of digital projects have been designed and put into action, becoming part of the strategy as well. On one side, regarding the digital communication strategy, the projects can be categorized under the “Valorization and Communication” block of the museal value chain and include the creation of an institutional website, the presence on the most popular social networks (like Facebook, Instagram, Spotify and Youtube) and lastly, the creation of a museum bot¹². The bot serves as an interactive digital guide available on Telegram and Messenger (so does not require users to download additional mobile apps) loaded with information and suggestions about the institution and its collections, which accompanies visitors both inside and outside the museum. Due to an informal communication style, the bot allows visitors to establish a direct relationship with the museum and to personalize their own path through its spaces and exhibitions. This project has been developed in collaboration with a private IT company named “Dimension” which specializes in software development for mobile platforms. The contact between the museum and this partner originated at a creative challenge promoted by the European Commission to financially support projects of innovative ICT solutions in cultural institutions of the territory. The museum bot received a grant of €50.000 on July 2017 for ending up among the best five proposals and, after three months of development, it was launched to the public. So, the collaboration with the IT company allowed the museum to develop a digital project and have access to the required digital skills, which lacked internally at the IT department. The same thing happened with the creation of the institutional website, which was done in outsourcing

¹² A chatbot is a computer program designed to interact with humans conversationally and programmed in a way to create the best user experience (Munroe, 2018)

relying on the company “Anthesi”: IT specialists dedicated to public-administration projects. This leaves the creation and update of social media profiles as the only element of the digital communication set of projects which is done internally by the museum personnel. As specified in the AR6 case study, the digital skills needed for social media communication are more diffused and less complex than those, for example, for the creation of the museum bot. Regarding its internal structure, the museum does not count with a department dedicated solely to the implementation of digital technologies, nor new roles have been created to take care of this aspect. As a consequence, each department deals with their own digital projects separately and, in the case of digital communication, the responsible office is Marketing & Communication. During the meetings, and recalling the PU1 and AR6 case studies, the interviewee commented on the difficulty of translating cultural content into social-media one and on the challenge of posting museums’ collections online due to their copyright. The latter is particularly relevant for the present case study considering that the museum handles modern and contemporary artworks.

Then, on the other side, there is the block of digital projects concerning the valorization of heritage through digital platforms. This section includes the digitization of collections, the digitization of the archive¹³ and a special initiative called a “Wikipedian Residence”. The latter was implemented only in 2014 for the period of six months during which a Wikipedian (Wikipedia employee) worked at the museum, alongside curators and archivists, for placing in Wikipedia information conserved by the museum, making its valuable heritage accessible to a vast public. This collaboration between museums and the Wikipedia community, which has proven to be successful at the British Museum (UK), at the Picasso Museum of Barcelona (Spain) and at the Chateau de Versailles (France) as well, was firstly introduced in Italy by the MT2 institution. Even though the initiative did not renew for the following years, the museum said it was very helpful for introducing digitalization competences into the archive. Indeed, much focus is placed upon the digitization activities of the archive and the creation of an integrated and digital catalogue: a database published online and freely accessible to the public. Parallely, the museum’s artwork collection is also being transformed into digital format with the aim of eventually publishing online the entire lot of approximately 20.000 pieces. This project, initiated in 2017, is done with the special collaboration of Google Cultural Institute through the Art Camera technology: a camera automatically controlled by a robotic system that

¹³ The heritage of the museum under study is composed by its artwork collections, plus the contents of its archive which include numerous documentary collections relative to Italian art and architecture of the 20th century.

takes hundreds of high-resolution shots of the paintings. Then these works are published online, where they can be explored with an incredible degree of detail. As in the digital communication projects, the diverse collaborations in this area reflect the museum's efforts in acquiring lacking digital skills from the outside. All of these three projects can be classified under the "Research and Conservation" section of the museal value chain, but also under the "Networking" block since these initiatives show the enthusiasm of the museum to spread the knowledge, to make the content accessible to the wide public and to conserve it for future generations.

From the digital strategy and projects previously described there is the clear evidence of the museum's effort in constructing collaboration and participation relationships, creating a great network with the community and different type of local and international organizations. This network includes private entities such as the aforementioned IT companies, public partners for events and special projects and other cultural institutions among which there are temporary heritage loans for exhibitions. Additionally, the museum receives interns (17 in 2017) from different Italian universities, helping students incorporate to the cultural heritage environment. Then, the digital leadership and culture within the institution can be observed not only in the numerous projects but also on the promotion of accessibility and openness to the community. This is depicted in the quote from the museum's Director presented previously, in which he altruistically acknowledges that the 21st-century museum occurs also beyond its physical walls and is made of visitors' participatory experiences and contributions. He conveys a digital vision of the entity and is able to transmit it to the entire institution successfully. Moreover, the top-management shows also the willingness to enlarge the internal digital skills through the promotion of training sessions on "Digital administration" and on "PITre": a software for the digital management of internal workflows, which has been adopted by the most relevant public-administration and cultural entities of the local territory.

Finally, the last model dimension concerns the financial resources of the museum, considered to be relevant for supporting the digital transformation. In the MT2 institutions, the funds derive 65% from the autonomous province holding the ownership of the institution as well as from additional public and private entities, while the remaining 15% from the museum's own income. A relevant aspect of this case study is the utilization of partners and collaborating companies not only as a source of knowledge and competences, but also as fellow entities with which to share the investment in digital projects.

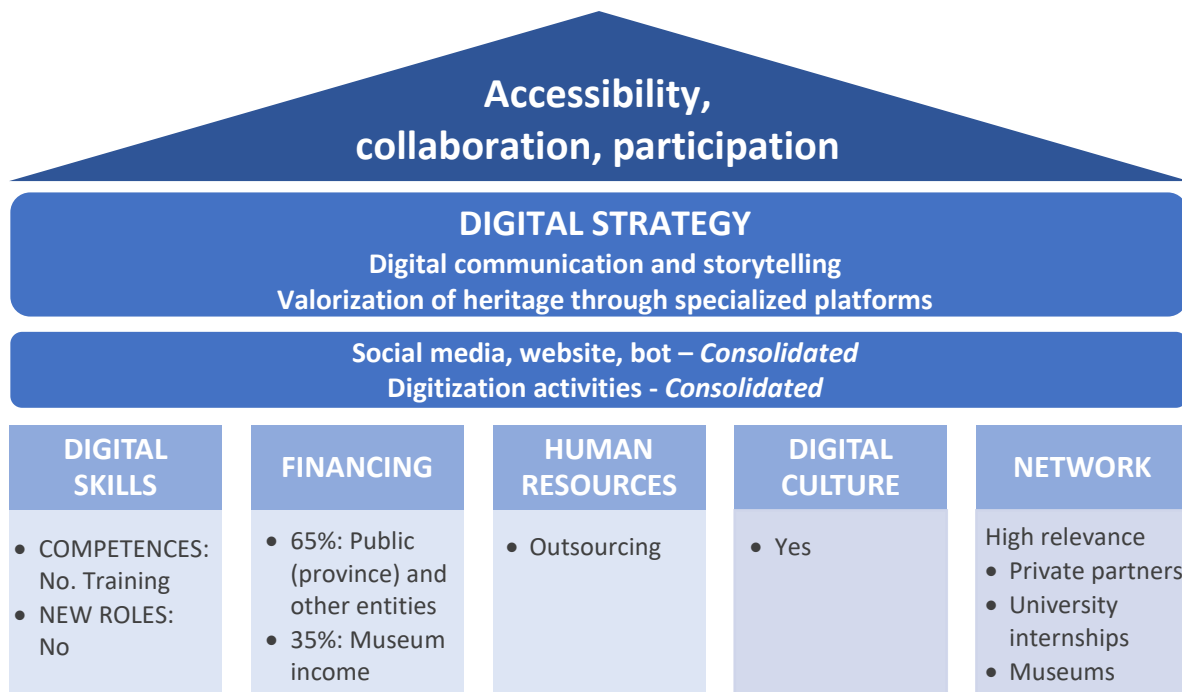


Figure 15: Application of the model to case study MT2

CASE STUDY	VALUE PROPOSITION	DIGITAL STRATEGY	DIGITAL PROJECT	DIGITAL SKILLS	FINANCING	HR	DIGITAL CULTURE	NETWORK	Notes
PU1	Integration Territory Identity	Absent	Not defined. <i>Topic:</i> user interaction and engagement	<i>New roles:</i> No <i>Digital competences:</i> lacking	Public - National	Outsourcing	No. Change aversion	<ul style="list-style-type: none"> Integration of member institutions University internships 	
SS8	Innovation Growth Territory	<ul style="list-style-type: none"> Valorization of cultural, touristic, historical/ artistic heritage Promotion and growth of the territory through digital tools. 	Innovation Lab: Virtual Reality, Augmented Reality	<i>New roles:</i> N/A <i>Digital competences:</i> Yes. Plus, training courses.	<ul style="list-style-type: none"> Private income from management activities Public funds from the Region 	In-house	Yes	<ul style="list-style-type: none"> Public stakeholders Private partners <p>Collaboration and diffusion of best practices and know how</p>	“New roles” does not apply, for the managing company is an IT entity.
AR6	Brand promotion, distribution	Foster digital communication	Website and social media	<i>New roles:</i> No. <i>Digital competences:</i> Yes	<ul style="list-style-type: none"> Private funds Museum income 	Outsourcing	Yes	<ul style="list-style-type: none"> Private partners Other cultural institutions 	
MT2	Accessibility Participation Collaboration	<p>1) Digital communication and storytelling</p> <p>2) Valorization of heritage through specialized platforms</p>	<p>1) Website, social media and museum bot</p> <p>2) Digitization and valorization projects with Wikipedia and Google Cultural Institute</p>	<i>New roles:</i> No. <i>Digital competences:</i> training courses.	<ul style="list-style-type: none"> Public (province) and other public and private entities: 65% Museum income: 35% 	Outsourcing	Yes	<p>Great emphasis on collaboration</p> <ul style="list-style-type: none"> Private partners University internships Other museums, Italian and foreign 	

Table 4: Comparison of case studies according to the model dimensions

5. DISCUSSION OF RESULTS

The multiple case studies and their digital transformation dimensions have been summarized and confronted in *Table 4* with the purpose of defining commonalities and peculiarities between them which allow to validate the constructed model for cultural institutions.

The presented case studies depict four museums which approach the transformation in diverse ways due to their distinctive value propositions and which are currently at different levels of digital advancement. PU1 is at an early stage, thus considering and evaluating different alternatives. Even though the orientation is most probably set towards improving the visitors' engagement and interaction (user experience), it has not been clearly defined what and how to do it yet. SS8 focuses on innovation and growth, for which they clearly envision the digital transformation as a way to valorize their heritage and promote communication with the audiences. After having implemented expensive digital tools, the institution is now taking a step backwards and is reconsidering whether the selected technologies are the most suitable ones for achieving their objectives. AR6 has initiated the projects included in a digital communication strategy, clearly following the institutional value proposition and its mission as a brand museum. Finally, MT2 is the case study placed at the most advanced stage of digital advancement. Their digital strategy is solid and well consolidated within the organizational strategy and museal mission. This case study shows an institution which has been able to incorporate the essence of the digital transformation and the 21st century within its operations and culture. Consequently, the efforts of MT2 for the implementation of digital technologies have been observed within three different clusters of the museal value chain: the participative practices and enlarged accessibility of visitors recall the "Valorization and Communication" area; the promotion of different digitization methods are placed within the "Research and Conservation" activities; and lastly the great emphasis on collaboration and openness to other players and institutions highlight the "Networking" cluster of the value chain.

5.1 Digital enablers

In the following paragraphs each one of the model dimensions will be critically analyzed according to the results of the four case studies with the final purpose of validating them and thus, the general framework as well.

Digital strategy

PU1 is the only case study in which a digital strategy has not been identified. Indeed, this absence is verified by the fact that the institution is uncertain about the path it wishes to follow with the digital transformation. Having chosen the mobile app technology just because of its popularity without justifying whether it was the right information system for the type of museum and its objectives was an erroneous approach. In fact, the risk of lacking a digital strategy is focusing on the technology itself, rather than on it as a mean to achieve a strategic objective. The importance of this aspect is even highlighted in the definition of the digital strategy as an “organizational strategy formulated and executed by leveraging digital resources to create differential value” (Bharadwaj et al., 2013). If the technology does not contribute to the museum sustaining its value proposition, it may not be worthy implementing it. This is the motivation behind why institutions should first concentrate on defining a digital strategy, which then translates into projects, rather than the other way around. On the contrary, the remaining three case studies have demonstrated a clear digital strategy (yet only formalized in MT2) which has guided the institutions through their own approaches to the digital transformation; in particular, by integrating the coordination, prioritization and implementation of digital technologies.

Considering that SS8, AR6 and MT2 count with a higher level of digital advancement than PU1, it is possible to determine that the results of the multiple case studies confirm the relevance of the digital strategy highlighted by academics in literature. As a result, the dimension “Digital strategy” is verified within the *Digital Transformation Model for Cultural Institutions* and maintains its transversal position, including and giving meaning to all the other levers.

Digital skills

- **New roles**

In all four Italian museums, there have not been identified structural changes to the organization with the purpose of allocating new digital-related roles. This would have implied the incorporation of positions within the organizational chart like “Digital Media Manager”, “Chief Digital Outreach” or “Chief Digital Officer” in charge of horizontal departments such as “Digital Experience”, “Digital Media Division” or “Web and Digital Platforms”. Instead, in the case studies, the different projects were managed by a reduced number of people of the

respectively concerned departments; generally starting by Marketing & Communication. So, no new roles were created but digital responsibilities were assigned to the already existing ones. Consequently, regarding the “New roles” aspect, the results obtained from the case studies diverge from the analyzed literature. This has led to questioning whether the difference originated from adapting dimensions from for-profit companies to the cultural sector. So, a brief additional analysis has been conducted on the Internet and an interesting article from Loic Tallon (2017) - current Chief Digital Officer at the Metropolitan Museum of Art, New York - was found, discussing about the creation of digital departments and new roles (which carried diverse names) within American museums. Indeed, he cites different examples of museums which have decided to face the digital transformation with the creation of *ad hoc* departments such as the Museum of Modern Art (MoMA – New York), the Art Institute of Chicago or the Museum of Fine Arts (Boston). Thus, this evidence reflects that it is indeed possible to talk about “New roles” in the cultural sector. Nonetheless, the reality of the mentioned American museums cannot be compared to the Italian context, starting by the size of the institutions and their level of digital advancement. For example, while the company size of the Museum of Fine Arts of Boston or of the Museum of Modern Art is within the “500 to 1000 employees” cluster (LinkedIn classification), the largest Italian museum presented at the case studies, the MT2, counts with 58 employees (not to mention the AR6 which counts with no more than five). Indeed, according to the 2015 ISTAT survey, “unlike other countries, the Italian museal offer is made of a consistent number of small-sized institutions”: from the 4976 surveyed entities, 67.5% presented less than five employees. In practical terms, this means a higher difficulty for Italian institutions to establish a separate chief digital officer role or even a new department within their organizational chart.

Consequently, it is possible to identify the American approach of creating new digital-related roles as a best-of-class practice, which surely will present numerous benefits but that it is not completely essential. This is evidenced by the MT2 case study, which even without a digital department, has presented a successful approach to the digital transformation as well as to the consolidation of its digital projects through the allocation of digital responsibilities to already existent roles.

On the basis of these considerations, it has been concluded that the creation of new roles is an improvement trait of digitally advanced institutions rather than a fundamental pillar sustaining the technological investment. Thus, even without a chief digital officer, institutions can move towards the adoption of digital technologies. As a result, given that the case studies could not

verify the “New roles” dimension within the “Digital skills” one, it will not be included in the final version of the *Digital Transformation Model for Cultural Institutions*.

- **Competences¹⁴**

In the case studies, it was observed that museum employees count with the necessary competences regarding the management of social media and communication tools, yet they do not possess the technical skills for creating, for example, an institutional website. Hence, cultural heritage professionals lack specific technical skills for the development and utilization of more complex technologies.

In the field of study of Engineering Information Systems, digital skills (as well as the management behavior and the organizational culture) are *complementary assets* of technological investments, i.e. additional investments necessary to derive value from the primary investment (in digital technologies). This means that technical limitations of museum professionals do not allow the institution to completely reap the benefits of the investment: introducing new technologies would be pointless if then employees were not able to use them. Furthermore, the lack of skills usually conducts to the decision of outsourcing the execution of digital projects, which fulfills its function but simultaneously creates a dependence on external providers for future improvements or corrections. SS8 case study depicts how the availability of digital skills within the museum allows entities to manage *internally* the digital transformation.

Moreover, the importance of digital competences and knowledge is reflected in the efforts that MT2 and SS8 make to promote training programs on methods for supporting and managing digital innovation. Additionally, in the MT2 case study it was acknowledged that the most relevant result from the collaboration with Wikipedia was the acquisition of digital skills (in particular, for the digitization of the archive).

So, through the case studies, it has been verified that the “Competences” dimension is an important lever for cultural institutions to master their digital transformation and thus, should be included in the created model. For better depicting the nature of such competences, they will be referred to as “Specific and technical competences”.

¹⁴ In the analysis of this dimension, the case study SS8 is an outlier since the museum is managed by an IT entity, in which employees, by definition, possess a higher level of digital skills than museum practitioners.

Human resources involved

This dimension considers the operational aspect of the digital programs and, in particular, refers to the human resources involved in their execution. The theory on Project Management determines that the most important resource to a project are the human resources and thus, they are a fundamental lever to be included in the created model. Having said so, the relevant aspect deriving from the multiple case study concerns analyzing who actually dealt with the execution of the digital projects. The results are consistent and reflect that the lack of expertise and technical skills for the development of technologies has pushed institutions into the outsourcing alternative, when it concerned more or less complex solutions like the museum bot or organizational websites. As previously remarked, this does not apply to the SS8 case study for its particular condition of being managed by an IT company. On the other hand, softer initiatives like social media accounts, for which employees did count with the required capabilities, were indeed managed internally.

Then, during the literature review for constructing the digital transformation model, an additional option for museums, apart from paid staff and outsourcing, had emerged: the volunteers. Nonetheless, in the multiple case studies and their respective interviews, no reference has been made to taking advantage and leveraging on the presence of volunteers. As a result, since the case studies selected for the present thesis could not verify the “volunteers” dimension, it cannot be incorporated for sure within the model and thus, remains as an interesting aspect for future research. Thus, the “Human Resources” lever remains with two alternatives: paid staff and outsourcing.

Digital culture

A digital organizational culture and the support and leadership of the top-management are another of the complementary assets sustaining the investment in digital technologies. As in any organization, in the digital transformation as well, the principal job of leadership is transmitting the strategy. Considering the case studies, these aspects can be found in three of them: AR6, SS8 and MT2, while in PU1 some governance issues have been identified. In particular, MT2 and PU1 cases are placed in two opposite extremes regarding their promotion of a digital culture and leadership. On the one side, the PU1 case does not depict an internal resistance problem as can normally happen, but rather the lack of support and guidance from the top-management for the investment in digital technologies. As a consequence, the employees who were actually pushing in that direction encountered insufficient commitment

from the top and thus, difficulty in advancing their projects. On the other side, MT2 museum reflects a completely different reality: the digital culture has been fostered by the Director in such a way that it forms a part of the institution's mission and value proposition. The top-management has succeeded in conveying a vision and in promoting the equation that motivated leaders equals motivated employees, succeeding in its initial approach to the digital transformation. From these differing case studies, it is possible to conclude that the "Digital culture" is indeed one of the pillars upon which technological efforts are sustained.

Network

The initiatives fostering the creation of a network around the museum have been particularly favored in the MT2 and SS8 case studies. With its "Innovation Lab", SS8 has transformed the Castle into a meeting point for private and public partners to share their know-how and best practices on the digital transformation topic. The contact with the museum's local ecosystem allowed the institution to exploit its connections and additionally contributed to the development of complex technologies like virtual reality and augmented reality. Such approach acknowledges the value of favoring the collaboration and communication between professionals of different backgrounds and expertise for the success in the digital transformation process. On the other hand, the MT2 museum acknowledges "network" as the keyword for cultural institutions of the 21st century. Their mission establishes an open museum, one that promotes ideas, encourages debate, exchanges and collaborations. This institution adds to the network equation the participation of the entire community, whether they are visitors or not, to help build the museum and its activities (participatory practices). Furthermore, the museum's collaboration with different partners for the execution of their digital projects confirms that partnerships can be a source of both skills, helping to fulfill the internal gap, and resources. Parallely, PU1 and AR6 have also resorted to external experts due to their lack of technical knowledge.

The multiple case studies have confirmed the importance of the "Network" dimension as an enabler of the digital transformation and thus, its presence in the model for cultural institutions. As a result, there is the need to recognize that institutions that benefit from exchanges with external companies, industry networks and universities have a greater chance of being successful at the digital transformation.

Financing

Regarding the last model dimension, the studied museums have presented diverse financial structures and thus, diverse fund sources for investing in their digital transformation. On the one hand, although both PU1 and MT2 are public institutions, the second one possesses an economical advantage since, apart from the funds coming from the province, the museum raises its own income through ticketing (€11 full ticket price), gift shop and additional services. The same situation does not apply to the PU1 case, in which the full entrance fare to the institutions of the *Polo* is just €5. Furthermore, as previously mentioned, MT2 has been able to take advantage of partnerships and collaborations for accessing resources. Nonetheless, considering that literature usually emphasizes the tight budget of public institutions, in the Italian case studies a particular situation has presented: these entities showed funds availability for implementing digital technologies. The reason comes down to the digital agenda of the Italian country, deriving directly from the European Commission's initiative to better exploit the potential of ICTs in order to foster innovation, economic growth and progress in every sector of the economy. This is clearly reflected in the funds received by the *Polo* (PU1) to be strictly invested in the digital transformation, following the ministerial guidelines; or in the creative challenge supporting ICT solutions in cultural institutions, which gave birth the museum bot in the MT2 case study. On the other hand, private institutions like AR6 or SS8 (which even though its ownership is of the Region, it is managed and controlled by a private company) count with their own financial structure for the necessary funds supporting their digital transformation. As a consequence, for example, it was possible for SS8 to implement expensive technologies like virtual and augmented reality.

To conclude, the results from the case studies have confirmed the “Financing” dimension as a digital enabler of museums' transformation: like any type of project, the digital one requires financial resources as well. Then, according to the type of project and the possibilities of each institution, the dependence upon this aspect could vary.

The critical analysis of the case studies' results has conducted to the verified version of the *Digital Transformation Model for Cultural Institutions*, presented below in *Figure 16*. As can be observed, in comparison to the initial version, the items “New roles” (within the dimension “Digital skills”) and “Volunteers” (within “Human Resources”) have been removed since they could not be verified by the selected museums for the multiple case studies. Additionally, the “Competences” are referred to as “Specific and technical competences” for better depicting

their nature. Apart from that, the model’s structure remains unchanged and contains the five digital enablers supporting the digital transformation of museums: “Digital skills”, “Financing”, “Human Resources”, “Digital Culture” and “Network”.

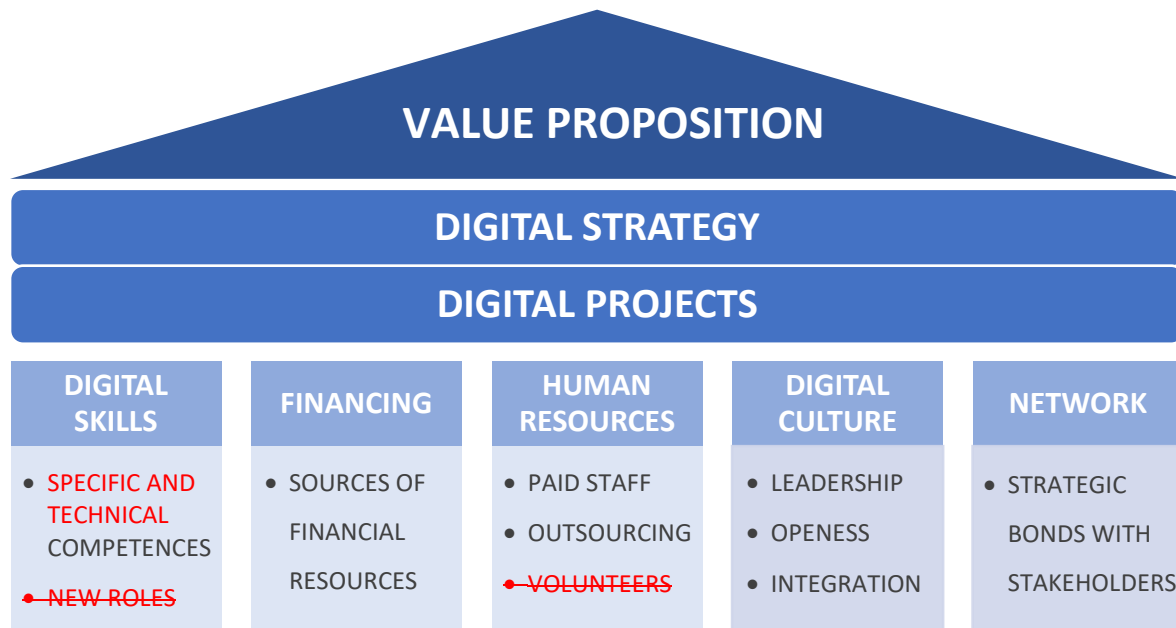


Figure 16: Validated Digital Transformation Model for Cultural Institutions

5.2 Common challenges

Along with the identification of the digital enablers, the multiple case studies have additionally allowed the recognition of four common challenges for cultural institutions in their digital transformation path. The relevance of these factors, motivating their introduction in the present Master Thesis, resides in their risk of compromising the achievement of a successful digital transformation, if not carefully considered. The identified challenges, including “Missing skills”, “Organizational inertia”, “Resource constraints” and “Management of cultural content”, will be presented in the following paragraphs.

1) Missing skills

The talent gap of staff members may be considered as the biggest obstacle for cultural institutions trying to implement digital technologies. Indeed, in the presented case studies, the lack of digital skills was a repeated aspect. The paths leading to cultural-heritage-related jobs are many and diverse, including master’s degree in museum studies, but also domain-specific graduate programs like art history, history, or anthropology, as well as short training courses (Marty, 2008). As a result, the background of cultural heritage professionals is varied and rich,

yet none of the aforementioned studies include instruction on technical skills, currently needed for managing and implementing digital technologies within museums. In fact, 21st-century institutions require staff members who understand not only the information itself, but also the information technology behind it. Hence, there is the need for museums to become strategic and deliberate around the development and expansion of the so-called 21st-century skills (or digital skills) among their human resources. Such competences include technical aspects like managing information resources, administering content management systems and evaluating information interfaces, but also more soft skills such as team work, problem solving, interdisciplinary knowledge and acceptance of continuous change. These competences are aimed at enhancing and complementing the existing ones, resulting in professionals with a broad set of knowledge on both content and technology. Of course, the development of such skills will require the revision of the institution's recruitment, hiring and training practices and even, at a higher scale, the re-elaboration of the educational system for cultural heritage professionals.

While the education may be challenging due to the diverse professional backgrounds and even though some roles could be outsourced, the complete lack of in-house skills would lead to institutions paying increasingly expensive consultants and lacking the confidence and knowledge to make crucial technology-related decisions. Thus, the success of the 21st-century institutions depends largely on their capability of preparing professionals able to meet the evolving needs of the museum, its visitors and surrounding environment.

2) Organizational inertia

As any organizational change, the digital transformation may encounter internal resistance, coming either from the top-management (as in the PU1 case study) or from the staff members. This inertia presents when either one of the parties fails to understand or underestimates the strategic importance of becoming a digital organization in a changing and evolving context. The challenge for institutions presents since the internal resistance can slow down or directly impede the progress towards the digital transformation. The consequences of such an issue can be better analyzed by distinguishing among its sources: if it originates in the top-management sector, the directors may show their lack of support towards digital projects by limiting the related investments or putting obstacles to their development; if, on the other hand, resistance comes from the staff members, tension in the workspace may arise between employees with a more traditional approach and those with innovative ideas. Usually, the struggle comes from older people who may lack a clear vision of the strategic advantages of digital technologies, in

comparison to digital natives. Furthermore, interesting studies show that the organizational challenge seems to be more pressing in institutions focused on historical heritage (as for example, PU1) compared to those possessing more contemporary and modern collections (as MT2) (Nash et al., 2016).

In order to avoid the challenge “Organizational inertia” to become an obstacle in the digital transformation path, institutions can embrace “Change Management” actions: the discipline that prepares, equips and supports individuals to successfully accept change in order to achieve organizational objectives (Prosci, n.d.).

3) Resource constraints

Almost inevitably, cultural institutions, and in particular public ones, must deal with resource scarcity. Recalling the objective function of museums (presented in *section 2.1.2*), it can be described as one involving the joint maximization of the level of output and its quality, subject to a break-even budget constraint. So, considering the characteristics of the digital transformation, which can be time-consuming and expensive, the resource constraints of museums may translate into limited in-house staff time and limited funding for digital projects. On the one hand, the scarce time availability, which had been mentioned in the PU1 case study, originates from having to divide the working time among the usual activities and the ones related to the digital projects. This issue can be observed, in particular, during the initial phase of the digital transformation when the technology is still not integrated with the normal operations of the museum. Additionally, this challenge may have greater presence in small organizations, where the number of staff members is reduced, and the responsibilities assigned to each one are extensive. On the other hand, regarding funding, the multiple case studies have depicted museums with availability of financial resources for their digital projects. Nonetheless, as previously stated, this situation was favored by a precise national agenda to promote digital technologies and hence, does not guarantee that all institutions always count with the necessary funds for the transformation (given that they are non-for-profit organizations and that the budget for the cultural sector has a decreasing trend). Furthermore, related to the restricted funding, a sustainability challenge arises since many digital projects last only for the lifetime of the funding and then are abandoned or staff is associated with another project. This was observed in the PU1 case study with an old-version of a museal app, which was simply eliminated after the funding cycle.

As a consequence, for dealing with the presented challenge, museum directors should assess the available resources before setting their digital strategy and plans, as well as consider the costs related to the investment *and* the ongoing costs for the maintenance of the projects.

4) Cultural content management

The challenges of managing cultural content originate with its transformation from analogue format to the digital one, i.e. its digitization. Specifically, this issue involves two aspects: the first one is the adaptation of the museum's artistic and historical content to a user-friendly type of communication, and the second one concerns the management of content's intellectual property rights. To begin with the first one, the focus on audiences (characterizing the 21st-century institutions) requires the adaptation of museums' collections and its interpretations to digitally suitable content. This aspect, which has been mentioned in diverse case studies (PU1, MT2 and AR6), originates since cultural heritage professionals care about the value of the collections and, usually, want to transmit to audiences lots of information and as detailed as possible. Hence, the challenge of such an enterprise resides in finding a way to produce and transmit enjoyable and public-friendly content that is simultaneously consistent with curatorial and educational standards of accuracy. This adaptation is a fundamental part of the process of approaching audiences and generating participatory and democratic content. In other words, this challenge can be summarized in being able to master the digital storytelling, where the focus is put in interpreting cultural content in a way that is appealing, emotional and engaging to audiences. Then, the second aspect relates to the intellectual property rights since the power of digital technologies has significantly changed the distribution and consumption patterns of cultural content; in particular, regarding the number of people who have access to it. Often, museums do not own the copyright or permissions of the materials they hold and, as a consequence, the digitization without a careful analysis and consultation with specialists may lead to files which cannot be effectively used due to legal constraints. Furthermore, if this aspect is overlooked and protected content is indeed published online, the risk of having serious legal problems is enhanced due to the extensive impact and reach of the Web. Consequently, the management of intellectual property rights, which is particularly relevant for museums with contemporary and modern collections, should be carefully considered, and even discussed with legal professionals, for achieving a successful digital transformation and avoiding risks.

5.3 Digital transformation approaches

The review of academic literature and the confrontation of several authors inspired the creation of the theoretical digital transformation model with the particular structure it has and that can be observed through its graphical representation. According to it, the starting point is the *Value Proposition* of the museum, which can be strategically enhanced and improved by the introduction of digital technologies. The precise objectives to be achieved are specified in the *Digital Strategy*, which is then translated into a series of *Digital Projects*. Finally, the latter count with the five identified digital levers for their management and execution. Thus, this linear and top-down sequence evidences the *theoretical* approach to the digital transformation. Nonetheless, the analysis of the case studies showed that, in reality, this linear approach is not always applied and that museums may organize their transformation diversely. This means that there are other ways to implement digital technologies, apart from the top-down reasoning. On the basis of these considerations, the different approaches to the digital transformation will be studied according to two of its dimensions:

- *Reach*: intended as the extension of the digital transformation within the institution. It may be categorized as:
 - *Focalized*: if only one or few areas are involved in the adoption of digital technologies.
 - *Extensive*: when several areas are involved and, eventually, the entire institution and its network, creating a digital museum.
- *Progress driver*: refers to the factor which motivates the development and advancement of the digital transformation. The options may be:
 - *Strategy*: denotes the theoretical and linear approach of a digital strategy guiding the adoption process of digital technologies.
 - *Project*: intended for when the advancement is, initially, technology-driven.

In *Figure 17*, the four case studies are confronted against these aspects with the aim of identifying common behaviors of museums towards the digital transformation.

AR6 and MT2 are the two museums which follow a strategy-driven approach, yet the reach of the transformation within each organization presents different characteristics. On the one hand, AR6 has found in digital technologies (especially Internet and social media) the right tools to advance its value proposition, related to brand communication and promotion. Thus, considering that this strategy involves solely the Marketing & Communication area, it can be

categorized as “focalized”. On the other hand, MT2 has a formalized and solid strategy which has guided the implementation of digital technologies throughout different areas of the museum, such as the ones dealing with marketing and communication, the different archives, exhibitions and visitors’ experience. Additionally, the extensive reach of their approach is such as to enlarge the boundaries of the museum and promote the generation of democratic content with both the community and other cultural institutions.

Then, on the project-driven transformations, it is possible to identify PU1 and SS8 museums. The latter definitely presents an interesting case study since, although having a defined strategy, the introduction of augmented and virtual reality experiences resulted being a technology-driven decision. This is evidenced in the fact that, after its implementation, the Director shared his worries about whether the chosen technologies, apart from being fashionable and expensive, were actually the most suitable ones for the achievement of their strategic objectives, due to their inability to attract visitors more than once. Moreover, like MT2, the transformation of SS8 shows an extensive reach by involving the diverse activities related with display management, communication and user interaction, as well as by promoting the participation of several private and public entities within the Castle through the “Innovation Lab”. Finally, PU1 approached the transformation without a digital strategy and thus, its motivation was purely project-driven. Then, regarding its reach, the idea of the mobile app could be classified as being in between a “Focalized” and an “Extensive” project, since it intended to involve both user communication and on-site interaction, yet the heritage pillar was not tackled in any way.

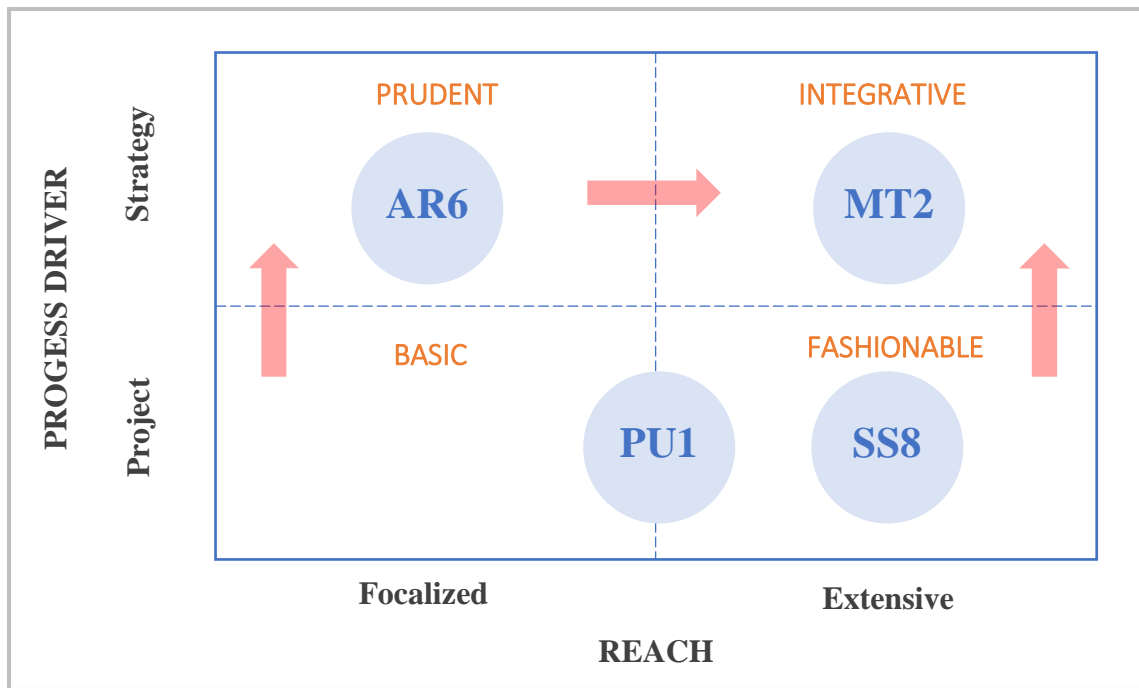


Figure 17: Empirical approaches to the digital transformation

So, on the basis of the presented matrix and its associated dimensions “Reach” and “Progress driver”, it is possible to identify and generalize four empirical approaches to the digital transformation of cultural institutions, according to each one of the quadrants.

Integrative approach

This quadrant is aligned with the theoretical approach to the digital transformation which identifies it as a strategical and linear sequence. Consequently, museums under this classification share a strong vision for the transformation, which is reflected in a digital strategy statement supportive of its mission and value proposition. The latter is, furthermore, deployed into a series of digital initiatives generating value for the institution across its many sectors and activities, creating a unified digital front. This quadrant combines both the knowledge on how to derive value from the introduction of digital technologies, as well as a supportive organizational environment committed to it and enabling the wide reach of the transformation.

Prudent approach

The digital vision, and thus strategy, exists but it may still be underdeveloped for a complete transformation since it is focalized on few aspects of the museum and not on it as a whole. As a consequence, digital features can be found only in some areas, like independent silos, across the institution. Nonetheless, the fact that a digital strategy has been created in the first place acknowledges the recognition of digital technologies as tools which may present several

opportunities for the museum and thus, are supported by the appropriate leadership and culture. On the other hand, its focalized reach denotes a prudent and sequential approach of the museum towards the digital transformation, which consists in testing the technologies within a certain group of activities and, if the results are positive, then move forward with the transformation (and the investment) in other sectors.

Fashionable approach

Museums within this category are motivated to advance digital innovation, yet their projects are not founded on a real knowledge on how to proceed since their decisions are technology-based rather than being drive by an underlying strategy. They are characterized by the willingness to move fast in the current dynamic context and thus, implement several attractive and expensive technologies which do not follow an integrative vision but, that make the museum appealing to audiences. As a consequence, advanced digital features can be observed in diverse areas of the museum, but that do not always create value collectively. So, museums following the fashionable approach, after a rapid beginning, may slow down for reconsidering their already implemented projects and try to coordinate and integrate them within the organizational objectives for actually creating additional value.

Basic approach

Within this quadrant it is possible to situate museums which are either unaware of the possibilities offered by digital technologies or that have just started investing in the transformation but without the necessary organizational support. This occurs when the top-management is skeptical of the value digital technologies can generate and thus, the resulting digital culture within the institution is immature. So, without a clear vision nor strategy, these museums approach new technologies (they may have to do so because of ownership-related aspects) through experimentation projects of medium-limited reach to explore what the transformation is about and for deciding whether it could work for the institution. Because of the lack of underlying objectives, and even internal support, the progress of such approach may be uncertain or, at least, complicated unless some of the aforementioned circumstances are modified.

Considering the presented empirical approaches and their description, it is possible to characterize each one of them with the digital enablers identified in the *Digital Transformation Model for Cultural Institutions*.

PROCESS DRIVER	Strategy	PRUDENT	INTEGRATIVE
		<i>Digital strategy:</i> YES, focused <i>Digital culture:</i> YES <i>Financing:</i> LIMITED expenditure <i>Network:</i> RESTRICTED (silos)	<i>Digital strategy:</i> YES, integrative <i>Digital culture:</i> YES, strong <i>Financing:</i> HIGH (progressive) <i>Network:</i> WIDE
	Project	BASIC	FASHIONABLE
		<i>Digital strategy:</i> ABSENT <i>Digital culture:</i> IMMATURE <i>Financing:</i> LIMITED <i>Network:</i> ABSENT	<i>Digital strategy:</i> NO (or not followed) <i>Digital culture:</i> YES, not coordinated <i>Financing:</i> HIGH (all at once) <i>Network:</i> WIDE
		Focalized	Extensive
REACH			

Figure 18: Characterization of empirical approaches with the digital enablers

As can be observed in *Figure 18*, the enablers “Digital skills” and “Human Resources” were not included in the characterization of the different approaches. While the other dimensions can be generalized in order to determine the common behaviors of each quadrant, these two enablers are interconnected aspects which will depend on the particular institution under analysis: if it counts with the necessary digital skills, most probably the digital projects will be developed in-house, while the lack of competences would lead to outsourcing. Having said so, regarding the other digital enablers, the following patterns can be identified:

- If the transformation is strategy-driven, then it means that behind its creation and promotion there is an effective digital culture and leadership, which recognizes digital technologies as tools for generating value and that communicates this vision through the entire institution. Furthermore, in the fashionable quadrant, although the digital strategy is initially disregarded (or may directly lack), the extensive reach of the transformation indicates that the implemented projects count with the support of a digital culture and leadership, as well.
- An extensive transformation, by impacting on several areas, requires larger financial expenditures than focalized changes do. Nonetheless, in the case of integrative approaches, the investments may be done more sequentially (following a long-term

vision) if compared with fashionable behaviors which lead to rapid and simultaneous expenditures.

- Lastly, museums following digital transformations of extensive impact present large networks since the adoption of digital technologies in cultural institutions entails, inevitably, the democratization of content and the broadening of its boundaries towards the community and its environment. On the contrary, focalized approaches present a more restricted network.

Finally, a few considerations can be made regarding the dynamic aspect (depicted with red arrows in *Figure 17*) of the presented approaches to the digital transformation. It could be considered that the objective quadrant is the upper-right one, where the transformation is supported by a strategy which determines an integrative vision and extends to a wide set of museal activities. It is worth noticing that this approach matches the theoretical one, supported by existent literature.

The simplest evolution is from the “Prudent” quadrant, since museums would need to replicate the same procedure they have followed for one area and extend it to the remaining ones. While this means intensifying the investments in digital technologies, the long-term vision and organizational support are already established. Contrarily, if the starting point is the “Fashionable” quadrant, the dynamics are more complicated for the technologies would be in place by then. So, the evolution is about analyzing the existent projects and identifying which are worthy for generating value in a coordinated way and which are not. Apart from the lost investment, the challenge resides in changing a short-term perspective for a long-term one, but that would guarantee the museum’s sustainability. Finally, the longest path presents if the initial approach is the “Basic” one, where the transition from a project-driven to strategy-driven transformation would, first, require recognizing the value of digital technologies and developing internal support. Only then, the museum could start with some areas, and eventually extend to the entire institution. Even though this process would require intensifying the investments in new technologies, as the institution advances, it will also benefit from a more open and collaborative environment from which to obtain possible partners.

6. CONCLUSIONS

This final chapter aims at highlighting the findings of the present thesis, as well as presenting its academic contributions and implications for museum practitioners and policymakers. Lastly, after presenting the dissertation's limitations, some outlooks for future research will be identified.

The Master Thesis pursued the objective of supporting cultural heritage institutions, in particular museums, along their digital transformation path by identifying the critical dimensions that drive such transformation (i.e. the critical success factors or digital enablers) and by understanding how they should be effectively leveraged. Additionally, and complementing the identification of such digital enablers, the thesis aimed at defining the common challenges institutions are most likely to encounter during their transformation.

The presented objectives can be summarized into the following research questions:

RQ 1. Which are the main factors enabling museums to achieve an effective digital transformation?

RQ 2. Which factors or conditions represent obstacles for museums in their digital transformation path?

For investigating these aspects, the work has been delimited to Italian museums. After the broad review of the existent literature on museums, their applications of digital technologies and the existent digital transformation models for the industrial sector, a theoretical framework has been constructed *ad hoc* for cultural institutions. Such model, entitled *Digital Transformation Model for Cultural Institutions*, includes the critical success factors of the digital transformation and how they should be integrated within the organization. Then, for validating the proposed model, a multiple case study analysis has been conducted thus, relying on a purely qualitative methodology. In particular, direct interviews were held with four Italian museums with diverse characteristics (such as ownership, size and type of collections) and with different levels of digital advancement.

6.1 Master Thesis findings

The findings of the present dissertation can be grouped into three main blocks: the first regards the elaboration of the *Digital Transformation Model for Cultural Institutions*, the second concerns the identification of the related common challenges, and, finally, the third, deals with the description of the empirical approaches to the digital transformation.

Firstly, the created model contains the five digital enablers or levers which sustain the investment in digital technologies. Furthermore, as the framework is intended to guide museums and help them in approaching the digital transformation, it has been graphically represented in a way to include these aspects and highlight the need of aligning the digital projects to the institution's strategic objectives. So, the starting point is the *Value Proposition* of the museum: from a theoretical point of view, it is fundamental to recognize that the fair motivation behind the adoption of digital technologies is their wide range of opportunities for strategically improving the delivered value and for creating a differential offering. Then, the particular strategic objectives pursued with the digital transformation should be clearly specified and formalized in a *Digital Strategy* for guaranteeing the alignment of the entire organization and avoiding isolated initiatives. Such strategy is latter on translated into a series of *Digital Projects*, which depend on the following five digital enablers:

- 1) *Digital skills*: in order to derive value from the investment in digital technologies and manage internally the transformation, museums' staff members should develop an additional set of technology-related competences which will be needed, not only for the change in itself, but also for the regular operations thereafter. The so-called 21st-century skills involve managing information resources, administering content management systems and, in general terms, being able to develop digital technologies' applications in-house.
- 2) *Human resources*: the most important and fundamental resource to a project are the human resources, intended as the team who deals with its execution and development. Depending on the level of in-house technological competences, the options will be to rely on the institution's employees, or otherwise, to turn to external companies and experts.
- 3) *Digital culture and leadership*: considering that people can be a much bigger obstacle than any technology, top-management has the key responsibility of leading the entire institution and communicating the vision set by the digital strategy. Furthermore, advancing in the right direction will require the correct organizational culture, characterized by openness to innovation, interdisciplinary work and cooperation between departments and roles.
- 4) *Network*: cultural institutions can deeply benefit from getting in contact with their surrounding ecosystem, including external private companies, universities, other entities from the sector and the entire community. Being the approach to digital

technologies such a new issue in the cultural area, the creation of a network and fostering interoperability will allow museums to learn from each other's experiences and spread good practices. Furthermore, through more formal partnerships, museums can gain accessibility to knowledge and resources for the development of their projects.

- 5) *Financing*: the availability of financial resources is fundamental for the digital transformation, as it is for any type of project. While the total necessary expenses will vary depending on the kind of technology being implemented, an initial amount will be required for launching the endeavor.

Then, the second block of findings regards the identification of four common challenges cultural institutions could face, and which should be carefully managed for avoiding them compromising the achievement of a successful digital transformation:

- A) *Missing skills*: 21st-century institutions need staff members who understand, not only museums' information (cultural content), but also the information technology behind it. Nonetheless, even though museum professionals may come from diverse backgrounds, none of them involves education on the required "Digital skills". While the education may also be challenging due to the diverse professional experiences, the investment in training staff members is necessary for managing internally the transformation and counting with employees who can make crucial technology-related decisions.
- B) *Organizational inertia*: when facing organizational transformations, internal resistance may appear (either from the top-management or from the staff members) and compromise its progress. In particular, older people or cultural professionals devoted to historical heritage may present a bigger struggle. Since the human resources and their collaboration are fundamental for the introduction of digital technologies, institutions may approach this challenge by embracing change management practices.
- C) *Resource constraints*: since the digital transformation can be expensive and time-consuming, the restricted resource availability of many museums may compromise its progress. In particular, the constraints could translate in limited in-house staff time and limited funding. Given that the sustainability of digital projects is an important aspect to consider, for dealing with this challenge, museum directors should assess their available resources against the expected required ones, and not only for the initial phases of the project but for its continuous operations and maintenance as well.

D) *Cultural content management*: the first challenge derives from museums’ approach to audiences and is the need to create and transmit content that is enjoyable and public-friendly, but that simultaneously maintains curatorial and educational standards. In other words, it is about mastering the digital storytelling and being able to interpret cultural content in ways that visitors can relate to. Then, the second challenge concerns the intellectual property rights of collections and thus, the publishing restrictions of their digitized versions, with which museums should comply. Since a single publication can reach huge number of users due to the broad distribution and virality of the Internet, this aspect should be carefully managed and even consulted with legal specialists.

Lastly, through the case studies’ analysis, it has been observed that in reality museums do not always follow a structured and linear approach to the digital transformation, as the theoretical one determined in the model for cultural institutions, but that they may organize their transformation diversely. In particular, four different approaches have been identified according to the “Reach” of the digital transformation within the museum and its “Progress driver”. Additionally, as observed in *Figure 19*, each one of the quadrants can be characterized with the enablers of the digital transformation (except from “Digital skills” and “Human Resources” which will depend on the particular institution and thus, cannot be generalized).

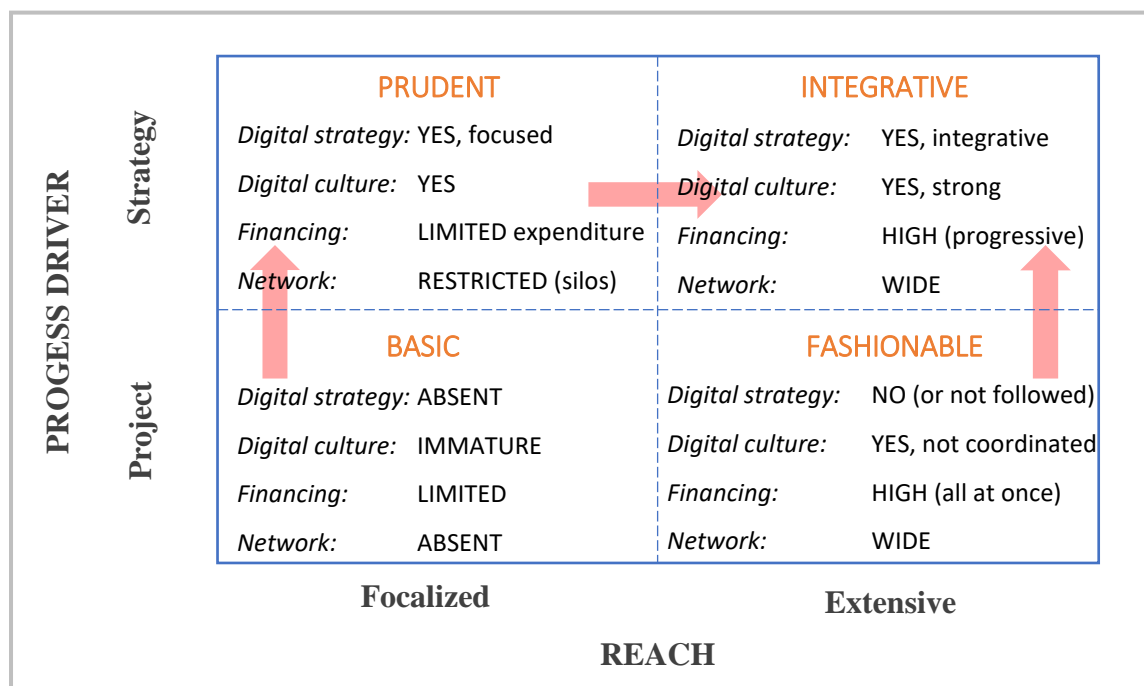


Figure 19: Result from the case studies: empirical approaches to the digital transformation and their respective digital enablers.

Integrative approach: these museums share a strong vision and support of the digital transformation which is deployed into a series of valuable digital initiatives across its many sectors and activities, presenting a unified front. This quadrant is aligned with the theoretical approach that identifies a strategical and linear sequence for the adoption of new technologies.

Prudent approach: the digital strategy, supported by leadership and digital culture, exists but is focalized on just few aspects of the museum. This denotes a prudent and sequential approach towards the digital transformation, which consists in testing new technologies within a certain sector and, if the results are positive, then move forward with the investment in other areas.

Fashionable approach: museums following this approach are willing to rapidly advance digital innovation within the current dynamic context and thus, implement attractive and expensive digital features in several areas, but that do not always create value collectively since they lack an integrative vision.

Basic approach: institutions in this category are unaware or skeptical of the possibilities offered by digital technologies and so, they present an immature digital culture. Without a clear vision, their approach to the digital transformation is through experimentation projects of medium-limited reach to explore how digital tools could work within the museum.

Considering the matrix in *Figure 19* under a dynamic perspective, and setting as objective the achievement of the upper-right quadrant, it has been possible to determine the evolution path of each one of the approaches according to their characteristics. While the simplest progress is from the “Prudent” area, since it basically requires intensifying the investment in additional areas, the longest path would be followed from the “Basic” approach, for it involves first recognizing the value of new technologies and developing its internal support for then, moving on. Lastly, when the starting point is the “Fashionable” approach, the dynamics are also complicated because it is necessary to assess the already installed technologies and see how (and if) they can be integrated according to a long-term vision.

To conclude, the results of the Master Thesis have allowed to characterize the digital transformation as a multidimensional and complex process, that can be approached in several ways, and which requires the support of different types of resources and agents. As any innovation process, the challenges will be present and thus, what will determine the success of such an enterprise will be the ability of institutions to overcome them. What remains a key aspect is that the digital transformation is not about the technology itself, but rather about how

museums combine its diverse elements to support the three interconnected and synergic pillars of cultural institutions: Heritage, Audience and Network.

6.2 Master Thesis contributions

Academic contributions

Up to now, the available literature on museums and their digital transformation has concentrated on the possible applications of new technologies for achieving a precise objective. In particular, the most repeated issues concern the utilization of digital communication and marketing instruments, such as social media, for approaching visitors; of on-site digital tools for improving the museal experience, like interactive exhibitions; and lastly, of digitizing technologies for the long-term preservation of artworks. In addition, there are several research reports on the state of digitalization of cultural institutions, which aim at determining the type of technologies most museums have already incorporated. Thus, there is a lack of material determining complete digital strategies specifically for museums, meaning: how to strategically approach the transformation, which are the key necessary resources, which are the most common barriers they may encounter... These are all issues which could help institutions mitigate their uncertainty on how to act, and yet this type of information is scarce and dispersed among different sources and authors. On the contrary, when referring to other industry fields, the literature on digital transformation models has proven to be extensive. In particular, the most mentioned sector is the manufacturing one, where the concept of digital transformation is of great popularity due the Industry 4.0 movement. Such models are integrative and include, not only a reference to the different digital levers, but also expand on the concept of digital strategies.

So, on the basis of these considerations, with the creation of the *Digital Transformation Model for Cultural Institutions*, the Master Thesis has contributed to a part of the literature which has not been previously explored completely and with big room for development. It is created *ad hoc* for museums and, furthermore, adopts an integrative approach, unlike the most usual one of treating transformation aspects singularly. Parallely, the identification of the common challenges has also been done according to museums' characteristics and their particular operating context.

Finally, through the conducted case studies, the Master Thesis has made an additional contribution to the academic environment by providing empirical evidence on museums' approaches to the digital transformation. In particular, four different patterns for digital

innovation within museums have been identified and also, characterized according to the previously identified digital enablers.

Practical implications

On the other side, the present dissertation has practical implications for the museum management and practitioners.

In the first place, the created framework, being a dedicated and integrative model for cultural institutions, serves as a tool which museums' directors can use for implementing digital technologies successfully. It has been created to specifically support the strategic decision-making process of digital innovation and an "Integrative" type of approach. This can be observed in the representation of the framework, which starts, first of all, from the entity's value proposition and the digital strategy, for then going down towards the digital levers or resources on which museums can act to achieve them. In this way, the thesis has intended to reduce the number of institutions which approach the transformation focused on technology, rather than on strategic objectives. Additionally, in order to support the evolution of those museums, some insights have been provided as well. Given the uncertainty of many cultural institutions on how to embrace the digital transformation, the more information is supplied, the better. The same applies for the identified challenges of the digital transformation: if museum practitioners are aware of them, there will be a lower probability of overseeing these factors and thus, of compromising the results of the innovation.

Moreover, providing a guidance tool to museums' directors is a way to help them pursue their digital agendas, established by the European Commission in an attempt to strengthen Europe's position in the cultural heritage sector. Recalling the 2014 communication, the Commission had recognized the need to:

- encourage the modernization of the heritage sector, raising awareness and engaging new audiences,
- apply a strategic approach to research and innovation and
- seize the opportunities offered by digitalization.

Finally, museums can use the created framework and matrix as benchmarking tools. If contemporarily applied on one's institution, as well as on others which pursue similar initiatives, it would be possible to identify the relative position of the museum (its strengths and weaknesses), and also identify good management practices to follow. Furthermore, it can

be useful to gain strategic insights on how other museums have managed certain digital projects, if such are part of the institution's digital agenda.

6.3 Limitations and future research

The limitations of the present thesis reside mainly in the chosen methodology. The purely qualitative analysis has been preferred since it is suitable for providing a close-up view, a deeper and richer understanding within a specific context (Thomas, & Magilvy, 2011). Although recommended, this type of research method may have provided some results subject to the interpretation of the writer. In addition, being the semi-structured interviews held face-to-face, the oral discussion of the previously-elaborated set of questions may have led to biased or ambiguous answers. For example, museums (especially private ones) were almost reluctant to disclose information regarding their financial aspects during the interviews.

As a result of the aforementioned considerations, the case study analysis in itself is unique and would be extremely difficult to replicate. Nonetheless, the authenticity and validity of the obtained results is ensured by a triangulation between the empirical data and the review of the academic literature.

Finally, considering the findings and limitations of the Master Thesis, two directions for future research can be identified.

The first regards enlarging the number of museums used for the case studies. Even though, the four selected cases served for depicting different levels of digital advancement, a larger sample would have resulted in a more robust validation of the created framework, as well as of the matrix depicting the empirical approaches to the digital transformation. Consequently, in future researches, it could be useful to consider, for example, more than one museum per level. Nonetheless, in order to support this modification, the form interview should be improved and, eventually, adapted as a survey for allowing its distribution to a greater number of recipients. Furthermore, complementing open-questions with others to be answered through Likert-type scales, would prove useful for obtaining some quantitative data, complemented with more detailed and qualitative opinions.

Then, the second direction for future research concerns expanding the application boundaries of the created framework and matrix. This would imply testing them on museums outside of the Italian context and, even, explore if they are applicable as well for other entities of the cultural sector such as archives, theaters and libraries.

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Appendix: Interview form

INQUADRAMENTO DIGITALE

1. Qual è il suo ruolo nell'istituzione?
2. Avete una strategia digitale definita? Può descriverla?
Se la risposta è negativa: è prevista la messa a punto di una strategia di questo tipo?
3. Quali sono i vostri progetti, sia terminati che attivi, sul digitale?
4. C'è una struttura organizzativa/dipartimento specialmente dedicata al digitale e allo sviluppo tecnologico? (*Ufficio digitale interdipartimentale*)
5. Che posizione ha nell'istituzione il responsabile dei progetti digitali?
6. Negli ultimi anni, sono state create figure professionali legati al digitale?
7. Negli ultimi due anni, il personale ha partecipato a qualche attività di sviluppo professionale sulla digitalizzazione?

Con focus su un progetto digitale in particolare:

8. Potrebbe descrivere il progetto? Quale sono le tecnologie digitali implementati?
9. A chi è particolarmente indirizzato il progetto? / Chi è il principale target?
10. Come considera che i progetti digitali vi permettano di raggiungere la propria strategia generale?
(*Efficienza, efficacia, impatto*)
11. Qual è lo stato di avanzamento del progetto?

RISORSE UMANE & COMPETENZE

12. Il progetto digitale è eseguito da una entità esterna o dall'istituzione stesa (**outsourcing**)?
13. Qual è il numero di personale interno e retribuito dedicato al progetto (in FTE)?
14. Qual è il numero di volontari dedicati al progetto (in FTE)?
15. Ritiene che il personale possieda le competenze digitali necessarie per i progetti di questo tipo?
(*gestione di informazione digitale, nuove tecnologie e tutti i mezzi associati*)

RISORSE FINANZIARIE

16. Le risorse economiche utilizzate per il progetto provengono dal budget interno o da fonti esterne?

NETWORK

17. È stato richiesto l'aiuto di consulenti esterni per l'**ideazione** del progetto? Perché?
18. Avete collaborato/cooperato con altre organizzazioni per lo sviluppo del progetto digitale?

CULTURA DIGITALE

19. Come descriverebbe l'atteggiamento del management rispetto ai progetti digitali? Sono entusiasti?

INFORMAZIONE ADDIZIONALE

20. Quali sono state le principali difficoltà/ostacoli?
21. Quali definirebbe come "fattori abilitanti" del digitale? / Quali considera siano elementi chiavi per una trasformazione digitale efficace?

FEEDBACK E SUGGERIMENTI

22. Considera ci siano altri aspetti da considerare?