

# **BUSINESS MODELS, STRATEGIES AND INNOVATION OF COMPANIES THAT APPLY HIGH TECHNOLOGY TO CULTURAL GOODS: FIRST EVIDENCE IN ITALY**

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## INTRODUCTION

Cultural goods are a crucial asset for all human beings: they tell us where we are from, what has happened in the past and help us understand who we are. As Settis (2002) says, “*the so-called ‘cultural heritage’ is the fulcrum of our national identity and of our historical memory, and therefore the maximum contribution that we can bring to the construction of supra-national identities such as the European one*” (p.5). Therefore, preserving and maintaining cultural goods is really important for all of us.

Additionally, beyond being an important source of knowledge and tools for human cultural development, they also represent an important resource for the economy. This is not a matter of selling cultural goods, but rather valorizing them and allowing their sustainable fruition, assuring their protection and their preservation for the future. Today there are 1121 sites (869 cultural sites, 213 natural sites and 39 mixed) recognized by the UNESCO over 169 countries worldwide. Among them, 55 are in Italy<sup>1</sup>, but these are only part of a wider system counting about 4000 museums, 6000 archaeological areas and several thousands of churches and historical buildings. According to De Ceglia (2019), “*Works of art classified as movable assets of cultural value, libraries and archives are worth 174 billion euros (10.4% of our GDP)*”. But, indeed, none could estimate their “real” value, especially from an intangible point of view<sup>2</sup>.

Indeed, the protection and valorization of this huge heritage requires the involvement of multiple stakeholders, from public institutions to individual private citizens. Of course, at least to a certain extent, each of us is also responsible for their preservation. Everyone is enjoying archaeological sites, historical monuments, exhibitions, thus benefiting from what previous generations have left, and contributing to what future generations would benefit. In fact, a single loss due to theft (e.g. Vermeer’s *Concert*, a painting stolen in 1990<sup>3</sup>), war (e.g. the Siria’s heritage loss), but also an unpredictable natural disaster (Chiodi & Fedeli, 2018), represent an irreplaceable damage for the whole humanity.

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<sup>1</sup> For an overview, see: <http://www.unesco.it/it/ItaliaNellUnesco/Detail/188>

<sup>2</sup> For a broader overview about the value created by cultural firms we recommend Dubini (2017). She provides an interesting classification of value created by heritage, arts and culture identifying identity-related value, educational value, political value and an excursus about the “growing debate on heritage, arts and culture as drivers for economic wealth” (p. 93).

While on the one hand public institutions and the several international and national foundations are doing their best to safeguard cultural heritage integrity while tourists are enjoying cultural and natural sites, there are some actors that – more silently – are developing new tools and practices to better identify, protect, valorize and make cultural goods available to all of us: companies.

This book intends to provide an overview about a specific kind of companies, those that apply high technology to cultural goods. In fact, if we consider the whole “supply chain” linked to cultural goods, we could also identify transportation and food companies (considering those actors involved in the broader tourism sector). Rather, there is a small niche of companies that have developed or are using ad hoc innovations to provide solutions capable of identifying, protecting, valorizing cultural goods and making them available. These companies are particularly interesting since they belong to multiple sectors, have business models, strategies and innovation processes that are very peculiar due to the resource constraints and the contextual uncertainties that they usually face.

Advancing our previous work (Casprini et al., 2014), this book provides a deeper overview about the actors and the factors that may influence how companies that apply high technologies to cultural goods operate. Additionally, it presents some preliminary results of a survey conducted on 120 companies in Italy. The detailed description of two case studies in Tuscany, the spin-off ATS and the centenary family firm Piacenti, conclude the book.

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<sup>3</sup> For an overview see: <https://www.barnebys.it/blog/top-10-opere-darte-rubate-e-mai-ritrovate>





# 1. CULTURAL GOODS: A MANAGERIAL PERSPECTIVE

This first chapter is dedicated to a broad overview of what we mean by companies that apply high technology to cultural goods and aims at providing a framework capable of guiding the following analyses. In the first subchapter we provide a brief literature review depicting the main topics addressed by management scholars when referring to cultural goods. Then, we proceed with a definition of “cultural goods”, providing an excursus about the legislations on cultural goods and concluding with the definition that we have adopted for this book. In the

third subchapter we focus on the actors and the factors that are affecting the management of cultural goods. After having described the main stakeholders, we focus on the companies that apply high technology to cultural goods and then look at those exogenous factors that might influence their strategies and operations. In the fourth subchapter we describe the phases of intervention on cultural goods. Finally, we link all the aspects described in a final framework and we provide an overview about the business model.

## 1.1 CULTURAL GOODS IN MANAGEMENT: A LITERATURE REVIEW

Despite the great importance of cultural goods from a socio-cultural point of view, research into management is still scarce and fragmented. A literature review conducted on the ISI web of science database with the keywords “cultural good\*” OR “cultural heritage\*” OR museum\*,OR archeolog\* OR painting\* OR monument\* in management and business field of research, returns 1144 journal articles, with only 751 published in AIDEA ranking. Of those, only 294 concentrate on cultural goods. The others, in fact, present the keywords used as

simple words in the abstract while the papers were linked to topics such as human resource management or expatriate.

The bibliographic coupling analysis conducted on these 294 publications (considering a minimum cluster size of 10 items) identifies 10 main communities (Figure 1.1), then reduced to 4 after qualitative investigation.

A first community (comprising the first, sixth and ninth cluster) is about museums. This cluster is about the use of history in organizations (Ravasi et al., 2019), memory repositories (Rodner & Preece, 2015), etc. Museums are also used as the privileged setting in order to study phenomena such as identity change. For example, Di Dome-

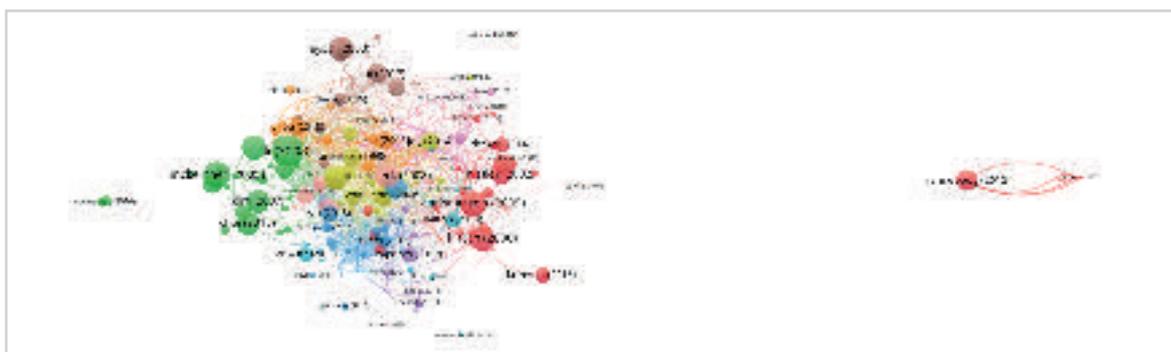


Figure 1.1. Bibliographic coupling (n= 294)

nico (2015) studies how organizational identification of public museums is changed and reconfigured. This group of papers is also characterized by particular attention to U.K. museums (e.g. Jafari & Taheri, 2014). Contrary to other clusters, where more focused disciplines and topics are present, this first group of papers is mainly linked to more theoretic topics, mainly identity.

A second community (comprising the second, seventh and eighth clusters) is about tourism and heritage. We can mention here contributions linked to the importance of authenticity (Taheri et al., 2019) and how to create a cultural tourism beyond the kind linked to sightseeing only (Petr, 2015), among the others. Additionally, this group also considers dark tourism (Light, 2017).

A third community (third, fifth and tenth clusters) is about marketing and technology in museums. This cluster is particularly interesting since it comprises some papers that describe the influence of technologies, such as augmented reality (He et al., 2018) and the role of relationship marketing (Camarero et al., 2019).

The fourth is about customer experience. It is still linked to the marketing side but mainly focused on understanding to what extent visitors are engaged. This cluster is interesting since it provides a glue about how some brands are using art in their stores, combining luxury and aesthetics in order to create a unique experience (Joy et al., 2014).

A broad overview of the literature shows us that there is high heterogeneity with respect to the field, without a clear definition of its boundaries. More precisely, a lot of attention has been paid to museums. Museums are the place where a lot of cultural goods are placed and they are also highly frequented by visitors, therefore it is not surprising that also academic research has focused on them. Additionally, there is specific attention to tourism with a lot of specific subthemes such as “dark” tourism and dedicated journals (e.g. *Tourism Management and Journal of Destination Marketing & Management*) reserved for tourism management and place management. Then, there are several topics (e.g. identity) that are studied within cultural goods-related contexts. This broad overview of the literature suggests some preliminary considerations. First, there is a need for a better defini-

tion regarding the field of study: what is a cultural good? In fact, some contributions refer to cultural industries considering movies and performing arts, while others focus on heritage sites or also traditions. Second, most of the studies we have analysed focus on tourist behaviour, while they have disregarded the management of cultural goods, with the exception of museums. Indeed, there are few contributions that focus on companies operating in the field of cultural goods (e.g. Capone & Lazzarretti, 2018; Casprini et al., 2014; Lazzarretti & Capone, 2016). However, there is a little knowledge about the stakeholders of cultural goods. Finally, none of the contributions has provided a comprehensive framework capable of disentangling the complexity of the actors and how they are involved in the management of cultural goods.

## 1.2 DEFINING CULTURAL GOODS: A BRIEF OVERVIEW

This book is not about legislation, but we provide a brief overview of the main milestones about cultural goods focusing on the Italian context. This section is mainly based on information from *Enciclopedia Treccani* and the *Ministero per i Beni e le attività culturali e per il turismo*'s websites.

The importance of protecting the heritage is not new. One of the first examples regarding the protection of the cultural heritage is the *Editto Pacca* emanated by the Cardinal Bartolomeo Pacca in Rome on 7th April 1820. This is among the first examples of limiting the exportation (at that time beyond the Vatican State) of cultural goods, but also the excavation of archaeological sites which needed to be authorized<sup>4</sup>. The same Editto is at the basis of the Law 30th June 1909 n. 364 (Legge Rava-Rosadi) and then Law 1st June 1939 n. 1089 (Legge Bottai). In that period, the cultural good was seen as static and a cultural good due to “aesthetic qualities” (Treccani)<sup>5</sup>.

According to art. 9 of the Italian Constitution “*the Republic promotes the development of cultural and scientific and technical research. It protects the landscape and the historical and artistic heritage of the nation.*”. Therefore, landscape and heritage are recognized as important and as something to be protected, and culture promoted.

<sup>4</sup> <http://www.treccani.it/enciclopedia/bartolomeo-pacca/>

<sup>5</sup> [http://www.treccani.it/enciclopedia/beni-culturali\\_%28XXI-Secolo%29/](http://www.treccani.it/enciclopedia/beni-culturali_%28XXI-Secolo%29/)

There have been several laws and various ad hoc groups and institutions about heritage have been created in Italy, as well as in Europe.

In 1954 the *Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict*<sup>6</sup> was held. The same covered “immovable and movable cultural heritage, including monuments of architecture, art or history, archaeological sites, works of art, manuscripts, books and other objects of artistic, historical or archaeological interest, as well as scientific collections of all kinds regardless of their origin or ownership”<sup>7</sup>.

In 1964, The Italian government established the Investigation Commission for the protection and enhancement of things of historical, archaeological, artistic and landscape interest (Commissione di indagine per la tutela e la valorizzazione delle cose di interesse storico, archeologico, artistico e del paesaggio), known as Commissione Franceschini. This Commission has been crucial since it introduced a definition of cultural goods that went beyond a “closed” list since the concept of art, science and culture in general changes over time: the cultural good is a concept which contains “historicity” (Treccani<sup>8</sup>). Extending the definition of cultural good, also the audience of cultural goods has been extended.

In 1975 the *Ministero de Beni Culturali e Ambientali* was established and Giovanni Spadolini was the President. This *Ministero* comprises competences and functions that belonged to other *Ministeri*, namely “Antichità e Belle Arti, Accademie e Biblioteche” (Ministero della Pubblica Istruzione), “Archivi di Stato” (Ministero degli Interni), “Discoteca di Stato, editoria libraria e diffusione della cultura” (Presidenza del Consiglio dei ministri)<sup>9</sup>.

In 1998 we witnessed a new definition of cultural goods: cultural goods are “those that make up the historical, artistic, monumental, demo-ethno-anthropological, archaeological, archival and book heritage and the others that constitute evidence of civil value”<sup>10</sup> (art 148, d.lgs. 31/3/1998 n. 112). The same decree also defines the “Ambiental goods”, the “protection”, the “management”, the “valorization”,

the “cultural activities” and the “promotion”:

- a. “beni culturali”, quelli che compongono il patrimonio storico, artistico, monumentale, demoetnoantropologico, archeologico, archivistico e librario e gli altri che costituiscono testimonianza avente valore di civiltà così individuati in base alla legge;
- b. “beni ambientali”, quelli individuati in base alla legge quale testimonianza significativa dell’ambiente nei suoi valori naturali o culturali;
- c. “tutela”, ogni attività diretta a riconoscere, conservare e proteggere i beni culturali e ambientali;
- d. “gestione”, ogni attività diretta, mediante l’organizzazione di risorse umane e materiali, ad assicurare la fruizione dei beni culturali e ambientali, concorrendo al perseguimento delle finalità di tutela e di valorizzazione;
- e. “valorizzazione”, ogni attività diretta a migliorare le condizioni di conoscenza e conservazione dei beni culturali e ambientali e ad incrementarne la fruizione;
- f. “attività culturali”, quelle rivolte a formare e diffondere espressioni della cultura e dell’arte;
- g. “promozione”, ogni attività diretta a suscitare e a sostenere le attività culturali.”

In the same year, the *Ministero de Beni Culturali e Ambientali* becomes *Ministero per i Beni e le Attività Culturali* (d. lgs. 368/1998): it comprises the same competences as before, plus the “promotion of sports and sports facilities and the promotion of entertainment activities in all its expressions: from cinema to theater, to dance, to music, to traveling shows”. The competences concerning sports are later assigned to the Ministero per le Politiche Giovanili e Attività Sportive (d.l. 181/2006), while in 2013 the competences concerning tourism are assigned to the Ministero that becomes *Ministero dei Beni e delle Attività Culturali e del Turismo* (MiBACT). The creation of MiBACT highlight the interconnectedness among cultural goods, cultural activities, and tourism.

In 2016 we assist to important changes. The first was that the main state museums became autonomous institutes, then coordinated by 17 regional museum centers (*poli re-*

<sup>6</sup> <http://www.unesco.org/new/en/culture/themes/armed-conflict-and-heritage/convention-and-protocols/1954-hague-convention/>

<sup>7</sup> <http://www.unesco.org/new/en/culture/themes/armed-conflict-and-heritage/convention-and-protocols/1954-hague-convention/>

<sup>8</sup> [http://www.treccani.it/enciclopedia/beni-culturali\\_%28XXI-Secolo%29/](http://www.treccani.it/enciclopedia/beni-culturali_%28XXI-Secolo%29/)

<sup>9</sup> [https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/MenuPrincipale/Ministero/index.html\\_742399898.html](https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/MenuPrincipale/Ministero/index.html_742399898.html)

<sup>10</sup> «quelli che compongono il patrimonio storico, artistico, monumentale, demoetnoantropologico, archeologico, archivistico e librario e gli altri che costituiscono testimonianza avente valore di civiltà», [https://www.gazzettaufficiale.it/atto/serie\\_generale/caricaArticolo?art.progressivo=0&art.idArticolo=148&art.versione=1&art.codiceRedazionale=098A4235&art.dataPubblicazioneGazzetta=1998-05-21&art.idGruppo=33&art.idSottoArticolo=10&art.idSottoArticolo=1&art.flagTipoArticolo=0](https://www.gazzettaufficiale.it/atto/serie_generale/caricaArticolo?art.progressivo=0&art.idArticolo=148&art.versione=1&art.codiceRedazionale=098A4235&art.dataPubblicazioneGazzetta=1998-05-21&art.idGruppo=33&art.idSottoArticolo=10&art.idSottoArticolo=1&art.flagTipoArticolo=0)

*gionali museali*). The second was that the Soprintendenza per l'Archeologia, le Belle Arti e il Paesaggio became responsible for the protection: from 17 Soprintendenze Archeologiche to 39 Soprintendenze Unificate (plus 2 dedicated to Colosseum and Pompei). Each Soprintendenza comprises 7 functional areas: organization and operation; archaeological heritage; historical and artistic heritage; architectural heritage; demo-ethno-anthropological heritage; landscape; education and research<sup>9,11</sup>. Additionally, there are also the Soprintendenze archivistiche e bibliografiche. These changes were implemented in order to reduce bureaucratic costs, to better valorize the heritage and be closer to citizens than before<sup>12</sup>.

In 1999, all the norms regarding cultural goods were inserted in a single document - the Testo Unico (490/1999) - and then, in 2004, the *Codice dei Beni Culturali e del Paesaggio* (Cultural Heritage and Landscape Code), also known as Codice Urbani (d.lgs. 22 January 2004, n. 42) was created. The same was modified by "D. Lgs. 24 March 2006, n. 156 e D. Lgs. 24 March 2006, n. 157 and further by D. Lgs. 26 March 2008, n. 62 e D. Lgs. 26 March 2008, n. 63"<sup>13</sup>. In this Codice, in article 10 (Figure 1.2), there is a definition of "Cultural goods"<sup>14</sup>.

The definition provided by the *Codice dei Beni Culturali e del Paesaggio* is very precise and, while on the one hand it circumscribes the list of cultural goods, on the other it refers to other regional or state laws.

Indeed, the present book that we are co-authoring does not intend to provide a new definition of cultural goods (this is not our objective) or to take a position within the legislative framework, but only to highlight that this topic is really complex and its legislation is very articulate and subject to changes on both national and also international level. Of course, it has been necessary to define the "object" over which companies could operate. Therefore, in this book, when speaking about cultural goods we focus on the so called "material cultural goods", i.e. archaeological, architectural, ethno-anthropological, and historical-artistic goods, as well as archives and books (Levy Orelli, 2007). We exclude the natural goods, i.e. landscapes, urban and naturalistic goods, and the imma-

terial cultural goods, that are represented by "traditions, rituals, social practices, and knowledge that the community recognises as part of their own cultural heritage" (Casprini et al. 2014, p. 177). More precisely, we broadly distinguish 4 places where cultural goods reside (adapted from the Italian d.lgs. 42/2004; Levy Orelli, 2007; UNESCO's Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972):

- 1. Museums.** There are lots of museums comprising archaeological objects, applied arts, music objects, paintings, among the others. These are places that acquire, catalogue, maintain and exhibit cultural goods for research and educational purposes. In Italy you can have a broad overview about Museum through the following website: <http://www.museionline.info/>;
- 2. Archaeological areas and parks,** characterized by the presence of fossil remains or prehistoric or ancient artifacts and structures;
- 3. Monumental complexes,** that are architectural and pictorial works, groups of elements/plurality of buildings built also in different areas with an artistic and historical aspect (Levy Orelli, 2007; UNESCO's Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972);
- 4. Archives and libraries,** that comprise archives and individual documents of the State, public and private bodies, ecclesiastical archives, photographic archives and any other form of registration on any type of support, plus State, public and private libraries, manuscripts, autographs, correspondence, books, prints, engravings, geographic maps, but also music sheets (Levy Orelli, 2007).

## 1.3 CULTURAL GOODS: THE ACTORS AND THE FACTORS

When looking at the management of cultural goods, we need to understand which actors, and to what extents, come into contact with the "cultural goods". In other terms, who are the stakeholders of cultural goods? Albeit

<sup>11</sup> "organizzazione e funzionamento; patrimonio archeologico; patrimonio storico e artistico; patrimonio architettonico; patrimonio demoetnoantropologico; paesaggio; educazione e ricerca"

<sup>12</sup> [https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/Contenuti/MibacUnif/Comunicati/visualizza\\_asset.html\\_1858420680.html](https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/Contenuti/MibacUnif/Comunicati/visualizza_asset.html_1858420680.html)

<sup>13</sup> [https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/Contenuti/Norme-e-Pareri/Evidenza/visualizza\\_asset.html\\_1095508472.html](https://www.beniculturali.it/mibac/export/MiBAC/sito-MiBAC/Contenuti/Norme-e-Pareri/Evidenza/visualizza_asset.html_1095508472.html)

<sup>14</sup> Please notice that the art. 10 has been modified later. You can find all the changes done here: <https://www.normattiva.it/do/atto/vediAggiornamentiAllArticolo?art.dataPubblicazioneGazzetta=2004-02-24&art.codiceRedazionale=004G0066&art.flagTipoArticolo=0&art.idArticolo=10&art.idSottoArticolo=1&art.idSottoArticolo=10&art.version=1>

DECRETO LEGISLATIVO 22 gennaio 2004, n. 43 Codice dei beni culturali e del paesaggio, ai sensi dell'articolo 10 della legge 6 luglio 2002, n. 137. (GU n.45 del 24-2-2004 - Suppl. Ordinario n. 28) note Entrata in vigore del decreto: 01-05-2004.	
<p><b>Articoli</b></p> <p><b>1</b></p> <p><b>PARTE PRIMA</b> Disposizioni generali</p> <p>1 2 3 4 5 6 7 7 bis 8 9 9 bis</p> <p><b>PARTE SECONDA</b> Beni culturali <b>TITOLO I</b> Tutela Capo I Categorie di tutela</p> <p>10 11 12 13 14 15 16 17</p> <p><b>Capo II</b> Vigilanza e ispezione</p> <p>18 19</p> <p><b>Capo III</b> Protezione e conservazione Sindacato Misure di protezione</p> <p>20 21 22 23 24 25 26 27 28</p> <p><b>Sezione II</b> Misure di conservazione</p> <p>29 30 31 32 33 34 35 36 37 38 39</p>	<p><b>Articolo 10</b> <b>Beni culturali</b></p> <p>1. Sono beni culturali le cose immobili e mobili appartenenti allo Stato, alle regioni, agli altri enti pubblici territoriali, nonché ad ogni altro ente ed istituto pubblico, o a persona fisica o morale, senza distinzione di natura, che presentano interesse artistico, storico, archeologico o etnoantropologico.</p> <p>2. Sono inoltre beni culturali:</p> <p>a) le raccolte di musei, pinacoteche, gallerie e altri luoghi deputati dello Stato, delle regioni, degli altri enti pubblici territoriali, nonché di ogni altro ente ed istituto pubblico;</p> <p>b) gli archivi e i singoli documenti dello Stato, delle regioni, degli altri enti pubblici territoriali, nonché di ogni altro ente ed istituto pubblico;</p> <p>c) le raccolte librarie delle biblioteche dello Stato, delle regioni, degli altri enti pubblici territoriali, nonché di ogni altro ente ed istituto pubblico.</p> <p>3. Sono altresì beni culturali, quando sia intenzionale la loro conservazione per fini dell'articolo 10:</p> <p>a) le cose immobili e mobili che presentano interesse artistico, storico, archeologico o etnoantropologico particolarmente importante, appartenenti a soggetti diversi da quelli indicati al comma 1;</p> <p>b) gli archivi e i singoli documenti, appartenenti a privati, che rivestono interesse storico particolarmente importante;</p> <p>c) le raccolte librarie, appartenenti a privati, di eccezionale interesse culturale;</p> <p>d) le cose immobili e mobili, o chiunque appartenenti, che rivestono un interesse particolarmente importante a causa del loro riferimento con la storia politica, militare, della letteratura, dell'arte e della cultura in genere, ovvero quali testimonianze dell'identità e della storia delle istituzioni pubbliche, collettive e religiose;</p> <p>e) le collezioni di cose, o di singoli oggetti, o di singoli appartenenti, che, per l'eccezionale, raro o particolare rappresentazione ambientale, rivestono come complesso un eccezionale interesse artistico o storico.</p> <p>4. Sono compresi tra le cose indicate al comma 1 e al comma 3), lettere a) e b):</p> <p>a) le cose che intenzionalmente, la storia o l'arte o la scienza rivestono;</p> <p>b) le cose di eccezionale importanza;</p> <p>c) i manoscritti, gli autografi, i carteggi, gli incunabili, nonché i libri, le stampe e le incisioni, con relative cartelle, aventi carattere di rarità e di pregio;</p> <p>d) le carte geografiche e gli spartiti musicali aventi carattere di rarità e di pregio;</p> <p>e) le fotografie, con relative negative e stampe, in particolare di eccezionale interesse ed a soggetto storico o di pregio, aventi carattere di rarità e di pregio;</p> <p>f) le ville, i parchi e i giardini che abbiano interesse artistico o storico;</p> <p>g) le pubbliche piazze, vie, strade e altri spazi aperti aventi interesse artistico o storico;</p> <p>h) i siti storici di interesse storico ed etnoantropologico;</p> <p>i) le vasi e i galleggianti aerei, intenzionalmente, storico ed etnoantropologico);</p> <p>l) la tipologia di architettura rurale aventi interesse storico ed etnoantropologico quali testimonianze dell'economia rurale tradizionale.</p> <p>5. Salvo quanto disposto dagli articoli 44 e 378, non sono soggetti alla disciplina del presente Titolo le cose indicate al comma 1 e al comma 3), lettere a) ed e), che siano oggetto di tutela vincente e la cui esecuzione non risulti ad oltre cinquanta anni.</p>

Figure 1.2. Art. 10 Codice dei Beni Culturali e del Paesaggio

(Source: <https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2004-01-22;42>)

several contributions focusing on one or more actors might be cited (e.g. Dubini, 2017), to the extent of this book, we consider the following as the main stakeholders:

- **Public institutions**, at **national** (e.g. state, regions, provinces, municipalities, metropolitan cities), **supranational** (e.g. European Union) and **international** (e.g. UNESCO) levels. These actors intervene on two main aspects: *legislation* and *funding*. First, they are particularly important since they define what we should consider a cultural good (hence setting the boundaries of our field of study), how the processes dealing with restoration, among the others, might work. Then, they often provide funding aimed at preserving and maintaining the cultural goods, being themselves the customers or, indirectly, defining the programs throughout which companies may rise funding. To this extent, it is important to mention the several calls for interests made at European level as well as national level. For example, the Tuscany Region (Italy) has recently financed more than 100 research grants in the field of cultural heritage and many European H2020 projects were related to them, such as in the case of tourism;
- **Universities**: for training and research (in particular for spin-offs and start-ups). For example, some learning programs have been recently created by the University of Siena (Tuscany, Italy) as the creation of a Master for the Management of Cultural Heritage (MAPAC); of course, there are also several researchers dealing with different aspects of cultural goods, from the study of stones (e.g. Conz et al., 2013) to public archaeology (e.g. Zanini et al. 2019);
- **Archaeological Associations**: these are important since contribute to the protection and valorization of cultural heritage. In Italy there is, for example, the *Gruppi Archeologici d'Italia* (<https://gruppiarcheologici.org>). Among its associates, there are many of the several archaeological groups present in Italy. These associations are mainly engaged in the excavation and restoration phases;
- **Patrons**. There are actors who finance activities related to cultural goods in various ways. For example, in the case of Italy, we count more than 14000 patrons who donated about 435 million euros thanks to

ArtBonus<sup>15</sup>, a fiscal incentive introduced in 2014. But Patrons are also individual citizens and Foundations that help in various ways the recovery and restoration of monuments, artistic objects, cultural heritage in general. Often Patrons take care of cultural goods on a local level;

- **Citizens** who benefits from the utilization of cultural goods through the places of culture and who may play a role in the “co-creation” of value (e.g. think of 3D applications, tablets used in the three-dimensional reconstruction of an archaeological site during a visit, etc.) or that may become an additional source of innovation;
- **Private and Public Companies** operating, more or less directly, along the various phases of intervention; in fact, there are several companies that do not operate directly in terms of cultural goods, but whose technologies could be also applied to cultural goods (thanks to cross-fertilization mechanisms).

### 1.3.1 FOCUSING ON COMPANIES: A CLASSIFICATION OF COMPANIES THAT APPLY HIGH TECH TO CULTURAL GOODS

The focus of this book is on companies that apply high technologies to cultural goods. Therefore, it is important to understand the key characteristics of these companies. Here we do not opt for a specific legal form, e.g. sole proprietorship, partnerships or corporations, but rather to one core element that is the application of high technologies on cultural goods. But what does it mean?

Traditionally, companies have been classified according to the sector they operate in and, in particular, we can mention the statistical classification of economic activities in the European Community, the so called NACE rev. 2. For example, NACE's Section R is about Arts, Entertainment and Recreation and is made up by 4 divisions (90-93). Division 91 corresponds to “Libraries, archives, museums and other cultural activities”. However, there is not a specific code capable of selecting, a priori, companies that apply high technologies, neither in general nor specifically to cultural goods. Therefore, we could consider both companies belonging to the high-tech sectors as well as medium and low tech sectors, and look at whether they apply high technologies (and what type of

<sup>15</sup> <https://uss-sisma2016.beniculturali.it/notizie/attivita/salvaguardia/artbonus-mecenatismo-italia-2020/>

technologies) on cultural goods.

We acknowledge that this is a by-firm approach, where the aim is to identify firms on quali-quantitative criteria, such as the adoption and use of technologies and the R&D intensity, rather than a sectoral approach, i.e. based on national classification (Lazzeroni et al., 2011). Indeed, understanding what “high technologies” means is a very delicate topic that depends on the context where it is used. After having provided a review on what we intend by high technology from various perspectives, from an industry-based one, to a firm-based, to a product-based (i.e. the content of the R&D in the product) to a life-cycle based (when the industry has a high clockspeed), Steenhuis & de Bruijn (2006) introduce a new approach based on complexity (of the final product and/or production process) and newness (that is related to the development rate of the product). We argue that firms that apply high tech to cultural goods can adopt technologies at both process and product level. For example, we can have companies that adopt augmented reality, but they belong to the entertainment, as well as a company that has developed augmented reality and therefore belongs to the ICTs, for example. Additionally, we think that beyond the product development rate, there is the fact that new technologies that maybe be already explored in one specific field, could be adopted, and used in novel ways for cultural goods. This is the example of drones that have been developed in the defence sector and later applied to archaeological sites, nowadays jointly with GPS devices, barometers, magnetometers, etc. (Masali, 2014).

It is not surprising that, due to the complexity of the technologies that have been adopted and the vast variety of actors, there have been some attempts to create in Italy several Technological Districts for Cultural Goods<sup>16</sup>. Some examples are linked to Tuscany Region, where we find the Distretto Tecnologico Regionale Smart city-Turismo-Beni Culturali. Another example in the Lazio Region, is the Centro d'eccellenza - Distretto tecnologico per i beni culturali, born in 2018 for the diffusion of innovative technologies aimed at valorisation, conservation, recovery and utilization of cultural heritage (Gagliardi and Maini, 2018).

For the purpose of this book, we rely on the report published by IRPET in 2012 where a list of high technologies that can be applied to cultural goods is provided. We would like to emphasise here that the list of high technologies identified by IRPET (2012) should be enriched on the basis of the most recent developments in terms of industry 4.0 technologies.

### 1.3.2 CONTEXTUAL FACTORS

In considering how companies operate in the field of cultural goods, we need to consider the external forces that might influence their business models. In so doing, we recur to the so called PESTEL analysis, i.e. the analysis of the Political, Economic, Socio-cultural, Technological, Environmental and Legal forces. Indeed, there are several other contributions and definitions about all or some of these forces (e.g. Cirrincione, 2020; Jones & George, 2020), since these factors are widely adopted.

- **Political and legal forces.** The context where a firm competes is influenced by the changes in policies and regulations. Indeed, at the European level, an important driver has been the *Research and Innovation Strategies for Smart Specialisation - RIS3* – that are agendas aimed at supporting national and regional priorities, among others. Starting from RIS3, Member States and Regions have identified key technological domains that are important for the regional policies. For example, the Tuscany Region identified specific Road Maps of Research, Development and Innovation on cultural goods and culture. Recently, the Region has launched the new regional program in terms of culture, identifying some strategic objectives such as strengthening the linkages between cultural offer and Tuscan communities. In so doing, the Region has established the Piattaforma di specializzazione “*Tecnologie-Beni culturali e Cultura*” [Specialization platform “*Technologies-Cultural Heritage and Culture*”] “*which was intended as an integrated method of coordination of the public system of skills to support businesses, resident communities and operators on the subjects of transfer and technological innovation and technical training, higher and labor, having as reference the relevant*

<sup>16</sup>We would like to highlight that technological districts are not the same of cultural districts. There is a vast body of research dealing with concepts such as “Cultural districts” and Cultural and Creative industries, but also cultural firms that we have not analysed in this book since our focus is on companies that apply high technology to cultural goods only. However, we would like to mention some important contributions about these topics such as Sacco & Tavano Blessi (2005), Belussi & Sedita (2008), Cooke & Lazzeretti (2008), Santagata (2009), Dubini, Montanari and Cirrincione (2017), Lazzeretti et al. (2018), Innocenti & Lazzeretti (2019).

*technologies and application fields in the cultural heritage and culture sector in its broadest sense*<sup>17</sup>.

• **Economic forces.** There are several factors that influence the general wellbeing of a nation and of a region: interest rates and inflation, but also unemployment. Indeed, when considering a company that has to borrow money, having a lower or higher interest rate can make the difference in terms of investment decisions. However, we will focus our attention on unemployment. The support of the community is essential in the preservation of the cultural heritage and in some countries, where unemployment is high, there have been specific programmes to help disadvantaged people. For example, in Slovak Republic there was a pilot project called “Renewal of castles by unemployed persons” thanks to which fifty people obtained a job and were trained. From a local project, it became a national project named “Engagement of the unemployed in the conservation of cultural heritage” between 2011-2015. This example shows how an economic force (unemployment) was used as a tool to improve the quality of the life of disadvantaged people while helping the maintenance of cultural goods<sup>18</sup>.

• **Socio-cultural forces.** We consider various characteristics of society, with respect to the demographics, such as the characteristics of the population (e.g. aging), but also the changes in attitudes and behaviours. It is necessary to highlight how important it is to assure that cultural goods can be utilized by everyone, especially disadvantaged people. A nice example is provided by the municipality of Castelfiorentino, a small town in the Florence province, that has introduced an app for disabled people. More precisely, the Be.Go. Museum, a museum dedicated to the painter Benozzo Gozzoli, has begun to render its artistic heritage accessible to deaf and blind people and Alzheimer’s patients. This project, which has received a 300000 euro investment from Fondazione CR Firenze, has considered the importance of social inclusion showing that it is necessary to tend to the needs of some specific groups of citizens<sup>19</sup>.

• **Technological forces** result from the technological development introduced by the research carried

out by private and public institutions (e.g. universities, research centres) and the corporate R&D departments (Cirrincione, 2017). Among the technologies that have been introduced we can cite the nine characterizing Industry 4.0 (Fantoni et al., 2017a, 2017b; Fiorini et al., 2019):

▷ *Big data analytics.* A recent example of application of big data to cultural heritage is linked to SCRABS (Smart Context-awaRe Browsing Assistant for Cultural EnvironmentS) system, “a “portable” prototype for the management, and context driven browsing, of cultural environments” (Amato et al., 2017, p. 2). This system is capable of: collecting different kinds of data from multiple sources such as web, social data, user data; storing the data and analysing the same, for example with respect to the user satisfaction.

▷ *Augmented reality.* It enriches the sensorial human perception via information, usually electronically manipulated, that would not have been perceived via the five senses (Fantoni et al., 2017b). This technology is used especially to create value for customers as described by Tschou & Buhalis (2016).

▷ *Autonomous robots.* Robots can be used for several activities such as support people with the fruition of the cultural goods, such as in FROG (Fun Robotic Outdoor Guide), an autonomous tour guide robot used in Seville (Karreman et al., 2015), but also protection and valorization of the cultural heritage. An interesting example is linked to OceanOne, a humanoid robotic diver (Carey, 2016);

▷ *Simulation.* Simulations could be particularly useful in cases such as the analysis of the impact of microclimate within an historical building (e.g. the conservation of frescos in Scrovegni Chapel in Pauda, Italy, were the core of a research project was carried out by Baggio et al. (2013);

▷ *Horizontal and vertical system integration.* It refers to the integration of the information along the value chain from supplier to customer;

▷ *(Industrial) Internet of Things.* Ardito et al. (2019) highlight the importance of the industry of things for the process of defining smart experiences and helping cultural heritage guides to design and customize the users’ experience;

▷ *Cybersecurity* could be particularly important in the context of detecting malware and protecting

<sup>17</sup> <https://www.regione.toscana.it/-/cultura-e-ricerca-le-roadmap-della-piattaforma-tecnologie-beni-culturali-e-cultura>

<sup>18</sup> <https://www.coe.int/en/web/culture-and-heritage/-/renewal-of-cultural-heritage-with-the-help-of-unemployed-people>

<sup>19</sup> <https://2017.gonews.it/2017/06/07/museo-be-go-polo-deccellenza-accessibile-ai-disabili-progetto-300mila-euro/>

privacy of users;

▷ *Cloud*. Some application of the cloud computing in the cultural heritage (e.g. Vecchio et al. 2015) can be found in several research projects such as OR.C.HE.S.T.R.A. (ORganization of Cultural HEritage for Smart Tourism and Real-time Accessibility) aimed at valorizing the cultural heritage of Naples, in Italy, by cataloguing the cultural heritage, creating a model capable of managing touristic fluxes and developing an integrated transportation system for visitors<sup>20</sup>.

▷ *Additive manufacturing*. This technology is particularly useful in cases of disabled or disadvantaged people who could benefit from 3D printed models of cultural goods (e.g. Neumüller et al. 2014), that also help protect and valorize goods. Such is the case of the Arch of Trajan in Ancona where researchers have used laser scanner survey, virtual reconstruction of the Arch's original status and a 3D printing with Fused Deposition Modelling additive technology, in order to develop the original structure of the arch and improve its fruition Clini et al. (2017).

• **Environmental forces.** Climate change and energy concerns are influencing how businesses operate. For cultural heritage, as highlighted in 1972 by UNESCO's adoption of the "Convention concerning the Protection of the World Cultural and Natural Heritage", climate change is particularly important. Many historic and archaeological sites are constantly undermined. According to an article by Liberti for the *Internazionale Magazine* (2019)<sup>21</sup>, based on the European severe weather database (<https://eswd.eu/>), in 2019 (up to November) Italy has had about 1600 events such as heavy rains, severe wind gusts, tornados- a number much higher than the about 200 registered a decade before. In November 2019, the news about the episode regarding Venice and its lagoon spread around the world: Venice is almost under the water.

• **Legal forces.** As seen in 1.2, legal forces are very important in defining a cultural good. Additionally, the legal environment changes across borders, thus making some economic activities possible or easier

in one country rather than another. For example, "since 1993, the EU has had legislation providing for the physical return of cultural objects that have been unlawfully removed from EU countries' territory. This legislation aims to reconcile the fundamental principle of the free movement of goods with the protection of national treasures. This legislation is applicable to the European Economic Area countries."<sup>22</sup>.

## 1.4 THE PHASES OF INTERVENTION AND THE TECHNOLOGICAL FIELDS INVOLVED

In one of our previous works (Casprini et al. 2014), we identified four main phases in which companies intervene when they apply high technology to cultural goods: identification, protection, valorization and utilization. Below, we describe each of them in detail.

### 1.4.1 IDENTIFICATION

"When I was on the roof of a house, with the Iliad in my hand, and I looked at the view, I seemed to see below me the fleet, the field and the assemblies of the Greeks, Troy and the fortress of Pergamum on the hill of Hissarlik, the marches and the counter marches and the battles of the troops in the plain between the city and the field. For two hours I had the main events of the Iliad paraded before my eyes, until darkness and great hunger forced me to descend"<sup>23</sup>: with these words Heinrich Schliemann, a businessman who was passionate about archaeology, described part of the discovery of Troy. During the excavations more than 7 strata were identified.

The description of the discovery of Troy helps us understand the difficulty to identify cultural goods. Indeed, many archaeological discoveries have happened almost randomly and serendipitously. Citing a few, the Domus Aurea (in Rome, Italy) of the Roman Emperor Nero was discovered in the XV century (Archeoroma, 2020); in 1963 the underground city of Derinkuyu (Nevşehir, Turkey) was found by a man who was restoring his house (Hoare, 2018).

<sup>20</sup> <https://www.iriss.cnr.it/progetti/or-c-he-s-t-r-a-organization-of-cultural-heritage-for-smart-tourism-and-real%E2%80%90time-accessibility/>

<sup>21</sup> <https://www.internazionale.it/opinione/stefano-liberti/2019/11/14/venezia-acqua-alta-sommersa>

<sup>22</sup> [https://ec.europa.eu/growth/single-market/goods/free-movement-sectors/return-cultural-goods\\_en](https://ec.europa.eu/growth/single-market/goods/free-movement-sectors/return-cultural-goods_en)

<sup>23</sup> <https://www.iltermopolio.com/archeo-e-arte/heinrich-schliemann-e-la-scoperta-di-troia-dalle-possenti-mura>

However, thanks to the recent advancements of technology, such as drones and radars, it is often possible to identify cultural goods in advance. This was the case with the discovery of a Mayan megalopolis in Guatemala that was found in 2018 thanks to the LiDAR camera (Hardware, 2019). Drones have substituted large archaeological expeditions. Tomography is helping with the discovery of objects in mummies. Magnetometers help depict underground maps. These technologies were not created for archaeological purposes, but have been adopted and adapted to archaeology, for example. These technologies, in fact, born in the fields of defence (drones), medicine (tomography), geophysics (magnetometer), are then used for cultural goods.

#### 1.4.2 PROTECTION

The protection phase refers to “activities aimed at conserving, preserving, and classifying cultural goods” (Casprini et al., 2014, p. 177). Cultural goods are often damaged or doomed to be damaged, and this would be a loss for the community. Therefore, it is really important to preserve cultural goods – even if they are not valorised immediately. It is necessary to evaluate the state of conservation, to analyse materials and characteristics, to pursue a preventive conservation capable of avoiding degradation, but also to protect them from thieves. For that reason, it is really important to integrate multiple disciplines from biology and chemistry, to physics and information technologies (Rogerio-Candelera et al., 2013).

Indeed, several technologies can be used in the protection phase such as photogrammetry (used to record and measure heritage structures), laser scanners (used for data acquisitions), and geographic information systems (GIS) or, more broadly, spatial information science (technologies that can be used in the identification phase as well). Geo-informatics technologies, for example, have been applied to cultural heritage for “measurement, documentation, modelling and monitoring” (Xiao et al., 2018, p. 4).

#### 1.4.3 VALORIZATION

The valorization phase refers to “activities aimed at promoting cultural goods and also guaranteeing the best conditions for using cultural goods” (Casprini et al., 2014, p. 177). Companies that are operating in this

phase look at cultural goods promotion and exhibition. As an example, we can cite companies belonging to the illumination sector that have developed ad hoc technologies to valorize cultural goods under glass cases, but also companies dealing with promotion of cultural events, so mainly service companies. Other companies are capable of making copies of cultural goods. The case of Tryeco 2.0, a company in Emilia Romagna Region, well describes this facet of valorisation. Tryeco 2.0 deals with 3D models, 3D printings, laser scanners, augmented reality, among others. As we can see on their website: “Enhancement of cultural heritage is based on preservation of historical memory and identity of a territory. In this perspective, historical artistic assets are resources that must be protected preserving their conservation and encouraging understanding and enjoyment by the community. Not only visiting museums, as well can buy faithful reproductions of the artefacts present within them”.

#### 1.4.4 UTILIZATION

The *utilisation phase* comprises all those activities that allow people to benefit from cultural goods. This happens thanks to technologies that are promoting larger access (both physical and digital) to cultural goods. To clearly understand how technologies can help the utilization phase, we can mention the case of virtual reality and other digital technologies that are helpful when it comes to improving the customer experiences. A famous example is the Guggenheim Museum that went virtual in the summer 2004. Another example is the Museum of Gamers, a digital heritage project aimed at the digitalization of architectural environments (Aydin and Schnabel, 2016). The recent covid19 pandemic has motivated several museums to offer virtual tours: for example, Google Arts&Culture has collaborated with more than 2500 museums and galleries (Romano, 2020).

Indeed, Virtual Reality and Augmented Reality create value, especially for small cultural heritage sites. Dieck & Jung (2017) identify multiple types of value deriving from augmented reality, distinguishing among the several stakeholders who interact with the cultural heritage in a tourism context. More precisely, these authors identify an *economic* value, related to increased sales or new target markets; *experiential* value, such as the one deriving from enriching memories; *social* value, such as sharing experiences and interacting with multiple people; *episte-*

*mic* value, deriving from the curiosity to try new technologies; and *historical and cultural* value, triggering interest in history (Dieck & Jung, 2017).

As the reader can foresee, several technological domains are involved in one or more of these phases. We have cited fields spanning from medicine to defence, from physics to microbiology. Even if we could broadly identify 6 technological fields, namely engineering, ICTs, chemistry, physics, geology and biology (Casprini et al. 2014), the world is becoming more complex. As an example, we can cite the case of nanotechnology that is a multi-disciplinary since linked to molecular biology, chemistry, physics. Among the several cross-fertilized products that have been applied to cultural goods, we could describe the one linked to plasma technology that can be applied to the biomedical field and manufacturing in general and, more recently, also for the restoration of cultural goods. For example, Nadir Plasma & Polymers company has developed an innovative atmospheric plasma technologies for cold, efficient and clean plasma surface treatments. This company has launched the Stylus Plasma Noble, an innovative soft plasma jet. Atmospheric plasma technology offers an *“alternative way to clean relative to mechanical methods or solvents and laser”*.<sup>24</sup>

## 1.5 FRAMEWORK

The analysis carried out in the previous paragraphs shows us the complexity of the field. In Figure 1.3 we provide a framework that links the three main building blocks that we have described:

- **The cultural goods** (right), namely museums, archaeological areas and parks, monumental complexes and archives and libraries;
- **The stakeholders** (left), as identified in public institutions, universities, archaeological associations, patrons, citizens and companies;
- **The intervention phases** (in between), as described in the identification, protection, valorizzazione and utilization.

This book focuses on the companies (stakeholders) and provides two in depth case studies concerning the identification and protection&valorization phase. Companies may operate in the field of cultural goods in one or more

of the intervention phases. They can do it independently or collaborating with other companies or one/more of the several stakeholders mentioned.

### 1.5.1 THE BUSINESS MODEL

Since the focus of this contribution focuses on companies, we think that a key concept to introduce is the one regarding the business model. Looking for a shared definition of a business model that, is broadly defined as *“the way a company creates and captures value”* (Zott et al. 2011), recent contributions have dedicated much more attention to business model innovation, both seen as business model dynamics of a firm’s business model over time or new business models at industry level (Casprini et al., 2014, Foss & Saebi 2017, Pucci, 2016, Pucci et al. 2013).

For the purpose of this book, we see the business model as a result of the interaction of three main components, namely: business strategy, business capabilities and business organization, thus identifying three main ideal types (Casprini et al., 2014; Casprini et al., 2016, Pucci, 2016; Pucci et al. 2017):

- (1) *The New Product Development-oriented* business model (NPDo BM) that emphasises the business strategy and the business capabilities components, thus highlighting the orientation of the company towards technological exploration and exploitation;
- (2) *The Market Management-oriented* business model, that highlights the business strategy and the business organization components, thus resulting into an exploitation of existing markets or the entrance into new ones;
- (3) *The Organizational Process-oriented* business model, model, that results from the focus on business capabilities and business organization components, thus enhancing the efficiency of the firms thanks to better processes and lower transaction costs.

Furthermore, we move a step beyond also considering that each of the three business model components could have been affected by two main factors, namely the *new*

<sup>24</sup> <http://www.nadir-tech.it/en/technologies/plasma-3/applications/cultural-heritage-2/>

*technological advancements* and the increasing role of the network of external partners that have allowed previously unforeseeable configurations of a business strategy, resources and organizational components. More precisely, the *new technological advancements*, especially when focusing on the Industry 4.0 technologies, have allowed companies to introduce completely new value offerings, a concept that embraces both product and service. Indeed, companies are increasingly oriented towards the provision of services even when they are pure manufacturers. For example, value offerings could be distinguished over a 3\*3 matrix with three different levels of service focus (i.e. product-oriented, use-oriented and result-oriented) and three different levels of com-

plexity of the adopted services (i.e. basic, intermediate and advanced) (Casprini, 2019).

Furthermore, the *network of external partners* plays a crucial role in the innovation process that, over the last couple of decades, has become increasingly open (Chesbrough, 2003). In order to analyse the partners' role within the innovation process, two main dimensions should be considered (Casprini, 2019): the type of partners, i.e. whether market-based (e.g. suppliers, customers), science-based (e.g. universities and research organizations), or civic (e.g. municipalities), and the intensity of collaboration.

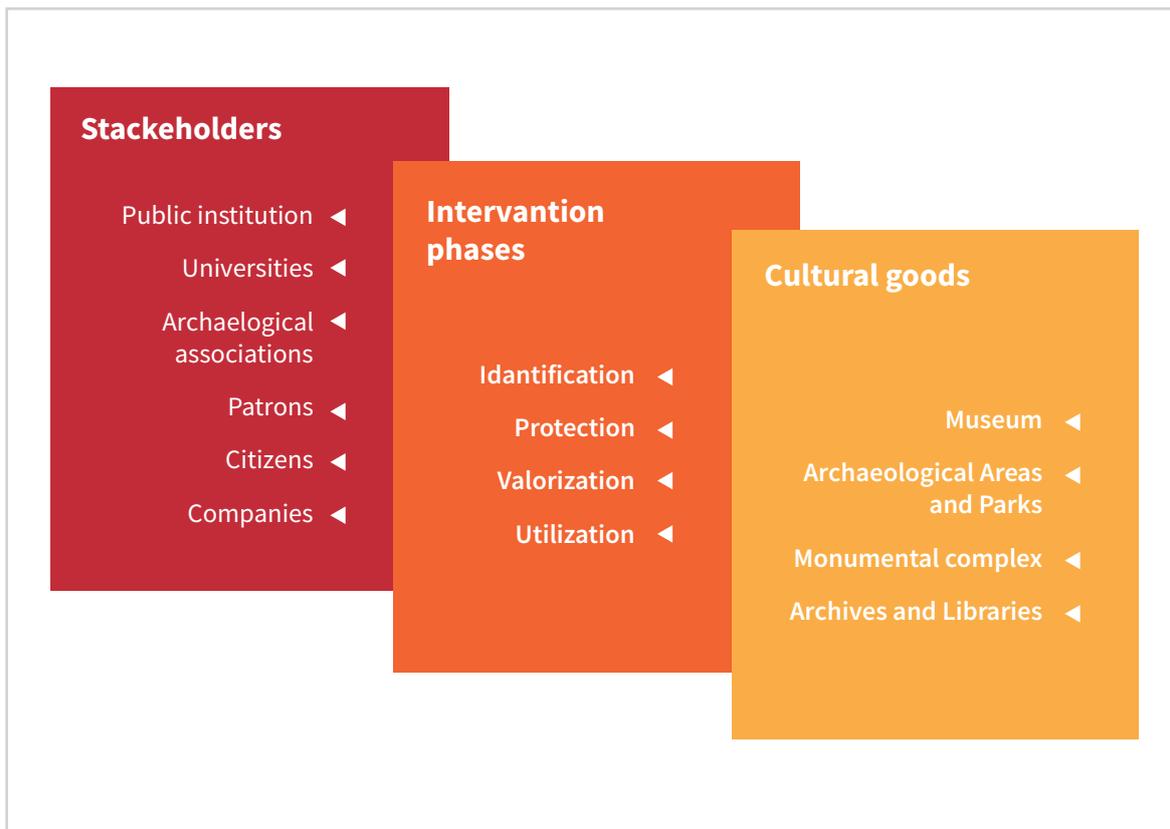


Figure 1.3. Framework





## 2. THE ITALIAN COMPANIES THAT APPLY HIGH TECHNOLOGIES TO CULTURAL GOODS

This second chapter is dedicated to the analysis of a survey we conducted in 2018 using a sample of 120 companies in Italy. In analysing our results, we distinguished

companies on the basis of the specific intervention phase they belong to.

### 2.1 METHODOLOGY

In order to identify the population of interest, since there is not an ATECO code capable of identifying a priori firms that apply high technology to cultural goods, we resorted to a list of ATECO codes that have been used in previous studies (Casprini et al., 2014; IRPET, 2012). Starting from these codes, AIDA database returned more than 100 000 companies. All the websites were manually checked in order to identify an initial sample of companies that have worked with cultural goods. In particular, the companies were selected based on whether their website contains a reference to cultural goods, art, monuments in general. For a specific category of

companies, those belonging to the building sector, companies were selected based on whether they possess or not the so-called SOA certification. Selecting only active companies (not under liquidation or insolvent), a final universe comprising 1067 companies was identified. We searched for their emails and, over them, 798 email addresses were collected. The authors sent them an email containing the link to a survey and 120 questionnaires were collected in 2018.

Before proceeding with the results of the questionnaire, we would like to briefly describe the final universe of 1067 companies. Firstly, this is a first map of the companies that could apply high technologies to cultural goods. These companies belong to AIDA Bureau van Djick,

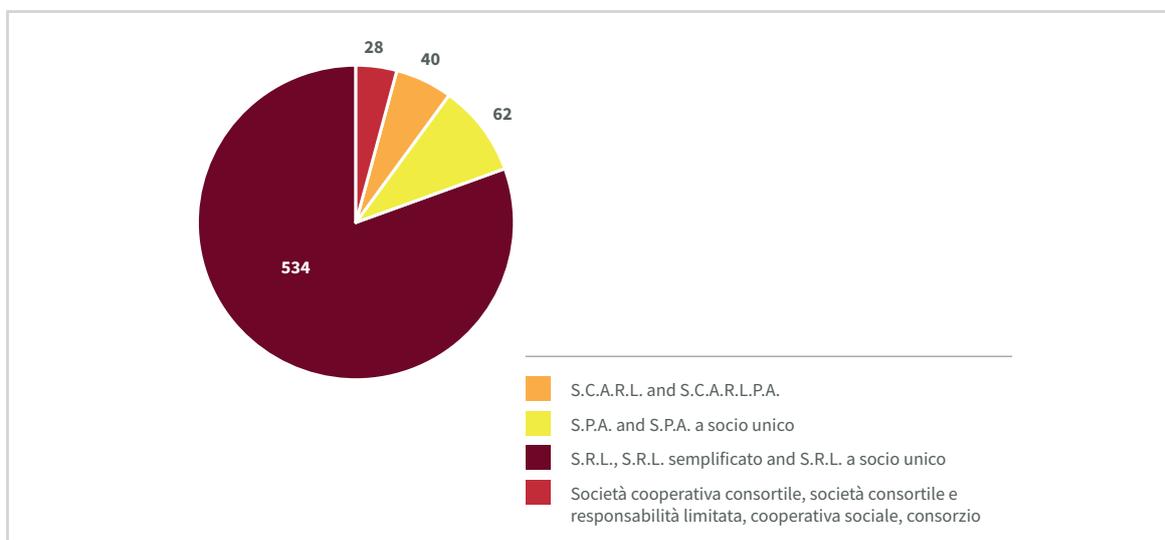


Figure 2.1. Sample distribution in terms of legal form

i.e. companies that have a particular legal form, more precisely they are “società di capitali” (e.g. s.r.l., s.p.a.). Consequently, all the other companies (e.g. “società di persone”), that might be quite numerous in several sectors such as the restoration one, were not included.

Conducting a deeper investigation of the 1067 companies, in order to provide the most updated information, we identified only 664 companies which have financial data available in 2018. As Figure 2.1 shows, most of the companies analysed are s.r.l..

Figure 2.2 presents the sample composition. Almost half of the companies belong to the construction sector. This is not surprising since, when we selected the companies, those belonging to the construction sector were the most numerous and, thanks to the SOA certification, it was easier to identify those operating also in the restoration of monuments for example. A second group of companies includes those operating in the software sector. They produce software linked to cultural goods, from improving utilization (as in the case of cultural goods gamification) to helping digitalization of cultural goods. About the conservation and restoration, there are 51 companies. Even if this number could seem very low, the activities related to conservation and restoration are often pursued by individuals and are therefore incompatible with the initial sample. There is also a certain number of companies belonging to the lightening, architecture and engineering and in the consultancy field. Finally, the broader

category “Others” comprises companies spanning from the shaping and processing of flat glass to disinfestation services. For example, one of the companies deals with the protection of cultural goods providing services such as woodworm treatments and fumigation.

About the financial data of the companies belonging to this sample, Table 2.1 presents some general information. From an analysis of the sample, it emerged that most of the companies are micro (below 2 million euro as balance sheet) or small (below 10 million euro balance sheet) businesses, while few companies are medium businesses (below 43 million total balance sheet) and very few companies are large (above 43 million euro total balance sheet) companies.

## 2.2 RESULTS

This section comprises the results of the survey. We first describe the technological fields in which the companies operate, then we looked at the intervention phases and then at their resources, knowledge sources and contextual factors.

### 2.2.1 TECHNOLOGICAL FIELDS

One of the sections of the questionnaire was linked to the technological field in which the company is opera-

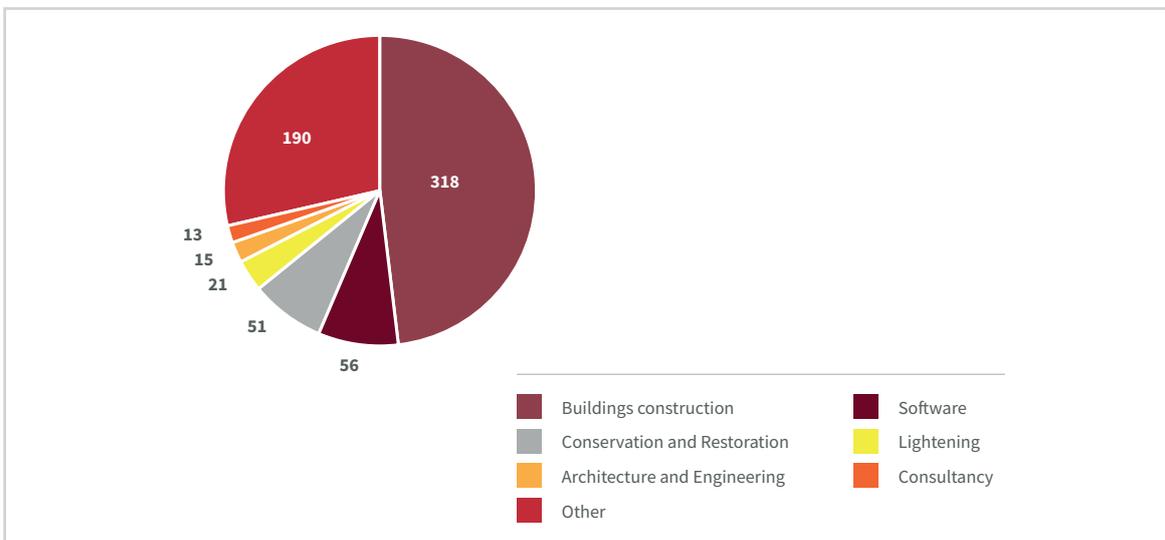


Figure 2.2. Sample distribution in terms of sector

	Architecture and Engineering	Buildings construction	Conservation and Restoration	Consultancy	Lightening	Software	Other	Total
large		21			3	1	11	36
medium		60		3	3	9	12	87
small	2	133	10		10	15	54	224
micro	13	104	41	10	5	31	113	317
total	15	318	51	13	21	56	196	664

Table 2.1. Sample distribution in terms of dimension

ting. As shown in Figure 2.3, about 50% of the companies work in restoration and in the ICT sector. Other technological fields such as biology and physics are the least represented. Indeed, this could be due to the initial sample considered. However, we could cite the case of the firm operating in the biology field as an example of how multiple domains could be applied to cultural goods. In particular, when dealing with materials such as paper and wood, the team's interdisciplinarity is important for complex works.

It is interesting to note the surveyed companies have a turnover that depends on cultural goods only for 49,3% on average (Figure 2.4), thus suggesting that these companies are operating both on cultural goods and on other fields.

The reasons underlying this outcome may be linked to

the companies' roots and to the changing markets where they operate. Going in detail, 28 companies among those investigated did not operated in the same technological fields when they began developing technologies for cultural goods. For example, three companies that apply today ICTs to cultural goods or another company that applies chemistry to cultural goods did not initially. Theorefore, there are some companies that started working in a specific field and only later started operating on cultural goods thanks to cross-fertilization mechanisms. However, as shown by companies in archaeology and restoration that might have been born focusing on cultural goods, there has been a need to find alternative revenues streams. For example, 92% of an archaeology firms' turnover on average comes from cultural goods, but there is an 8% deriving from other activities. Going into detail, we can see that two companies derive only 70% of their turnover from cultural goods, while the rest

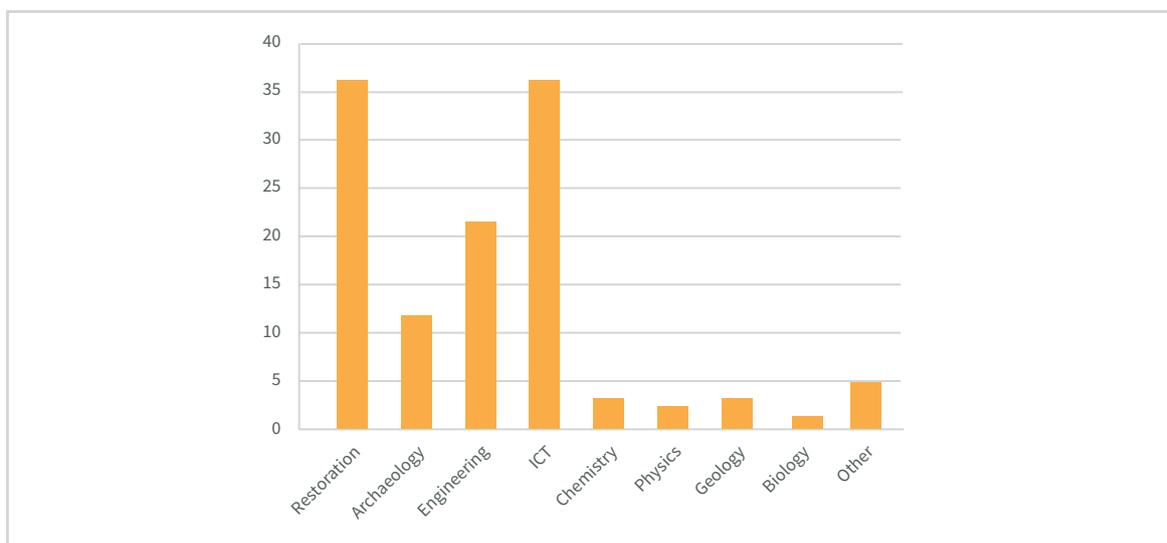


Figure 2.3. Technological fields

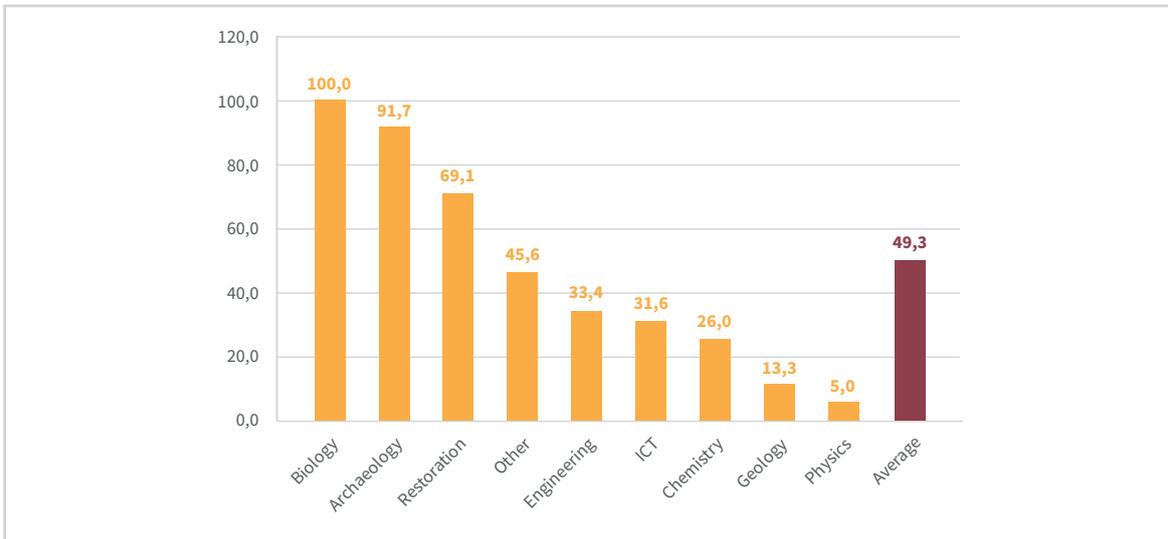


Figure 2.4. Turnover deriving from cultural goods

comes from services and multimedia solutions.

The reasons underlying this outcome may be linked to the companies' roots and to the changing markets where they operate. Going in detail, 28 companies among those investigated did not operate in the same technological fields when they began developing technologies for cultural goods. For example, three companies that apply today ICTs to cultural goods or another company that applies chemistry to cultural goods did not initially. Therefore, there are some companies that started working in a specific field and only later started operating on cultural goods thanks to cross-fertilization mechanisms. However, as shown by companies in archaeology and restoration that might have been born focusing on cultural goods, there has been a need to find alternative revenues streams. For example, 92% of an archaeology firms' turnover on average comes from cultural goods, but there is an 8% deriving from other activities. Going into detail, we can see that two companies derive only 70% of their turnover from cultural goods, while the rest comes from services and multimedia solutions.

### 2.2.2 THE INTERVENTION PHASES

About the phases of intervention, as we can see from Figure 2.5, 48% operates in the protection phase. This is the case of firms operating in the conservation, preservation, but also classification of cultural goods. In terms of technological fields, these are companies operating in engineering and ICT, beyond restoration. However, there

is also a company operating in physics and one in biology, plus the three surveyed companies in chemistry. 22% of the sample works in the valorisation phase, 18% in the utilization and 13% in the identification.

### 2.2.3 GENERAL CHARACTERISTICS OF THE FIRMS

**R&D.** The companies surveyed are quite small. Getting rid of an outlier operating in the ICT with 105 employees, they have about 10 employees (data on 31/12/2016) and, on average 9% of them are dedicated to R&D. The % of R&D employees could be used as a proxy for the absorptive capacity of the firm and it is one of the proxies that we also adopt when talking about a qualitative and quantitative approach to the identification of companies that apply high technology to cultural goods. Only 3 companies have 100% of employees dedicated to R&D, but going into details these companies have 1 or 2 persons only so it is highly probable that they do everything. These are a companies operating in the valorization phase since 1996, another in the protection phase and one in the identification phase.

**Export.** These companies are quite local. Their exporting activities are very low, with an average turnover deriving from exports of 7%. Focusing only on those whose turnover depends on foreign sales for more than 50%, these are companies that mainly work in the protection sector. As an example, we could cite the case of a company that develops solutions for the analysis and management of 3D data.

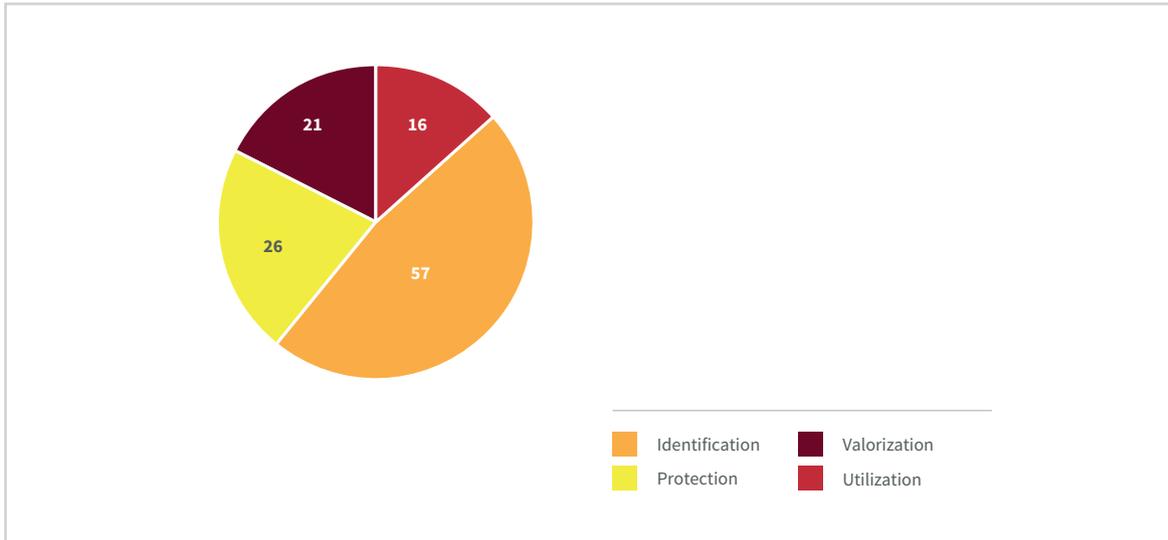


Figure 2.5. Intervention phases



Figure 2.6. Satisfaction about performance

About the level of satisfaction of these companies about their performance, we can say that they are slightly above the average with respect to both, their competitors and the sector (Figure 2.4). In particular, we can notice that companies operating in the identification and protection phase are more satisfied with respect to the average of the sector rather than that of competitors, while the contrary happens if we look at those companies operating in the valorization and utilization.

**Resources.** We also acquired information regarding the resources possessed. In particular, we distinguished

between financial resources, human resources, physical assets, network-related factors. In the following, we briefly describe the average score obtained on a 5 point Likert scale, where 1 is equal to “scarce resource or absent” and 5 is equal to “maximum”. It emerges that the surveyed companies poorly score on financial resources, while they are quite goods in terms of both employees and network-related factors.

More precisely, they have very scarce access to financial capital, a high cost of **financial capital**, with little profit to reinvest, and a scarce “patient” capital, i.e. a capital

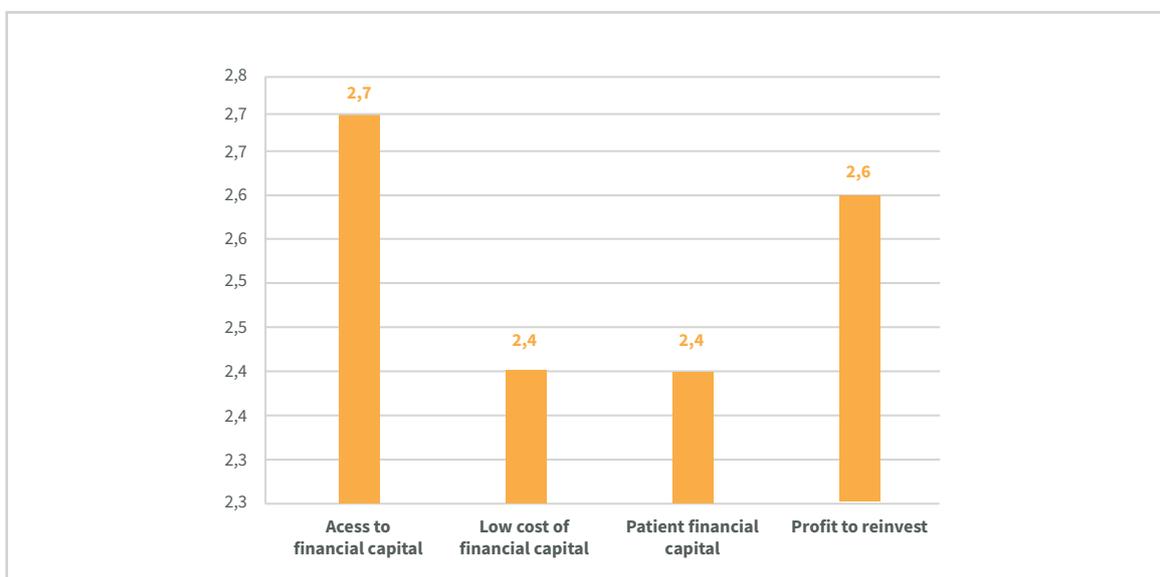


Figure 2.7. Financial capital

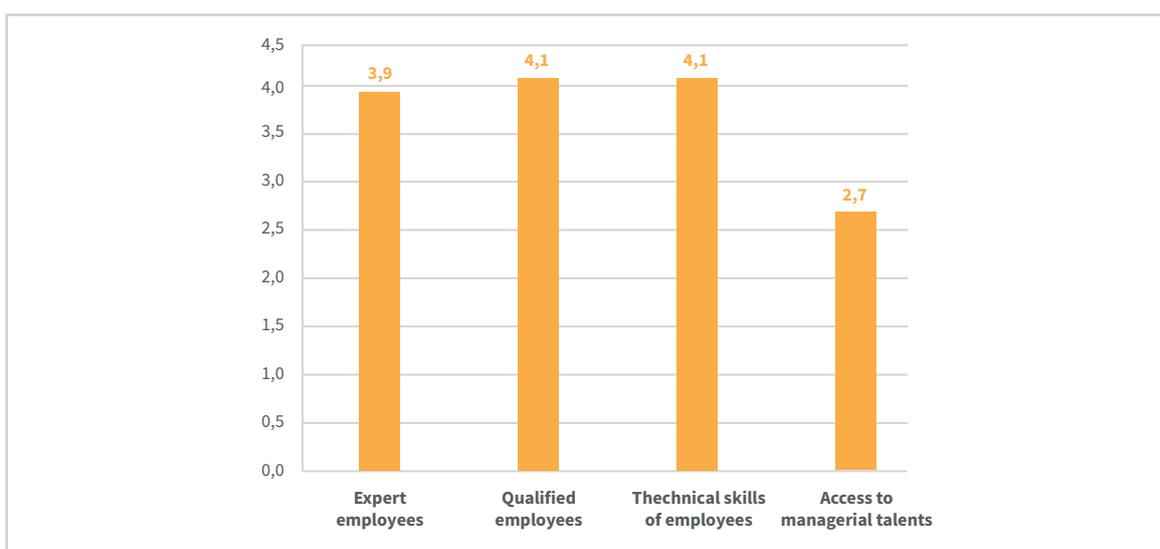


Figure 2.8. Human resources

with low threat of liquidation (Figure 2.7).

The situation is better when looking at the **human resources**. In particular, as we can see from Figure 2.8, they can count on very qualified and expert employees, with very good technical skills. However, the companies have a scarce access to managerial talent. This is one of the key problem of many SMEs companies. As we will see in the case of ATS (Chapter 3), even if the technical skills are very important, they are not sufficient to grow and having managerial skills is crucial both when the company

is founded, but also over the company's lifecycle. Learning managerial skills is not easy since they are a blend of hard and soft skills. The difficulty accessing managerial talents could be also a reason why the companies from our survey are scarcely internationalized.

What about the **physical assets**? From the data analysed, it seems that companies do not have unique machineries and have sufficient, but not extraordinary buildings, technologies, and locations (Figure 2.9). The fact that these companies do not heavily rely on unique technolo-

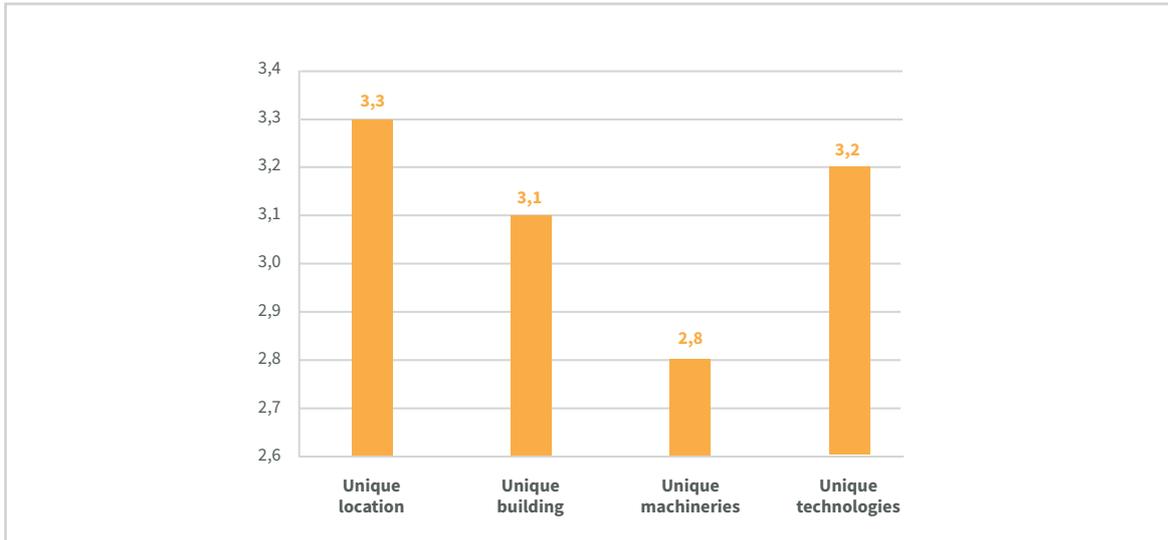


Figure 2.9. Physical assets

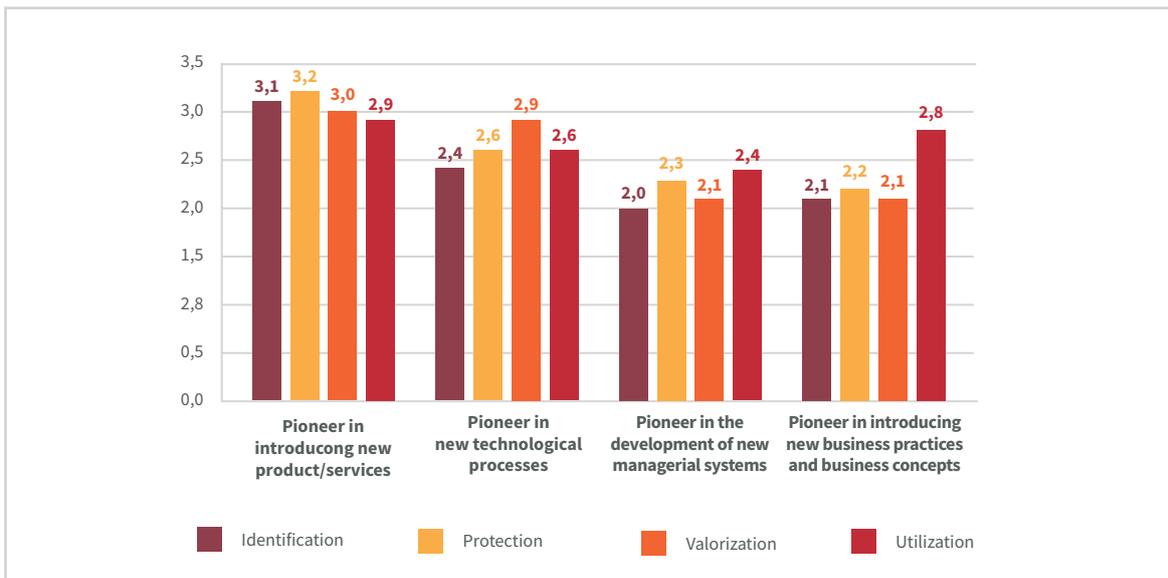


Figure 2.10. Pioneering with respect to technologies introduced in their sectors

gies suggests us a couple of things. First, on average these companies tend to mainly rely on their employees (as also described above) who probably possess high tacit knowledge deriving from field experience. As we will see in the Piacenti case (Chapter 4), especially when considering restoration, there is a lot of tacit knowledge that is crucial to the success of the core activities. Second, the scarcity of machineries or unique technologies could highly depend on the fact that these companies have low access to financial capital. Considering that the questionnaire was submitted in 2018, we expect that these

values would be higher in the light of the more recent investments done at regional level supporting industry 4.0 technologies.

Focusing on technologies, from Figure 2.10 we can see that the companies are mostly pioneers in their sectors regarding the introduction of new products/services, rather than processes, managerial systems and business practices. However, the average scores are not so extraordinary. What are the reasons? The data we possess does not provide an answer, but we could imagine that

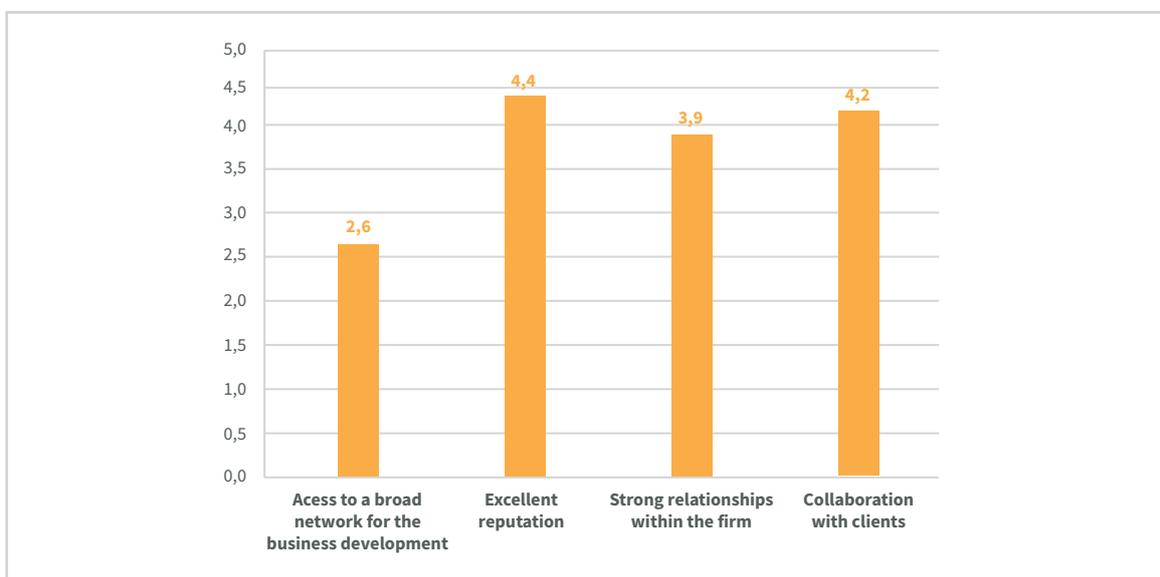


Figure 2.11. Network-related resources

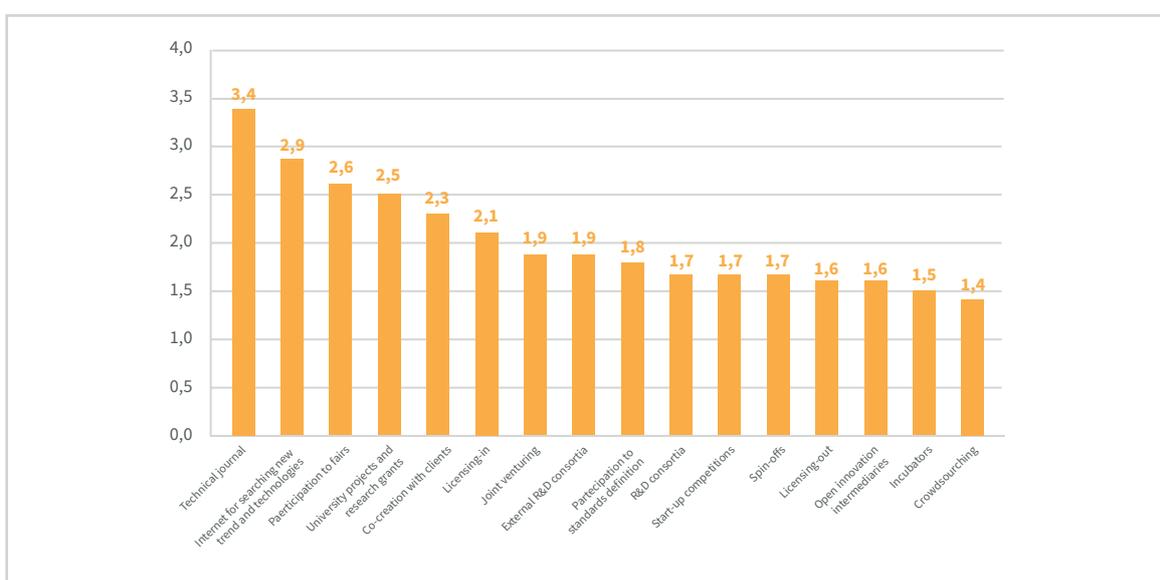


Figure 2.12. Knowledge sources

bigger players are those who are introducing very innovative product, process and organizational innovations in their sectors, while our companies only adopt them or apply them to cultural goods. Indeed, since most of the attention is focused on product/service innovation, companies should also consider to the extent to which they

Last but not least, the importance of **network related factors**. As emerging from Figure 2.11, while on the one hand there is a low access to a broad network necessary

for the development of the business, on the other hand, these companies also have an excellent reputation, collaborate with clients and can count on strong relationships within their boundaries.

The data suggest that these companies have a strong relational capital that they can use as leverage. Indeed, as the ATS and the Piacenti case will tell us, relationships within the firm are crucial especially considering the importance of the team work. Many projects need mul-

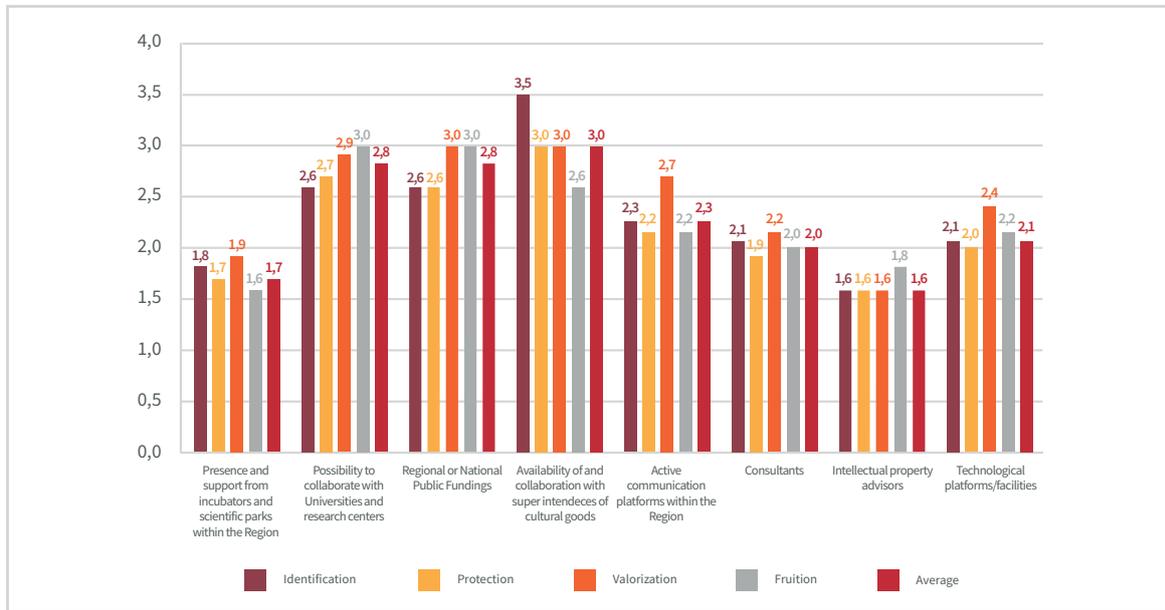


Figure 2.13. Contextual factors

tiple members from the same company and additional partners: therefore, possessing good relationships within the firm (thus facilitating also the transfer of tacit knowledge) as well as good collaboration with clients is crucial. However, the low access to a broad network for the business development signals danger for the interviewed companies since it highlights the lack of partners capable of boosting firms' businesses.

## 2.2.4 KNOWLEDGE SOURCES

Companies are increasingly recurring to multiple sources for their innovations, from partners to the crowd. The open innovation paradigm represents, indeed, a very important aspect to consider. Capone (2016) provided a very detailed overview of the Tuscan situation, showing that relationships are really important for the innovative process, even if, what matters, is the heterogeneity of relationships.

Our questionnaire also comprises a section on sources. Figure 2.12 represents a synthesis of what has emerged. As we can see, the interviewed companies still mainly rely on 'traditional' channels of information such as technical journals, the Internet for new trends and technologies and participation to fairs. On the other side, universities and clients seem to represent a fairly important source of knowledge. Other types of collaboration, such

as joint venturing, licensing in and licensing out activities, relying on external R&D services and participation to R&D consortia are not so used. We finally recognize that the companies do not rely neither on open innovation intermediaries, nor on incubators, start-ups competitions and spin-offs.

Overall, it seems that these companies are still quite "closed", tend to pursue internal R&D and prefer to collaborate either with research partners or clients rather than with other businesses or intermediaries.

## 2.2.5 CONTEXTUAL FACTORS

We conclude this chapter with a focus on the contextual factors that the interviewed firms think contribute or impede their development and growth. Figure 2.13 presents the details. On average, we could see that companies do not rely too much neither on incubators nor on consultants or intellectual property advisors. On the other hand, they think that strengthening collaboration with superintendences of cultural goods would be particularly important for their development. Similarly, the possibility to collaborate with universities and research centres, as well as the availability of public funding, an active communication platform within the Region and the presence of technological facilities would be important elements that would help them grow.



## 3. THE POWER OF SPIN-OFF: THE ATS CASE

This chapter describes the case of ATS, (Archaeolandscapes Tech&Survey), an Italian spin-off that operates in the identification phase. This is an interesting case due to the opportunity that a group of academic researchers had about a decade ago. When considering drones and 3D we tend to think about either defence or entertainment industries. However, in the late 2000s, a group of archaeologists and historians proposed their application in the field of cultural goods. Academic spin-offs are a

phenomenon that has attracted a lot of attention in the last four decades, in Italy too (Chiesa & Piccaluga, 2000), and especially in the last ten years (Miranda et al., 2018). Even if scholars have investigated those factors, at all levels: micro-, meso- and macro- (Hossinger et al., 2020) that facilitate their birth, we know little about the drivers of their growth over time (Rasmussen et al., 2011). The present chapter intends to identify those elements that may help academic spin-offs along their lifecycle.

### 3.1 ACADEMIC SPIN-OFF

Literature on academic spin-off (ASOs) has reached a certain degree of maturity. Indeed, about 40 years ago, the Bayh-Dole Act introduced a new role for universities in commercializing their research, thus opening several opportunities for knowledge exploitation (Grimaldi et al., 2011). Universities have a third mission, beyond that of doing research and teaching, aimed at capitalising knowledge (Etzkowitz, 1998). This new mission has been widely supported by different actors such as technology transfer offices, ad hoc entrepreneurial programs, and the entrepreneurial spirit of many academics who, beyond their more traditional responsibilities of teaching and conducting research, have been encouraged to knowledge dissemination and diffusion, also through the creation of academic spin-offs.

As summarized by the recent literature review by Hossinger et al. (2020) academics who becomes entrepreneurs are driven by intrinsic and extrinsic factors at individual level, organizational factors (e.g. industry ties and entrepreneurship support programs) (D'Este & Perkmann, 2011) and have to overcome several barriers such as, in particular, market-related obstacles (i.e. marketing knowledge and sales skills and customer base) at the individual level or bureaucracy at the institutional level.

Whether, on the one hand, understanding what drives academic entrepreneurship has received lot of atten-

tion, which factors influence the ASOs' growth and success have been less explored. ASOs' success is related to the composition of the founding team, the relation with parent organizations and the support from venture capitals, among the others (Chiesa & Piccaluga, 2000; Hossinger et al., 2020). Indeed, academic spin-off are quite heterogeneous in terms of who create them and what is the type of knowledge transferred (Pirnay et al., 2003) and, even if some recent empirical evidence has shown that the presence of academics into spinoff ownership does not influence sales growth, it is extremely important that spinoffs have a heterogeneous (both academic and non-academic) board composition (Ferretti et al., 2020). Among the factors explaining the success of an ASOs, there are the entrepreneurial competencies such as opportunity refinement competency (i.e. develop an opportunity and develop a business concept), leveraging competency (i.e. linked to the development and acquisition of resources), and the championing competency (i.e. personal commitment) (Rasmussen et al., 2011). However, how academic spin-offs evolve over time and which are those factors that contribute or impede their sustainable development is still a matter of investigation, since most of work has been done with respect to their antecedents and outcomes (Miranda et al., 2018)

### 3.2 THE ATS CASE

The idea was born in 2009 from the *Dipartimento di Archeologia e Storia delle Arti* and *Dipartimento di Storia of the University of Siena*. At that time there were two laboratories, the *Laboratorio di Archeologia dei Paesaggi e Telerilevamento* (LAP&T) in the *Dipartimento di Archeologia e Storia delle Arti* and the *Laboratorio di Geografia* in the *Dipartimento di Storia*. The two labs had important expertise in terms of archaeological impact evaluations, archaeological cartography, use of laser scanners and photogrammetry as well as historical cartography reconstruction and spatial analyses. Additionally, they had lots of international and national relationships.

The opportunity of creating a spin-off emerged in a particular “historical” context. On the one side, there was an increasing request for preventive archaeology from the market due to the introduction of new legal requirements. On the other side, there was an increasing awareness by researchers about having a sustainable career in academia. These contingencies pushed 11 persons among researchers and younger fellows to search for new placement opportunities: the ATS spin-off was created on the 9<sup>th</sup> January 2009. The main proponent was Stefano Campana, at that time researcher at the *Dipartimento di Archeologia e Storia delle Arti*. Stefano has had the opportunity to work with drones since 2006 and on other prospective technologies since 1999. They were part of Stefano’s PhD.

At the beginning, each of the 11 shareholders presented in depth technical knowledge. Furthermore, they had a clear strategy in mind: partnering. Indeed, from the business plan, it emerges that since its foundation, ATS clearly identified the importance in partnering at both scientific and commercial levels. And in the last 10 years the spin-off has created lot of synergies thanks to third parties. Some of them, have become over years strategic partnerships.

Over the years, the spin-off has had an up and down in terms of both revenues and total assets (Figure 1). This has been probably due to a couple of big projects that ATS did in 2009 and 2014. In 2009, soon after its foundation, ATS was involved in the Bre.Be.Mi. (Brescia-Bergamo-Milano) project, while in 2014 it was involved in the Pompei project. These two years represent important moments for the spin-off: the 2009 for the fact that the spin-off was founded and soon it had to face an important commission; the 2014 because it was the first moment where Stefano Campana had not the opportunity to participate to the Pompei project (since he was in UK) and therefore the ‘youngsters’ have had to do everything by themselves.

As Stefano Campana affirms:

*“This was an important moment: I was abroad, and they had to grow by themselves ... Obviously, even before they did things by themselves, but they were still dependent on me. The 2014 represented an emancipation moment for them?”*

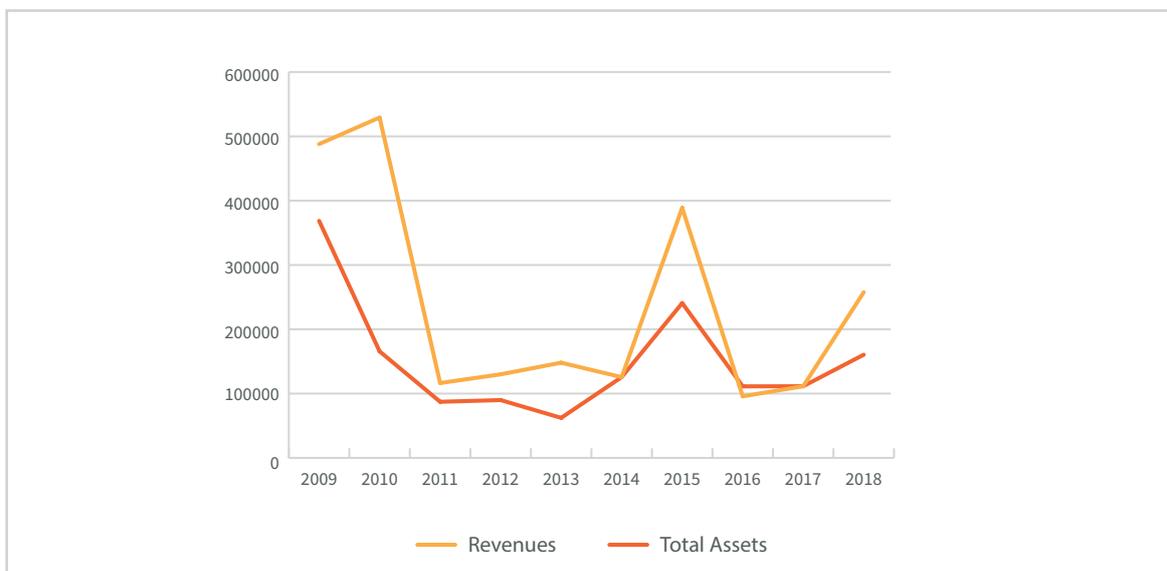


Figure 3.1. ATS' Revenues and Total Assets (2009-2018). Own elaboration from AIDA Bureau van Djick database

A third important moment is represented by 2019, when the spin-off has been reorganized in terms of ownership and governance. Today, only 3 out of the 11 shareholders own and lead the company: Matteo, Francesco, and Cristina. All of them are independent from the “older” researchers, but they have been able to maintain relationships, especially thanks to the several national and international projects that ATS and others (university and companies) submit jointly.

ATS business model can be classified as a new product development-oriented, even if it has also shifted over time, especially towards an organizational processes-oriented business model. Soon after the Bre.Be.Mi project that was characterized by the use of very new technologies that brought higher efficiency and, simultaneously, cheaper services for the clients, ATS has been characterized for several years by a focus on efficiency. However, as Matteo Sordini said, ATS is about 50-50 between traditional (i.e. archaeological excavation, archaeological surveillance – activities that do not require lot of innovative equipment) and innovative (i.e. preventive archaeology, 3D reconstruction) services, but with a grow of innovative ones.

### 3.2.1 BUSINESS STRATEGY

ATS is operating in the service sector and provides services of archaeology diagnostics (remote sensing and geophysics), topographic survey, 3D survey and reconstruction (laser scanner and photogrammetry), archaeological and historical cartography (GIS), landscape analysis, spatial analysis. Then there were two main business areas: preventive archaeology and 3D modelling.

Its **clients** are from public administrations to private companies, especially dealing with infrastructure and commercial building realizations. At the beginning the market was still blurred. The importance of predictive archaeology resides in saving time and costs (deriving from the stop of the works) when companies finds archaeological evidence. Thanks to the integration among diagnostics, data acquisition and artificial intelligence, it has been possible to provide solutions.

ATS operates mainly at national level. Its strategies are influenced by two main factors. The first factor is linked to the **institutional context**. Technological innovation in traditional fields such as archaeology, but also more he-

terogeneous – and sometimes inert - stakeholders such as administration, are not always perceived as good. Thereof, it may happen that, following a change in the head of an administrative department, there could be a cognitive barrier at individual-level that may impact the processes. This is even worse considering that, when dealing with public administrations, there are changes following reorganization.

A second factor is the opportunity to provide services thanks to the **new technologies**. ATS has started thanks to the previous application of multiple technologies to cultural goods. The use of these new technologies has been a key driver of competition. ATS provides expertise in acquiring information and making preventive archaeology. It does not create or sell products, but rather co-develop products that are then used to provide services.

### 3.2.2 BUSINESS CAPABILITIES

In terms of business capabilities, ATS has been characterized by both innovation and relational capabilities. It is very difficult to separate the two, since they have been mutually reinforcing over time. In fact, since its foundation, ATS has favoured scientific collaborations with third parties. This is in the spinoff DNA. A first example is linked to the use of drones or, as written in the business plan, unmanned aerial vehicle. These tools are useful to acquire images at low quotes.

As prof. Stefano Campana says:

*“my laboratory has always carried on activities with a strong link with the real world: there were concrete activities, strictly connected with the technological innovation.”*

During its first project, ATS has worked with a French company that possessed a patent that has been exploited in the project. This exploitation has been possible thanks to ATS’s foresight. Indeed, even if competitors have grown over the years, ATS has been able to leverage on partners’ patents. The unique capability of being able to identify the right partners to work with has been developed over the years. Partners are selected in terms of competences, technologies, and also cultural values. However, the first hook is always whether potential partners have developed very innovative technologies.

Relational capabilities are also reinforced by other stakeholders. For example, in the case of Pompei project,

ATS partnered with other two spinoffs thanks to a professor of Politecnico di Milano who has put them in contact. Furthermore, ATS is part of the Technological Pole of Navacchio that is helping the spinoff in its promotion.

### 3.2.3 BUSINESS ORGANIZATION

When ATS was founded, founders have had a wide array of expertise from archaeology to historical geography to geomatics. All of them were characterized by a humanistic culture and were used to collaborate among them within national and international projects. At the beginning, Stefano was dealing with all managerial issues, while the rest was mainly focused on carrying on operations. Over the years, many of the founders have left the spinoff. Today, ATS is owned and managed by the three youngest team members of the founding team: Matteo, Francesco and Cristina. Indeed, ATS has several collaborators in pursuing its activities.

One element that characterizes the new team is that all of them moved from being research-oriented to be market-oriented. As one of the interviewees said, whether doing research is - to a certain extent - autoreferential, being on the market forces you to satisfy someone else (i.e. the client) who also allows you to make profit. This awareness has arisen during 2014, when Stefano Campana was doing research abroad, thus leaving the youngest alone:

*“at the beginning, this situation was scaring us. Then, it was good since we learned to manage the company: live or die.”*

### 3.2.4 THE NEW PRODUCT DEVELOPMENT-ORIENTED BUSINESS MODEL IDEAL TYPE

ATS has a business model that can be classified as New Product Development-oriented Business model ideal type. This business model results from the company's capacity to explore and exploit external knowledge as well as to introduce new products and services (Casprini et al., 2014).

Being a spinoff embraces a certain degree of novelty per se. What surprised us, however, has been how this spinoff has evolved over time and why.

From the case analysis, we think that two are the main drivers of the NPD-oriented BM: a sustained universi-

ty-industry relationship and the continuous - not discontinuous- investments in technologies.

The continuity of the relationship between the spinoff and the university is at the core of the innovation capability of the company. As prof. Stefano Campana underlies, even if the fact that the drones nowadays are diffused and so they do not represent a competitive advantage anymore, the real advantage is the approach towards innovation: *“You need always to be a step ahead: you can maintain the technological advantage only if you do not stay still”*.

All the owners want to maintain relationships with the university and this represent an important source of innovation, especially when the company is small and absorbed to daily operations.

A second element influencing the NPD-oriented BM has been the importance of investing financial resources in innovation. Indeed, having a first, important customer has helped the spinoff to further invest in technologies - something that the University, per se, could not supply for. However, the several investments made have also forced the spinoff to search for new opportunities when the archaeological market was not profitable enough. In this context, ATS has been able to diversify its activities, entering new markets. For example, drone previously used for archaeology have been also used for monitoring rubbish dump.

## 3.3. WHAT DOES ATS TEACH US?

When striving for survival, it is really difficult to invest into innovation. However, the ATS case shows us how an ASO could stay stick to a NPD-oriented business model over time. This happens thanks to three core elements: a dynamic founding team, the maintenance of relationships with the university and also dual business models.

As seen, founding team has been really important in terms of complementary competences, but over the years the ASO has seen a reshuffling of the competences and a reconfiguration of its governance structure that is much more flexible. Started with 10 researchers, today ATS comprises 3 persons who are grown a lot in terms of managerial competences and have been able to leverage on existing resources (Rasmussen et al., 2011). Indeed, the ASO has not make a fortune or grown disproportionately,

but as Stefano Campana says: *“It is true that it is a spin-off that has difficulties in growing, but it grows”*.

Second, the founding team has been able to maintain its relational network. This has been extremely important in terms of innovation. We should distinguish here between academic and business partners. As said, the ASO maintains lot of contacts with University of Siena and its network and this is good since forces Matteo, Francesco and Cristina to remain updated, even if they are more focused on the business side. Similarly, the business partners are chosen on the basis of their innovative technologies, irrespective of their geographical proximity. This highlights the importance of scouting new actors, identifying potential areas of joint solution co-development, especially understanding potential areas of cross-fertilization.

Third, the ATS case reveals that it is important to run dual business models. The fact that the ASO has always pursued a NPD-oriented business model, has not impeded the spin-off to also shift towards an OP-oriented business model in order to exploit its technologies. This opens new questions about to what extent multiple business models can be run simultaneously (Aversa et al. 2017).

Finally, as compared to the literature reviewed (Hossinger et al., 2020; Miranda et al., 2018), the ATS case also adds one important motivation previously underexplored by research: assuring opportunities for younger scholars. In fact, as Hossinger et al. (2020) says when talking about intrinsic motivations *“academics decide to engage in entrepreneurial activities so as to pursue an intrinsic source of rewards, such as independence, a sense of achievement, skill enhancement, inner satisfaction, self-realisation and self-esteem [...], they may feel a sense of social responsibility or of having a ‘mission’ to be of public service, to improve living standards by applying and disseminating technology or they may have a ‘need for utilisation”* (p. 106). In the case of ATS, the ASO’s entrepreneurial driver was the lungimiranza of assuring a future to youths who would not have necessary had a chance to remain in academia in the long run. We would like to highlight that in those years the University of Siena was prospering and none would have foreseen the disaster that plumed on the city few months later ATS’s foundation. Theoreof, ATS demonstrates that the opportunity recognition can happen also in a moment where resources are abundant.



## 4. A FAMILY OF RESTORERS: THE PIACENTI CASE

This chapter describes the case of Piacenti, an Italian family firm that operates in the restoration sector. This is a unique case due to the long-lasting tenure of the firm (over 100 years) in a very traditional sector, always characterized by dexterity, but nowadays increasingly so by technology. When we think about restoration activities, we think about people such as Alfio Del Serra who restored frescos and

paintings by Giotto, Botticelli, Leonardo, among the others. However, restorers are progressively adopting more advanced technologies in order to preserve and valorize cultural goods. This requires willingness to adopt innovation, something that appears to be particularly difficult for family firms (Chrisman et al., 2015).

### 4.1 FAMILY FIRMS

Literature on family firms is rich and there are several definitions. For example, an interesting paper by Astrachan et al. (2002) highlights the importance of considering an index capable of taking into consideration different dimensions of family influence. In fact, we need to distinguish not only between family and non-family firms, but also within family firms with respect to ownership, governance and management (since these are the ways throughout which a family influences the business). The same authors introduce the F-PEC scale, an index of family influence that is based on power, experience and culture. However, to the extent of this book, we recur to Chua et al. (1999)'s one according to which "*The family business is a business governed and/or managed with the intention to shape and pursue the vision of the business held by a dominant coalition controlled by members of the same family or a small number of families in a manner that is potentially sustainable across generations of the family or families*" (p. 25).

A recent contribution on the topic Combs et al. (2020) provides a framework summarizing the vast amount of main literature on family businesses. Among them, importance is given to the *antecedents* and the *family attributes*. The authors note that before talking about family firms we need to look at their antecedents. These are linked to the external factors that influence them. These are for example governmental policies and religious norms. We could consider, for example, differences in terms

of context when comparing European to Asian countries or also focusing on specific historical periods - such as before 1990s comparing Eastern and Western Europe. All the cultural, but also legal environment, have influenced processes such as succession and marriages. The second aspect that Combs et al. (2015) highlight is about the so called *family attributes* that are related to *family relationships* (e.g. family cohesion, harmony, conflict), *family member roles* (e.g. spouse, parent, sibling) and *family transitions* (e.g. birth or death of a member).

We think that, beyond the antecedents and the attributes, two broad topics need attention when talking about family firms: their resources and their goals. To us, these are the real drivers capable of explaining why family firms are unique and worthy to be studied.

#### 4.1.1 FAMILY FIRMS' RESOURCES

Family business differ from non-family firms due to multiple factors. First, they possess unique resources. According to the resource-based view (RBV), firms that possess resources that are valuable, rare, inimitable, and not substitutable (VRIN) are doomed to succeed (Barney, 1991). For example, a firm may have physical capital resources (such as plant, location, IP), human capital resources (skills and knowledge, relationships), organizational capital resources (policies, culture, technology) and process capital resources (leadership, teams, etc)(Habbershon & Williams, 1999; Nahapiet &

Ghosgal, 1998). From this perspective, family firms possess a bundle of resources that is unique since result from the interaction between the family, its individual members and the business: the familiness (Habbershon & Williams, 1999). However, possessing unique resources is necessary, but not sufficient in achieving a competitive advantage. Sirmon & Hitt (2003) advance that resources need to be managed in an effective way. They introduce a process model that show how companies need to pursue resource inventory, resource bundling and resource leveraging. In their paper, they examine 5 resources and attributes that provide advantages for family firms.

A first resource is the **human capital** that embraces the knowledge and skills embodied in people. Family firms are a unique case since family members are simultaneously members of the family and members of the firm. In other terms, their personal and professional lives are interconnected. Second, the **social capital** is about all the resources embedded in the relationships among people. In family firms we have two types of social capital: the family social capital and the firm social capital (Arregle et al., 2007). A recent contribution on the family social capital (Sanchez-Ruiz et al., 2019) has highlighted that family firms possess different degrees of family social capital via distinguishing on the structural, relational and cognitive dimensions of family social capital. Third, the **patient financial capital** is about the invested financial capital “without threat of liquidation for long periods” (Sirmon & Hitt, 2003, p. 343). Patient capital might allow the firms to take long terms decisions, thus influencing for examples choices about R&D investments. Fourth, **survivability capital** refers to “*pooled personal resources family members loan, contribute, and share for the benefit of the family business*” (Sirmon & Hitt, 2003, p. 343). Finally, for what concerns the **governance structure** attributes, it is important to note that, especially when the firm is small, usually ownership and management coincide. This allows to lower potential agency costs that would arise when ownership and management are separated. According to Sirmon & Hitt (2003), the management of these resources can differentiate high- and low- performing family firms. They specifically distinguish three components of resource management, namely the resource inventory, the resource bundling, and the resource leveraging, thus shedding light on the “management”, on how companies use these resources.

Family firms’ resources are the core value for reaching competitive advantage. We think that, especially human

capital and social capital embedded in family firms could be particularly important in industries characterized by knowledge intensive workers. Some evidence could be found with companies operating in traditional, low-tech sectors, such as that of jewellery (Casprini, Melanthiou, Pucci & Zanni, 2020), but also high-tech sectors, as described in the Loccioni case (Casprini, De Massis, Di Minin, Frattini & Piccaluga, 2017).

#### 4.1.2 FAMILY FIRMS’ GOALS

A second unique characteristic that differentiates family from non-family is about goals. Family firms have unique interests that are related to the so called **socioemotional** wealth (Berrone et al., 2012). Family firms usually aim at maintaining a dynasty, values and status and therefore pay particular attention in preserving reputation and create wealth which is sustainable over generations (Xu et al., 2020). As a consequence, they develop unique behaviours with respect to innovation and internationalization decisions (Casprini et al. 2020), for example. A crucial aspect in determining family firms’ attitudes towards bringing risk, for example, is linked to whether family firms’ performance is above or below their aspiration level.

Family firms’ goals are particularly evident also when we consider the role of family businesses for their territory. The attention posited to traditions, to the preservation of the local culture, but also of the local heritage demonstrates that family firms pay lot of attention to the environment surrounding them.

## 4.2 THE PIACENTI CASE

Piacenti is a family firm in the Tuscany Region. It is based in Prato, a city close to Florence. The company was set up in 1875 in the Tuscany-Emilian mountains, and it began as carpenters and cabinet making workshop. The company has been situated in Prato for 70 years (Gianfranco Piacenti was leading the firm at that time). This location has enabled it to be very well connected internationally thanks to the airport. Somehow Prato has been a strategic place to set the company since, due to the many Chinese investments, also the several stakeholders (from banks to local institutions) have been exposed to internationalization quite early as compared to other places. Take logistics as an example can: there are all logistic

service, there are experts of 'customs codes, and this has been possible due to the rich entrepreneurial surrounding.

Over the years, the company has grown a lot (Figure 2) and today it represents an international excellence in the restoration sector. Just to cite the most important, and recent, restoration activity, we can cite the restoration of the Nativity in Jerusalem.

Starting as a firm operating in the wood restoration, Piacenti diversified its activities introducing over time different specializations, satisfying additional needs (such as the case of archaeology), investing in competences, innovation and operational efficiency. This has differentiated the company from its competitors. Piacenti's business model may be classified as **organizational processes-oriented**,

as we can derive from Gianmarco Piacenti's words: "The idea of structuring the company with a control of its executive capacity and a cost control and keeping an eye on the entire company progress always been our prerogative. We don't even talk about it in our sector".

Indeed, this is also a peculiarity with respect to the other companies operating in the local context of Prato. One of the interviewees remembered that during a meeting with the industrial association of over 28000 companies, only few of them had adopted analytical accounting. Among these few cases, there was a company that wanted to enter the stock exchange and had to adopt analytical accountability by law. As Datini, one of the richest merchants in Prato in XIV century, said: "la gente deve saper far di conto" [people must know accounting].

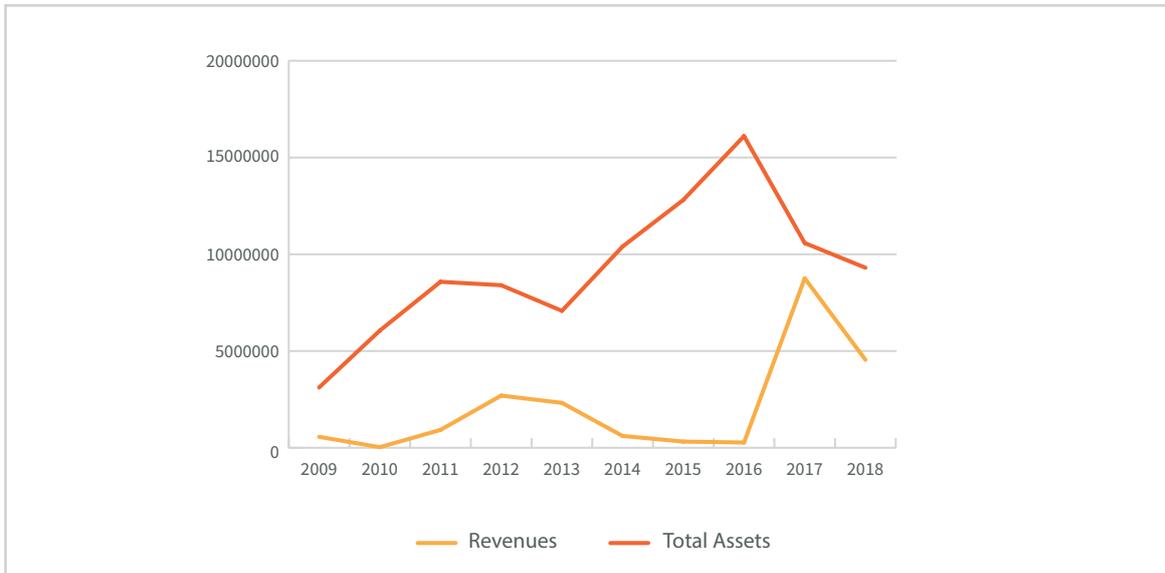


Figure 2. Piacenti's Revenues and Total Assets (2009-2018). Own elaboration from AIDA Bureau van Djick database

#### 4.2.1 BUSINESS STRATEGY

Piacenti is a restoration company and it operates in the service sector. Its clients are the Church, public entities or private citizens who need to either preserve their cultural goods through restoration, for example, or to make archaeological sites and then restore or maintain them in a certain way. Over time, Piacenti has entered also in the field of archaeology which required the introduction of other rules and procedures. Therefore, Piacenti has

adopted multiple ways to satisfy customers' needs providing a series of competences spanning from several domains (from archaeology to engineering to chemistry) and using multiple technologies. For Piacenti, it is really important to advance knowledge in multiple fields since in order to restore a cultural good you need to understand also the context it belongs to.

Piacenti operates at international level. This is a very well-known restoration company worldwide, especial-

ly in Europe. As mentioned before, the most important activity is about the restoration of the Nativity in Jerusalem, but among the several international campaigns we can cite the Synagogue in Budapest in mid-1980s, the Pagoda in Wenzhou in China and the experience in Russia in 2000s, other works in Moldova and, since 2013 in Jerusalem. The excellence regarding their restorations is also proven by some episodes the owners have had. Gianmarco remembers that once, while in Budapest and looking at the Synagogue, one person who did not know his identity, said him: *“This [the Synagogue] has been restored by the best company in the world. An Italian company called Piacenti”*. And indeed Gianmarco was moved.

Piacenti focuses on quality and performance as two drivers for competing. Indeed, being able to manage costs is important, but this is an instrument necessary to invest more in technology and training of its restoring activities.

#### 4.2.2 BUSINESS CAPABILITIES

Describing Piacenti’s capabilities we should focus on its innovation capabilities and managerial capabilities. The continuous pursuit of innovation and the importance of internationalization find their roots in the influence of Leonetto Tintori, a well-known international restorer. Mr. Tintori was born in Prato in 1908 and attended the “Leonardo School of Art and Crafts” of Prato in his spare time. He was self-taught and his passion was about the fresco technique. He was one of the protagonists of the “Prato School” artists. After the second world war, Mr. Tintori worked as a restorer and as a painter. Retiring in the 1970s, he created a school focused on frescos and based on the model of the middle age “bottega”<sup>25</sup>. Piacenti’s brothers were Tintori’s pupils. As Gianfranco argues:

*“Leonetto was a restorer of international fame. He died in 2000 at the age of 95. He was very advanced from a technological point of view. Leonetto is the one who pushed us more towards international markets. He had relationships, contacts and needs. He trusted us”*.

An interesting example of the innovation capability of the company resides in the application of a technology traditional to one field to another field. Silvia, one of the last generation family members, describes that individual passions has driven innovation sometimes as in the case of her uncle Marcello. Marcello Piacenti, Production Director of Piacenti, has a passion for aquariums and for

the technologies that gravitate around water, glass and sea creatures. His passion has allowed him to consider the use of ozone to purify archaeological wood. Something that no one has done before.

Silvia also has been following the research and development activity of the firm for the past 4 years. She searches for a new topic to follow either regarding the methodologies or the practices (as we explain in section 4.2.4). For example, since 2018 Piacenti has taken part of a research project called “AGM for CuHe - Advanced Green Materials for Cultural Heritage”. The project is coordinated by the Università di Catania and involved multiple departments from several universities and companies as SB engineering, MEGARES, LBC, Edilponti and Piacenti. The project focuses on research into geopolymers and biopolymers to be applied to cultural goods as consolidation or as copies of majolica and stone elements or artificial stones.

#### 4.2.3 BUSINESS ORGANIZATION

In order to understand Piacenti’s organization we should mainly describe its resources and its organizational structure. We start by describing two core resources: the laboratory and the employees. Then, we focus on the role of the family.

Piacenti has invested both in the headquarters and the **laboratory**, plus it possesses specific warehouses for the equipment, for a total of 2400 meter squares. Everything is located in the same place and this constitutes, among the others, one of the very interesting realities in the restoration industry. The laboratory covers 1500 square meters and it is divided into areas with specific functional activities. There is an internal laboratory for diagnostics, a lab for wooden artefacts, a lab for polychrome artefacts, a lab for paintings on canvas or wood, but also dedicated areas for antiparasitic treatment and controlled atmosphere area (corporate website). Most of its competitors do not have a laboratory internally. The company pays attention to R&D and new technologies. It is always looking for new equipment, new materials and new techniques that can be adopted and in doing so, it collaborates with research centres, universities and also private parties.

The key resources of the firm reside in its human resources that are represented by both family members and nonfamily members. The family is involved in all, the ow-

nership and the management of the company. The Board of Directors, is made up of the three siblings, Gianmarco, Marcello and Daniela, and the last generation, Daniela's daughter, Silvia. The three siblings have different roles. Gianmarco deals with the commercial function, Marcello deals with production function, while Daniela deals with the administrative function. There are also other two last generation family members involved, Silvia and Christian (Daniela's daughter and son) and Matteo (Marcello's son). As Gianmarco said: *"They are training. One is a foreman, the other is under "observation". The goal is to make him manage a construction site operationally. All of us first worked as restorers, then we drove construction sites, then we chose one thing"*.

Being a family member does not lead to a special position or working favouritisms. When the younger generation works in the restoration site, it has to follow the rules of the foreman. He/she can express his/her opinion about his/her own area of expertise, but then it is the foreman's decision. The structure is pyramidal. There is a foreman and then a technician. For the larger sites and orders, there are also a work commission and a client committee: there is a family firm top management and a site supervision team.

Interestingly, none of the third generation has a *degree* in *restoration*. Indeed, the restorer title derives from a long history at national level. In Italy there were no classes or masters in restoration up to few years ago. In order to obtain the title, there was a period of 8 years to be spent within the so called "bottega", the place where young apprentices work with the master in order to learn how to restore. For the past ten years, the new generations are hired after an internship.

As we before said, beyond family members there are nonfamily members. Human resources are crucial for all the activities of the company. They are younger and older restorers who share the passion for restoration. Knowing how to restore is a blend between specific technical knowledge (e.g. about materials) and know-how that is learned on the job. In other terms, there is a lot of tacit knowledge embedded into the restorers' work and this implies that employees are difficult to substitute. A lot of training is needed, and this is learnt at the "bottega", the physical place where young people work day after day in close contact with a magister. This is what happened to Leonardo Da Vinci who was at Verrocchio's bottega as well as many other artists who have advanced

their predecessors, once having studied in their *botteghe*.

Due to the changing environment, especially due to the new technologies, possessing a deep technological knowledge is a necessary condition to become a good restorer. Therefore, **high schools and universities** play a very important role in determining the quality of human resources. Some schools are able to provide a very interesting background, especially in terms of the products that can be adopted. For example, in the case of the matting paint for paintings, students have profoundly studied and tested the product and are capable to bring the product to the company. This is very peculiar since often companies tend to buy a product that is suggested and recommended by the supplier. This is very different from adopting a new product because a new restorer has studied it during his/her degree for example.

How does Piacenti work in the field? For each site, Piacenti has a dedicated restoration team. The foreman is probably the main character in Piacenti's operations. He/she is an expert, knowing the types of analyses to be conducted, where to conduct the analysis and for which aim. He/she has to have clear idea of the final result to obtain in order to lead all the team and to make the team understand which techniques and materials to use are.

Usually a team is made up of 6-8 people who are experts in a certain field. In these teams, sometimes, you can have one or two apprentices, who must be supervised. The foreman has a crucial role since he/she has to know each individual's know-how, but also the characters: working in team is important and not only the individual technical skills, but also their characters need to fit appropriately.

Due to the various domains and the increasing number of technologies and new materials, Piacenti's members tend to ask for the main expert over a specific discipline for advice. For example, Silvia has a degree in technologies applied to cultural goods, and people ask for her advice when they have to adopt a technology rather than another.

#### 4.2.4 THE ORGANIZATIONAL PROCESSES-ORIENTED BUSINESS MODEL IDEAL TYPE

Piacenti has a business model that can be described as an Organizational Processes-oriented Business Model ideal type: this business model ideal type results from the intersection between the business organization and

the business capabilities constituent blocks. This ideal type results from the exploitation of internal resources and competences and focuses on improving efficiency in terms of both technologies applied to processes and reduction in transaction costs. Piacenti is very careful in efficiently managing its operations and activities and in doing so it leverages on its structure (organizational, but also legal) and processes.

Being a family firm allows Piacenti to speed up decisions. In the Board of Directors (Consiglio di Amministrazione) the three siblings (Gianmarco, Marcello e Daniela), represent one specific activity of the company (commercial, production, financial) and Silvia. The entrance of the third generation (with Gianmarco, Marcello and Daniela) has represented the turning point towards collaborations with other partners, the focus on bigger clients and larger commissions than before, and the need of better structuring processes.

Contrary to many of its competitors that are cooperatives or individual firms, Piacenti's **legal structure** is an s.p.a. (so a capital firm). Its turnover is about 3.2 million euros and its social capital is 1 million euro. As one of the owners said, this is very important especially when you have private clients. The choice to become an s.p.a. was planned over years and the firm has reconfigured itself in a gradual way passing from s.n.c. to s.r.l. and then s.p.a. This is a good example of the evolution of a small enterprise to a more structured one. The fact of being an s.p.a. is also a warranty for the employees.

For what concerns processes, we would like to highlight the importance of *methodologies* (e.g. restoration) and *techniques* (e.g. restoration cleaning) as adopted in the restoration sites. Silvia has introduced a restoration protocol. This is something against the traditional theory of restoration since restoration cannot be protocolled. However, as Silvia points out, there are some "macro-phases" that are repetitive and should be repetitive in order to assure quality. These macro-phases should be codified *a priori*, before starting the restoration. The case of the restoration of the Nativity in Bethlem is explanatory. In that case there was the urgency to standardize the procedures, the chrono program, the list of tasks for each single person. The techniques are linked to the steps to be followed when restoring. In the case of the cleaning, for example, the techniques are linked to how to speed up the cleaning. In doing so, there is the need to test new tools. Here the network of relationships, espe-

cially with universities and research centres, is important. An example is linked to the restoration of wooden beams, for which research was carried out which led to the development of a consolidation technique.

Additionally, Piacenti is investing in new Industry 4.0 technologies such as the robotic arm. Other technologies adopted are the drone – this has been used several times for many years – and the 3D printers – even if they are not used so much.

### 4.3 WHAT DOES THE PIACENTI CASE TEACH US?

Piacenti is one of the leaders in the restoring sector. It is a family firm with over 100 years of history and it has grown a lot in a sector characterized by small, craft companies. According to ConfArtigianato in 2018 there were about 3500 firms operating in the "Attività di conservazione e restauro di opere d'arte" and about 80% were artisans. Based on AIDA database, only 691 are capital companies in 2018 and, among them, Piacenti is among the biggest in terms of revenues in Italy. Why is it the case?

We think that two main elements have helped Piacenti growing: control and passion. Control is important for several aspects. First, the company has been able to monitor the environment, selecting partners and also scouting talents in terms of employees. As an example, we can cite the episode of hiring a person who was losing his job since his employer was closing. Some years ago, one company dealing with monument restoration was about to close. That company worked in the building sector, and only more recently it had approached the restoration one. The company was closing but Gianmarco, who was monitoring the competitors, had the opportunity to talk to the President in order to understand whether there were people who could be hired. Piacenti, in fact, at that time was looking for insourcing competences.

Control is intended here as the capability to scan and take into account the environment where a firm operates. This is related to the awareness for what is going on around the company and beyond. Often, family firms are thought to stay geographically focused and search locally. The Piacenti case shows us that this is not always the case. More than searching locally, it searched for close complementarities: it gradually extended its core competences by gradually extending its sectors of activities (from wood, as in the beginning, to archaeology).

The second core element is the passion (cf Casprini et al., 2019). Passion is transmitted not only from one family member to the other, but also among employees. Passion is transmitted and preserved in several ways, from education to trust and respect. Piacenti is investing a lot in education, especially on a local level, holding lectures and seminars in high schools and universities. What is interesting in the Piacenti case is that family members are under experienced people: it is not a matter of being the son or the daughter of an owner, but having more expertise than another is what really matters. The underlying reasoning is the diffusion and dissemination of knowledge across levels. As Silvia says: *“We are going towards multidisciplinary. The bottega has taught us a lot, but somehow it is an exclusive environment. Due to multidisciplinary, when we consider an équipe, the environment should be inclusive, not exclusive... this is the only way we can proceed”*.



## CONCLUSION

This book wanted to provide an overview about business model, strategy and innovation of companies that apply high technologies to cultural goods. In doing that, the book first presented a synthesis of the main actors and factors to consider when talking about the management of cultural goods. Then, it provides a brief description of the results of a survey conducted on 120 companies in Italy and in depth description of two case studies: ATS mainly operating in the identification phase and Piacenti mainly operating in the protection and valorization phases.

Despite the limitations of the book, one for all the lack of a representative sample for what concerns the methodology of the survey, we think that it has some merits.

First of all, this book contributes to previous works (e.g. Capone, 2016; IRPET, 2012) by providing additional insights into a very heterogeneous context. The results show that companies do not operate exclusively on cultural goods, but rather that their turnover only depends on cultural goods for about half of the total. This means that companies have either to find alternative sources for financing their activities or that they started applying their technologies later also on cultural goods.

Additionally, they are often involved in the protection phase, while only a small percentage work in the identification and the utilization phases. Even if this result could be due to the sampling, we invite the reader to consider the potentialities that could emerge in that specific intervention phase. The recent technological advancements related to Industry 4.0 could open new, interesting possibilities.

Third, we think that one interesting result from the survey is related to the resources that these companies possess: while they have a very low access to financial capital these companies are very satisfied in terms of the human resources they possess. However, as emerged, there is a lack of access to managerial talents. The data suggest a couple of considerations in terms of potential interventions. First of all, we are dealing with companies with highly skilled, technically-expert, human resources, but with not enough managerial competences. Indeed, both cases we analysed (ATS and Piacenti) well emphasise how important it is to have managerial skills. Therefore, a first recommendation would be to develop ad hoc training courses capable to fill the gap between the high technical skills and the less explored managerial talents. Secondly, the excellent

reputation and the strong relationship with clients, jointly with a low access to a broad network for the business development, suggest that these companies tend to work with few -and probably the same- clients. In other terms, their ability to manage multiple networks and projects simultaneously could be strengthened. The causes can be several, from the average small size of the companies that might impact their ability of scouting and also managing partners, to the fact that projects could require several years of work. This seems to be confirmed also by the more traditional (i.e. technical journals and Internet or participation to fairs) knowledge sources. We think that these companies could benefit from licensing or also other collaboration strategies. Indeed, the case of both Piacenti and ATS show us that working with universities represents an important tool through which adopting and developing innovations.

Furthermore, our analyses reveal how important tacit knowledge is, especially for companies operating in the protection phase. This implies that high technologies are important and can help a lot in improving both efficiency and effectiveness, but they should not substitute the human eye that “drives” them.

What’s next? This is our second attempt in the context of companies that apply high technology to cultural goods. In a first work, we saw that companies may shift their business model over time (Casprini et al., 2014). In this book, we go deeper, looking at a broader sample of companies and showing their heterogeneity in terms of factors such as knowledge sources, technological fields, resources, but also performance. Additionally, the two cases present a more detailed description of the strategy, capabilities and organization components of their business models, also introducing two additional elements that we would like to consider in further analyses. Second, the context where they operate. ATS is a spin-off of University of Siena while Piacenti is a private firm in a long-lasting, entrepreneurial city: which are the exogenous factors that could help their growth? Second and foremost, the organizational archetype characterizing the firms: ATS is a spin-off that has recently concentrated its ownership in a smaller group of people, while Piacenti is a family firm, owned and managed by several family members. We encourage to understand better to what extent elements that are unique to family firms, for example, could be able to boost innovation processes, or whether different governance structures could improve, for instance, spin-offs’ innovation and financial performance. Of course, other avenues of research, such as making international comparative analyses, would be extremely helpful to better identify the specificities of the unique setting represented by companies that apply high technology to cultural goods.

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