PAINTED LANDSCAPES FROM ANOTHER AGE:
WHAT THE VASARI'S FRESCOES IN PALAZZO VECCHIO, FLORENCE, TELL ABOUT URBAN FORTIFICATIONS

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ABSTRACT

Palazzo Vecchio is a cultural-historical centre full of elements from different periods able to offer multiple ideas and reflections. Inside there are objects, rooms and environments that document many years of history interacting with many other realities and contexts. The "Hall of the 500", the large audience hall restored by Giorgio Vasari commissioned by the grand duke Cosimo I, shows in its sumptuous wall paintings the views of cities, places and landscapes, captured in scenes of war and siege. It is possible to observe the city walls of Pisa, the Towers of Siena and Livorno, the military fortifications of Porto Ercole and San Vincenzo, the Mediterranean coasts and the inland valleys. Different places, conquered by the Medici family, which branch off throughout Tuscany and characterise the territory. These places today appear transformed and modified, in part or not, in the landscape and urban fabric. In some cases, it is still possible to find the remains of the sixteenth-century defensive buildings, while in others there is no longer any trace, or at most only few remains. Instead, they are legible in the paintings that identify their elements and characteristics. The opportunity arises for a comparison between real and painted architecture. From this point of view, the frescoes in the hall not only have value as artistic works but also as historical sources and documents

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able to tell through painting the conformation of the sites represented with well-defined details and historical reliability. Comparing the paintings with today's urban and landscape fabric, analogies and discrepancies appear, present, missing and added objects that allow to reconstruct the analysed structures, and also to catalogue them according to the level of knowledge acquired with a good degree of reliability of the source. With these assumptions it was possible to model the painted defensive structures in 3D, using not only the frescoes but also writings, drawings and archive plans and also to catalogue it. A map was then edited to identify the level of knowledge achieved with each model. The aim is to increase knowledge of historical and cultural structures to enhance the city's cultural heritage.

Introduction

This report summarises the procedure adopted to analyse and study the six large frescoes made by Giorgio Vasari (1511-1574) from 1566 to 1571 in order to broaden the knowledge of the territories and military structures of the fourteenth, fifteenth and sixteenth centuries represented in the frescoes. The views of the Tuscan landscapes in the background of the paintings characterise the setting of this particular collection

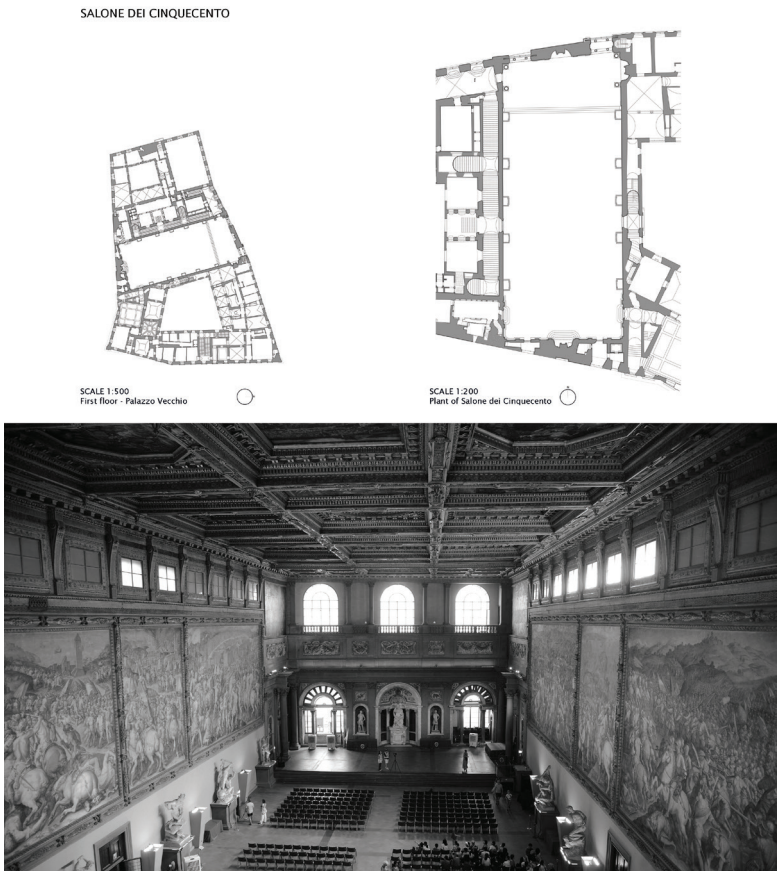


Figure 1. Salone dei cinquecento, tables, Palazzo Vecchio.

of memorable and heroic (that is, those which had seen the Florentines prevail) battles, conducted by the Medici family and the city of Florence. They were commissioned by Cosimo I (1519-1574) in the context of a large and ambitious renovation program of the Sala Grande, now called the Salone dei Cinquecento, in Palazzo Vecchio. The history of the Palace dates back to the 13th century, since then many extensions and renovations already took place, always linked to political and cultural events of the city of Florence. With the death of Lorenzo "the Magnificent" Dei Medici in 1492, Florence was governed severely by the Dominican friar Girolamo Savonarola. The renovation of the government building was functional to the friar's reform program. It was necessary to build a hall capable of accommodating the members of the new city council, which was richly increased: the *Salone dei Cinquecento*, characterised by its austere nature, in line with the political vision of Savonarola. When Cosimo I became Lord of Florence, he felt the necessity to radically restructure this hall, to be the place to represent republican liberties. Going back to his family's tradition of patronage, Cosimo supported the arts as a means of strengthening his image as an absolute Lord and surrounded himself with refined artists. In this climate of centralization of power, Vasari becomes the main interpreter of the will of the duke, who places him in charge of the works. The extensive renovation program included many parts of the hall such as the paintings. The ultimate goal of the architect was to praise and glorify the Medici family, Cosimo I, and the greatness of the city of Florence.

Three pitched battles relating to the Pisa war were reproduced on the west wall and three battles concerning the Siena war on the east wall. The historiographic character of Vasari's paintings allows us to consider these frescoes not only as important artistic works, but also as historical documents, reliable sources that accurately report the architectural and environmental past of Medici Tuscany. In the preparatory phase of the frescoes, the defensive structures and the topography of the places are studied with extreme accuracy through the execution of sketches and drafts of the landscape and architectures, by Vasari's collaborators, who were sent to collect information directly on the site.

Of the six frescoes, three were selected: "Maximilian removes the siege of Livorno", "Defeat of the Pisans at the tower of San Vincenzo" and "Presa di Porto Ercole". These three subjects developed the basis for a practical and technologically advanced approach to the documentation, interpretation and communication of the contents, represented as an artistic form. The central location of this study is, therefore, the *Salone*

Cycle	Title	Date of realization	Date of the event	Position in the Hall	Authors
War with Pisa	Assault to Pisa	1568	1499	Nor-th-West	G. Vasari and collaborators
War with Pisa	Maximilian I ends the siege in Livorno	1567	1496	Cen-tre-West	G. Vasari and collaborators
War with Pisa	Defeat of the Pisan army at the St. Vincent Tower	1569	1505	South-West	G. Vasari and collaborators
War with Siena	Assault to the Siena fortress near the Camollia's gate	1570	1554	North-East	G. Vasari and collaborators
War with Siena	The fall of Porto Ercole	1570	1555	Centre-E-ast	G. Vasari and collaborators
War with Siena	Pietro Strozzi defeated in the Scanna-gallo battle, Valdichiana	1571	1554	South-East	G. Vasari and collaborators

Table 1. Classification of the frescoes in the "Salone dei Cinquecento" Hall.

dei Cinquecento, to then expand to the places represented on its walls. The project was born, in fact, during the digital survey of Palazzo Vecchio, commissioned by the City Municipality to the Dipartimento di Architettura of the University of Florence. The survey has been essential for all types of analyses that were subsequently made, providing a reliable, accurate metric model capable of offering certain insights into the proportions among the parts present in each work.

Survey Methodology

For the complete survey of Palazzo Vecchio, six 3D laser scanners units were used. These collected a considerable amount of data (5500 scanning stations carried out in about 21 days of detection). Two in particular were used for the hall, the 3DLS CAM/2 FARO with 330 metred range and 2 millimetres accuracy at 10 m distance, and the 3DLS CAM/2 FARO Focus-3D 70s with 70 metres of range and one millimetre accuracy at 10 metres distance. From this survey it is possible to obtain the 2D reproduction of the orthographic and perspective drawings, typed down in Autodesk. Within the perspective drawings, the three photographic images of the examined frescoes were repositioned, which entered as a reference in the CAD tracking operations. For the photographic survey of the Salone, a NIKON D800E was used, a DSLR camera with a resolution of 36.3 Megapixels, with two different lenses: a Nikkor zoom 24-120mm F4 and a Nikkor zoom 70-300mm F4.5. The former lens made it possible to obtain high-resolution shots of the individual paintings and of the overall space of the hall; with the latter, photogrammetric details of the architectures shown in the background and of the main details of each pictorial work were acquired. All the shots were subsequently processed to correct the distortions of the lenses in use and therefore the perspective distortions based on the LS3D survey.

Outside the palace, three other photographic surveys, in the historical sites of the battles (Livorno, San Vincenzo, Porto Ercole), were carried out. The tools used are the same as those used for the Salone. In this way, material relating to the territory, to the conformation of places, villages and cities was collected to be analysed and compared with the Tuscan landscape views painted in the hall.

3D reconstruction and analysis

For all paintings the same methodology of analysis and 3D reconstruction was used, both to keep the common thread of the whole research clear, and to better highlight the differences between the three locations: Porto Ercole, San Vincenzo and Livorno. The work phases were carried out in the following order: compositional analysis, analysis of the battle, study of the landscape, study of the architecture and fortifications and 3D reconstruction, final reading of the results. The compositional analysis of the paintings proved to be of primary importance. Vasari chooses, for the six large wall frescoes, muted colours and light chiaroscuro in such a way as to mitigate the force of the gigantic figures represented in the foreground. Vasari creates the paintings using imaginary diagonals and reference lines, a wide range of variation is allowed between the effective perspective of the places, and the crushing and alteration needed to compose scenarios and figures. Each painting is studied on three different levels. In the foreground stand the gigantic figures of captains, lords and emperors who took part in the battles. Many of them are dressed in old-fashioned clothes and accompanied by symbolic objects, to highlight the value and power they owned. Further the battle scenes, the clashes between the militias, the cavalry and the infantry fighting. And furthermore the banners, the coats of arms and the flags flying between the heads of the soldiers, armed advancing accompanied by drums and trumpets. In the end, beyond the battle, appear: coasts, forests, valleys, perched citadels, watchtowers, entire cities defended by walls. These structures too are caught in the heat of battle, during sieges and assaults. The defensive structures appear, therefore, invaded, destroyed or still intact in the midst of the defence action.

The next step: historical research.

The capture of Porto Ercole is part of the more general scenario of the war with Siena and takes place between May and June 1555. The story in the fresco concerns one of the last phases of the war. Following the fall of Siena on April 17, 1555, the few surviving, who escaped the capture of the city, decided to continue the resistance under the command of Piero Strozzi.

The only help from the outside could have come only to Porto Ercole. There Strozzi gathers the Franco-Sienese troops and fortifies the place waiting for the Turkish fleet of Dragut Rais. On the opposite front the imperial troops of Charles V are deployed. The frescoes entitled "Maximilian removes the siege of Livorno" and "The defeat of the Pisans at the tower of San Vincenzo" regard two battles linked to the Pisa War. In 1406, following the fall of Pisa, the city passed under the Florentine dominion. However the Pisan independence forces have not subsided. When Charles VIII, King of France, goes to Italy directed to the Kingdom of Naples, to claim the rights of the Angevins, Pisa creates an alliance to recover the old territories. In this context, in 1496 the emperor Maximilian, an ally of Pisa, attacked Livorno, which however strenuously defended itself and forced Maximilian to retreat. Between 1494 and 1509 Pisa rebelled several times against Florence so as to be garrisoned by Florentine troops. It is in this climate of revenge that the "Battle of San Vincenzo" takes place between Florentines and Pisans on 17 August 1505. The captain Bartolomeo d'Alviano, together with about a thousand men from the Sienese Maremma, rushes to the aid of the Pisans. The Florentines tried to stop him, sending an expedition of

Figure 2. The fall of Porto Ercole, photo, Palazzo Vecchio.

about 1200 armigers commanded by Ercole Bentivoglio. He has the intention of attacking near the Tower of S. Vincenzo, a strategic point that makes the place easily defensible. The clash ends with the victory of the Florentine army.
The research continues with the inspection of the three battle sites. The aim is to better study the place and the remains, carry out the photographic survey, find the prevalent point of view chosen by Vasari to represent the scenes of the painting, and to relocate its on the territory. Vasari sends his collaborators to the territories of the battles with the task of drawing sketches of the landscape and thus being able to evaluate the appropriate points of view to set the events. The composition of the painting exceeds the geometric construction rules and resorting to various "licences" in order to obtain a more impressive and dynamic result.
During the survey in Porto Ercole, the search for the point of view required a significant exploration of the area. Looking at the painting, in the background, the coast between the sea and the land appears. Galeries, troops and encampments settle around eight military forts. The place today appears invaded by nature, the dense Mediterranean scrub and the vegetation extend up to the rocky coast. On the heights of the woods and in the basin on which Porto Ercole rests the more

Figure 3. Maximilian I ends the siege in Livorno, photo, Palazzo Vecchio.

rigorous and geometric profile of the port unfolds, flanked by the houses of the village. Even today it is possible to see the traces of the mediaeval walls of the Rocca and the Spanish stratifications built later. Clearly visible along the road leading to Porto Ercole appears the Isolotto, a very small island, a characteristic natural element of the place. Two fortifications are visible on the crests of the nearby mountains: Forte Stella and Forte Filippo, built after the battle. From the Forte Stella, the point of view adopted by Vasari can be identified. The comparison between the real territory and the painted territory shows correspondences among the promontories, the coast and the vegetation, but also some discrepancies, for example, the elongated strip of land of the Isolotto is eliminated in the fresco. It can be seen that Vasari adapts the painted area to his scenographic and celebratory needs, for instance, by raising the horizon line to give more space to the clash and better show the forts. Of the eight defensive forts built, almost nothing remains.

The survey in San Vincenzo shows how today the tower and the landscape are very different. The strong presence of woods and nature are prevalent in the fresco. The only architectural feature present in the area is the tower itself, which overlooks the surroundings and the main road. The road reveals the identity of the place: a junction to nearby cities and a point of communication with the other coastal towers. The same view of this area today appears built and strongly altered. Non-homogeneous urbanisation is dominant, not always a good example of contemporary architecture. The tower is still present, but modified. A long series of interventions and

Figure 4. Defeat of the Pisan army at the St. Vincent Tower, photo, Palazzo Vecchio.

restorations transformed its appearance. On one side of the buildings are linked to the walls of the tower themselves, on the other side a public square and the coast open up. The pitched roof was replaced by the battlements, the lack of the entrance door, the absence of overhanging elements present in the painting, as well as the opening of a new door at the roadway level. We can trust the original shape of the tower as it appears in the fresco, on the contrary the landscape is not entirely realistic: there are several discrepancies between what is painted and what is present in the area. Probably, the architect-painter choosed to mix more points of view to represent the beauty of the coast and also to tell the salient episodes of the battle. The forest, for example, could have been inserted to represent the arrival of the Medici troops. At the same time, this setting of the fresco serves the artist to enrich the scenography with inserts typical of the territory and tuscany architecture, as in the case of the fortified village present in the setting. The village could represent the fortress of Populonia which, however, has some significant differences.

As for Livorno, the point of view chosen by Vasari and his collaborators appears today to be largely altered by the urban expansion and development of the port. The residential settlement grew between the fortification system of the fifteenth century. The landscape around the walls, that surrounded the city and the coast, appears to have changed greatly. Of the five towers present in the painting, only some are still present and in good condition (such as the Marzocco tower and the lighthouse), the others no longer exist. To search more precisely the point of view of the painting, it was decided to look at the area using Google Earth, which, thanks to the aerial view, allows one to travel around the city without losing sight of the main objects of study. Once the main possible points were identified, these were also verified on the territory, and the most probable was therefore chosen on the basis of the greatest visual correspondence with what Vasari painted. The chosen position allows one to see the Marzocco tower and the landscape behind it. Unfortunately, due to the actual port and constructions, the other towers, the old fortress and the walled village are completely blocked from view.

The reconstruction of the defensive system of the three scenes represented was possible thanks to the careful analysis and research carried out up to this point. The following paragraphs recount the steps of the work from the historical-artistic study of the representation of the battle, to the 3D drawings of the fortifications.

The defensive system of Porto Ercole

The defensive system of Porto Ercole, built for the battle against the Medici and their allies, consisted of eight fortifications. Unfortunately, it is not known who the creator of these buildings is. From the documents of the time, it is clear that

more people actually contributed to the strategic decisions. Piero and Leone Strozzi were certainly involved in the transition between the design and executive phases. Paul de la Barthe, a French military engineer who was involved in the fortification works in Maremma, was also involved. We have received various descriptions of individual forts, collected from the writings of the Florentine military, who, when they conquered a position, reported the territory taken on paper. From the information obtained it is possible to make some observations. The eight forts had to be for the most part small, had to perform specific functions and were equipped with buildings and service facilities, such as warehouses or remittances, some of which were close to waterways. The largest building was the Rocca, while the smaller ones were Fort Guasparino, Ercoletto and Sant'Ippolito. Archival plans have only been found for some of the forts, and graphical scales are indicated only for some of them. The plant of Fort Sant'Ermo, for example, is shown in the Braccia Florentine measure.

The defensive system of San Vincenzo

Historical research on defensive structures shows how the 15th century towers built on the coast shared the same typological pattern of shapes and composition. The San Vincenzo tower is no exception. These structures had different functions, all inextricably linked to the position and the surrounding area. They served as watchtowers against possible pirate or enemy incursions, for sighting so as to get in touch with other towers thanks to luminous or acoustic signals, or as control points for health and customs surveillance reasons. The tower of San Vincenzo had a square plan and is characterised by having a base part with very thick shoe walls on which three floors were inserted. The top consisted of a terrace that could be covered by a pitched roof. On this level, shooting platforms were built to place the Battery. The top floor was intended for the guardhouse, while the rooms below were used as housing for the garrison. Usually the first floor was occupied by the castellan. The space obtained from the base nut was often used as a water tank and was without direct entry to the outside. For safety reasons, the access to the tower was placed on the first floor and was reached via a stone staircase and a small retractable wooden element, if necessary. This could be a ladder or a small bridge. The internal vertical connection between floors, which normally consisted of a single room, was characterised by retractable wooden stairs. The rooms were lit by small windows that allowed the surrounding area to be kept under control. The tower was also flanked by small

buildings, used as ovens, stables or sheds; it was probably also flanked by a small vegetable garden.

Defensive system of Livorno

From the fresco it was possible to identify the coastal towers, the lighthouse, the walled village and the Old Fortress. These structures as a whole characterise the defensive structure of the village. From the painting it is possible to clearly identify the general appearance, the geometric, volumetric and spatial shape and the position in the territory, in which they are inserted. The Farone or Fanale (1302), the Torre del Marzocco (1439), the Torre del Magnale, the Torre della Rocchetta and the Torre del Palazzotto. The Fanale and Torre del Marzocco are the largest in size. The Torre del Marzocco is the highest (54 m), the other three towers have heights around 30 metres.

The interventions made by Giambacorti in 1392 are evident from the reconstruction, such as the walls that surrounded the entire settlement. These walls had to have no embankment, isolated and equipped in the corners of some towers. The enclosure measured one thousand and six hundred fathoms (approximately 933.76 metres). If the walls defending the port were also considered, it is then to arrive at two thousand and two hundred braccia. They started west, where the Porta a Mare was and continued north towards the Porta a Terra, then turned in a semicircle. Via Maestra (now San Giovanni still existing) connects the two gates.

3D reconstruction methodology

To model the fortifications defensive system depicted by Vasari, the information obtained during the analyses and surveys were processed and compared with each other. The reconstruction took place in three phases. First of all, the plan of the individual structures was drawn. For the fortifications and towers, in which the plans with their respective dimensions were found, it was possible to convert the Braccia Florentine into metres and then scale the plan according to the measurements obtained. For the architectures, the original plants have not been found, other sources of information have been used: the frescoes by Vasari and other artists, the reports and descriptions written by the captains of the Medici, the comparison with the territory and the morphology of the site. Secondly, the heights were reported, extruded and the main curtain wall of the fort was modelled. Later the details, the overhangs and openings and the characteristic elements of the sixteenth-century fortifications were added such as the ramparts, the battlements, the walkways on the walls and the service structures present in the fresco (accommodation, remittances and storage areas). The military constructions have gradually taken a more concrete form and

have been reconstructed in their main features. This procedure was followed for all the three battle locations analysed. For San Vincenzo it was possible to model not only the external structure, but also the internal rooms of the tower. This is thanks to an ad hoc analysis carried out on the defensive coastal towers of the area dating back to 1400-1500. For the sizing of each reconstruction, the resulting shapes were compared using the two graphic scales used: Braccia Florentine and metres. The Braccia Fiorentine, used in Tuscany of 1400-1500, obviously found a greater confirmation than the measures in metres in the definition of the compositional matrices. They are clearer and more precise as they are original units in use in the design phase.

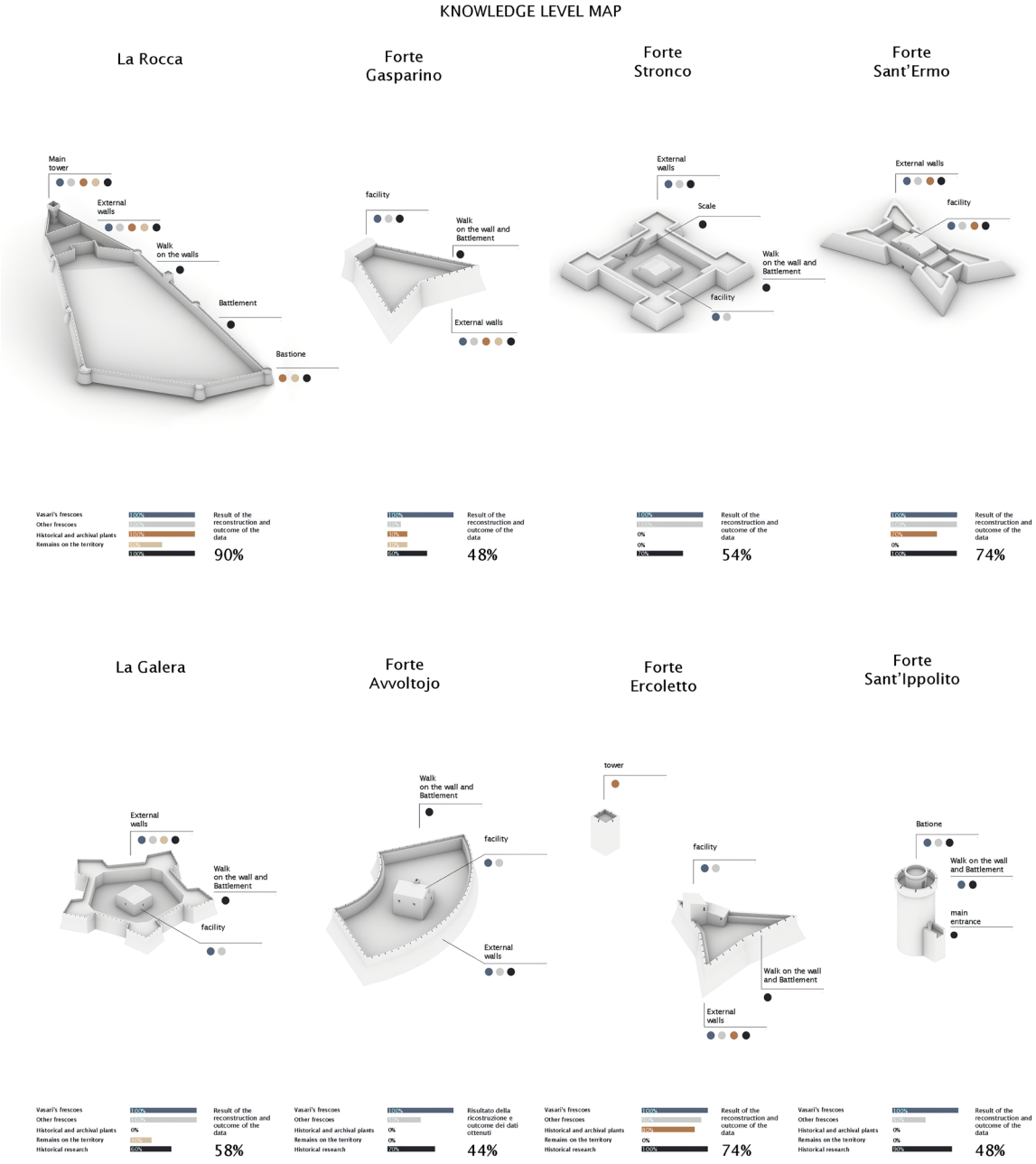
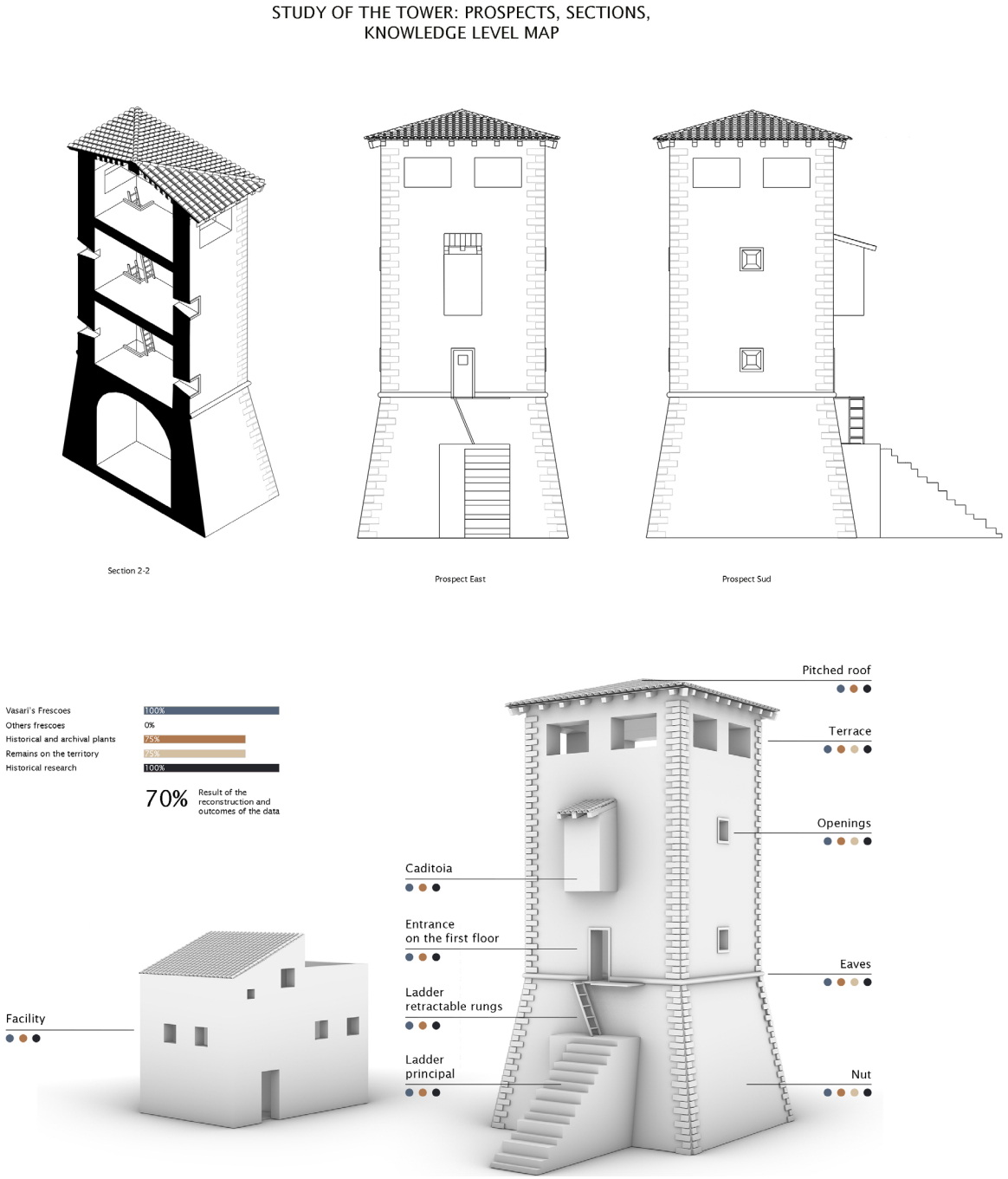


Figure 5. Giulia Emilio, knowledge level map, 3D reconstruction, Porto Ercole.

Conclusions

The final result of the 3D reconstruction of the defence systems is linked to several factors. For Porto Ercole the reconstruction of the eight fortifications is more geometrical and spatial, closely connected to the conformation of the village and Monte Argentario. For San Vincenzo a typological and architectural reconstruction of the coastal tower is obtained. While for Livorno, the five towers, the old fortress and the walled city, appear to be deeply linked to the urban aspects, such as the development of neighbourhoods, roads and the seaport. The model reports a realistic as detailed as possible reconstruction

Figure 6. Giulia Emilio, knowledge level map, 3D reconstruction, St. Vincent.



of the defensive system examined. The trace left by Vasari's representation, beyond the great artistic value, becomes a fundamental historical clue, which allows the best understanding of a territory that is now transfigured. The difference in available information and the different transformation undergone in places and architectures led to a significant variation in the results obtained for the individual structures, leading to a heterogeneous final outcome. Hence the need to prepare a map able to facilitate the reading and understanding of the 3D models, showing how and which elements were reconstructed and the degree of assurance. From the analysis carried out and the sources acquired, the data

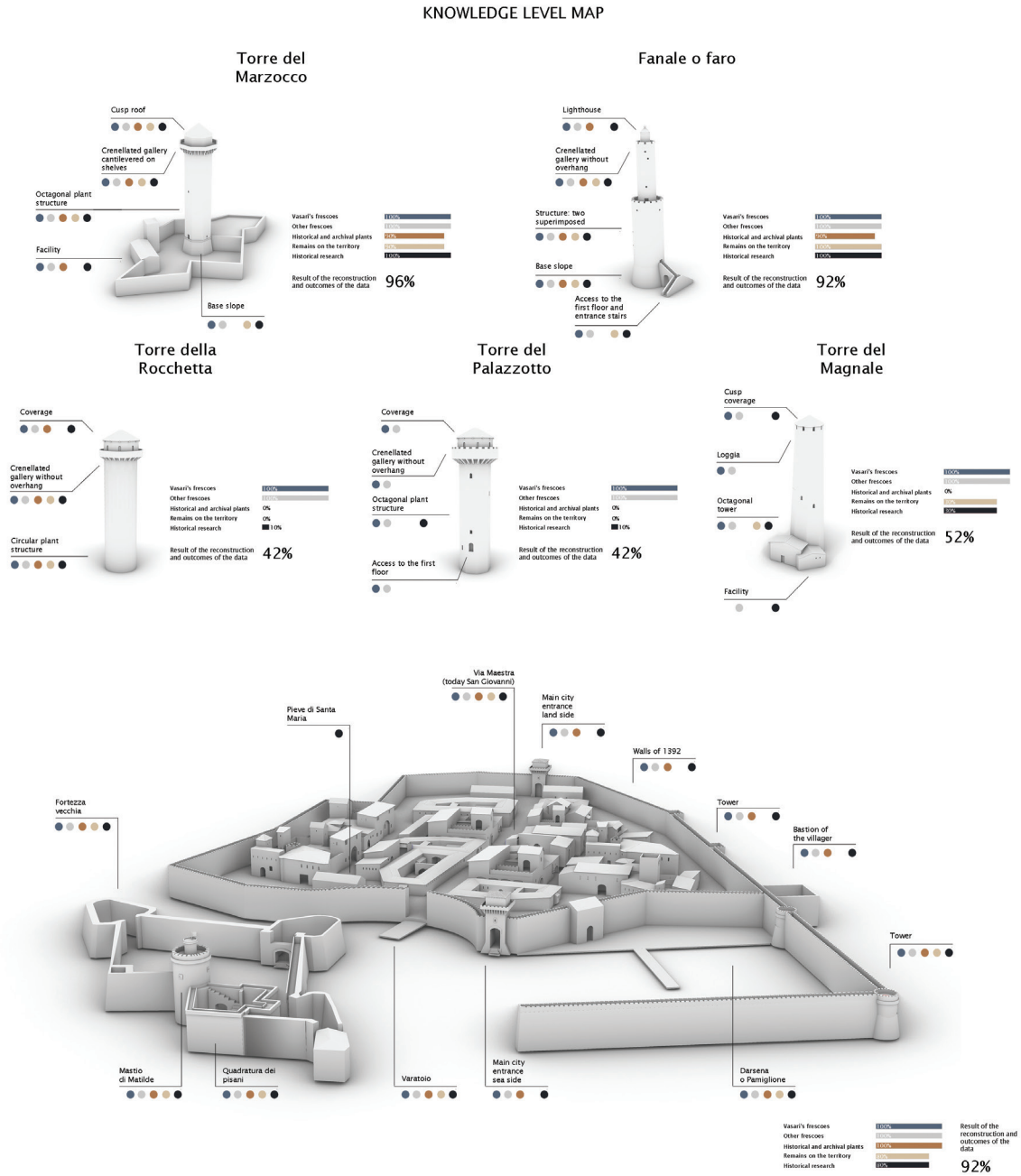


Figure 7. Giulia Emilio, knowledge level map, 3D reconstruction, Livorno.

obtained were synthesised through an original solution, prepared and based on a score that defines the degree of approximation of the results according to a scale of values from zero to one hundred. The sources considered are: consistency of the representation in Vasari's painting, confirmation by other paintings, the remains on the site, archival plans, historical research. If the data is missing, the score obtained is zero, if it is certain the score is one hundred, intermediate values indicate the degree of detail and the certain correspondence between the testimony and its confirmation with the other tests. The reading of the 3D models obtained is easier and more direct, not distorted in interpretation by the simple fact of appearing "resolved". Plus, it clarifies for each reconstructed element which sources have been taken into consideration, and what percentage these have influenced the choices. This is because it has not always been possible to find all the sources of the information necessary for the 3D reconstruction. For San Vincenzo an optimal source was historical research, for Livorno two other Vasari paintings, preserved in Palazzo Vecchio, concerning the battle were of great help. Finally, it can be concluded that the frescoes in the hall have always been considered in the 3D reconstruction as the main sources for the graphic and architectural choices.
The intention is to correctly classify the level of knowledge achieved, relating to all the structures and, at the same time, underline the transformation of the urban / natural landscape and the level of enhancement (as a state of fact or as a potential) of the built heritage arrived at present day from the late Renaissance scenario.

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