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A Proposal for the Development of a Digital Database of Military Architecture Treatises

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# *Early Modern Age Fortifications*

Knowledge for Management, Conservation and Valorisation

*Marco Giorgio Bevilacqua, Roberta Spallone, Andrea Giordano, Michele Russo (Eds.)*



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MARCO GIORGIO BEVILACQUA, ROBERTA SPALLONE, ANDREA GIORDANO,  
MICHELE RUSSO (EDS.)

EARLY MODERN AGE FORTIFICATIONS.

KNOWLEDGE FOR MANAGEMENT, CONSERVATION AND VALORISATION

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The volume presents the outcomes achieved at the end of the first year in the project 'INFORTREAT. Reconstructing the Early Modern bastioned front. Information models for the fruition of constructive knowledge in FORTified architecture TREATises (16th-18th Century): a new integrated analysis tool for the interpretation, restoration and maintenance of Early Modern fortified heritage', financed by the European Union - Next-GenerationEU - National Recovery and Resilience Plan (NRRP) – MISSION 4 COMPONENT 2, INVESTMENT N. 1.1, CALL PRIN 2022 D.D. 104 02-02-2022 – CUP N. I53D23005420006.

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Martina Casciola

in COPERTINA

Immagine delle mura della Cittadella di Alessandria; in primo piano il baluardo di Santa Cristina.

Foto ed elaborazione di Michele Russo & Martina Casciola.

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# Index

Preface	8
<i>Marco Giorgio Bevilacqua, Roberta Spallone, Andrea Giordano, Michele Russo</i>	
INformation Models for the Fruition of Constructive Knowledge in FORTified Architecture TREATises (16th-18th Century)	13
<i>Marco Giorgio Bevilacqua, Roberta Spallone, Andrea Giordano, Michele Russo</i>	
Digital Tools for the Documentation Fortified Architecture. A Literary Review	20
<i>Giulia Flenghi, Fabrizio Natta</i>	
A Proposal for the Development of a Digital Database of Military Architecture Treatises	29
<i>Valentina Burgassi, Rosa Maria Marta Caruso, Iole Branca, Martino Pavignano, Denise Ulivieri</i>	
The Ontology of the Information Classes for the Knowledge and Modeling of Military Architecture in the Restoration and Maintenance Processes	40
<i>Marco Saccucci, Assunta Pelliccio, Andrea Giordano</i>	
Digital Informative Models of Early Modern Military Architecture Treatises. Methodological Approach and First Results	50
<i>Piergiuseppe Rechichi, Virginia Miele, Enrico Pupi, Fabrizio Natta, Marco Vitali, Roberta Spallone, Marco Giorgio Bevilacqua</i>	
Digital Survey Techniques for the Documentation of Military Architecture. The Case of the Citadel of Alessandria and Santa Croce Bastion of Lucca	72
<i>Michele Russo, Gabriella Caroti, Andrea Piemonte, Edoardo Piccoli, Paolo Bertoncini Sabatini, Martina Casciola</i>	

Restoration and Maintenance Issues for the Early Modern Fortified Heritage <i>Michele Asciutti</i>	81
The Defense Towers of the Coast of The Kingdom of Valencia in the Modern Age <i>Pablo Rodríguez-Navarro, María Teresa Gil Piqueras</i>	92
Beyond the Walls. The Entrenched Camp of Rome, Studies, Surveys, Drawings <i>Giovanna Spadafora</i>	105
The Model of Reality and the Project. Interpretative Aspects for the Restoration of Fortified Structures <i>Bianca Gioia Marino</i>	118
Protection Activities for Cultural Heritage. The Case of the Military Forts in the Entrenched Camp of Rome <i>Elvira Cajano</i>	130



***A Proposal for the Development  
of a Digital Database of  
Military Architecture Treatises***

*Valentina Burgassi, Rosa Maria Marta Caruso, Iole Branca,  
Martino Pavignano, Denise Ulivieri*



## Introduction

The examination of extensive theoretical works on military architecture from the early modern period (16th–18th centuries) has identified several significant contributions that follow a dual approach. On the one hand, there is a body of theoretical literature on fortifications produced by military engineers actively engaged in the field. This literature is predominantly practical and instructional. On the other hand, there exist treatises intended for educational purposes, designed to impart knowledge of modern warfare to engineers in training at military academies through theoretical descriptions and tabulated data. At present, this rich textual and visual heritage remains largely inaccessible to nonspecialist audience. A comprehensive bibliographical survey has underscored this gap in both Italian and international scholarship. The primary objective of the PRIN 2022 INFORTREAT project is to render this valuable body of knowledge more widely accessible (Fig. 1).

A detailed analysis of construction knowledge in military architecture, as presented in key treatises of the early modern period, was essential to achieving this objective. Given the extensive range of available treatises, the research team conducted an initial historical-critical review, selecting approximately thirty works that played a pivotal role in disseminating the knowledge required by military architecture professionals between the 16th and 18th centuries (Fig. 2). The selection criteria for these treatises were primarily based on their recognised significance, the inclusion of geometric delineation principles applicable to defence, structural design, and references to construction techniques. A digital infrastructure was designed to store relevant information for the INFORTREAT project, in order to systematically analyse the selected treatises. To this end, a database was designed to accommodate the collected data, which was standardised through the creation of structured records that facilitated the comparative critical analysis of the treatises. The digital database could be populated through two methods: by uploading information via a predefined online form that generated a summary sheet or by entering structured data into an extended sheet (Fig. 3).

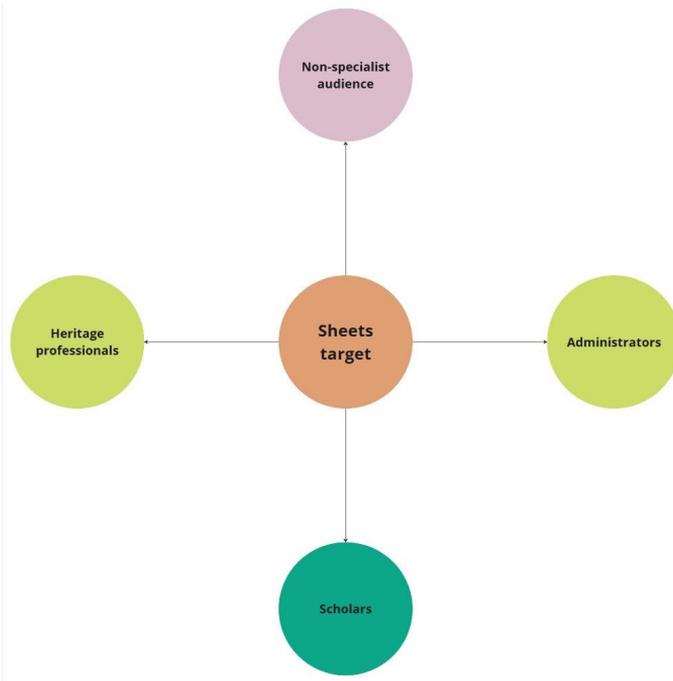


Fig. 1 - Representative outline of the target users of the realised critical sheets constituting the database. By IB

Both databases and index cards were developed as tools for collecting and organising the contents of the analysed treatises.

1554 Cataneo	1564 Maggi. Castriotto	1570 Alghisi	1598 Belluzzi	1599 de Marchi	1601 Lanteri Zanchi Lupicini	1609 Lorini	1628 de Ville	1630 Tensini
1635 Freitag	1654 Floriani	1661 Ruggiero	1668 Pagan	1674 du Breuil	1676 Guarini	1676 Porrioni	1677 Milliet de Chales	1689 Bernard
1654 <i>Escuela de palas</i>	1706 Coehoorn	1707 Sesti	1729 Vauban- Béldor	1735 Medrano	1737- 1742 Vauban	1759- 1782 Papacino d'Antoni	.... ...	.... ...

Fig. 2 - Data collection: some of the analyzed treatises (Source: MP).

These tools enabled the extraction of specific information from each work, thereby facilitating comparative analyses and improving accessibility for nonspecialist audience.

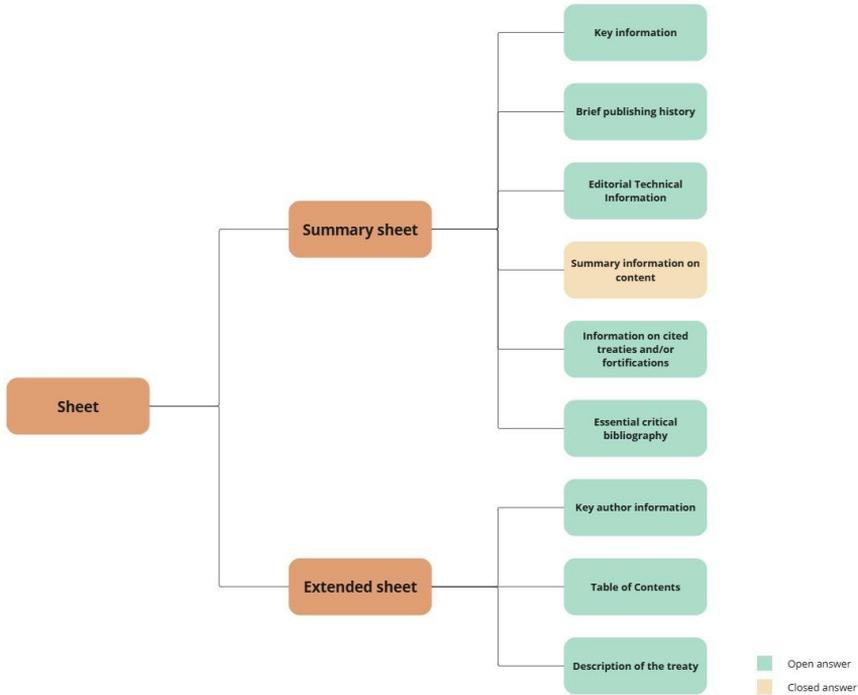


Fig. 3 - Structure of the internal subdivision of the sheet and the sections that can be filled in a closed or open form. Source: IB

## The Methodological Approach

The first section, the ‘summary sheet,’ presents key information about the treatise, including the author’s name, title of the work, publisher, and place of printing, year of publication, location of the analysed copy, and a link to the consulted resource for fully digitised works (Fig. 4). To ensure consistency and ease of consultation, a standardised reference format has been adopted, structured as ‘Author’s surname\_ Abbreviated title of the work.’

The remaining fields accurately reflect information related to the treatise. A brief publishing history follows, providing context regarding the treatise's original publication and its subsequent circulation, based on the number of editions. This circulation may have been limited to a specific geographical area or extended to multiple contexts. Additionally, the 'summary sheet' offers a concise description of the volume's specifications, including the number of pages, the count of in-text and out-of-text illustrations, as well as details on its format and printing techniques. Subsequent fields allow for the entry of structured responses, including keywords and closed-response (Yes/No) answers. These fields pertain to the units of measurement identified and the content of the work. When compiled systematically, this information facilitates efficient data collection and enables comparative analyses between treatises with similar content. Additionally, the structured entries contribute to the development of a glossary of military architecture.

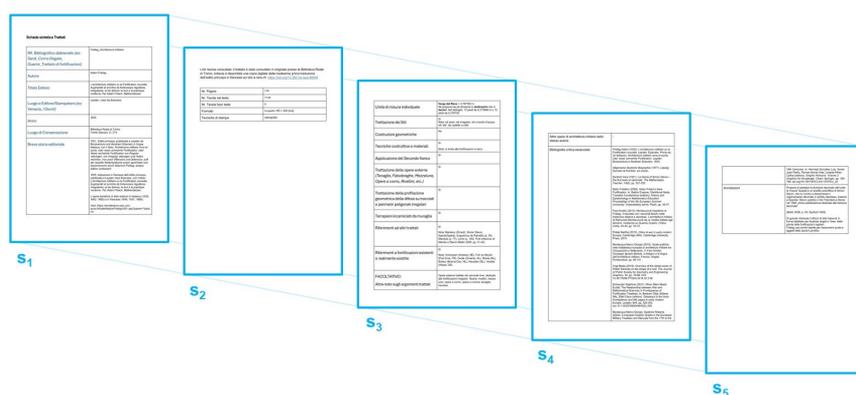


Fig. 4 - Digital database: a summary sheet provides synthetic classification of encoded information. This file collects only textual data, as shown in Freitag 1635 (Source: MP).

For research purposes, it is particularly relevant to determine whether the treatise discusses specific topics such as site treatment, geometric constructions, construction techniques, the application of the second flank, and external defensive works (including tenaglie, falsebraghe, opere a corno, and rivellini), as well as the description of fortifications with embankments encased by walls.

Furthermore, references to other treatises or existing fortifications provide additional context regarding the author's background, influences, and potential intellectual connections.

A critical bibliography related to the respective treatise can be added at the end of each 'summary sheet.' This is essential not only for providing an overview of the studies of Italian and international scholarship on individual works but also for expanding the bibliographic record of military treatises, which constitutes an additional objective of the research project.

The second section of the sheet is dedicated to the 'extended sheet,' which provides a detailed description of the treatise (Fig. 5).

Rather than summarising its contents, this section serves as a descriptive annex to the work. It begins with a bibliographical note and a presentation of the index, offering the reader — or anyone accessing the database — a critical overview of the treatise's contents.

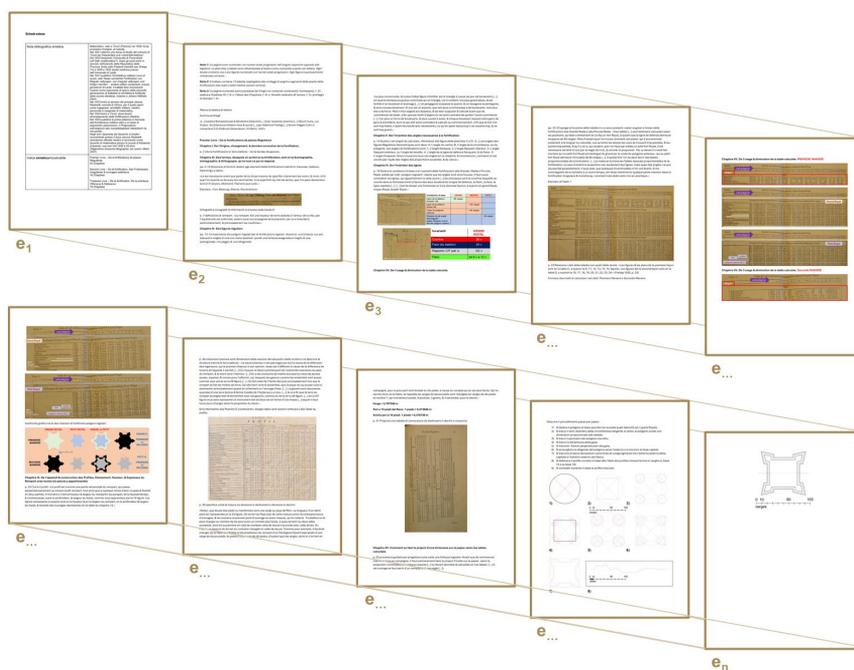


Fig. 5 - Digital database: an extended sheet provides the analytical description and the critical interpretation of the treatise. This file collects both textual and visual data, as shown in the example of Freitag 1635 (Source: MP) images from Freitag 1635 (BRT0, Saluzzo D. 274, details of plate C, tables I, V and du profil, p. 31. MiBACT - Musei Reali).

This section juxtaposes descriptions with tables and highlights the most significant aspects of the work, taking into account the multidisciplinary objectives of the research project. Particular emphasis is placed on the graphic analysis of the illustrations within the treatises, employing critical interpretive methods to explore the languages and conventions of representation. This approach enhances the understanding of visual materials, shedding light on their role in conveying technical knowledge within the context of early modern military architecture.

## *Results and Discussion*

The constructed digital database compiles critical sheets on the analysed treatises, which are accessible in both summary and extended sheets. The summary sheet facilitates the synthesis of information from various treatises by presenting it in the form of keywords. During the initial phase of database development, these keywords were standardised through an iterative process to enable more efficient comparisons between different treatises and to enhance research by subject, date, and author. Additionally, the use of closed-ended responses for specific fields streamlined the completion of forms while ensuring the inclusion of key comparative data, which were designated as mandatory fields. Furthermore, the creation of a more detailed form for each work allows for greater flexibility in critical analysis and accommodates the inclusion of graphic elements, which are integral to the treatises and essential for interpreting the written content.

The database aims to advance the understanding of the geometric profiling of fortress defences, a fundamental aspect of early modern military strategy. This objective is pursued both theoretically and practically through the examination of example sites. Particular attention has been given to identifying graphic scales, geometric constructions applied to both regular and irregular fortification profiles, and references to existing sites within fortification systems, with a specific focus on the application of the second flank.

Where available, relevant graphical representations of these elements have been included, accompanied by appropriate legends or captions. Additional objectives include the systematic description of fortress components to develop a glossary of key architectural elements. External works and related defensive structures have been recorded for each fortification, as they provide essential information for defining and reconstructing fortification systems (Fig. 6).

Moreover, the database places significant emphasis on technical and construction-related details, not only for educational purposes but also through references to both theoretical principles and existing fortifications.

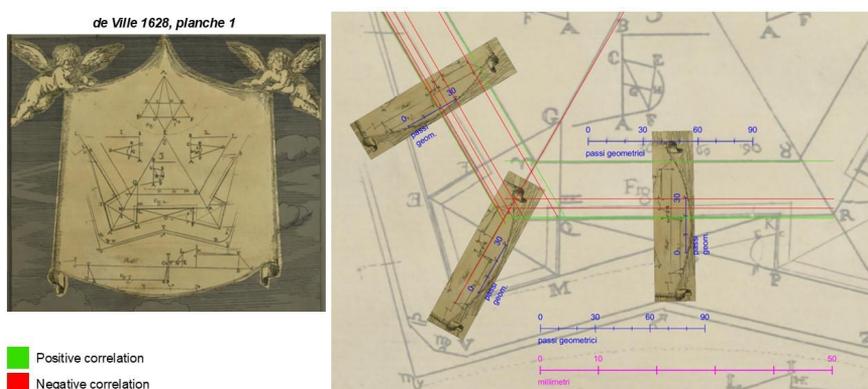


Fig. 6 - Digital database: the extended sheet also collects critical interpretation of each treatise, as shown in the example of the design of the regular hexagon by de Ville 1628 (Source: MP) images from De Ville 1628 (BRT0, Saluzzo F. 171, details of plate 1. MiBACT - Musei Reali).

The primary goal of the database is to create a freely searchable anthology of fortress elements. In addition, it aims to develop a comprehensive knowledge base encompassing geometric constructions, structural components, construction techniques, and references to historical sites. Through the meticulous collection and critical organisation of this information, the project lays the groundwork for the future development of three-dimensional digital models of fortifications. Furthermore, the database serves as an extensive resource for conducting in-depth analyses of treatises, authors, and referenced sites, making it a valuable tool for searching, consulting, cross-referencing, and comparing information efficiently.

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