MAJOR POINTS OF EXTENSION

The numbering refers to sections and subsections of the new version of the paper.

ABSTRACT

The abstract has been modified.

1. INTRODUCTION

A comprehensive bibliographic analysis (Masonry churches diagnostics, Analytic Hierarchy Process, Decision Support System) has been included.

2. AHP APPLICATION

2.1. Step 1: the problem of the masonry damages and quality

The third macro-criterion has been added to take the state of conservation of Wood Floor into account (improved version of Figure 2).

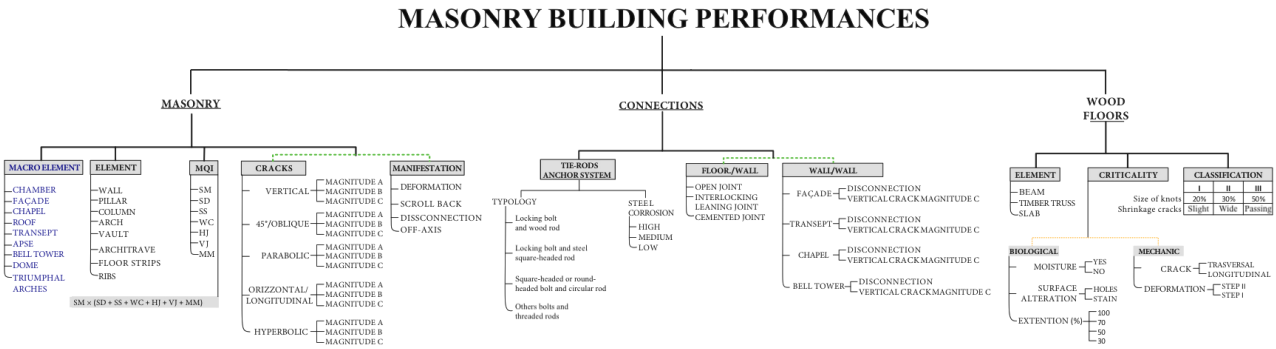


Fig.2. Structure of the Problem: Masonry diagnostics

2.2. Step 2: weight evaluation

The example of the Tie Rods (Figure 3) study has been showed to better explain the qualitative analysis to achieve the judgment matrix and extract the tabulated weights.

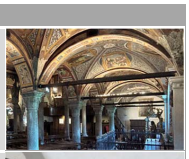
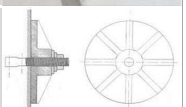
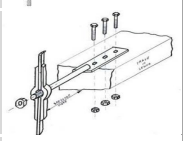
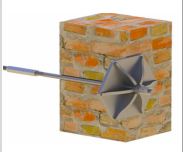
Tie Rods evolution over time		
Before 1500 A.D.	–Wood Tie-rods; –Strong aesthetic impact; –High weight; –Problems related to the degradation both of wood and steel; –Locking bolt.	
Between 1500 and 1700 A.D.	–Steel Tie-rods; –Locking bolt; –Clamping techniques not very effective.	
Between 1800 and 1900 A.D.	–Advanced clamping systems; –Static or aesthetic needs; –Stiffening ribs; –Multiple threaded and tensioned rods; –Square-headed or round-headed bolt.	
	–Bilateral connection on the wooden beams; –Bolted systems.	
After 1900 A.D.	–Advanced clamping systems; –Static or aesthetic needs; –Corrosion protection by austenitic or duplex steels; –Polymeric sheath inside between steel and masonry to avoid direct contact; –Remaining voids filled by injection of resins; –Chain joining via sleeve for threaded junction, clamped, clamped, bolted or grooved; –Bars equipped with threaded ends for clamping;	

Fig. 3. Study of the Tie Rods evolution over time.

3. INTEGRATION OF THE AHP-BASED APPROACH IN A DSS

A novel section has been developed to explain the integration of the AHP-based approach in a DSS (including novel Figure 4 and Figure 6)

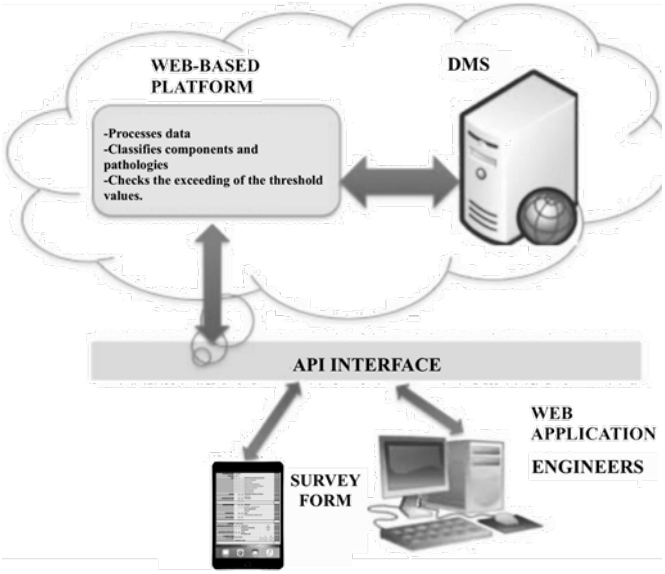


Figure 4. Components of the DSS Architecture.

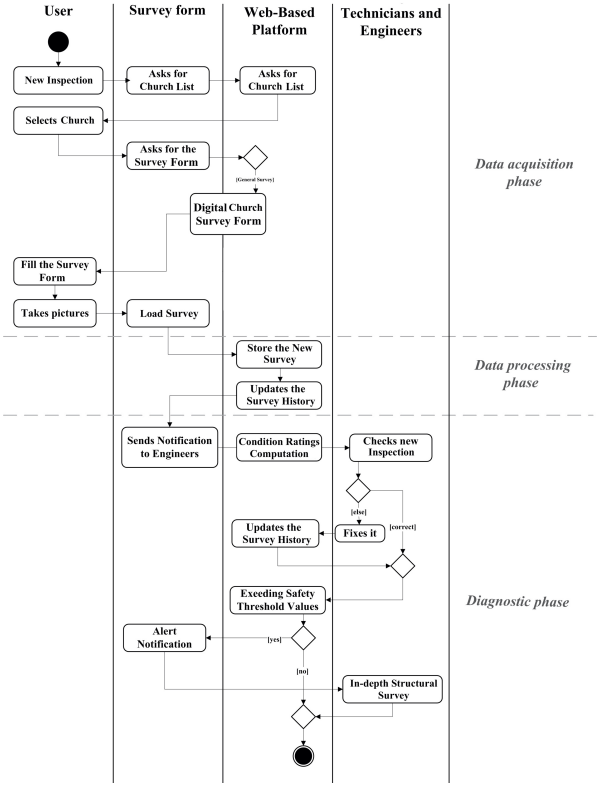
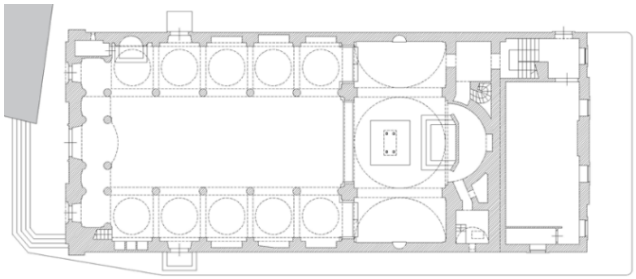


Figure 6. Components of the DSS Architecture.

4. CASE STUDY

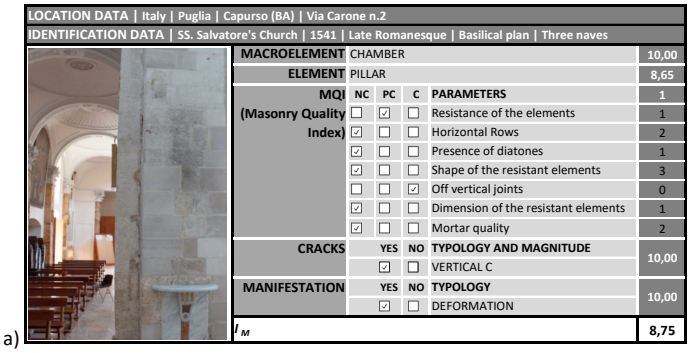
The text has been modified and enriched with more representative images (Figure 7a,b; Figure 8a,b; Figure 9)

a)



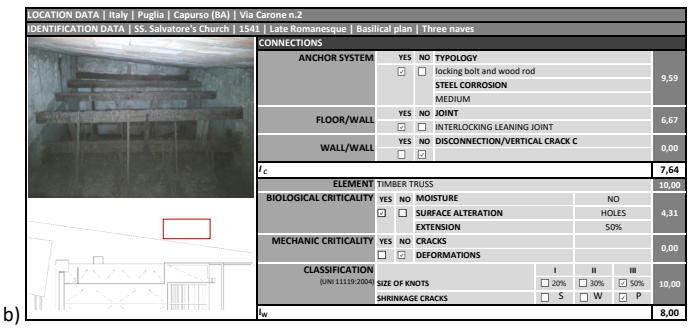
b)

Figure 1. “SS. Salvatore’s” church: a) principal façade; b) church’s plan



LOCATION DATA | Italy | Puglia | Capurso (BA) | Via Carone n.2					
IDENTIFICATION DATA | SS. Salvatore's Church | 1541 | Late Romanesque | Basilical plan | Three naves					
MACROELEMENT	CHAMBER				10,00
ELEMENT	PILLAR				8,65
MQI (Masonry Quality Index)	NC	PC	C	PARAMETERS	1
	☐	☑	☐	Resistance of the elements	1
	☑	☐	☐	Horizontal Rows	2
	☑	☐	☐	Presence of diatones	1
	☑	☐	☐	Shape of the resistant elements	3
	☐	☐	☑	Off vertical joints	0
	☑	☐	☐	Dimension of the resistant elements	1
	☑	☐	☐	Mortar quality	2
CRACKS	YES	NO	TYPOLOGY AND MAGNITUDE		10,00
	☑	☐	VERTICAL C		
MANIFESTATION	YES	NO	TYPOLOGY		10,00
	☑	☐	DEFORMATION		
I_M					8,75

a)



LOCATION DATA | Italy | Puglia | Capurso (BA) | Via Carone n.2				
IDENTIFICATION DATA | SS. Salvatore's Church | 1541 | Late Romanesque | Basilical plan | Three naves				
CONNECTIONS				
ANCHOR SYSTEM	YES	NO	TYPOLOGY	9,59
	☑	☐	locking bolt and wood rod	
			STEEL CORROSION	
			MEDIUM	
FLOOR/WALL	YES	NO	JOINT	6,67
	☑	☐	INTERLOCKING LEANING JOINT	
WALL/WALL	YES	NO	DISCONNECTION/VERTICAL CRACK C	0,00
	☐	☑		
I_c				7,64
ELEMENT	TIMBER TRUSS			10,00
BIOLOGICAL CRITICALITY	YES	NO	MOISTURE	NO	4,31
	☑	☐	SURFACE ALTERATION	HOLES	
			EXTENSION	50%	
MECHANIC CRITICALITY	YES	NO	CRACKS		0,00
	☐	☑	DEFORMATIONS		
CLASSIFICATION (UNI 11119:2004)			I	II	III	10,00
	SIZE OF KNOTS		☐ 20%	☐ 30%	☑ 50%	
	SHRINKAGE CRACKS		☐ S	☐ W	☑ P	
I_w						8,00

b)

Figure 2. Survey forms: a) damaged Pillar; b) damaged connection system.

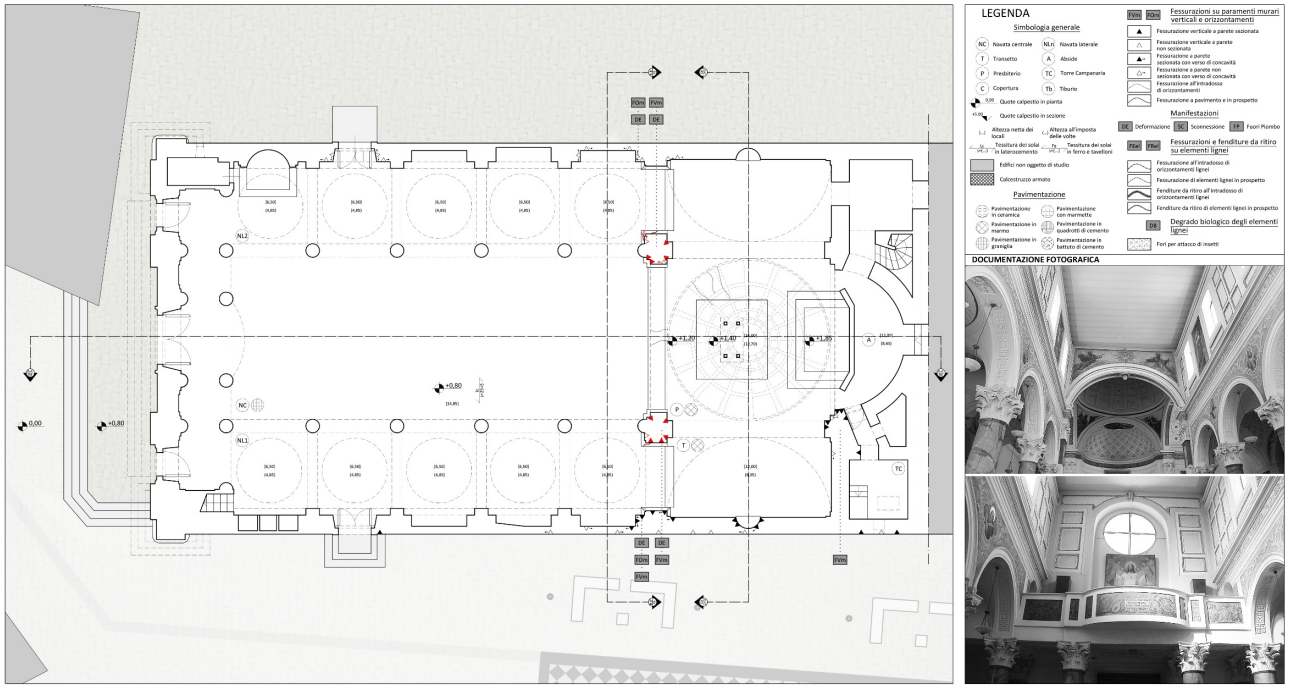


Figure 3. Technical drawing by specialists with damages representation

5. CONCLUSION

Novel conclusions have been added.

REFERENCES

30 references have been added.