

## **CHAPTER 2**





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## THE AHP APPROACH TO EVALUATION OF CULTURAL HERITAGE IN SREDAČKA ŽUPA: THE CASE OF MUŠNIKOVO VILLAGE

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**Summary:** The aim of this paper is to emphasize the importance of cultural heritage in the region of Mušnikovo village (Prizren) using the Analytic Hierarchy Process, considering sacred criteria, location parameters and the process of digitalization of two 16th century orthodox churches. As the most important criteria, exceptional quality from the artistic aspect of frescoes, the medium distance from the high-ranking road, and completely performed digitalization stand out. In order to preserve the Orthodox heritage in these difficult times, significant work should be done on the restoration of churches, removal of the effects of moisture and the ravages of time, as well as media coverage of buildings, a greater degree of digitization and digital promotion.

**Key words:** *Cultural heritage, Prizren, church, Analytic hierarchy process*

JEL classification: [http://www.aeaweb.org/jel/jel\\_class\\_system.php](http://www.aeaweb.org/jel/jel_class_system.php)

### 1. Introduction

All the heritage of past generations, material, and immaterial things of special cultural, artistic, scientific or historical importance represent the cultural heritage, the wealth of a nation, its inspiration and the center of identity for future

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generations. Physical objects, buildings and monuments, archaeological sites and works of art bear witness to the history, traditions and beliefs of a certain time period, representing tangible cultural heritage, while oral traditions, traditional stories and poems, customs, the language, music, folk dances and religious ceremonies constitute intangible heritage. Churches, as a combination of religion, art, architecture and history, are a true jewel that shows the richness of every nation. Artworks in churches: frescoes, icons, stained glass and mosaics depicting saints, angels and other religious motifs are an important part of cultural heritage. Apart from prayers and religious services, churches can often be places of preservation of traditions, customs and culture, so it is extremely important to constantly invest efforts in their preservation, protection and restoration. Digitization of religious buildings would certainly help in promoting cultural tourism, which with increasing development in recent years plays an important role in maintaining churches, because visitors enjoy their beauty and history (Sančanin, B. 2019). One of the ways to bring cultural heritage closer to the larger masses of the people is to define criteria that more closely determine the elements of heritage and their possible ranking, which can be achieved by using the Analytic hierarchy process.

## 2. Historical background

In the south of Metohija, in the basin, lies one of the most beautiful cities, *a crossroads*, the capital of Emperor Dušan. Divided by Bistrica into two parts and located between the mountains of Šara, Ošljak, Paštrik and Koritnik, and the Cvilen hill, with the altitude no higher than 500 m, Prizren, first mentioned in the Charter of Emperor Vasilij in 1019, amazes with its wealth, a multitude of cultural and historical monuments, a wonderful river bank and an enchanting view from the Kaljaja fortress. The most important Orthodox monuments are the Church of the Holy Virgin Ljeviška, an endowment of King Milutin and the Monastery of the Holy Archangels, an endowment of Emperor Dušan, both from the 14<sup>th</sup> century. The church of St. George, the Church of Holly Saviour, the Church of St. Nicholas, and many churches and monasteries around the town stand out for their beauty and monumentality (Timotijević, 2015).

## **2.1 Sredačka Župa**

Not far from Prizren, on the eastern side, in the upper reaches of the Bistrica river, named after the central village that belongs to it, is Sredačka (Sretečka) župa. The first mentions of this parish can be found in the chrysobulls of kings Dragutin and Milutin from the 13<sup>th</sup> century and Emperor Dušan from the 14<sup>th</sup> century. In the Middle Ages, all the villages of this parish, depending on the ruler, belonged to the Hilandar Monastery complex or the Holy Archangels Monastery. This is evidenced by the names of one of the villages and places: Manastirica (contains the word 'monastery'), Kraljev dvor (literal translation 'King's Court'), and Kaluđerica (literal translation 'nun'). Elliptical in shape, about 17 km long, about 2 km wide and about 1000 m above sea level, the parish consists of 13 villages distributed as follows: Rečane, Sredska, Mušnikovo and Gornje selo are in the Bistrica valley, Lokvica, Stružje, Manastirica, Nebregošte, Gornje Ljubinje, Donje Ljubinje and Drajkiki are on the left side, while Planjane and Živiniane are on the right side. The wealth of this region is the multitude of pastures and forests that make up about 80% of the territory and the abundance of water in all seasons, as the snowfields of the Šar Mountains feed numerous springs, streams and rivers with water. Jovan Cvijić was involved in the study of this region, as far as the situation allowed him, and based on his tables, it can be concluded that the parish is a geographical, ethnographic, and almost linguistic unit (Tanasković, 1992).

## **2.2 Orthodox churches in Mušnikovo village**

On the elevation called Ravnjište, from which Ošljak can be seen and even the still snowy Šar Mountains in summer, the Church of the Holy Apostles Peter and Paul was built on the old foundations. According to the old narrative, the original church was built in the 14<sup>th</sup> century on the same spot, but was demolished by the Turks. The single-nave rectangular building with a semicircular inner apse was built in 1564. This is evidenced by the inscription in the Table of Oblation: "By the will of the son, with the help of the holy spirit, this divine temple was built with the effort and with the help of the Holy Apostles Peter and Paul in the year of 7072" (Jastrebov, 1882).

**Picture 1.** The Church of the Holy Apostles Peter and Paul, Mušnikovo



Source: Authors (2023)

Through three small windows, sun rays illuminate the God's table made of stone and two side niches, while there is an arched door with a lunette opposite the altar on the rectangular porch added in 1920. In the restoration of 1866, the western wall was demolished, the nave was expanded by the thickness of the wall, and extended to the west, and the façade got an overhanging, stepped gable instead of a triangular gable (Lukić, 1968-1971). According to art historian Predrag Pajkić (1956), "The Church of St. Peter and Paul in Mušnikovo differs considerably in its artistic qualities from the series of village churches that were built after the restoration of the Patriarchate of Peć. It is assumed that perhaps the Patriarch Makarije Sokolović himself or someone from his circle was the founder of this church, because the fact is that, after only three years of work on the narthex of the Patriarchate of Peć, and seven since its renovation, solid artistic creations appeared in Mušnikovo." The church was most likely painted by painters of the Italo-Cretan school at the end of the 16<sup>th</sup> century, and only a small part of the original fresco painting has been preserved.

**Picture 2.** The fresco *Apostles Peter and Paul*, The Church of the Holy Apostles Peter and Paul, Mušnikovo



Source: Authors (2023)

The apostles Peter and Paul were painted on the south wall, embracing, facing each other, with their arms crossed over their shoulders. Paul was represented as a thin, old man with an elongated face dressed in a red chiton and a blue cloak, while Peter was depicted as an old man with gray hair, dressed in a blue dress and a shouldered cloak (Picture 2). This fresco shows the talent and skill of medieval painters.

**Picture 3.** The fresco *Saint Theodor*,  
The Church of the Holy Apostles Peter and Paul, Mušnikovo



Source: Authors (2023)

*Saint Theodore* (Picture 3) was also painted on the same wall. The frescoes of *Virgin Mary More Spacious than the Heavens* (Picture 4), *The Adoration* and *The Annunciation and The Four Archbishops from the Adoration of Agnes* have also been preserved.

**Picture 4.** The fresco *Virgin Mary More Spacious than the Heavens*,  
The Church of the Holy Apostles Peter and Paul, Mušnikovo



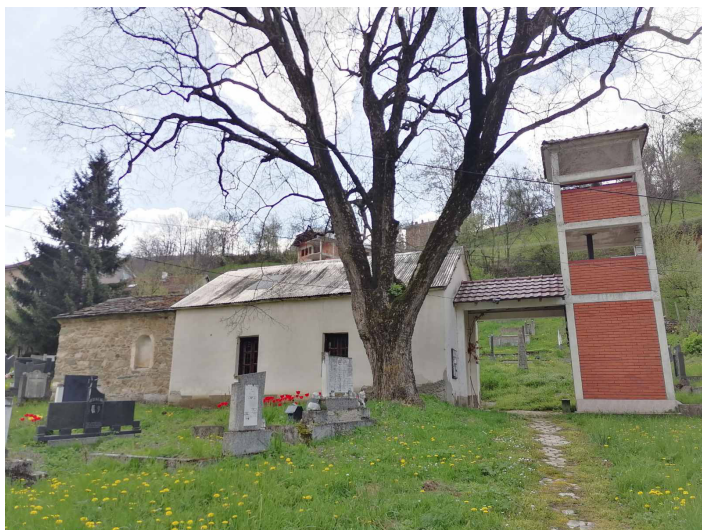
Source: Authors (2023)



The church was declared a cultural asset of national importance by the decision of the Institute for the Protection and Scientific Study of Cultural Monuments AKMO in Priština, number 508 of 20<sup>th</sup> December 1956. In 2022, drainage and waterproofing were carried out, new stone slabs were installed on the roof and the sidewalk was paved. To the west of the church, there is a bell tower, which was probably built by the locals at the end of the 19<sup>th</sup> century. The bell weighs 560 kg and, on its side around the coat of arms of the Kingdom of Serbia, there is the inscription: "Balkan Foundry-Belgrade, to the Church-Temple of St. Petka in Mušnikovo, Prizren, pledges this bell with voluntary contributions. Thank you, contributors. 10<sup>th</sup> August 1880" (Slavković S. & Slavković, D. 2015). Since the belfry is not under the protection of the state, it is more susceptible to the ravages of time, so, at the time of writing this paper, it is being restored thanks to the voluntary contributions of the locals. Since the last large exodus of the Orthodox population of the village in the summer of 1999, Slavka Ugrinović took care of the church until her death. Now Snežana and Slavoljub Slavković take care of the church.

The second church in the village was built for the protector of children, the poor, travelers, crops and fields. It is assumed that this single-nave building with a three-sided apse on the outside and a later added narthex dedicated to St. Nicholas (Picture 5) was built and painted in the second half of the 16<sup>th</sup> century, a decade or two after the construction of the church of St. Peter and Paul (Đokić, N. & Nadoveza. 2019).

**Picture 5.** The Saint Nicholas church, Mušnikovo



Source: Authors (2023)

It is built of pressed stone and covered with a gable roof made of stone slabs. From the contributions of the locals themselves, the church was built by craftsmen from the village, whose names can be seen in the name list in the church's Table of Oblation. The frescoes were the work of the monks of the Prizren icon painting workshop and have been well preserved, although they have suffered to a significant extent from moisture (Picture 6). Following the established patterns in the area of Metohija, there are frescoes of Saint Sava and Saint Simeon, Saint Stephen, Saint Roman, Saint Nicholas, Saint Constantine and Empress Helena.

**Picture 6.** Some frescos from the St. Nicholas church, Mušnjikovo



Source: Author (2023)

In the narthex of the church, there were, as exhibits, a metal rattle and a hammer, which, ten years ago, and almost half a century after the construction of the church, thanks to Veselin Todorović and many donors, were replaced by a belfry. Bishop Atanasije Jevtić donated the bell (Slavković S. & Slavković, D. 2015). Stana Todorović currently takes care of the church. A priest from Prizren, Jovan Radić, performs the service on major holidays in both churches in the village.

You can find out more about medieval monasteries in Metohija from (Šuput M. 1991, Jastrebov, I. 1904, 1995, Pajkić, P. 1958, Novakov, 2019).

### **3. The AHP related cultural heritage criteria and sub-criteria**

In this section we firstly give a short overview of the application of the AHP and some of its generalizations. Afterwards we will identify the main criteria and related sub-criteria affecting two churches described in the previous section.

#### **3.1. Literature overview**

The AHP, as a multi-criteria decision-making approach, is greatly important in assessing and prioritizing various alternatives based on multiple criteria. From the architectural point of view, AHP models find application in supporting diverse design decisions, including selecting the optimal site, choosing suitable materials, optimizing spatial layouts, and evaluating a building's environmental performance (Peng, L. 2023). Similar methods are also used in developing weighting system for refurbishment building assessment scheme (Kamaruzzaman et al. 2018), architectural design quality evaluation (Canan, F. & Varolgüneş, 2018), cultural heritage fire protection (Naziris et al. 2022). Also, AHP integrated model is used for the evaluation and choice of integrated interventions on historic buildings (Fiore, P et al. 2020), in the energetic rehabilitation of historical buildings (Gigliarelli, E. et al. 2011), in protection of cultural heritage buildings and artistic assets from seismic hazard (D'Alpaos, C., & Valluzzi, M. R, 2020) and in sustainable management for the architectural heritage in smart cities (Milošević, M. et al. 2021). AHP and its generalizations are also applied in e-commerce-paper (Simjanović et al. 2022) and in smart city papers (Simjanović et al. 2022, Simjanović et al. 2023), Based on the ideas presented in (Sančanin et al. 2019) and (Sančanin et al 2023), Analytic hierarchy process could be applied in city tourism area.

#### **3.2. Main criteria for cultural heritage**

In this section we have identified three major criteria with corresponding sub-criteria for the cultural heritage in the Mušnikovo village. Four experts from the fields church affairs, architecture, art history and management and IT sector have acknowledged all sub-criteria and in consensus with the authors gave their ranking. The summary of each criteria, and sub-criteria are given below.

X1 – Sacred criteria

X11 – The artistic quality of the frescoes

- X111 – Exceptional quality
- X112 – Excellent quality
- X113 – Very good quality
- X114 – Mediocre quality

X12 – The degree of coverage of the walls with frescoes

- X121 – 90%-100%
- X122 – 70%-89%
- X123 – 50%-69%
- X124 – 30%-49%
- X125 – less than 30%

X13 – The degree of preservation of the frescoes

X131 – 90%-100%

- X132 – 70%-89%
- X133 – 50%-69%
- X134 – 30%-49%
- X135 – less than 30%

X2 – Location parameters

X21 – The distance from a high-ranking road

- X211 – less than 200 m
- X212 – 200m-350m
- X213 – more than 350 m

X22 – Belonging free area

- X221 – less than 20% P
- X222 – 20%-50% P
- X223 – more than 50% P,

Where P represents projected free surface

X23 – Facility access number

- X231 – one access
- X232 – two accesses
- X233 – more than two accesses

X3 – Digitalization

- X31 – completely performed
- X32 – performed for the most part
- X33 – performed no more than half
- X34 – performed little or nothing

## 4. Methodology

The creation of Thomas L. Saaty from the 1980s, the Analytic hierarchy process (AHP), (Saaty, 1980) has been proven as an effective tool at the hands of researchers, describing comparison estimates by natural numbers. This method, being one of the known multi-criteria decision-making methods, has been widely applied in all branches. The AHP method is based on the following axioms presented in Figure 1:

**Figure 1.** Axioms of the Analytic hierarchy process

<b>Reciprocity axiom:</b>	If the element A is $n$ times more significant than the element B, then the element B is $1/n$ times more significant than the element A.
<b>Homogeneity axiom:</b>	The elements should be comparable, otherwise comparison makes no sense.
<b>Dependency axiom:</b>	Allows the comparison among the group of elements of one level in relation to the element of a higher level, i.e., comparisons at lower levels depend on the elements of a higher level.
<b>Axiom of expectations:</b>	Any change in the structure of the hierarchy demands recalculating priorities in the new hierarchy.

Source: Authors, adopted from (Milošević et al., 2020)

The steps of the AHP method are listed below:

- Step 1: Defining the main goal.
- Step 2: Defining the criteria and sub-criteria.
- Step 3: Creating a hierarchical structure.
- Step 4: Conducting pairwise comparisons.
- Step 5: Choosing the best sub-criteria/alternative.

This method is characterized by definition of best assessment for collide criteria, sub-criteria, and alternatives, combining and coordinating logic and intuition and enabling the decomposition of complex problem into multiple hierarchy. The main goal, placed at the top of the hierarchy, is followed by criteria and sub-criteria in the top-down direction making comparisons between two elements at the same level of the hierarchy, with respect to their influence at a higher level. Conducting these comparisons of the elements in pairs with a total of  $n(n - 1)/2$  comparisons, a square matrix  $A = (a_{ij})_{n \times n}$  is created, illustrating how changes in one criterion can influence others. Increasing the number of criteria causes the enlargement of the problem complexity. Since comparing more than seven

objects at the same time is not always practical (Pamučar et. al, 2011), Saaty defined (Saaty & Vargas, 2001, Saaty, 2008) the appropriate scale of 17 discrete values symmetric to 1 with a lowest value 1/9 and a highest value 9. Except for this scale  $\{9, 8, 7, 6, 5, 4, 3, 2, 1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}\}$ , there is also properly distributed scale  $\{9, \frac{9}{2}, \frac{9}{3}, \frac{9}{4}, \frac{9}{5}, \frac{9}{6}, \frac{9}{7}, \frac{9}{8}, 1, \frac{8}{9}, \frac{7}{9}, \frac{6}{9}, \frac{5}{9}, \frac{4}{9}, \frac{3}{9}, \frac{2}{9}, \frac{1}{9}\}$  proposed by Ma and Zeng.

The priority between criteria can be defined and explained using natural numbers as follows:

- 1 = Equal importance (Two activities contribute equally to the objective)
- 3 = Moderate importance (Experience and judgment slightly favor one activity over another)
- 5 = Strong importance (Experience and judgment strongly favor one activity over another)
- 7 = Very strong or demonstrated importance (An activity is favored very strongly over another, its dominance demonstrated in practice)
- 9 = Extreme importance (The evidence favoring one activity over another is of the highest possible order of affirmation)
- 2,4,6,8 = Represent intermediate values (Requires compromise or further division)

Consistency of the estimates obtained by decision-makers subjective assessments should be under constant review to maintain mandatory precision. For matrix  $A$  the consistency index  $CI$  and consistency ratio  $CR$  are calculated using formulas  $CI = \frac{\lambda_{max} - n}{n - 1}$ ,  $CR = \frac{CI}{RI}$ , where  $\lambda_{max}$  represents the maximal eigenvalue of matrices  $A$ , and  $RI$  is a known random index. In our case, since we will have matrices no more than dimension 5,  $RI$  values could be represent as  $RI = \{(three, 0.58), (four, 0.9), (five, 1.12)\}$ . If the comparison matrices hold  $CR < 0.1$ , the relative importance of criteria are acceptable. Otherwise, one must find the reasons why the inconsistency of the assessment is unacceptably high, remove them by partial repetition of the comparison in pairs, and if the degree of consistency does not obey tolerable limits, repeat the whole process.

## 5. Results and discussion

We firstly discuss the main criteria ranking, for the AHP method applied. Afterwards we rank individual sub-criteria and give their local and global weights.

We have calculated comparison matrix and weights for the three main groups of criteria and since  $CI = 0.004604333$  and  $CR = 0.007938506 < 0.1$ , the matrix is consistent. In addition,  $\lambda_{max} = 3.009208667$ .

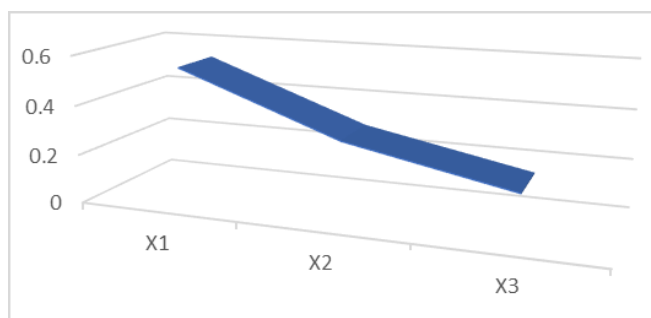
**Table 1.** Comparison matrix for main criteria

Criteria	X1	X2	X3
X1	1	2	3
X2	1/2	1	2
X3	1/3	1/2	1

Source: Authors (2023)

The weights of the main criteria are represented in Figure 2 below.

**Figure 2.** The weights of the main criteria



Source: Authors (2023)

In the sequel we present the results for the comparison matrices of the criteria X1, and sub-criteria X11-X13.

**Table 2.** Comparison matrix for criteria X1 and weights (CR= 0.033374725)

X1	X11	X12	X13	Weights
X11	1	3	5	0.633346
X12	1/3	1	3	0.260498
X13	1/5	1/3	1	0.106156

Source: Authors (2023)

**Table 3.** Comparison matrix for sub-criteria X11 and weights (CR= 0.011496112)

X11	X111	X112	X113	X114	Weights
X111	1	2	3	4	0.465819
X112	1/2	1	2	3	0.27714
X113	1/3	1/2	1	2	0.16107
X114	1/4	1/3	1/2	1	0.09597

Source: Authors (2023)

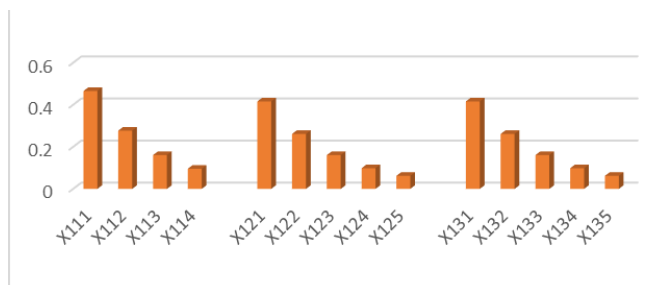
**Table 4.** Comparison matrix for sub-criteria X12 and weights (CR= 0.015251)

X12	X121	X122	X123	X124	X125	Weights
X121	1	2	3	4	5	0.416212
X122	1/2	1	2	3	4	0.261788
X123	1/3	1/2	1	2	3	0.16105
X124	1/4	1/3	1/2	1	2	0.098573
X125	1/5	1/4	1/3	1/2	1	0.062376

Source: Authors (2023)

Comparison matrix and weights for sub-criteria X13 are the same as for sub-criteria X12.

**Figure 3.** The local weights of sub-criteria corresponding criteria X1



Source: Authors (2023)

From Figure 3 one can tell that sub-sub-criteria X111 with weight 0.465819398 is the most important in first group and overall in X1, followed by sub-sub-criteria X121 and X131 whose weight is 0.416212445. The lowest ranking in groups have



sub-sub-criteria X114, X125 and X135 respectively, being approximately 4.85 and 6.67 times less important than the leading sub-sub-criteria from their groups.

In the sequel we present the results for the comparison matrices of the criteria X2, and sub-criteria X21-X23.

**Table 5.** Comparison matrix for criteria X2 and weights (CR= 0)

X2	X21	X22	X23	Weights
X21	1	3	3	0.6
X22	1/3	1	1	0.2
X23	1/3	1	1	0.2

Source: Authors (2023)

**Table 6.** Comparison matrix for sub-criteria X21 and weights (CR= 0.01580798)

X21	X212	X211	X213	Weights
X212	1	3	4	0.623225
X211	1/3	1	2	0.239488
X213	1/4	1/2	1	0.137288

Source: Authors (2023)

**Table 7.** Comparison matrix for sub-criteria X22 and weights (CR= 0.021296081)

X22	X222	X223	X221	Weights
X222	1	4	5	0.680643
X223	1/4	1	2	0.201411
X221	1/5	1/2	1	0.117947

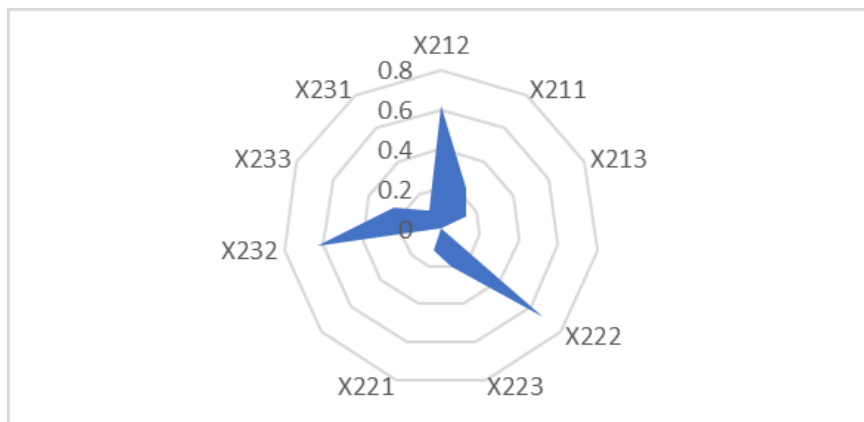
Source: Authors (2023)

**Table 8.** Comparison matrix for sub-criteria X23 and weights (CR= 0.033374725)

X23	X232	X233	X231	Weights
X232	1	3	5	0.633346
X233	1/3	1	3	0.260498
X231	1/5	1/3	1	0.106156

Source: Authors (2023)

**Figure 4.** The local weights of sub-criteria corresponding criteria X2



Source: Authors (2023)

From the Figure 4 we can conclude that sub-sub-criteria X222 has the highest ranking in local group and overall, in X2 with a weight 0.680642633, being 1.07 and 1.09 times more important than two first-placed sub-sub-criteria X232 and X212 from their local groups. Sub-sub-criteria X212 has 4.54 times more important ranking than X213, while X232 is approximately 5.96 times more important than X231.

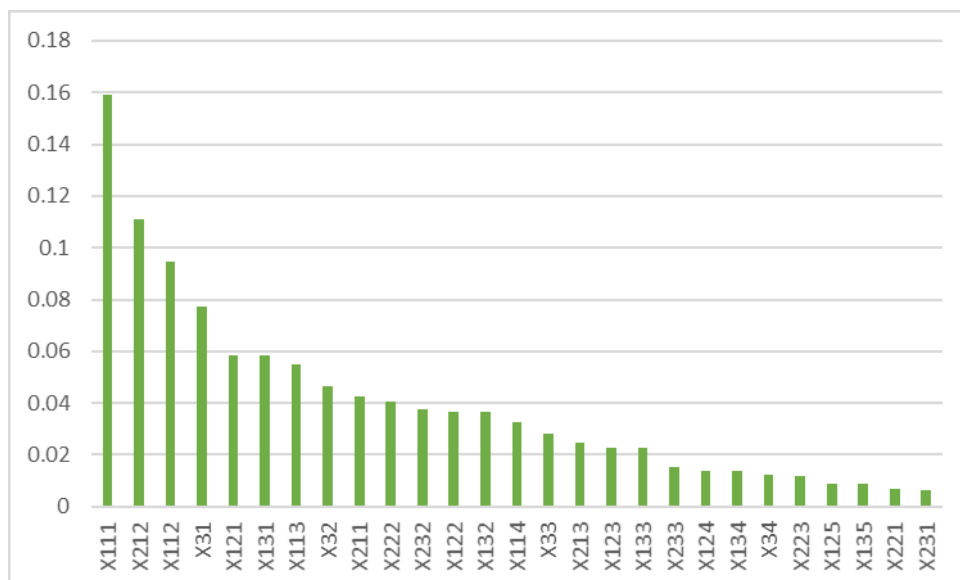
Next, we will present a comparison matrix for criteria X3.

**Table 9.** Comparison matrix for criteria X3 and weights (CR= 0.019024249)

X3	X31	X32	X33	X34	Weights
X31	1	2	3	5	0.470859
X32	1/2	1	2	4	0.284013
X33	1/3	1/2	1	3	0.171483
X34	1/5	1/4	1/3	1	0.073645

Source: Authors (2023)

**Figure 5.** The ranking of global weights of all sub-criteria



Source: Authors (2023)

The final ranking of sub-sub-criteria is given in Figure 5. We observe that sub-sub-criteria from X11, namely X111 still ranked highest, the remaining sub-sub-criteria X112, X113, and X114 are ranked third, seventh, and thirteenth, respectively. Furthermore, the highest ranked sub-sub-criteria from the degree of coverage of the walls with frescoes, namely, X121, is ranked fifth and is 1.58 times higher than X122 and 6.67 times higher than X125. Completely fulfilled digitalization, M31 is ranked fourth, emphasizing the importance of the digitization process in the purpose of cultural heritage preservation, protection, and promotion. The highest degree of preservation of the frescoes, X131 is also highly ranked, in the sixth place, being 1.58 times higher than X132, and 4.22 times higher than X134. Among the sub-sub-criteria at the bottom of the ladder with the lowest rank are the lowest degree of preservation of the frescoes, X135 and the degree of coverage of the walls, X125, as well as X221, the shortest distance from the road, and X231, smallest number of access roads.

## Conclusion

Preservation of cultural heritage, as one of the most important things that is passed on to future generations, is very important for the survival of a nation. This paper describes the condition of two churches from the vicinity of Prizren, the former imperial city. Between 27 criteria, based on the expert's opinion, the most important ones are determined, showing the importance of the quality of the frescoes, distance from the road and high degree of digitization process. The Church of the Holy Apostles Peter and Paul fulfills criteria X112, X125, X134, X212, X222, X232 and X34, while The Saint Nicholas church fulfills criteria X114, X123, X133, X212, X222, X231 and X34.

The findings in this paper present a starting point for our continual research in the cultural heritage area. Depending on the type of heritage, we plan to add or remove certain factors or sub-factors. Furthermore, an extension to this research could focus on the increase of the number of sacred criteria and sacred objects or practical application for the ranking of the alternatives of given churches. Finally, various generalizations of AHP, could be applied with Triangular fuzzy numbers, Pythagorean fuzzy numbers, Intuitionistic fuzzy numbers, z-Numbers, and/or Spherical fuzzy numbers. One of the popular directions of research development can certainly be the tourism aspect.

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