

# Quantitative Evaluation of Visitation Dynamics and Audience Segmentation for Sustainable Management of Civil War Memorial Heritage in Alicante, Spain

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## ABSTRACT

This study assesses the impact of visits to the Civil War shelters in Alicante as key elements of memorial cultural heritage, using a quantitative approach and data collected between August 2023 and January 2024. Through visitor segmentation, diverse visitor profiles were identified. Time series analysis observed patterns of visits without a clear trend, although ARIMA models predicted a slight stabilization of demand. The segmentation revealed two distinct groups of visitors, highlighting the importance of adapting dissemination and heritage education strategies. The findings underscore the significance of the shelters as tools for conservation and heritage education, suggesting the need for personalized approaches to enhance the visitor experience and promote the preservation of cultural heritage. This analysis provides valuable evidence for effective heritage management and tourism planning.

*Keywords:* cultural heritage; sustainable tourism; time series analysis; visitor segmentation; ARIMA models.

## 1. INTRODUCTION

### 1.1 Heritage, Memory, and Tourism

This study assesses the impact of visits to the Civil War shelters in Alicante as key elements of memorial cultural heritage. It employs a quantitative approach

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and uses data collected between August 2023 and January 2024. Through time series analysis and visitor segmentation, diverse public profiles were identified, and visit patterns were observed without a clear trend, although ARIMA models predicted a slight stabilization in future demand. Segmentation revealed two distinct visitor groups, highlighting the importance of adapting dissemination and heritage education strategies. Findings underscore the significance of shelters as tools for conservation and heritage education, suggesting the need for personalized approaches to enhance visitor experience and promote cultural heritage sustainability. This analysis provides valuable evidence for effective heritage management and tourism planning [1–4].

Capturing the interest of the young public, through collaboration with educational centers, is vital for educating and fostering respect for history [5]. Planning tailored educational visits ensures that the experience is enriching and meaningful, using history as a discipline that could facilitate transformative citizenship [6,7]. On the other hand, the adult and older public are also fundamental in the dissemination of these spaces as a tourist and cultural resource, using means such as advertising and social media to promote the shelters.

The intersection of cultural tourism and cultural heritage management, and how these two fields can effectively collaborate to benefit each other while ensuring the conservation and protection of cultural heritage for future generations, is vital. In this sense, the need to balance the commercialization of cultural heritage with its conservation has been emphasized. Tourism can act both as a positive force, promoting awareness and generating funds for conservation, and as a negative pressure, potentially damaging cultural resources through overexploitation or inadequate visitor management [8–10].

Therefore, it is very important to study strategic planning, visitor management, interpretation, and marketing, as well as the involvement of the local community and sustainable development. A key point is the need to balance heritage conservation with the needs and expectations of visitors, ensuring at the same time that the benefits of tourism are fairly distributed among all stakeholders, including local communities [11–13].

In this sense, Boyd and Timothy have analyzed the nature of heritage and how it becomes a tourism resource, discussing the importance of heritage tourism for cultural identity, education, and economic development, while highlighting the need to manage it sustainably to protect heritage resources for future generations [14]. The reflection they pose on the complex relationships between tourists, local communities, and heritage managers is interesting. The authors argue that the success of heritage tourism depends on finding a balance between meeting visitors' expectations and needs and preserving the authenticity and value of cultural heritage [14]. Richards examines how cultural tourism can contribute to economic development, heritage conservation, and the promotion of cultural identity [15].

Furthermore, and more specifically, memorial cultural heritage is highlighted for its unique historical and cultural value, attracting tourists in search of authentic experiences and deep connections with the history and identity of places. It offers opportunities to experience local culture genuinely and contribute to its conservation. Carman has examined how conflict archaeology can contribute to our understanding of war, not only through battlefield sites but also by analyzing everyday aspects, personal experiences, and the long-term repercussions of conflicts on societies. This approach allows for a broader and deeper understanding of war, considering not only military and strategic aspects but also the human, social, and cultural impact of conflicts [16]. Toji analyzes how cultural heritage policies can interact with living cultural practices, especially those carrying memories of traumatic events, and how these interactions can reveal tensions, challenges, and opportunities for the preservation and recognition of intangible cultural heritage [17]. Laderman shows how war tourism serves as a means for various ends. For some, it is a way to confront the past and process trauma, while for others, it represents an opportunity to learn about history in a more intimate and personal manner. However, he also points out the tensions and contradictions inherent in this type of tourism, such as the commercialization of memory and the possibility of simplifying or distorting the complexity of the conflict [18]. Meanwhile, Atabay et al. [19] have researched the role of memorializing sites affected by conflicts in post-trauma recovery and reconciliation processes. The study focuses on how memorialization can contribute to the healing of communities affected by armed conflicts [19]. For these authors, the memorialization of conflict-affected sites is presented as an invaluable part of post-trauma recovery and can contribute to the reconciliation of different groups involved in a conflict, as these sites are representative of collective memory, community identity, and a source of unity and resilience (19).

Tamm explores the concept of mnemohistory, a way of understanding history that focuses on how events are remembered and reinterpreted over time, rather than how they actually occurred. Tamm argues that the way we remember past events and integrate them into collective and individual narratives has a profound impact on our understanding of the present and the construction of identity [20,21]. Wagner-Pacifici proposes a look at events not as static entities or isolated moments but as "restless" processes that are continually in motion, being redefined and reinterpreted by those who participate in them and those who observe them from the outside [22].

The literature review highlights the inherent complexity in managing memorial cultural heritage and the need for innovative approaches that not only preserve but also interpret this legacy in ways that will resonate with diverse audiences. Despite the plethora of studies on heritage conservation and cultural tourism, there is a notable gap in understanding how visits to specific memory sites, such as the Civil War shelters in Alicante, impact the perception and valuation of heritage by different visitor segments. This research aims to fill that gap by exploring not only how the profiles of visitors are characterized and differentiated but also how these visits contribute to the recognition and education about memorial cultural heritage.

Similarly, forecasting visitor numbers has been a critical tool in heritage tourism management, allowing sites to anticipate resource needs and manage visitor impact effectively [1,23,24]. Despite its recognized value, the application of forecasting techniques in the context of Civil War shelters, or similar sites with fluctuating visitor patterns, remains underexplored.

## **1.2 Autocorrelations and the ARIMA Model (AutoRegressive Integrated Moving Average)**

Survey analysis aids in identifying specific interests and needs, allowing for the adaptation of cultural and tourist offerings [1]. This approach not only enhances visitor experience but also promotes sustainable tourism and contributes to the valorization and protection of historical and cultural heritage, ensuring the memory of significant events like the civil war is preserved and respected.

In this vein, we have sought to implement analyses that delve deeper into these issues, and we have done so, for instance, through autocorrelations and the ARIMA model. Autocorrelation describes the linear interdependence between consecutive observations in a time sequence, evaluating how current observations relate to their predecessors over various intervals, known as lags. Notable autocorrelation indicates past observations significantly influence current values, and although this influence tends to diminish as the number of lags increases, it remains statistically relevant, demonstrating there is a substantial linear correlation between successive observations even at a long distance [25–27].

On the other hand, the ARIMA model is an advanced statistical tool for analyzing and predicting time series, integrating autoregressive components, differentiation, and moving averages. This model is characterized by its ability to capture various patterns in temporal data and make future projections. The ARIMA model's components include the autoregressive (AR) that predicts future values from past ones, integrated differentiation (I) to stabilize the series making it stationary, and the moving average (MA) that adjusts the model based on previous prediction errors [28].

For the optimal configuration of the ARIMA model parameters, autocorrelation (ACF) and partial autocorrelation (PACF) plots are used. The ACF identifies the number of moving average (MA) terms required by the model, while the PACF determines the number of autoregressive (AR) terms needed, both through the observation of the statistical significance of the bars in the plots for the respective lags. These plots are crucial for precisely adjusting the ARIMA model, enabling effective prediction of future observations in time series [29–31].

The selection of autocorrelation analysis and the ARIMA model is based on the identified need to understand the patterns of visits more deeply to the Civil War shelters and their impact on memorial cultural heritage. This methodological approach aligns directly with our objectives to investigate the temporal evolution of visits and predict future trends, allowing us to design more effective strategies

for heritage management. Thus, these advanced analytical methods are crucial for bridging the gap in the literature on how visit dynamics influence and can be optimized to strengthen the valorization and education surrounding the cultural heritage in question.

After thoroughly reviewing the literature related to heritage tourism and Civil War shelters as components of memorial cultural heritage, a significant gap has been identified in understanding how different visitor segments perceive and value these sites. Although previous studies [14,18] have underscored the importance of memory tourism in education and cultural identity, there is a critical need to explore further the diversity of experiences and expectations of visitors at sites marked by past conflicts. This observation highlights an opportunity to delve deeper into the understanding of the interactions between visitors and memorial cultural heritage, particularly in conflictual contexts like the Civil War shelters in Alicante. Therefore, this study aims to address the following essential research questions:

How are the visitor profiles to the Civil War shelters in Alicante characterized and differentiated, and what patterns of visitation emerge from these characterizations?

What are the perceptions and valuations of these visitor segments regarding the shelters as elements of memorial cultural heritage, and how do these perceptions affect their tourism experience?

Considering the identified perceptions and valuations, what strategies can be developed to improve the management of heritage tourism at sites of contentious memory, promoting sustainable conservation and effective education?

The identification of these questions underscores the research purpose of the study and guides the applied methodology, ensuring a direct connection between the needs detected in the existing literature and the quantitative approach adopted. This connection is evidenced in the selection of time series analysis techniques and visitor segmentation, aimed at uncovering visitation patterns and profiling in detail the audiences that interact with these memory spaces.

In the current landscape of research on cultural heritage, a meticulous review of the literature has revealed a notable deficiency in the application of predictive models for planning and managing heritage tourism. Although the importance of preserving and promoting cultural heritage is widely recognized, there exists a significant gap in utilizing advanced quantitative approaches that allow for anticipating visitation dynamics and adapting conservation and education strategies proactively. Specifically, the application of ARIMA models in the context of heritage tourism has been scarcely explored, representing a unique opportunity for this study to make a significant contribution to the field.

Our methodological approach is designed to address this gap, employing the ARIMA (AutoRegressive Integrated Moving Average) model to analyze and

predict visitation patterns to the Civil War shelters in Alicante. This model has been chosen due to its robustness and versatility in the analysis of time series, enabling not only the identification of existing trends but also the forecasting of future fluctuations in visitor influx. The application of ARIMA directly aligns with the theoretical and practical needs identified, offering an invaluable tool for strategic planning in cultural heritage management. By predicting how and when visitation patterns will change, heritage managers can anticipate conservation needs, design tailored educational programs, and optimize the visitor experience, thereby contributing to sustainable heritage management.

This methodological approach not only fills a significant gap identified in the literature but also sets a precedent for future research in the field of heritage tourism, demonstrating the applicability and value of predictive models in the study and management of cultural heritage.

On the other hand, despite extensive research on the conservation of cultural memory heritage [19,32], there remains a lack of understanding regarding how visits specifically impact the perception and valuation of heritage in Civil War shelters [33,34]. This study aims to fill this gap through the following specific objectives, which are directly derived from the identified shortcomings in the existing literature.

### **1.3 General Objective**

To evaluate the impact of visits to the Spanish Civil War shelters, rehabilitated and opened to the public in the city of Alicante, on the memoristic cultural heritage, by employing quantitative techniques of time series analysis and visitor segmentation.

### **1.4 Specific Objectives**

In response to the needs identified in the reviewed literature, this study sets specific objectives aimed at deepening the understanding of the impact of visits to the Civil War shelters in Alicante on memorial cultural heritage. Each objective is designed to directly address the following key questions arising from the previous discussion: How are the profiles of visitors to these memory sites characterized and differentiated? What is the temporal evolution of visits, and how can we predict future trends? How can more effective dissemination and heritage education strategies be designed for different segments of the public? Through the achievement of these objectives, the study seeks to offer valuable insights into the sustainable management and long-term valorization of the involved cultural heritage.

To characterize the profile of visitors to the Civil War shelters in Alicante, distinguishing between the general public and school groups, to identify patterns and trends in visits and better understand their impact on cultural heritage.

To analyze the temporal evolution of the number of visitors to the shelters between August 2023 and January 2024, using time series analysis techniques, to identify seasonal patterns, and trends, and forecast future visit volumes.

To study visitor segmentation through cluster analysis, aiming to identify homogeneous groups based on relevant variables such as age, how they learned about the visits, origin, and type of visit, to design more effective dissemination and heritage education strategies.

To predict the future demand for visits to the shelters using ARIMA models, to facilitate planning and sustainable management of the tourist and cultural resource, ensuring its conservation and valorization in the long term.

To evaluate the effectiveness of the promotional and heritage education tools used to attract different segments of the public, based on information gathered about how they learned of the visits, to optimize communication and marketing strategies.

To contribute to the conservation and dissemination of the memoristic cultural heritage of the Civil War in Alicante, through the generation of knowledge about the dynamics of visits and the interaction of visitors with this heritage, to reinforce its role in education and historical memory.

## **2. METHODOLOGY**

The design of the current research has been meticulously conceived to address the research questions arising from the gaps identified in the literature review. In response to the first question, concerning the characterization and differentiation of visitor profiles to the Civil War shelters in Alicante, a robust quantitative approach has been chosen. The selection of this approach is based on the need for precise and measurable data that allow for clear and objective segmentation of visitors, using advanced statistical techniques to analyze patterns within a large dataset collected.

To predict visitation patterns and address the second question related to the perception and valuation of the shelters as elements of cultural heritage, the ARIMA (AutoRegressive Integrated Moving Average) model has been implemented. This model has been selected for its proven ability to analyze and forecast trends in time series, offering a powerful predictive tool that allows for anticipating future visit demands and understanding fluctuations over time. The implementation of ARIMA is directly aligned with understanding the temporal dynamics of visits, facilitating the identification of possible periods of high demand or interest by different visitor segments.

Furthermore, the analysis of visitor segmentation is employed as a key strategy to unravel the complexities of the diverse perceptions and valuations of heritage. This analysis allows for grouping visitors into homogeneous segments based on

relevant variables, such as age, motivations, and ways of learning about the shelters, among others.

Visitors were segmented into two distinct groups based on a combination of demographic data and survey responses. The first group, primarily students, was identified based on age and visit context (school-related visits), while the second group, independent tourists, was distinguished by their motivations, which were collected through survey questions focusing on reasons for visiting independently of organized educational activities.

The segmentation not only strengthens the response to the first research question but also contributes to the development of specific strategies to improve heritage management, in tune with the third research question.

Each component of our methodological design, from the choice of the quantitative approach and the use of the ARIMA model to the analysis of segmentation, has been carefully selected to ensure a coherent and comprehensive investigation that effectively addresses the posed questions. This integrated approach allows us not only to understand the profiles of the visitors and their visitation patterns but also to offer data-based recommendations for the management and sustainable promotion of memorial cultural heritage.



**Fig. 1. Location and images of the four shelters rehabilitated with the European DUSI project**

This study adopts a quantitative approach to analyze the impact of visits to the six Civil War shelters, rehabilitated and opened to the public in the city of Alicante, on the city's memorialistic cultural heritage. Within the framework of the ERDF Operational Programme "Sustainable Growth 2014-2020" (CCI: 2014ES16RFOP002, Priority Axis: 12 Urban Development), the City Council of



Alicante, under the supervision of the General Subdirectorate for Urban Development (D.G. of European Funds, Secretary of State for Budgets and Expenses, Ministry of Finance and Public Function), promoted the DUSI Alicante Strategy "Área Las Cigarreras". This initiative, co-financed by the European Commission and framed in the Order HAP/2427/2015 of November 13 (BOE no. 275 of 17/11/15), is oriented towards sustainable urban development, integrating the recovery of industrial, religious, and military heritage of historical and touristic relevance. In this context, the rehabilitation and public opening of 4 Civil War air-raid shelters in Alicante in 2022 occurred, adding to the two already opened in 2015.

Following this new public opening, a series of guided, dramatized visits and cultural events to these air-raid shelters were scheduled. Thus, during the year 2022 and the beginning of 2023, they attracted 5,229 people, of which 3,472 participated in guided tours and 999 in dramatized visits and presentations on historical memory and the role played by the air-raid shelters. After this phase and following the hiring of a guided tour company by the Alicante City Council, these visits were re-launched. After six months of operation, we now intend to analyze the impact, visitor profile, and future projection, leaving the comparison of previous, current, and future data for future studies to draw appropriate conclusions for the better management of our memoiristic cultural heritage. Through a retrospective longitudinal design, the data collected from August 2023 to January 2024 are examined, focusing on two types of visitors: the general public and school groups. The goal is to identify patterns and trends in the visits to better understand their impact on cultural heritage.

The analyzed sample includes 407 visitors to the shelters, distributed in two categories: individual visitors or groups (general public) and organized school groups. Participants, who could be local, national, or international, made their reservations by email or phone.

Data collection included information on the visit date, type of visitor, type of group, number of participants, their origin, and responses to questions related to how they learned of the existence of these heritage resources and their interest in visiting them.

Data were systematically collected, recording each visit from the beginning of the study period in August 2023 to January 2024. This period includes the end of summer, autumn, and part of winter, providing a representative sample of visit trends across different seasons, although it does not cover the entire year.

For data analysis, quantitative tools such as SPSS Statistics version 29.0.1.0, R Studio, and Python were used. Statistical models, cluster analysis, ANOVA, etc., were applied to predict future visit trends and understand their dynamics. ARIMA models, Autoregressions, and Autocorrelations were employed to assess temporal patterns and their influence on visits to the shelters. The model selection was based on complexity, significance of coefficients, and overall fit to the data.



**Fig. 2. Photograph with layout and location of the air-raid shelter in Músico Tordera square**

The study was conducted following the ethical principles of scientific research, ensuring informed consent from all participants and confidentiality of the collected information. However, a limitation of the study is acknowledged due to the analysis being restricted to data collected in those first months of the contract, i.e., between August 2023 and January 2024, which may affect the general interpretation of the results by not capturing visit trends in all seasons.

The design of the current research has been meticulously conceived to address the research questions arising from the gaps identified in the literature review. In response to the first question, concerning the characterization and differentiation of visitor profiles to the Civil War shelters in Alicante, a robust quantitative approach has been chosen. The selection of this approach is based on the need for precise and measurable data that allow for clear and objective segmentation of visitors, using advanced statistical techniques to analyze patterns within a large dataset collected.

To predict visitation patterns and address the second question related to the perception and valuation of the shelters as elements of cultural heritage, the ARIMA (AutoRegressive Integrated Moving Average) model has been implemented. This model has been selected for its proven ability to analyze and forecast trends in time series, offering a powerful predictive tool that allows for anticipating future visit demands and understanding fluctuations over time. The implementation of ARIMA is directly aligned with understanding the temporal dynamics of visits, facilitating the identification of possible periods of high demand or interest by different visitor segments.

Furthermore, visitor segmentation analysis is employed as a key strategy to unravel the complexities of diverse perceptions and valuations of heritage. This analysis allows grouping visitors into homogeneous segments based on relevant

variables such as age, motivations, and ways of learning about the shelters, among others. Segmentation not only strengthens the response to the first research question but also contributes to the development of specific strategies to improve heritage management, in line with the third research question.

Each component of our methodological design, from the choice of the quantitative approach and the use of the ARIMA model to segmentation analysis, has been carefully selected to ensure a coherent and comprehensive investigation that effectively addresses the posed questions. This integrated approach allows us not only to understand visitor profiles and visitation patterns but also to offer data-based recommendations for the management and sustainable promotion of memorial cultural heritage.

The distinction between the two groups in data collection and analysis was clearly articulated through specific methodologies. To differentiate between the groups of visitors to the Civil War shelters in Alicante, advanced statistical techniques were employed within a large dataset. This involved segmenting visitors based on relevant variables such as age, motivations, and ways of learning about the shelters. Additionally, the analysis of visitor segmentation allowed for the grouping of visitors into homogeneous segments, strengthening the response to the research questions and facilitating the development of specific strategies to improve heritage management. Each component of the methodological design, including the choice of the quantitative approach, implementation of the ARIMA model, and segmentation analysis, was carefully selected to ensure a coherent and comprehensive investigation that effectively addressed the research questions and provided data-based recommendations for the management and sustainable promotion of memorial cultural heritage.

### **3. RESULTS AND DISCUSSION**

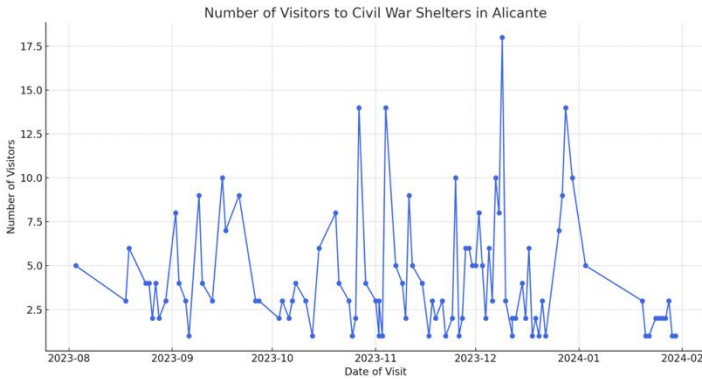
#### **3.1 Visitor Numbers and Future Forecast**

To analyze the number of visitors to the Spanish Civil War shelters in the city of Alicante, we first conducted a descriptive analysis based on the survey data provided.

**Table 1. Statistical summary of visitors to the civil war shelters in Alicante**

Average	4.24 visitors per visit date
Standard Deviation	3.39, indicating variability in the number of visitors across different dates.
Minimum	1 visitor
25th Percentile	25% of the dates had 2 or fewer visitors.
Median (50th Percentile)	3 visitors, indicating that half of the dates had 3 or fewer visitors.
75th Percentile	5.25 or fewer visitors
Maximum	The highest number of visitors on a single date was 18

Additionally, Fig. 3 displays variations in the number of visitors, with no clear trend or defined seasonality at first glance.



**Fig. 3. Time series graph showing fluctuations in the number of visitors over time**

The autocorrelation analysis (ACF) revealed that the first lag (delay) was significant (0.315) and decreased with an increasing number of lags (Table 2). This suggests a strong relationship between consecutive observations in the time series. The significance of autocorrelations in the initial lags (< 0.001) indicates that the values are not random and are influenced by their preceding values.

**Table 2. Autocorrelations for Total Number of Visitors**

Lag	Autocorrelation	standard error <sup>a</sup>	Ljung-Box Statistic		
			Valor	gl	Sig. <sup>b</sup>
1	,315	,050	40,637	1	<,001
2	,251	,054	66,622	2	<,001
3	,163	,057	77,552	3	<,001
4	,082	,058	80,328	4	<,001
5	,081	,058	83,032	5	<,001
6	,021	,059	83,210	6	<,001
7	,051	,059	84,285	7	<,001
8	,023	,059	84,512	8	<,001
9	,057	,059	85,881	9	<,001
10	,040	,059	86,547	10	<,001
11	,142	,059	95,042	11	<,001
12	,129	,060	102,048	12	<,001
13	,079	,061	104,691	13	<,001
14	,140	,061	112,934	14	<,001
15	,100	,062	117,201	15	<,001
16	,158	,062	127,765	16	<,001

a. The underlying process assumed is MA with the order equal to the number of lags minus one. Bartlett's approximation is used

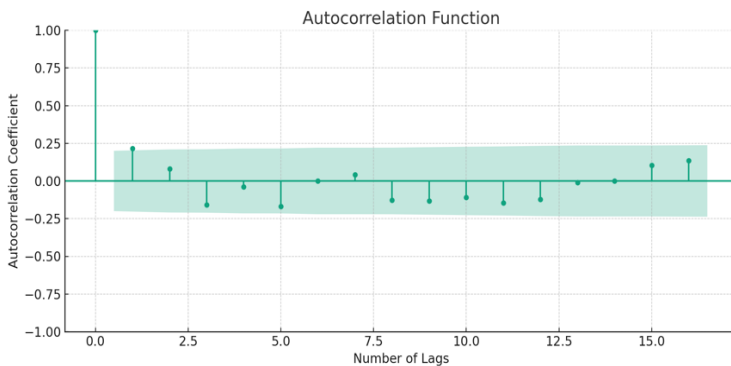
b. Based on the asymptotic chi-square approximation

Autocorrelation (ACF) measures the correlation between observations in a time series and their lagged (delayed) versions (Table 3), with significant peaks (Fig. 2) indicating a relationship between the observations and their preceding values.

**Table 3. Lags and Autocorrelations (ACF) and Partial Autocorrelations (PACF)**

Lag	ACF	PACF
1	0,216175	0,218451
2	0,081482	0,037274
3	-0,15747	-0,1979
4	-0,03978	0,033429
5	-0,16853	-0,16031
6	2,8E-05	0,045593
7	0,042597	0,068351
8	-0,12805	-0,25617
9	-0,13356	-0,06556
10	-0,11005	-0,06037
11	-0,1447	-0,21063
12	-0,12166	-0,07588
13	-0,01115	-0,06043
14	0,001067	-0,11637
15	0,104285	0,130178
16	0,135421	0,036394

If the peaks are outside the confidence bands (the green-shaded area in Fig. 4), they are statistically significant. The ACF chart, therefore, shows how observations in the time series are correlated with their own previous values, meaning that visitor patterns on a given day could be influenced by the number of visitors on previous days.



**Fig. 4. ACF Plot**

Partial autocorrelations (PACF) show significant correlations at the first lag and then at the eleventh and sixteenth lags (Table 3). This may indicate the presence of a seasonal or cyclical structure in the data, especially if the time series length is such that these lags correspond to a season or cycle (Table 4).

**Table 4. Partial Autocorrelations**

<b>Series: Total Number of Visitors</b>		
<b>Lag</b>	<b>Partial Autocorrelation</b>	<b>Standard Error</b>
1	,315	,050
2	,169	,050
3	,050	,050
4	-,016	,050
5	,029	,050
6	-,028	,050
7	,036	,050
8	-,003	,050
9	,045	,050
10	,005	,050
11	,130	,050
12	,052	,050
13	-,017	,050
14	,076	,050
15	,027	,050
16	,088	,050

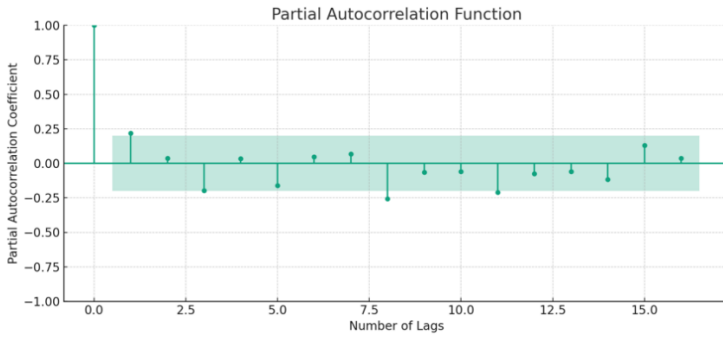
Significant peaks in the PACF plot suggest which lags are important when fitting an autoregressive (AR) model. For instance, a significant peak at lag 1 and not in subsequent lags indicates an AR(1) model might be appropriate.

Finding significant peaks at higher lags, such as 11 and 16 as seen in our case (Tables 3 and 4), could suggest that an AR(11) or AR(16) model may be suitable, possibly indicating seasonal or cyclical effects that should be considered.

The PACF chart (Fig. 5) displays the partial correlation of a time series with its own previous values, controlling for the values at all shorter lags. Similar to the ACF, bars outside the green-shaded area indicate significant correlations at those specific lags.

A slow decay pattern in the ACF suggests an AR model, while a sharp cutoff after a lag in the PACF suggests an MA model. Based on the data obtained, significant peaks in the early lags of the PACF and then stabilization (Table 4) indicate that an AR model of a certain order might be appropriate. Forecasts for the next 12 months were generated using the autoregressive model of order 1 (AR(1)), based on the last available data point.

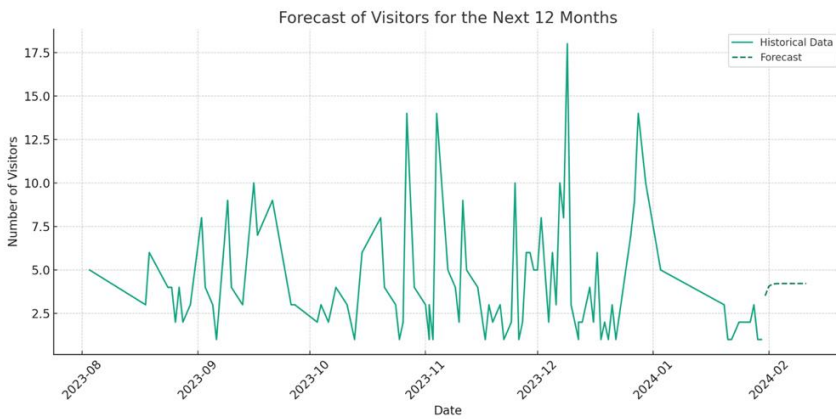
Forecasts for the next 12 months have been generated from the autoregressive model of order 1 (AR(1)) based on the last available data.



**Fig. 5. PACF Plot**

**Table 5. Forecasted Values**

<b>periods</b>	<b>visitors</b>
1	3.52
2	4.07
3	4.19
4	4.21
5	4.22
6	4.22
7	4.22
8	4.22
9	4.22
10	4.22
11	4.22
12	4.22



**Fig. 6. Forecast Plot**

These forecasts represent the model's estimation for the number of visitors in each of the next 12 months, based on documented historical information and the dynamics captured by the AR(1) model.

It's important to note that forecasts become less varied and trend towards a constant value as the forecast horizon extends, a common characteristic of AR(1) models when the time series exhibits a strong trend or level.

The outcome of this analysis serves as a starting point for the construction of time series models, which may include AR, MA, ARMA, or ARIMA models, depending on the nature and structure of the observed autocorrelations.

The results of the Akaike Information Criterion (AIC) for each model help us compare and select the best model in terms of fit and complexity.

**Table 6. Akaike Information Criterion (AIC) results for each model**

AR Model (1, 0, 0)	AIC = 507.21
MA Model (0, 0, 1)	AIC = 507.93
ARMA Model (1, 0, 1)	AIC = 509.16
ARIMA Model (1, 1, 1)	AIC = 507.05

Furthermore, the Augmented Dickey-Fuller (ADF) test for stationarity yielded the following results: ADF Statistic: -7.69 and p-value: 1.45e-11. Given that the p-value is significantly less than 0.05, we reject the null hypothesis that the series has a unit root and conclude that the series is stationary. This means it is not necessary to differentiate the series for the AR, MA, and ARMA models.

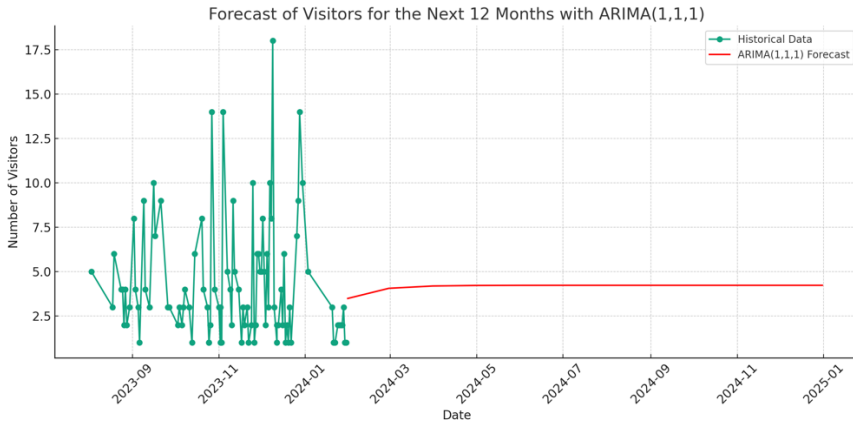
Among the models considered, the ARIMA (1, 1, 1) model has the lowest AIC, indicating it may be the most suitable model tested. However, the AR (1, 0, 0) model has a very similar AIC and is simpler, which may make it preferable due to parsimony.

The next step will be to make a forecast using the selected model and then validate that forecast with actual future data to verify the model's accuracy.

Therefore, we have calculated the forecast for the next 12 months from the last data available in the time series, using the ARIMA (1,1,1) model. The forecasts start in January 2024 and extend to December 2024.

The forecast values indicate a slightly upward trend in the first months, stabilizing towards a constant value of approximately 4.23 visitors in the later months. The confidence intervals widen as we move into the future, which is typical in time series forecasts due to the accumulation of uncertainty.





**Fig. 7. Simplified chart showing the forecasts for the next 12 months using the ARIMA (1,1,1) model, alongside the historical data.**

**Table 7. Forecast for the next 12 months, using the ARIMA (1,1,1) model, along with confidence intervals**

	<b>Forecast</b>	<b>Lower CI</b>	<b>Upper CI</b>
2024-01-31	3,492113	-3,0264	10,01063
2024-02-29	4,062558	-2,63944	10,76456
2024-03-31	4,193133	-2,52174	10,90801
2024-04-30	4,223022	-2,49331	10,93935
2024-05-31	4,229863	-2,48672	10,94645
2024-06-30	4,231429	-2,48521	10,94807
2024-07-31	4,231788	-2,48487	10,94844
2024-08-31	4,23187	-2,48479	10,94853
2024-09-30	4,231888	-2,48477	10,94855
2024-10-31	4,231893	-2,48477	10,94855
2024-11-30	4,231894	-2,48477	10,94855
2024-12-31	4,231894	-2,48477	10,94856

These visitor patterns and the predictive insights from the ARIMA model mirror findings from similar heritage sites, underscoring the dynamic nature of cultural tourism and its implications for heritage conservation, as studied in Santiago de Compostela [35], Angkor [36], Kimberley [37], and New Zealand [38]. Our analysis contributes to the broader discourse on visitor management and the sustainability of cultural heritage sites, as discussed in the scientific literature [39–46], by offering a methodological framework that can be adapted to understand visitor trends and their impacts.

The insights obtained from the temporal analysis and forecasting of visitor numbers to the Civil War shelters can inform strategic planning for similar heritage sites. By understanding the factors that influence visitation patterns,

managers can customize educational and marketing efforts to engage specific visitor segments and manage visitation flows, thereby ensuring the preservation and appreciation of cultural heritage more effectively. These strategies encompass targeted outreach programs, the planning of seasonal events, and the creation of interpretive materials that align with visitors' varied motivations and interests.

Our study underscores the importance of data-driven approaches to visitor management as a cornerstone of sustainable heritage conservation. By aligning our findings with the principles of sustainable tourism and cultural preservation, we provide a roadmap for other heritage sites seeking to balance visitor engagement with the imperative of conserving cultural memory for future generations.

The results of applying the ARIMA model indicate a future stabilization in the demand for visits to the Civil War shelters in Alicante, a trend that contrasts with other projections [35] for cultural heritage sites in Santiago de Compostela, where a steady increase was anticipated. This difference can be attributed to the specific nature of the heritage related to the Civil War in Alicante, suggesting that factors such as historical context and the type of heritage can significantly influence visitation trends.

### **3.2 Visitor Segmentation**

Visitor segmentation is a key strategy for understanding and addressing the diverse needs of the public at cultural heritage sites. Previous studies have demonstrated how different visitor profiles can influence management and communication strategies [47–53]. This analysis aligns with such research, seeking to identify homogeneous groups of visitors at the Civil War shelters in Alicante to inform more effective management practices.

The interpretation of our findings goes beyond the mere quantification of visitors and future projections. By analyzing the observed trends through the ARIMA model and visitor segmentation, significant patterns emerge that reflect changes in the valuation and engagement of the public with cultural heritage. For example, the anticipated stabilization in the number of visitors, far from being an isolated datum, can be interpreted as an indication of the maturation of the heritage tourism market in Alicante. This phenomenon highlights the need for adapting heritage management strategies that not only seek to attract a larger number of visitors but also delve into the quality and significance of the experience offered.

Moreover, the identification of specific visitor segments, 'Cultural Explorers' and 'Keepers of Memory', points towards diversification in the motivations and expectations of the audience. This diversification reflects broader trends observed in cultural tourism studies, where a shift towards more personalized and meaningful experiences is evident. In this context, our findings underscore the importance of developing interpretive and educational programs that meet

these individual needs, fostering a deeper connection between visitors and the heritage they explore.

The practical application of these insights requires a cultural heritage management that is both dynamic and reflective. Heritage managers and tourism planners are called to consider not only visitor flows and their future projections but also the wider social and cultural fabric into which these sites are woven. Therefore, the promotion of cultural heritage must balance preservation with innovation, ensuring that heritage education evolves alongside the expectations of an increasingly informed and diverse audience.

This expanded approach to data interpretation not only enriches our understanding of visitation patterns but also offers a framework for future research. Subsequent studies could explore, for example, the interactions between different visitor segments and their impact on heritage conservation, or how heritage education initiatives can be designed to foster greater community engagement. By delving into these areas, we can begin to chart a path toward cultural heritage management that is truly inclusive, sustainable, and enriching for all involved.

### 3.3 Quick Cluster Analysis

We have also conducted a quick cluster analysis to study visitor segmentation. The results indicate the formation of two distinct groups. The initial cluster centers show specific values for the considered variables, such as the visitors' age, how they learned about the shelter visits, the countries of origin, the autonomous community, and the type of visit.

The initial clusters significantly differed in the age variables from 0 to 14 years and 15 to 25 years, indicating that one of the clusters is oriented towards younger visitors, while the other is geared towards older visitors.

At the end of the clustering process, the centers are adjusted to reflect the data structure better, showing more nuanced differences between groups in variables such as age, how they learned about the visits, origin, and type of visit.

**Table 8. Initial Cluster Centers**

	<b>Clúster</b>	
	<b>1</b>	<b>2</b>
Age 0 to 14 years	,00	72,00
Age 15 to 25 years	98,00	4,00
Age 26 to 35 years	,00	,00
Age 36 to 65 years	,00	,00
Age over 65 years	,00	,00
How did they learn about the shelter visits?	13,00	22,00
Countries of origin	3,00	3,00
Autonomous Community	2,00	2,00
Type of visit	2,00	2,00

Regarding the Iteration History, the process converged in 3 iterations, indicating that the cluster centers found a stable position quickly.

**Table 9. Initial Cluster Center**

<b>Iteration History<sup>a</sup></b>		
<b>Iteration</b>	<b>Change in cluster centers</b>	
	<b>1</b>	<b>2</b>
1	54,672	71,235
2	,851	,070
3	,000	,000

*a. Convergence achieved due to no change in cluster centers or a small change. The change in the maximum absolute coordinate for any center is .000. The current iteration is 3. The minimum distance between initial centers is 118.748.*

The majority of cases were assigned to cluster 2, with only a small fraction assigned to cluster 1, demonstrating that most visitors shared similar characteristics, in contrast to a smaller group with marked differences.

**Table 10. Number of cases in each cluster**

<b>Clúster</b>	1	26,000
	2	380,000
<b>Valid</b>		406,000
<b>Missing</b>		1,000

The ANOVA analysis conducted for each variable shows significance in variables such as age from 15 to 25 years and type of visit, indicating that these characteristics are distinctive between the formed clusters.

**Table 11. ANOVA**

	<b>Clúster</b>		<b>Error</b>		<b>F</b>	<b>Sig.</b>
	<b>Mean Square</b>	<b>gl</b>	<b>Mean Square</b>	<b>gl</b>		
Age 0 to 14 years	64,781	1	66,006	404	,981	,322
Age 15 to 25 years	42331,048	1	25,435	404	1664,253	<,001
Age 26 to 35 years	20,744	1	15,539	404	1,335	,249
Age 36 to 65 years	11,966	1	5,340	404	2,241	,135
Age over 65 years	,082	1	,397	404	,207	,649
How did they learn about the shelter visits?	210,904	1	24,631	404	8,563	,004
Countries of origin	2,343	1	4,458	404	,526	,469
Autonomous Community	39,390	1	11,905	404	3,309	,070
Type of visit	18,619	1	,077	404	241,894	<,001

F tests should only be used for descriptive purposes as clusters have been chosen to maximize differences between cases from different clusters. The observed significance levels are not corrected for this and therefore cannot be interpreted as tests of the hypothesis that cluster means are equal.

The cluster characteristics are as follows:

Cluster 1: This cluster appears to represent a smaller group of visitors (26 cases assigned to this cluster) with more specific characteristics. Based on the final cluster centers, this group is characterized by:

A notable presence in the age range of 15 to 25 years with a high average in this variable, suggests that this cluster might be predominantly young individuals.

A higher level in the variable "How did they find out about the shelter visits?", could imply that this group tends to learn about the visits through specific means identified by higher values in this variable.

A distinguished type of visit, indicating they primarily belong to type 2 of the visit to the shelters, that is, through educational centers and with children or young people.

Cluster 2: This cluster is significantly larger, with 380 cases assigned, showing it represents the most common profile among visitors. The final cluster centers indicate that:

There is a more general distribution in ages, though with a slight increase in young visitors (noted by low but present values in ages 0 to 14 years and 15 to 25 years).

The way they found out about the shelter visits has a lower average than in Cluster 1, indicating this group uses a wider variety of sources to learn about the visits.

The countries of origin and autonomous communities have averages that suggest diversity in terms of where these visitors come from and their regions of origin within the country.

The type of visit has a lower average, indicating this cluster includes visitors without as marked a preference as in Cluster 1, showing that it includes both the general public (Type 1: General public) and those organized through educational centers (Type 2: School groups).

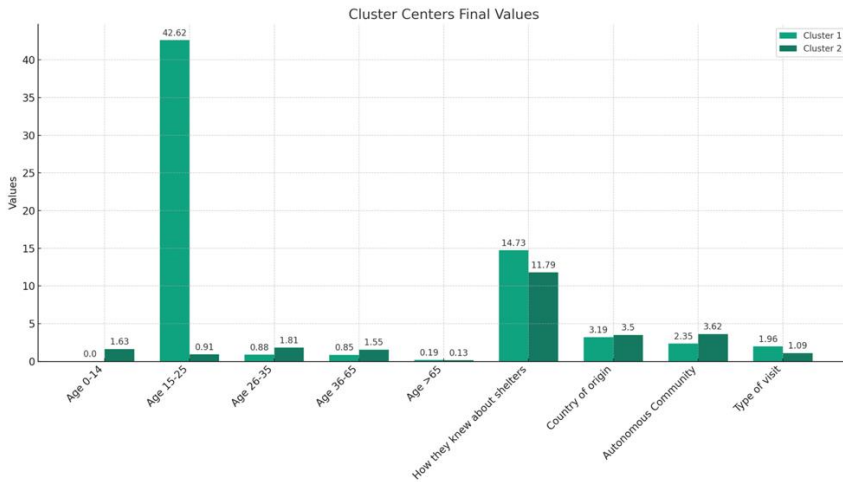
Variables that most contribute to differentiating between these two clusters are:

- Age of 15 to 25 years: This variable is significantly highlighted in Cluster 1, showing a focus on young visitors.

- Type of visit: The difference in averages indicates that preferred types of visit vary between the two clusters.

- How they found out about the shelter visits: Differences in this variable suggest variations in the organization of communication or marketing channels between the two groups.

This cluster analysis allows identifying specific visitor profiles and their distinctive characteristics, which can be interesting for decision-making in marketing, service development, and communication. Understanding these groupings helps to direct efforts more effectively towards the identified visitor segments, optimizing resources, and enhancing the visitor experience.



**Fig. 8. Clusters according to the visitors' age, how they found out about the visits, country of origin, autonomous community, and type of visit.**

The two clusters identified in our study reflect the diversity observed in similar research (reference to relevant studies), where age and the mode of discovery have also served as key bases for segmenting visitors. Although in tourism, segmentation studies typically lead to the identification of tourist groups derived from dividing the population based on prior knowledge ("commonsense segmentation"), however, as has been demonstrated [48], a systematic approach to different segmentation methods should be proposed, as we have done in our research. Our findings on the relevance of these factors in the Civil War shelters in Alicante indeed underscore the utility of this analytical approach in tailoring marketing and heritage education strategies.



**Fig. 9. Micro-theater in the anteroom of the Tabacalera air-raid shelter.**

Cluster analysis revealed the existence of two main segments among visitors to the Civil War shelters in Alicante. The first segment, which we have termed 'Cultural Explorers', is predominantly composed of visitors aged between 15 and 25 years. This group is characterized by a particular interest in the educational aspects and the pursuit of interactive experiences that allow for a deep immersion in the history of the Spanish Civil War. Unlike other visitors, 'Cultural Explorers' highly value the availability of educational materials, specialized guided tours, and interactive exhibitions that facilitate active learning about the conflict and its repercussions on contemporary society.

On the other hand, the second segment, identified as 'Keepers of Memory', includes mainly individuals over 36 years of age, with a significant interest in the preservation of heritage and the transmission of historical memory to younger generations. The 'Keepers of Memory' show a preference for visits that emphasize the historical narrative, the contextualization of the conflict, and the tribute to the victims. This group particularly values experiences that allow for personal reflection and the recognition of the importance of keeping the memory of the past alive.

Both segments, though different in their motivations and preferences, underscore the diversity of the audience interested in the Civil War shelters and the need to adopt differentiated management and communication approaches to meet their

expectations. While 'Cultural Explorers' benefit from a more dynamic and educational approach, 'Keepers of Memory' require an approach that delves into the memorial and emotional significance of the spaces visited.



**Fig. 10. Guided tour of the air-raid shelter in General Marvá park**

The segmentation of visitors to the Civil War shelters in Alicante, revealing the presence of 'Cultural Explorers' and 'Keepers of Memory', can be profoundly understood through the prism of social identity theory [54–56] and the tourism experience model [57,58]. These theories provide a valuable framework for explaining the differences in preferences and behaviors of these segments.

Social identity theory suggests that individuals classify themselves and others into various groups, influencing their self-concept and behavior. This approach can help understand why 'Keepers of Memory' feel deeply connected to the historical and emotional narrative of the shelters, seeking experiences that reinforce their sense of belonging to a community that values memory and history. On the other hand, 'Cultural Explorers' might be more motivated by the pursuit of new experiences and knowledge, reflecting a desire to expand their social identity through learning and exploration.

Additionally, the tourism experience model by Pine and Gilmore [57] distinguishes between educational, aesthetic, escapist, and entertainment experiences. Applied to our findings, it suggests that 'Cultural Explorers' primarily seek educational and escapist experiences, which allow them to actively acquire new knowledge and immerse themselves in the historical context of the Civil War. In contrast, 'Keepers of Memory' may prefer aesthetic and entertainment experiences, offering them the opportunity to reflect and emotionally connect with the past.



Integrating these theories into our analysis not only enriches the understanding of the underlying motivations and expectations of each visitor segment but also grounds recommendations for cultural heritage management. Recognizing the diversity of experiences sought by visitors, managers can develop more precise and effective strategies to meet the needs of the different groups, fostering a deeper and more meaningful connection with the heritage.

The outcomes of our analysis, as outlined in the methodology, directly address the specific objectives of the manuscript. Firstly, our results offer a detailed understanding of visitor profiles, including age distribution, preferred visit types, and information channels for learning about Civil War shelters in Alicante. This characterization aims to identify visitation patterns and trends crucial for comprehending their impact on cultural heritage.

Secondly, employing time series analysis techniques, we study visitor numbers over time to fulfill the objective of exploring visitation trends. By utilizing the ARIMA model, we not only identify significant autocorrelations and seasonal patterns but also forecast visitation for the next 12 months. These forecasts aid in informed decision-making for the sustainable management of heritage sites.

Furthermore, our cluster analysis contributes to studying visitor segmentation. We identify two distinct segments: 'Cultural Explorers' and 'Keepers of Memory'. This segmentation enables tailored management and communication strategies to meet the diverse needs of these segments, enhancing the visitor experience and fostering a deeper connection with the heritage sites.

These insights directly support the overarching objective of evaluating the impact of visits to Civil War shelters on Alicante's cultural heritage. By providing valuable insights into visitor profiles, visitation patterns, and segmentation, our study offers a comprehensive understanding of their contribution to cultural conservation. Ultimately, our findings emphasize the importance of data-driven approaches to visitor management and heritage conservation, aligning with sustainable tourism and cultural preservation principles.

Analysis revealed that student groups primarily engaged with interactive technologies designed to enhance educational outcomes, reflecting their structured learning objectives. In contrast, independent tourists demonstrated a broader range of motivations, including personal interest and leisure, which influenced their preference for self-guided tour technology.

If we examine, more specifically, the data obtained from visitors to the Spanish Civil War shelters in Alicante, we highlight significant differences in their behavior, participation, and feedback, and we can glean some noteworthy insights. Specifically, within the Cultural Explorers visitor group, predominantly comprising individuals aged 15 to 25, a particular interest in educational aspects and interactive experiences facilitating a deep immersion in the history of the Spanish Civil War is observed. This cohort values the availability of educational materials, specialized guided tours, and interactive exhibitions that enable active

learning about the conflict and its implications for contemporary society. Furthermore, they positively value experiences that foster reflection and acknowledge the importance of preserving the memory of the past.

Conversely, within the Keepers of Memory visitor group, primarily consisting of individuals over 36 years old, a significant interest in heritage preservation and the transmission of historical memory to younger generations is noted. This demographic exhibits a preference for visits emphasizing historical narratives, contextualization of the conflict, and homage to its victims. Additionally, they appreciate experiences that encourage personal reflection and recognition of the significance of preserving the memory of the past.

These visitor segments reflect the diversity of audiences interested in the Spanish Civil War shelters in Alicante, underscoring the necessity of adopting differentiated approaches in management and communication to meet their expectations. While Cultural Explorers benefit from a more dynamic and educational approach, Keepers of Memory requires an approach that delves into the memorial and emotional significance of the visited spaces.

### **3.4 Discussion**

The use of quantitative analysis of visitor surveys has been successfully utilized in various studies. For instance, quantitative analyses of visitor satisfaction and its relation to tourist attributes were carried out at the Fantawild Adventure Theme Park in Taiwan, China, using a fuzzy method and an importance-performance analysis (IPA) to determine the impact of various attributes on visitor satisfaction [24]. Surveys have also been employed to provide a broader historical context of social dynamics and perceived human impacts over time [1]. Notably, similar to our case, the study of visitor profiles at coastal and marine tourism sites in Eastern Cape, South Africa [53] has been mentioned.

Time series autocorrelation analyses have played a crucial role in various fields of study, proving their relevance in scientific research. The importance of simulation processes, for example, using the Monte Carlo procedure to examine the presence of autocorrelations in the analysis of residuals and significant statistics [59], has been highlighted. This approach has been applied in areas as diverse as medicine to address problems of poor metabolism [60,61], demonstrating the versatility of these analytical techniques.

In the realm of tourism, time series analysis has enabled a deeper understanding of patterns and trends affecting the sector. The influence of cultural tourism, seen as an emerging product, by changes in Western society and its impact on heritage and culture has been explored [62]. This analysis is complemented by studies providing detailed insights into the characteristics of individuals engaging in rural tourism in Spain, based on research conducted in 1994 [63]. Furthermore, the need for reliable and coherent statistics that reflect the interdependence of tourism with other economic and social sectors has been

emphasized, highlighting the importance of developing statistical systems that capture the reality of tourism [64].

The ARIMA (AutoRegressive Integrated Moving Average) model has been a key statistical tool for analyzing and predicting time series. Its utility ranges from predicting river flow, crucial for water management in agriculture [59], to forecasting prices in the agricultural sector [65], and crop yields such as Chinese potatoes [31]. Its application has also been relevant in the context of the COVID-19 pandemic, assisting in predicting the disease's trajectory in the most affected countries [28].

In the tourism sector, the ARIMA model has proven to be particularly useful. This model, along with ETS models, has been used to predict trends in the US tourism industry from 2000 to 2020, analyzing data from airlines, hotels, car rentals, and travel agencies [60]. Similar studies have applied the ARIMA model to forecast the demand for whale watching tourism in Ulsan [66], health tourism demand in Turkey [67], and the development of rural tourism in the Guangshan County region [68]. In Spain, the forecasting of tourist flows has been improved using Google search indices related to travel [69], and the predictive capacity of tourism demand models has been explored through the incorporation of weather variables [70].

The identification of two distinct visitor segments reflects similar findings [18], which also reported the existence of multiple visitor profiles at cultural heritage sites. However, our study delves deeper into this understanding by revealing how these profile differences specifically impact the perception and valuation of the Civil War shelters, an aspect less explored in previous literature. This enrichment of visitor segmentation underscores the importance of customized management strategies, resonating with the recommendations of Laderman [36] on the need to tailor heritage experiences to visitor expectations. Nevertheless, unlike the conclusions drawn by Laderman in the context of war tourism, our findings suggest a greater predisposition towards educational experiences rather than merely contemplative ones, indicating an evolution in the preferences of visitors to sites of contentious memory.

While school groups presented clear engagement patterns, it's important to consider the potential overlap during peak visit times when independent tourists might also experience or interact with the educational tools targeted at students. This overlap could influence the independent tourists' responses and their interaction with the site.

The identification of the 'Cultural Explorers' and 'Keepers of Memory' segments not only enriches our understanding of the diversity of the visiting public but also raises key considerations for the management, promotion, and education of heritage in the Civil War shelters in Alicante. The distinction between these groups provides a solid foundation for the development of differentiated management strategies, ensuring that interventions and resources align with the specific needs and expectations of each segment.

For the 'Cultural Explorers', interested in educational and interactive experiences, the creation of digital interpretive materials, such as mobile applications and augmented realities, that offer immersive and participatory historical narratives is suggested. Additionally, the implementation of workshops and educational programs designed to foster dialogue and critical reflection on the Civil War and its legacy can significantly enhance the value of their visit. These initiatives will not only enrich their experience but also promote active and engaged learning with the heritage.

On the other hand, to meet the expectations of the 'Keepers of Memory', whose interest lies in the preservation of memory and tribute to the victims, the development of specialized guided tours that delve into the historical context and emotional significance of the shelters is recommended. The inclusion of personal testimonies, period photographic material, and historical documentation can facilitate a deeper and more emotive connection with the site. Similarly, organizing commemorative events and temporary exhibitions that highlight the importance of collective memory will contribute to reinforcing their commitment to heritage conservation.

Adapting management and communication strategies to address the needs of these segments will not only optimize the visitor experience but also reinforce the social and educational relevance of the shelters as spaces of memory. These differentiated strategies underline the importance of an inclusive and reflective approach in the management of heritage tourism, where a detailed understanding of the target audience is crucial for creating meaningful and enriching heritage experiences.

A comparative perspective of our findings with similar case studies in other cultural heritage contexts reveals both similarities and notable differences that enrich our understanding of the impact and perception of the Civil War shelters in Alicante. For instance, research [65] on tourism in Angkor Wat, Cambodia, highlights how visitor segmentation based on cultural and educational interests can inform heritage management strategies, resonating with our discoveries of 'Cultural Explorers' and 'Keepers of Memory'. However, unlike our study, Alvarez-Sousa and Paniza Prados observed a significant third category focused on spirituality, suggesting that the cultural context and type of heritage can influence segmentation categories.

Moreover, research on the Alhambra of Granada [53] reflects a shared concern for sustainability and heritage education, akin to the implications of our study on the Civil War shelters. Nonetheless, they also emphasized the importance of the aesthetic and recreational dimension of heritage tourism, an aspect less pronounced in the preferences of our identified segments.

These comparisons underscore the importance of considering site-specificities and visitor expectations when developing management strategies for cultural heritage sites. While there are common trends in the search for educational experiences and in the valuation of heritage, contextual details, such as the site's

history, its cultural significance, and the demographic composition of visitors, play a crucial role in shaping visitor expectations and, hence, in planning the heritage experience.

Considering these comparative case studies not only reinforces the validity of our findings but also opens avenues for future research, highlighting the need for adaptive and context-sensitive approaches in heritage tourism management. Therefore, this comparison offers a valuable contribution to the ongoing dialogue on the preservation, interpretation, and enjoyment of cultural heritage in diverse global contexts.

The successful application of time series forecasting at the Civil War shelters suggests that similar methodologies could be effectively implemented at other heritage sites to manage visitor capacities and enhance the visitor experience while protecting the site's integrity.

Finally, understanding the differences among visitor groups, as we have done in our study, is crucial for tailoring educational content that meets the needs of student groups while also providing independent tourists with resources to explore more freely. This could involve the development of specific educational programs for students and self-guided tour options for independent tourists.

The findings of this study offer valuable insights into the effective management and promotion of the Civil War shelters in Alicante as key elements of cultural heritage. Below are several recommendations aimed at heritage managers and tourism planners:

**Dual-track programming:** Based on the distinct needs of the two segments, we recommend the development of dual-track programming at heritage sites: one track focusing on educational engagement for school groups and another on enriching the cultural and leisure experience for independent tourists.

**Adaptation to Visitor Segments:** It is essential to develop communication and promotion strategies that align with the interests and expectations of the 'Cultural Explorers' and 'Keepers of Memory' segments. For 'Cultural Explorers', the use of interactive technologies and social media platforms to highlight educational aspects and immersive experiences is recommended. In contrast, 'Keepers of Memory' might be more effectively attracted by focusing on the historical and emotional importance of the site through newsletters, lectures, and commemorative events.

**Integration of Predictive Models:** The implementation of ARIMA models and other time series forecasting tools should be integrated into long-term strategic planning. These models can help foresee fluctuations in visit demand, allowing managers to adjust resources and management strategies to optimize the visitor experience and ensure site conservation.

Development of Tailored Educational Programs: Building on the learning preferences of 'Cultural Explorers', creating educational programs that encourage interaction and active participation can significantly enrich their experience. Similarly, to meet the needs of 'Keepers of Memory', offering specialized tours that delve into the historical narrative and significance of the shelters is suggested.

Encouragement of Community Engagement: Engaging the local community in the management and promotion of the shelters can enhance the authenticity of the experiences offered and strengthen the emotional connection to the heritage. This can be achieved through volunteer programs, collaborations with schools and cultural associations, and the inclusion of local testimonies in interpretative materials.

Finally, we recommend the implementation of dual-pathway signage that directs independent tourists to less crowded sections of the site during school visits, enhancing the experience for both segments.

These recommendations aim not only to improve the visitor experience but also to promote sustainable management of cultural heritage that balances conservation needs with the growing tourism demand. The effective implementation of these strategies will require a collaborative and flexible approach, capable of adapting to changes in tourism trends and visitor expectations.

#### **4. CONCLUSION**

This study has employed a quantitative approach to analyze the impact of visits to the Civil War shelters in Alicante on memorial cultural heritage, using data collected between August 2023 and January 2024. Through the adopted methodology, significant patterns and trends have been identified that contribute to the understanding of the cultural-tourism phenomenon in question and its relationship with heritage conservation.

The characterization of visitors reveals diversity in the audience attending the shelters, including both individual or group visitors (general public) and school groups. This result underscores the importance of tailoring dissemination strategies and educational activities to the needs and preferences of different visitor segments.

Time series analysis shows variability in the number of visitors without a clear trend or defined seasonality. However, the application of ARIMA models predicted a slight increase in the demand for visits, stabilizing towards a constant value. These findings are essential for the planning and management of the shelters, suggesting the need for strategies to manage demand fluctuations and ensure a quality visit experience.

Cluster analysis identified two distinct groups of visitors, indicating the presence of different profiles within the audience. This result is crucial for the development of more specific marketing and communication strategies, as well as for the adaptation of activities offered in the shelters, in order to meet the expectations of each segment.

The quantitative evaluation of the impact of visits on memorial cultural heritage highlights the relevance of the shelters as tools for heritage education and historical memory. The active participation of visitors, especially school groups, in educational activities, suggests a positive effect on the conservation and dissemination of heritage.

The continuation and expansion of similar studies to include a broader temporal range that captures seasonal variations and special events are recommended. Additionally, it is essential to strengthen promotion strategies and educational initiatives, leveraging the diversity of visitor profiles identified to enhance the visitor experience and promote heritage conservation.

In conclusion, this study provides valuable insights for the management of memorial cultural heritage associated with the Civil War shelters in Alicante, highlighting the importance of quantitative analytical approaches to inform decisions related to heritage conservation, education, and cultural tourism. The application of time series models and visitor segmentation techniques offers a solid foundation for optimizing dissemination strategies and improving the visitor experience, thus contributing to the sustainability and long-term value of cultural heritage.

This study has employed a quantitative approach to analyze the impact of visits to the Civil War shelters in Alicante on memorial cultural heritage, using data collected between August 2023 and January 2024. Through the adopted methodology, significant patterns and trends have been identified that contribute to the understanding of the cultural-tourism phenomenon in question and its relationship with heritage conservation.

Firstly, the characterization of visitor profiles has revealed diverse audience compositions, including individual visitors, groups from the general public, and school groups. This diversity underscores the importance of tailored dissemination strategies and educational activities to meet the varied needs and preferences of different visitor segments, thereby enhancing the overall visitor experience.

Time series analysis shows variability in the number of visitors without a clear trend or defined seasonality. However, the application of ARIMA models predicted a slight increase in the demand for visits, stabilizing towards a constant value. These insights are crucial for planning and managing the shelters effectively, especially in terms of managing demand fluctuations to ensure a quality visitor experience.

Cluster analysis identified two distinct groups of visitors, indicating the presence of different profiles within the audience. This result is crucial for the development of more specific marketing and communication strategies, as well as for the adaptation of shelter activities to meet the expectations of each segment. This segmentation approach enhances the effectiveness of promotional efforts and contributes to a more personalized visitor experience.

Moreover, the quantitative evaluation of the impact of visits on memoiristic cultural heritage emphasizes the significance of the shelters as tools for heritage education and historical memory preservation. The active engagement of visitors, particularly school groups, in educational activities suggests a positive influence on heritage conservation and dissemination.

The continuation and expansion of similar studies to include a broader temporal range that captures seasonal variations and special events comprehensively are recommended. Furthermore, strengthening promotion strategies and educational initiatives, leveraging the diversity of visitor profiles identified, will be essential to enhance the visitor experience and promote heritage conservation effectively.

In conclusion, this study provides valuable contributions to the management of memorial cultural heritage associated with the Civil War shelters in Alicante. By employing quantitative analytical approaches, it informs decisions related to heritage conservation, education, and cultural tourism, thereby contributing to the sustainability and long-term value of cultural heritage assets.

Our study not only fills a gap in the literature regarding the application of forecasting techniques in heritage tourism but also provides a methodological framework that can be adopted by heritage managers worldwide to optimize operational and conservation strategies.

## **5. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS**

While this study has provided valuable insights into visitation patterns and visitor profiles at the Civil War shelters in Alicante, it is important to acknowledge its limitations, which inevitably influence the interpretation of the results. First, data collection was limited to a six-month period, which may not fully capture seasonal and annual variations in visits. This temporal limitation can affect the generalizability of the predictive models and identified trends, suggesting the need for longitudinal studies covering a broader time range.

Moreover, the study focused exclusively on visitors who had already decided to explore the shelters, without including the perspective of those who, despite being aware of the site, chose not to visit it. This selection of the audience may introduce bias in understanding the barriers to visitation and in assessing visitor motivations.

Methodological limitations also extend to the use of the ARIMA model for predicting future visits. Although this model provides a powerful predictive tool, its



accuracy significantly depends on the quality and quantity of available historical data, which highlights the importance of integrating multiple data sources and analytical methods to strengthen future projections.

These considerations highlight critical areas for future research. An expanded approach that includes long-term data would allow for a richer understanding of visitation patterns and help validate the robustness of the predictive models used. Similarly, studying the perceptions and attitudes of those who are aware of the shelters but decide not to visit them could offer additional insights for developing more inclusive and effective marketing and management strategies. Finally, adopting mixed-methodological approaches that combine quantitative analysis with qualitative could enrich the understanding of visitors' experiences and expectations, providing a more solid foundation for heritage and tourism planning.

By addressing these limitations and exploring the unanswered questions, future research can continue to advance our understanding of heritage tourism and its contribution to sustainable development and cultural education.

## **DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## **CONSENT**

All authors declare that verbal informed consent was obtained from the interviewed street visitors (all adults) for conducting the survey from which data for this research were derived, within the framework of a municipal project that does not have an Ethics Committee. Therefore, authorization was obtained from the Alicante Memory Department, which is responsible for matters related to the Spanish Civil War air-raid shelters in the city.

## **ETHICAL APPROVAL**

In conducting the research detailed within this manuscript, all ethical guidelines for human subjects were meticulously followed, despite the project operating outside the purview of an established Ethics Committee due to its municipal framework. Specifically, verbal informed consent was obtained from all adult participants interviewed in street settings, ensuring their voluntary participation and understanding of the study's purpose. To further uphold ethical standards, strict measures were implemented to guarantee the anonymity and privacy of all data collected. The Alicante Memory Department, which oversees matters related to historical sites such as the Spanish Civil War air-raid shelters in the city, provided necessary authorizations ensuring that our research did not contravene any local or national regulations and adhered to the ethical standards laid down in the 1964 Declaration of Helsinki regarding research involving human subjects.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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