Assessing Critical Criteria for Historical Archeological Buildings in Iraq

Oday Hammoody Abdullah
Department of Civil Engineering
University of Baghdad
Baghdad, Iraq
10984@uotechnology.edu.iq

Wadhah Amer Hatem
Baquba Technical Institute
Middle Technical University
Baghdad, Iraq
wadhah1970wadhah@gmail.com

Abstract-This research was conducted to identify and evaluate the relative importance of the criteria in an archaeological building. Open and closed questionnaires were used and interviews with experts and specialists from many ministries and governorates were conducted to identify the most important criteria. The aim determines what factors influence historic archaeological building success, and which criteria should be used to determine the best response. The data were analyzed with the SPSS V25 program using the Relative Importance Index (RII) method to determine the relative importance of the considered 15 variables. RII allows the identification of the most important criteria based on responses from participants, and it is a useful tool for prioritizing indicators rated on Likert-type scales. The data were analyzed using a formula from a previous study's relative index analysis method. Providing information or a database of historic old buildings ranked first with RII = 92%, and providing information on the changes taking place in old buildings ranked second with RII = 88%.

Keywords-construction projects; historic archaeological buildings; relative importance index

I. INTRODUCTION

Architectural and art historians, historical geographers, and local historians are among those who study the environment of historical archaeological buildings [1]. Archaeological discoveries of buried structures are frequently dismissed in favor of artifacts recovered from buried deposits associated with them [2]. The original architectural and structural system of approximately 25% of structures changes by restoration [3]. As a result, in some historical archaeology overviews, the study of buildings is virtually invisible. Instead, surveys of vernacular architecture studies are being conducted [4]. Others, aware of the importance of more integrated archaeology of buildings, find such perspectives strangely limited, whether in interpretations of Neolithic Europe or descriptions of mediaeval Britain [5]. Archaeologists around the world have used a variety of methods to focus their research and cultural resource management efforts on building remains that have survived above or below ground as wall foundations, floor surfaces, or post holes over the past 40 years, despite the general lack of attention paid to the study of buildings in the mainstream historical archaeology literature. Some of this

material is reviewed in [6]. We argue that built structures are an important part of the material remains of the past 500 years and that their study should be integrated with the study of sites, artifacts, and landscapes. To quantify the relative importance indices of an exhaustive list of the criteria of historical archaeological building in Malaysia, the Relative Importance Index (RII) technique was used in [7]. The paper is divided into five sections based on the importance of historical, archaeological building factors. In this study, the RII technique was used to rank historical and archaeological building criteria [8]. The survey's findings revealed that ignorance of planning and building regulations, insufficient housing schemes, unrealistic zoning, and the location of land are important factors that influence unauthorized building sitting [9]. Data from previous related studies were analyzed using a formula for the relative index analysis method for historical/archaeological buildings. The results revealed that site maintenance ranked first (RII = 0.836), warranty clauses in contract specifications to incorporate construction quality ranked second (RII = 0.830), and construction personnel training ranked third (RII = 0.826) [10]. The RII of the main criteria in descending order in [11] is: Experience & Past Performance (EP), Financial Stability (FS), Personnel Capabilities (PC), Equipment Capabilities (EC), Managerial Capabilities (MC), Health & Safety (HS), Past Relationships (RR), and Geographic Location of contractor (GL) [11].

II. IDENTIFYING IMPORTANT CRITERIA FOR HISTORICAL ARCHEOLOGICAL BUILDINGS

Because different criteria apply to different areas, different authors considered different criteria for historical buildings. Previous research has identified a number of critical standards for historical and archaeological constructions (see Table I).

III. RESEARCH OBJECTIVES

The research objectives are:

- To determine the factors that should be examined and taken into account when recommending a historical or archaeological structure.

- Criteria ranking according to their RII values.

Corresponding author: Oday Hammoody Abdullah

TABLE I.   IDENTIFIED CRITERIA FROM PREVIOUS STUDIES

No.	Criterion	Symbol	Ref.
1	Providing information or a database of historical old buildings	C01	[10]
	There are differences and intersections between architectural, construction, electrical and other disciplines	C02	
	Existence of complete plans as a reality for the old buildings	C03	
2	Having a regular maintenance system	C04	[11]
	Providing a schedule to determine the times of processing materials for maintenance	C05	
3	Existence of a facility management system	C06	[12]
	Availability of specialized staff using BIM technology	C07	
	There is coordination between the members of the team that design the architectural, construction, electrical, and other specializations	C08	
4	Presence of information on the changes taking place in old buildings, including additions and removals through time	C09	[13]
	Existence of a facility management system	C10	
	Availability of specialized staff using BIM technology in the department	C11	
5	Provides 3D models of old buildings	C12	[14]
	There is documentation of information on ancient buildings	C13	
	Damage and lost items are controlled on site	C14	
	There is continuous work to improve the quality of the design	C15	

IV. RESEARCH METHODOLOGY

The following points describe briefly the methodology of the current research:

- Obtaining the necessary information and data during theoretical and field research on the study topic and using the research map to locate the historical/archaeological structure criteria.

- Using an open questionnaire to collect data from a group of experts to identify the criteria.

- Determining the criteria and selecting the study sample by using a closed questionnaire to collect data from the open questionnaire.

- Ranking the criteria with the RII method from higher to lower importance on the given scale, i.e. 1-very low, 2-low, 3-medium, 4-high, and 5-very high.

V. PILOT STUDY FOR THE CLOSED QUESTIONNAIRE FORM

A pilot study can be used to validate and evaluate closed questionnaires. Risk is vital to contractors, clients, and consultants within the construction industry; however, the problems of risk assessment are complex and poorly understood in practice [15]. A questionnaire run that includes testing of question formulation is known as a pilot study, in which the effectiveness of various data collection methods is assessed by identifying and testing the most challenging inquiries [16]. In this phase, the questions are checked for clarity and any issues that may arise are discovered. An assessment group with at least 15 years of experience was used

for this pilot study's closed questionnaire distribution. Evaluation and assessment of the validity of the closed questionnaire form was carried out by experts, who confirmed the validity and suitability of the sections of the closed questionnaire form. All suggestions and comments were collected and rated, and all suggestions and proposed changes were discussed [17].

VI. CLOSED QUESTIONNAIRE FORM DISTRIBUTION

Closed questionnaires were handed out to a selected group of participants. Fifty survey forms were collected out of 60 sent forms and some samples were excluded due to lack of data and information. In the end, 45 closed questionnaire forms were considered and analyzed.

VII. QUANTITATIVE ANALYSIS DATA

Quantitative data were gathered and analyzed using a statistical program (IBM/SPSS V25). The factors were calculated for ranking using the RII technique. RII was used to rank the importance of each recommendation provided by the respondents [18]. The RII of the criteria is calculated by [19]:

$$\text{RII} = \left(\frac{\Sigma W}{A * N} \right) \quad (1)$$

where RII ranges from 0 to 1, W is the weight given to the factors by the responders, ranging from 1 to 5 (1 is less important and 5 is highly important), A is the total number of responses for that factor or option, and Z is the highest weight (in this case, 5).

VIII. RELIABILITY AND VALIDITY TESTS

Validity and reliability consider the most important method conditions for research tool design. Therefore, validity and reliability of the closed questionnaire forms must be provided before any statistical analyses data. The value of Reliability can be founded by finding the value of (Cronbach's Alpha, α) [20].

1) Reliability of Closed Questionnaire

The term "reliability" refers to the measurement of true results and the stability and equality checks. Reliability is a necessary, but not sufficient factor in determining the viability of a tool for measuring historical building criteria.

2) Validity of Closed Questionnaire

More than any single statistical tool, it is necessary to establish a relationship between the assessment and the behavior it is meant to measure in order to determine its validity. It is critical that the test be valid to use and interpret the results correctly. Validity is equal to the square root of the coefficient of reliability [21]:

$$V = \sqrt[2]{\alpha} \quad (6)$$

where V is the validity and α the reliability.

IX. STATISTICAL ANALYSIS

The top test criteria were determined using the SPSS V25 statistical program. The results are provided in the form of tables to make them more understandable and straightforward. Following the distribution and collection of completed

questionnaire forms, the next step was to determine a specific method for statistical and measurement purposes to complete the calculations and data analysis.

1) Reliability

Most the social science research situations use the Cronbach's alpha. If it is more than 0.7, then the consistency index shows high reliability and it would be acceptable [18]. Table II shows the closed questionnaire's reliability for each criterion.

TABLE II.   CRONBACH'S ALPHA FOR THE CLOSED QUESTIONNAIRE

No.	Criterion	Cronbach's Alpha {α}
1	C01	0.920
	C02	0.810
	C03	0.780
2	C04	0.800
	C05	0.70
3	C06	0.77
	C07	0.87
	C08	0.88
4	C09	0.90
	C10	0.65
	C11	0.95
5	C12	0.88
	C13	0.75
	C14	0.77
	C15	0.70

2) Validity

Table III shows the validity of each criterion for the historical archaeological building in the closed questionnaire.

TABLE III.   VALIDITY

No.	Criterion	α	Validity coefficient
1	C01	0.920	0.959
	C02	0.810	0.900
	C03	0.780	0.883
2	C04	0.800	0.894
	C05	0.700	0.836
3	C06	0.770	0.877
	C07	0.870	0.932
	C08	0.880	0.938
4	C09	0.900	0.948
	C10	0.680	0.824
	C11	0.950	0.974
5	C12	0.880	0.938
	C13	0.750	0.866
	C14	0.770	0.877
	C15	0.700	0.836

X. ANALYSIS OF THE CLOSED QUESTIONNAIRE FORMS

The first stage of a closed questionnaire is a description of the sample members' general experience. The second stage is an assessment of the criteria. Respondents were asked to mark (spot) the criteria of historical archaeological buildings that they thought were important in a closed questionnaire and RIIs were calculated. The analysis and discussion of the results will be according to the parts mentioned, so each axis will be analyzed and discussed separately.

A. Part One: (Personal Information)

Part one includes the personal information in closed questionnaire forms.

1) Scientific Qualifications

Table IV shows the frequency distribution of respondents according to their scientific qualification.

TABLE IV.   SCIENTIFIC QUALIFICATIONS

Scientific qualification	Frequency	Percentage
BSc	23	51.00%
MSc	12	27.00%
PhD	10	22.22%
Total	45	100.00%

2) Engineering Specialization

Table V shows the engineering specialization of the respondents.

TABLE V.   ENGINEERING SPECIALIZATION

Engineering specialization	Frequency	Percentage
Civil	24	53.33%
Electricity	6	13.33%
Architectural	5	11.11%
Mechanical	4	8.89%
Environment	3	6.67%
Chemical	3	6.67%
Total	45	100.00%

3) Actual Experience

Table VI shows the experience of the respondents.

TABLE VI.   EXPERIENCE

Actual experience	Frequency	Percentage
(15-20)	15	33.33%
(21-25)	5	11.11%
(26-30)	11	24.45%
More than 30	14	31.11%
Total	45	100.00%

4) Labor Sector

The respondents' distribution according to the labor sector is shown in Table VII.

TABLE VII.   LABOR SECTOR

Labor sector	Frequency	Percentage
Public	35	77.78%
Private	10	22.22%
Total	45	100.00%

B. Part Two: Evaluation of the Criteria

Part two includes the evaluation of the criteria for historical archaeological buildings from the respondents. Each question will be analyzed by RII to find the criteria ranking. Table VIII shows the analysis and ranking of the criteria from higher to lower importance.

TABLE VIII.   CRITERIA ANALYSIS AND RANGING BY RII FOR HISTORICAL ARCHAEOLOGICAL BUILDINGS

Criterion	Very high	High	Medium	Low	Very low	Ranking
C01	30	12	3	0	0	92%
C09	26	15	3	1	0	88%
C15	21	16	8	0	0	86%
C10	21	14	8	2	0	84%
C02	12	28	4	1	0	82%
C03	8	30	7	0	0	80%
C11	7	29	9	0	0	79%
C08	15	15	10	5	0	78%
C12	8	23	13	1	0	76%
C06	8	21	15	1	0	75%
C04	10	19	10	6	0	74%
C07	7	17	20	1	0	73%
C05	13	13	11	5	3	72%

XI.   CONCLUSION

The development of a set of evaluation criteria for historical and archaeological structures is described in this paper. Based on a thorough literature review, fieldwork, and discussion with selected experts from many governorates, a total of 15 criteria were identified in this study. RII calculation and analysis was used to rank the criteria from the most to the least important. The researchers were able to compare the relative importance of the criteria as perceived by respondents using these rankings. The first criterion is the provision of information or a database of old historical buildings which received the 92% of the vote, indicating that this criterion is very important. Most of the criteria are construction activities, indicating that respondents agreed that historical and archaeological building criteria should be implemented. Ministries and local governments can use the findings of this study to develop historical and archaeological structures, as well as using it as a pilot study to get feedback from a group of experts. Experts were contacted to assess the questionnaire's validity and to confirm the suitability of the items for the research goals in order to identify any flaws in the questionnaire.

REFERENCES

[1] E. Ziglio, *Gazing into the Oracle: The Delphi Method and its Application to Social Policy and Public Health*, 1st ed. London, UK: Jessica Kingsley, 1996.

[2] O. P. Akadiri, "Development of a Multi-Criteria Approach for the Selection of Sustainable Materials for Building Projects," Ph.D. dissertation, University of Wolverhampton, Wolverhampton, UK, 2011.

[3] H. I. Polat, "A Classification Study on the Development Stages of Construction Technologies in Turkey," *Engineering, Technology & Applied Science Research*, vol. 7, no. 5, pp. 1909–1913, Oct. 2017, https://doi.org/10.48084/etasr.1606.

[4] S. Balubaid *et al.*, "Assessment Index Tool for Green Highway in Malaysia," *Jurnal Teknologi*, vol. 77, no. 16, Nov. 2015, https://doi.org/10.11113/jt.v77.6405.

[5] J. M. Bryce, *Developing Sustainable Transportation Infrastructure Exploring the Development and Implementation of a Green Highway Rating System*. Washington, DC, USA: ASTM International, 2008.

[6] A. L. Delbecq and A. V. D. Ven, *Group techniques for program planning: A guide to nominal group and Delphi processes*. Glenview, IL, USA: Scott, Foresman, 1975.

[7] G. Fernández-Sánchez and F. Rodríguez-López, "A methodology to identify sustainability indicators in construction project management—Application to infrastructure projects in Spain," *Ecological Indicators*, vol. 10, no. 6, pp. 1193–1201, Nov. 2010, https://doi.org/10.1016/j.ecolind.2010.04.009.

[8] A. Griffith and K. Bhutto, "Better environmental performance: A framework for integrated management systems (IMS)," *Management of Environmental Quality: An International Journal*, vol. 20, no. 5, pp. 566–580, Jan. 2009, https://doi.org/10.1108/14777830910981230.

[9] R. E. Anderson, R. L. Tatham, W. C. Black, and J. F. Hair, *Multivariate Data Analysis*, 5th ed. Upper Saddle River, NJ: Prentice Hall College Div, 1998.

[10] K. Nikumbh and P. D. Aher, "A review paper - Study of green highway rating system," *International Research Journal of Engineering and Technology*, vol. 4, no. 5, pp. 2014–2018, 2017.

[11] A. Khoso, N. Memon, S. Sohu, F. H. Siddiqui, and J. Khan, "Decision Criteria For Assessment Of Contractors In Prequalification Phase Of Public Projects," *International Journal of Advanced Science and Technology*, vol. 29, no. 11s, pp. 2624–2635, Jun. 2020.

[12] S. R. Sahamir, R. Zakaria, G. Alqaifi, N. I. A. Abidin, and R. R. R. M. Rooshdi, "Investigation of Green Assessment Criteria and Sub-criteria for Public Hospital Building Development in Malaysia," *Chemical Engineering Transactions*, vol. 56, pp. 307–312, Mar. 2017, https://doi.org/10.3303/CET1756052.

[13] M. Soderlund, "Sustainable Roadway Design - A Model For An Environmental Rating System," M.S. thesis, University of Washington, Washington DC, USA, 2007.

[14] M. Loosemore and T. Uher, *Essentials of Construction Project Management*. NewSouth Publishing, 2003.

[15] U. H. Issa, M. A. Farag, L. M. Abdelhafez, and S. A. Ahmed, "A Risk Allocation Model for Construction Projects in Yemen," *Civil and Environmental Research*, vol. 7, no. 3, pp. 78–88, 2015.

[16] N. M. N. Saeed and A. S. Hasan, "The Effect of Total Quality Management on Construction Project Performance," *Journal of Science and Technology*, vol. 17, no. 2, pp. 11–30, 2012, https://doi.org/10.20428/jst.v17i2.93.

[17] J. D. Princy and S. Shanmugapriya, "A Probabilistic Fuzzy Logic Approach to Identify Productivity Factors in Indian Construction Projects," *Journal of Construction Engineering and Project Management*, vol. 7, no. 3, pp. 39–55, 2017, https://doi.org/10.6106/JCEPM.2017.9.29.039.

[18] J. N. Gatitu, C. K. Kabubo, and P. Ajwang, "Approaches on Mitigating Variation Orders in Road Construction Industry in Kenya: The Case of Kenya National Highways Authority (KeNHA)," *Engineering, Technology & Applied Science Research*, vol. 10, no. 5, pp. 6195–6199, Oct. 2020, https://doi.org/10.48084/etasr.3737.

[19] R. A. Majeed and H. K. Breesam, "The criteria for selecting the landfill sites in Baghdad governorate," *IOP Conference Series: Materials Science and Engineering*, vol. 1090, no. 1, Nov. 2021, Art. no. 012013, https://doi.org/10.1088/1757-899X/1090/1/012013.

[20] F. Magalhaes, *Facing the Challenges of Informal Settlements in Urban Centers: The Re-urbanization of Manaus, Brazil*. Washington DC, USA: Inter-American Development Bank.

[21] R. A. Majeed and H. K. Breesam, "Application of SWARA Technique to Find Criteria Weights for Selecting Landfill Site in Baghdad Governorate," *IOP Conference Series: Materials Science and Engineering*, vol. 1090, no. 1, Nov. 2021, Art. no. 012045, https://doi.org/10.1088/1757-899X/1090/1/012045.

[22] M. A. Akhund, H. U. Imad, N. A. Memon, F. Siddiqui, A. R. Khoso, and A. A. Panhwar, "Contributing Factors of Time Overrun in Public Sector Construction Projects," *Engineering, Technology & Applied Science Research*, vol. 8, no. 5, pp. 3369–3372, Oct. 2018, https://doi.org/10.48084/etasr.2276.