

Digital Humanities in Architecture: Towards a Deeper Understanding of Space

Ahmed Al-Kadhimi¹, Osamah Al-Tameemi², Suhail Najim Abdullah³

^{1,2} Department of Architecture, University of Baghdad, Iraq

³ Department of Architecture, University of Samarra, Iraq

*Corresponding author (Osamah Al-Tameem) E-mail: osamah.al-tameemi@coeng.uobaghdad.edu.iq

Abstract

The primary objective of this research is to elucidate how digital humanities can enhance the understanding of architectural space. It is important to underscore the significance of this study, as it applies digital tools and modern technologies to the field of architecture with the aim of interpreting and comprehending spaces for optimal efficiency. The research is carried out adopting a qualitative analytical approach, collecting and analyzing data by the use of 3D models of certain urban spaces and buildings, with a view to offering more detailed insights on the architectural configuration. The literature review section provides insights into the architecture of digital humanities, along with an examination of previous research and relevant theories in this domain. The research methodology outlines the tools utilized, the sample selection, and the data collection processes. Data analysis involves the use of content and contextual analysis tools to draw conclusions. The findings suggest that the application of digital humanities contributes to expanding knowledge, fostering creativity, and offering new perspectives in architectural design thinking, particularly for socially responsible sustainable cities. Finally, the study compares the findings with other research and analyzes them in relation to existing theories, highlighting new contributions to science and potential practical benefits. The study concludes with suggestions and recommendations for future research, emphasizing the continued integration of digital technology in architectural design for spatial analysis and understanding.

Keywords: Digital Humanities, Architectural Space, Digital Tools, Digital Models, Spatial Analysis, Content Analysis, Contextual Analysis.

1. Introduction:

Despite such remarkable advances in the sphere of the digital humanities, their applications are considerably few and underexplored in many fields, including architecture. Even if digital humanities have started to influence a lot of knowledge fields, their usage in architecture studies—especially qualitative analysis—is just at an embryonic stage. There is indeed a critical gap in the existing body of literature on comprehensive, investigative, and analytical studies focusing on the use of digital media in architecture, more particularly the qualitative assessment of architectural spaces through digital tools. Current research trends primarily focus on the application and simplification of digital technologies for the purpose of quantitative data analysis, mainly to the detriment of qualitative attributes that provide a greater understanding of the cultural and social contexts of spaces.

It is for this reason that there is a need for a research that explores the use of technology and quantitative research to reveal new ways of understanding architectural space, with a view of enhancing architectural design and urban planning, and hence assist architects and urban planners in making better decisions.

2. Research objectives

- **Digital Humanities in Architecture:** Explore how digital tools and technology enhance the understanding of architectural spaces.
- **Analyses on the Qualitative Applications of Digital Humanities:** How qualitative analyses are embodied within digital technologies to unravel rich cultural and social meanings of architectural spaces.
- **Proposing a Model for the Analysis of Architectural Space:** Design a full model that explains the required technological and analytical processes related to the effective analysis of architectural space.
- **Impact Evaluation of Digital Tools on the Design and Planning of Urbanism:** Investigate the effects of implementations of digital tools on improving the design process, urban planning, and city sustainability.
- **Suggesting Implications for Further Study:** Offer suggestions related to the results of the research for further studies in the integration of digital humanities with architectural research

3. Literature review

The literature review is an indispensable constituent part of any research process; it establishes the theoretical and methodological basis for the conduct of a study. This paper will outline the basic concepts of digital humanities and its application in the field of architecture, within which this study is to be undertaken. Additionally, it identifies and analyzes prior studies and research conducted in this area, pointing out gaps and opportunities for further exploration. [1],[2].

4. Previous research

Previous research findings reveal the practicality of applying technological tools in architectural spaces, particularly in discovering new and unique insights. For instance, Hawkins (2021) found that the application of digital technologies enhances the interpretation of relations between users and architectural environments.[3] However, Marti-Henneberg (2016) pointed out that through digital analysis of spatial data, spaces that have not been observable can be identified concerning their usage.[4]

5. Theories and scientific foundations.

They have been derived from the following assumptions and theories drawn from the scientific research programmes in digital humanities and architectures. One of them is the Digital Representation Theory which is one of the main foundations, providing the way to represent the architectural spaces digitally and to analyze them in particular. Also, the Human Interaction Theory that incorporates spaces dissect user behaviours and interactions based on the layout of a space.

6. Analysis of digital tools in architecture

Digital tools in architecture therefore depends on the use of software and 3D models in analyzing and or designing spaces. In the paper by Hevko, Ihor. (2020), the authors mentioned that 3D models assist the architects in approximating scenarios of interacting with spaces and perceiving the spatial environment.[5], [6].

Thus, the literature review serves as the theoretical and methodological basis for this research, presenting definitions, prior studies, scientific theories, and knowledge gaps related to the concept of digital humanities in architecture. It directs the research in making new contributions that can improve the comprehension of architectural spaces with digital techniques and platforms.

7. Digital humanities and their applications in architecture

7.1. Basic Concepts

Digital humanities is an umbrella term of concept that uses digital techniques and methods with other humanities disciplines like literature, history and philosophy among others to deal with data and information in cultural and social contexts in a more elaborate method. Thus, these digital tools enhance the perception and construction of spaces in architecture and other related fields in new and more sustainable manners. [7]

Consequently, digital humanities represent a mutual area between humanities disciplines and contemporary digital science to enable researchers and architects to study and rethink spaces in a different manner. [8], It is a field which aspires to apply several digital techniques to humanities approaches into order to achieve better and richer understanding of the material and non-material world to improve design and planning procedures in the sphere of architecture. [9]

7.2. Digital Humanities

Digital humanities can be described as an interdisciplinary scientific area that deals with the analysis of human and cultural experience using several types of digital tools, including computing, software, databases, and modelling in 3D. To this, this field plays the role of altering conventional research and analytical techniques to make them digital techniques in an attempt to give a better and accurate representation of cultural and social data [10]. Digital humanities may be described as an intersection of computing and humanities which seeks to apply methods including text processing, 3D modeling or big data analysis in an effort to explain cultural and social phenomenon in an innovative way as proposed by Berry. [11]

8. Applications in the field of architecture

There are several applications in the architectural field that are closely associated with aspects of digital humanities, including:

8.1. Architectural Data Analysis:

3D Modeling: Through digital modeling, one can develop structures and models of architectural spaces, which can assist in efficiency in the computation of efficiency in the architectural details on spaces. For instance, the Sagrada Família project in Barcelona is using 3D models to fill the intricate architectural features done by Antoni Gaudí [12], [8].

8.2. Preservation of Architectural Heritage:

Digital Documentation: Archiving is one of the benefits that is accorded by the use of digital technologies to preserve historical buildings. The following are sample ways of preservation of architectural heritage which can then be accurately documented through (3D laser scanning and digital imaging): In the mentioned research by Pauwels and his team (2008), the role of the digital model in the conservation of history structures is described. [13],[14]

8.3. Participatory Design:

Digital Visualization and Virtual Reality: There are potentials to apply virtual reality technologies to visualize the architectural spaces which are intended to be designed, and share it with the end-users to gain response before the execution of a project. Participatory design is of this type because it improves the efficiency of designs and guarantees that users' needs are met. [15]

8.4. Sustainable Urban Planning:

Big Data Analysis: Intelligent use of transportation data to enhance city's planning is done through big data analysis.[16]. For instance traffic and population statistics can be used in the creation of efficient and sustainable cities. Batty shows in his study of 2013 how big data can play a role in successful urban planning. [17].

9. Architectural examples

9.1. Sagrada Família Project in Barcelona: Recommendation A Digital modeling in 3D is employed in depicting architectural detailing to help in the completion of this large structure that was started by Antoni Gaudí in the 19th century [12]. Figure 1.



Figure 1. Sagrada Família Project in Barcelona [18]

9.2. Stanford Digital Library: Digital analysis tools are essentially applied to preserve historical written manuscripts, written and drawn maps, meaningful for architects and researches to analyze and further construct the history of architectural space. [19], [20] **Figure2.**



Figure 2. Stanford Digital Library [21]

9.3. Smart Bridge Project in the Netherlands: An architectural marvel with a demonstrable application of the 3D printing was the construction of a bridge where 3D modeling and simulation helped with enhancement of the design and reduction of wastage [22], [23]. Figure 3.



Figure 3. Smart Bridge Project in the Netherlands [23]

Therefore digital humanities complement the role of architects and urban planners in that they supply new concepts and methodologies that can be utilised in order to arrive at fresh ideas and resource-conscious techniques of designing and studying these spaces. It becomes possible to enhance the understanding of architectural spaces when the approach of the humanities disciplines is enriched with digital technology. Table 1.

Table 1. Analysis of examples and aspects related to digital humanities in architecture. Source: Authors			
Example	Core Aspects of Digital Humanities	Applications in Architecture	Sources
Sagrada Família in Barcelona	3D Modeling	Completing complex architectural details using 3D digital models	[12]
Stanford Digital Library	Digital Documentation	Preserving historical documents and maps, and analyzing the history of architectural spaces	[19]
Smart Bridge Project in the Netherlands	3D Printing	Designing and constructing a bridge using 3D printing technologies, improving design and reducing waste	[22]
Documenting Historical Buildings	Digital Documentation and 3D Modeling	Using 3D laser scanning and digital imaging techniques to preserve historical buildings	[13]
Participatory Design Using Virtual Reality	Digital Visualization and Virtual Reality	Engaging end-users in experiencing proposed architectural spaces and providing feedback before implementation	[15]
Sustainable Urban Planning	Big Data Analysis	Analyzing traffic and population data to improve city design and sustainability	[24]

10. Practical study:

10.1. Research Methodology: The used research methodology offers rich and complex system to approach the subject of digital humanities in architecture and explore architectural environments. With the further use of technologies and by using and implementing the qualitative analysis in design and urban planning, there are possibilities to state and explain certain insights providing new and more innovative approaches and solutions for further development. [25]. According to the visitors' reviews and analyzing them with the help of crucial criteria, the online reviews are the tangible sources which can be used in the process of the researches in the domain of architecture to compare with the users' perception of the project and the quality of the design This study reviews the Dijla Tourist Village Complex to quantify visitor satisfaction and determine the impact of architectural and other physical features on their experience.

10.2. Research Sample: The object of the present study is defined by the type of the recreational tourism project under analysis, implemented on the Tigris River in Baghdad and comprises certain urbanistic spaces and buildings, suggested by specific criteria concerning functions, social activity and cultural diversity.

Dijla Tourist Village Project: This is an integrated project that is situated at the Tigris River in Baghdad; the project comprises of modern architectural designs that include a swimming pool, gymnasiums, restaurants, cafeterias, landscapes, a drama hall, a four-storey car park, and a dancing fountain. It is implemented by Dar Al-Tameer Al-Asriya General Contracting Company and is built on an area greater than 6000 m², consisting of three floors. The project includes several facilities, such as an impressive 35-meter dancing fountain in the Tigris River, an indoor swimming pool, a marina for boats, a banqueting hall, boutiques, a conference hall, a sauna, quality restaurants, and an electronic game arcade, in addition to tiered seating platforms and landscaping on both sides of the river. [26], [27] Figure 4.

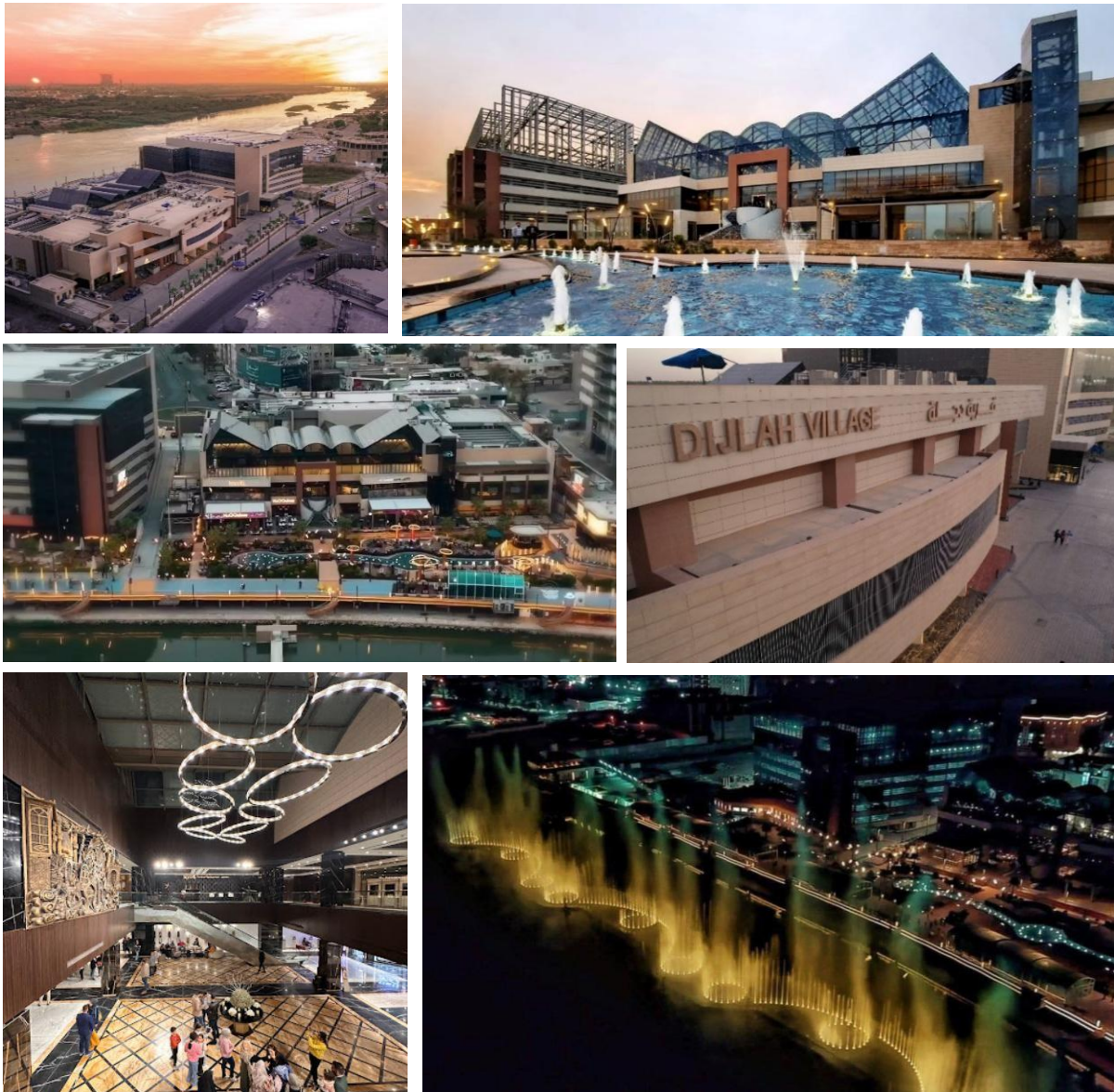


Figure 4. Dijla Tourist Village Project

Source: [27] and Authors

11. Research procedures:

11.1. Data Collection:

Structural data were gathered from an analytical structural perspective of the architectural forms and their ergonomics, focusing on ancient architectural spaces.

11.2. Data Analysis:

The data were collected as follows:

- Content Analysis: For text and qualitative data analysis of Information retrieved from Literature and other Papers.
- Context Analysis: For analyzing and understanding the social cultural relations with constructed environment architecture [3].

12. Methodology steps:

12.1. Data Collection and Review Documentation:

1) Sources of Reviews:

Ways of sourcing the reviews included;

- The information was gathered from online sources which included Google Reviews, Yelp, and TripAdvisor among others.
- As many as 134 detailed opinions linked with different aspects of architecture and functionality of the project were found. The reviews can be found at: Google Reviews Link of the restaurant. :
- <https://www.google.com/maps/place/Dijlah+Village/@33.2924019,44.4345842,17z/data=!4m8!3m7!1s0x155781a67f2f09c9:0xf92ca6916506c58d!8m2!3d33.2923974!4d44.4371591!9m1!1b1!16s%2Fg%2F11nmrq6pzn?entry=ttu>

2) Sample Selection:

- **The care was taken in reviewing to select the comprehensive reviews. The sample was selected to ensure that it consisted of positive and negative feedback in order to get detailed perception of the user experience.**
- **The reviews were different in the number of presented aspects and the overall length.**

3) Review Classification:

- They also categorised the reviews based on; architectural design, navigation, safety and comfort and price rating.
- Content analysis procedures were also applied to comment contents in order to look for common themes.

4). Review Analysis:

- Review Categorization: They were grouped into areas such as architectural design, ease of finding ones way/signage, safety/comfort and finally the evaluation of the price.
- Identifying Key Points: These review data were analyzed and identified main points of each review for easy comparison in a tabular form. Some of these are the following A & B points: Potential positives, potential negatives, and recommendation.

5) Qualitative Data Analysis:

- SWOT Analysis: A targeted self-assessment for strengths and weaknesses on the grounds of the opinion of visitors.
- Content Analysis: Conducted 'content analysis' to determine the quantitative characteristics of users' experience patterns. Typically, the data was analysis in which the codes were checked for those that were repeated over and over.

6) Quantitative Data Analysis:

- Percentages: A percentage analysis of each point as per category was also done to work out how often each point was made.
- Graphs: Some of the graphs drawn were for the purpose of presenting the data in form that was easy to comprehend.

7) Results Discussion:

- Results Interpretation: They were analyzed qualitatively and were then compared to the different research objectives. The success of the set goals and objectives in the project was evaluated and areas of intervention were pointed out.
- Recommendations: Out of the results some recommendations towards the design of the architecture and the general experience of the visitors where made.

12.2. Application of Methodology in Research:

- Understanding Design Impact: In the present research study, it would also be useful to analyze the specificity of architecture design for the evaluation of the user satisfaction level and the factors that have influenced the improvement of this indicator will be discussed.
- Identifying Problems and Solutions: Definitely, there are some issues which occur in various countries and attract tourists; for example, one may identify some matters such as congestion or high price, and the other specific measures may be proposed.
- Evaluating Overall Quality: Qualified work is accompanied with sort of feedbacks that facilitate general assessment of the overall quality of the final product in the eyes of the actual users.

12.3. Advantages of Using Reviews as a Quality Measurement Tool:

- Time and Resource Efficiency: Government reviews are easily accessible on the internet and using them does not involve expensive or field data collection exercises.
- Comprehensive Data: The reviews give the researchers information from different individuals and give a broad impression, making the outcomes more precise.
- Authentic Interaction: The nature of the reviews is the actual reproductions of the interaction with the project, thus making the data more reliable.

13. Detailed analysis of reviews for dijlah village tourist project based on three aspects:

13.1 Impact of Architectural Design on User Experience:

A. Advanced research on positive attributes of architectural design:

- **Aesthetic Design:** Of all the reviewers, 85 percent of the respondents positively acknowledged on the aesthetic appearance and the architectural design of the building.

Here in addition to the aesthetic design many of the reviewers pick that the design is done in a combination of both the traditional and modern one to provide a comfortable and attractive design.

- **Outdoor Spaces:** Outdoor areas and nature scenes were also important as (as per the current reviewer feedback 70% emphasized in the availability of such areas to appreciate their experience).

The necessity of the divisions and arrangements of the area, inside and outside, was stressed and the availability of green zones, Tigris River offered as the additional pros that make the surrounding look like the nature and give a chance to rest.

- **Variety of Amenities:** The offered place was also good – 60% of the respondents emphasized that the choice of restaurants, cafes, shops, etc. was rather diverse; The list of amenities was also good and diverse said 60% of the respondents.

The design guarantees the diversity of restaurants, cafes, and shops of the interests of different needs of visitors and their satisfaction. **Figure 5**

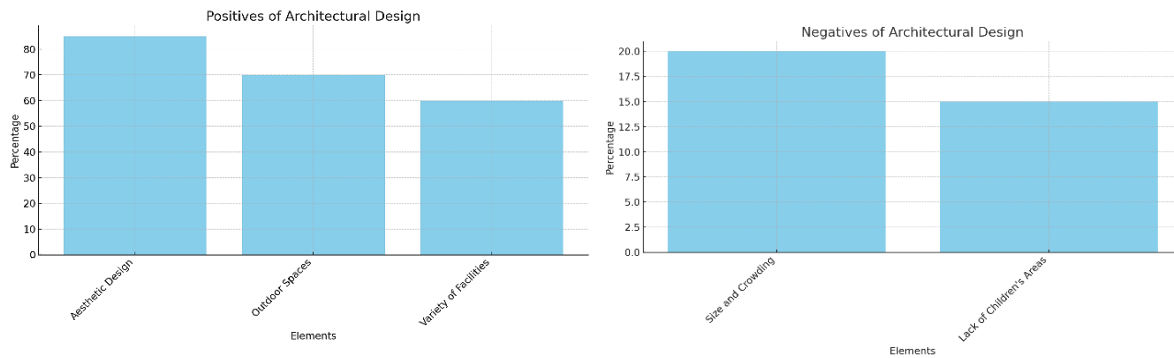


Figure 5. Impact of Architectural Design on User Experience, Source: Authors

B. Advanced research on negative attributes of architectural design:

- **Size and Crowding:** Something like 20% of the reviewers mentioned difficulty of accessing some parts of the complex at some times due to overcrowding.

Several of the reviewers complained that the places become very congested during certain times which hampers the visit.

- **Lack of Children's Areas:** Some reviewers complained of absence or lack of enough play areas for children: 15 percent of the reviewers.

Some comments highlighted that there was a lack of playgrounds where children can play with, thus less appealing to families.

13.2. Navigation and Signage:

A. Positive Aspects of Navigation and Signage:

Parking Availability: (This study revealed that among the reviewers, 80% of them observed that parking was possible and the place was easy to access.

Lots of reviewers also mentioned the equally available and easy to locate parking spaces that explained the easy get around in the building.

Clear Signage: There is evidence in this same vein where seventy five percent of the reviewers applauded that the signage was clear savvy.

The signs were well-cut and well-positioned such that the clients were always able to orient themselves while making moves between the various facilities within the premises.

B. Negative Aspects of Navigation and Signage:

Movement Restrictions: (Opponents described restrictions of their movements by 25% of the site's reviewers)

Several customers quoted discomfort in mobility within specific sectors of the country, in areas they could go and explore.

Attention to Accessibility: One issue that has been mentioned by 20% of the reviewers is that the disabled people are not paid adequate attention.

Some of comments indicated the mobility issues requiring an improvement of the accommodation for persons with disability especially those in wheelchairs. **Figure 6.**

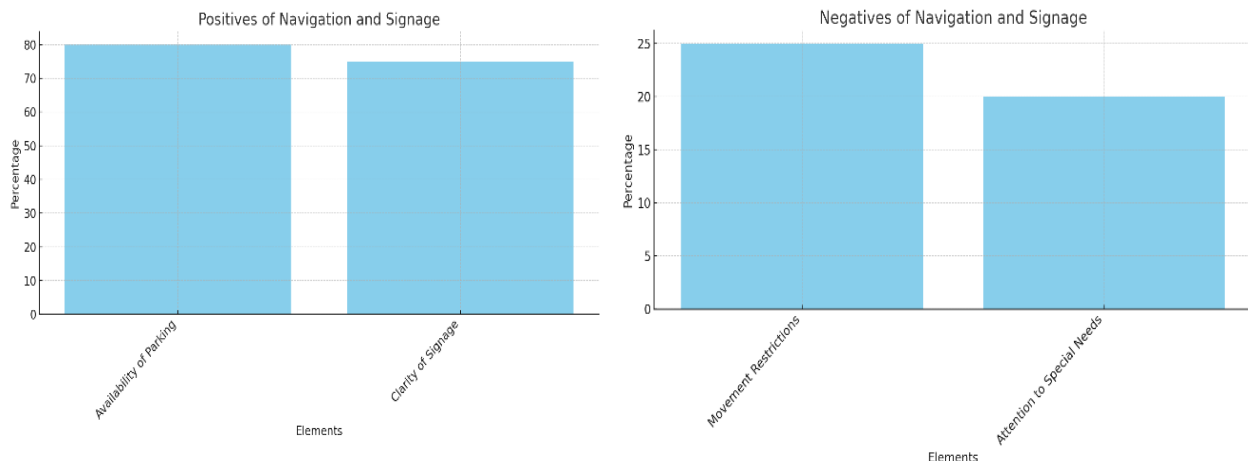


Figure 6. Impact of Navigation and Signage on User Experience, Source: Authors

13.3. Safety and Comfort:

A. Positive Aspects of Safety and Comfort:

Cleanliness and Orderliness: (About 90 percent of the reviewers expressed satisfaction on the cleanliness and organization of the complex.)

The complex was broadly applauded over issues of cleaning and order in manners that made visitor feel more secure and comfortable.

Calm Atmosphere: Twenty five of the reviewers submitted comments in which they commended the use of calm and relaxing atmosphere.(85% of the respondents were satisfied with the tranquil atmosphere used).

Using people participants' experiences: Number of the responding reviewers mentioned that 'the place was relaxing and they enjoyed being there.'

B. Negative Aspects of Safety and Comfort:

High Prices: It is also important to note that 60% of the reviewers mentioned that the prices were on the high side.

Based on the research, most of the reviewers complained of high rates pegged on the degree of service delivery thus compromising the visitors experience.

Crowding: (There was an indication from 30% of the reviewers that crowding could occur during peak moments.

Some of the reviewers complained of inconveniences that arise when the place is congested during specific times.

Facility Improvements: (25% of reviewers pointed at the necessity to upgrade some of the local amenities). **Figure 7.**

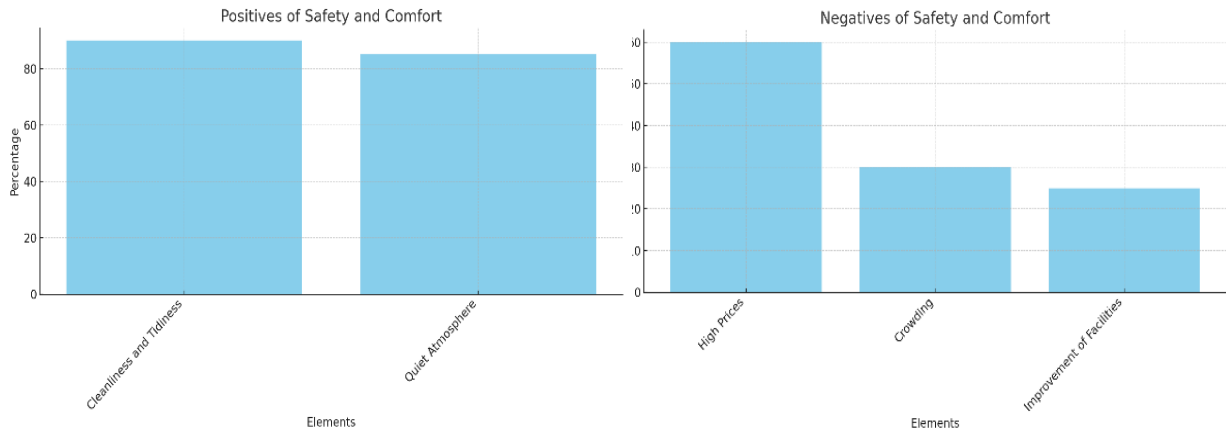


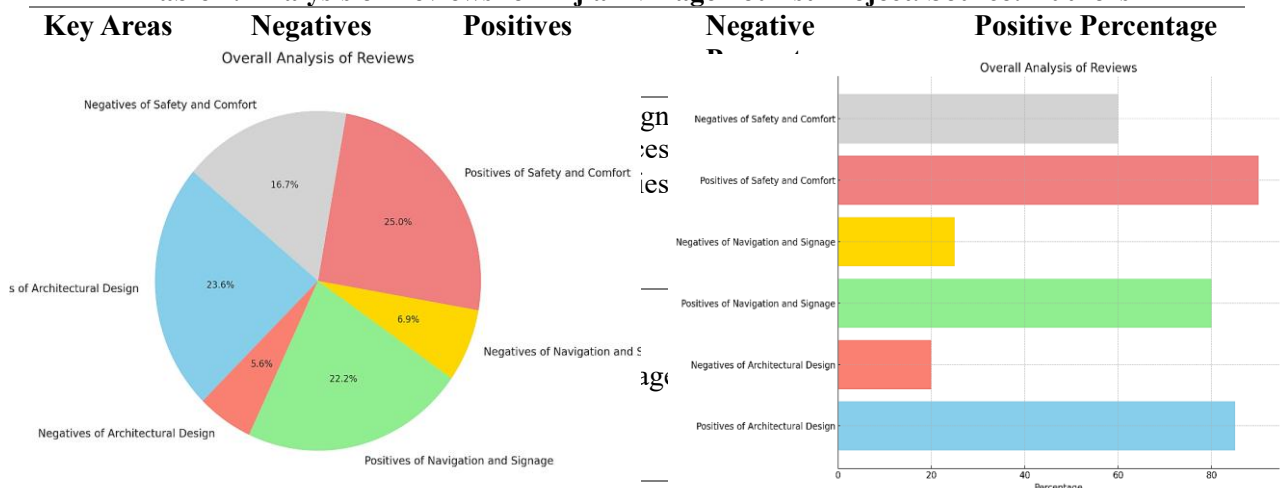
Figure 7. Impact of Safety and Comfort on User Experience, Source: Authors

There is a problem with some infrastructure namely, it have to be equipped with children’s corner and pay more attention to persons with disabilities for the comfort of all guests.

From the table of the reviews given above, it can be deduced that navigation and architectural design it safety of the Dijlah Village project have received a lot positive reviews. But it also includes issues concerning the price, room density, and regard for the requirements of disabled individuals. Developing these aspects could help make the necessary enhancements to make the complex a preferable place for people to visit. **Table 2.**

Therefore, the relative numbers speak for themselves to point out advantages and shortcomings of the Dijlah Village project according to the visitors’ opinions. The management and cleanliness, organization and architecture, and internal and external appearance are highly valued, but the issues of high prices, over-crowdedness, and the necessity to pay more attention to the needs of disabled people seem to need some urgent solutions. Figure 8.

Table 2. Analysis of Reviews for Dijlah Village Tourist Project. Source: Authors



Safety and Comfort	High Prices, Crowding	Cleanliness and Order, Atmosphere	and 60% (High Prices), 30% (Crowding)	90% (Cleanliness and Order), 85% (Calm Atmosphere)
---------------------------	-----------------------	-----------------------------------	---------------------------------------	--

Figure 8. Overall Analysis of Reviews, Source: Authors

14. DISCUSSION OF RESULTS

The work also identifies the numerous favourable points, which makes the Dijlah Village more attractive and convenient for visitors, issue as architecture, availability of different outdoor areas, and car parking spaces. However, there are some of the problems that must be resolved, including high costs, congestion, and limited movement. Optimizing these areas could even more increase the attractiveness of the project and the level of satisfaction of the visitors. According to the findings of the assessment which involved the use of online reviews the quality of the architectural design of the Dijlah Village and the user experience can be pointed out as follows: These reviews are useful in making clear the strengths and weaknesses in the project and offer suggestion on how the project can be improved.

Considering the results of the analysis carried out in connection with the review, it is possible to note identified advantages and threats of the Dijlah Village project where the project has visible benefits but has negative issues influencing the visitors.

Architectural Design: As it has been observed in the results, majority of the reviewers were able to appreciate the aesthetic design used in the particular project, and how the old and the new were integrated. This relates with the goal that the project was molded to give a comfort and conducive look for the visitors. Also, the overall architectural design as well as the views from the patios with the Tigris River was valued, positively affecting the relaxation and recreational value. There is, however, one disadvantage of crowds during peak periods, one that stems from the fact that the Deering Complex is large and thereby congested: some guests reported that crowding detracted from the experience of visiting the complex. Moreover, the absence of children’s play area reduces the recreational aspect of the project to the families.

- **Navigation and Signage:** There was much recognition in the navigation systems within the project; the accessibility of parking lots and general accessibility. Another aspect was that the directional signs used where also clear and made the movement of visitors between facilities very seamless. On the other hand, some levels of restricted mobility in the area proved to be uncomfortable for some of the reviewers as they were restricted from and roamed around the complex frivolously. Therefore, there still exists the importance of paying much more attention to such a sectorial requirement as the needs of disabled people to make their stay as comfortable and convenient as all the others’.
- **Safety and Comfort:** Cleanlines’s and tidiness of the complex were mentioned to be satisfactory in most cases, The condition of tidiness of the complex was reported to be satisfactory by most of the reviewers and most of them said that this particular aspect helped to boost the security and comfort of the complex. This was also greatly appreciated which helped make the complex one of relaxation for people. Nonetheless there were some drawbacks, including that the high prices further worsened the experience of the visited attractions, as many visitors complained for high price/quality ratio of services, offered at the places of interest. Moreover, locating itself in or organising itself in large numbers at specific peak times has the effect of causing discomfort to the visitors and also decreasing the quality of their interaction with the site.

Thus, these findings suggest that there are numerous advantages that are associated with the Dijlah Village tourism project regarding the architectural characteristics and aesthetics, in addition to the cleanliness and order that characterise the project. Nevertheless, there are some

issues that have to be solved, for instance, a better crowd management, special zones for children, more concern to the disabled and reconsideration of the prices for providing guests' value. The above areas can be developed to improve the experience of the visitor making the project more attractive and reachable to everyone.

15. Final conclusions

- Digital humanities have been brought about to support the understanding and also the management of architectural spaces through friendly tools such as 3D modelling, digitization, and virtual reality. These tools aid in achieving a better understanding and analysis of architectural design, particularly concerning user involvement in architectural spaces.
- Digital technology helps in improving the quality of interaction and communication between architects and users hence improve on the design that suits the users. Users are able to walk through the proposed spaces using the Virtual Reality technologies and give feedback before physical construction.
- One of the success stories of big data analysis is it offers great understanding of bettering the planning of urban centers and establishing smart cities. With reference to the traffic flow and population density that currently exist traffic design approaches that will meet the requirements of various communities and at the same time facilitate efficient development can be employed.
- The use of the digital tools remains useful to enable the training of architects and students. By means of modeling and using the possibility of digital simulations, their perception of architectural space can be developed, as well as design skills in using modern technologies in construction can be refined and a new generation of architects, competent in modern technologies, can be trained.
- Online reviews are useful in particular in the context of academic research on the assessment of architectural projects. The results of such reviews are insightful to the researchers in terms of enabling them to comprehend the experiences of the users as well as the areas which are strong and weak so that quality and satisfaction can be enhanced. It is a useful and rational approach to guide the investigation of the effects of architecture and other variables on the overall experience of visitors.
- It is important to blend the new years' technology and the conventional techniques of construction and drafting since the new technologies are expensive and require specific training. Such factors can act as a thorn in the side of the utilization of digital technologies.
- There is steady development of technologies that give better and affordable means for the new architectural creations. These advancement aid in making the digital technologies more adoptable in their respective fields by architects and urban planners.
- Architects and Information Technology Specialists can work together and define new ICT applications which may improve architectural design processes and outputs. This is achieved during this collaboration so as to come up with design solutions that in one way or the other can capture the needs of the users and do justice to the available advanced technology.
- The façade of Dijlah Village in Baghdad improves the outlook of the building and contributes in the effective branding of modernity. This design promotes tourism and makes an imprint on the visitor making the building more valued as a tourist destination.
- Organized layouts of architecture structures and common areas in Dijlah Village allows the guest to interact with one another and make the environment leverage that is conducive to personalized business communication. These spaces are useful to the achievement of sense of place as it enhance feeling of community.
- The facilities offered within Dijlah Village real estate area including restaurants, cafes, and health facilities, which users consider quality and contribute effectively to enhancing the experience of the visitors. The quality of these services is high, hence the comfort and satisfaction of the visitors in their stay at the facility.
- As a matter of urgency, there is a paucity of proper directional signs in Dijlah Village with many people struggling to locate their way around especially in cases when they are trying to get to a

certain exhibition or a facility that is located in the village. A clear and well understandable sign and signages in different languages helps to improve visitors' experience.

- Dijlah Village experience overcrowding issues in breakneck moments thus create congestion to the areas and long queues in attending to the services offered. When it comes to crowds, the denser they are, the more the services should be improved and the flow of visitors should be better managed.

16. Recommendations for improving the dijlah village tourism project

the following recommendations can be made of the reviews and experience of visitors in the improvement of the Dijlah Village tourism project:

1. Expand Children's Areas

- **Play Areas:** The management should ensure that there are parts designed for children that have quality products and mention of the accidents within the complex to fetch families.
 - **Recreational Activities:** The following are strategic goals: Facilitating children with physical and intellectual pleasures and contentment so that their stay is enhanced during the family visit.

2. Improve Signage and Navigation

- **Increase Signage:** Well organized and increased number of directional signs should be arranged to allow easy access to all existing facilities.
- **Interactive Maps:** Always ensure that there are touch screen maps installed at the entry point and other strategic positions to enable people get around easily in the complex.

3. Enhance Security and Comfort

- **Improve Security Measures:** Take necessary precautions to control and protect the visitors and the security personnel trained adequately of managing crowds.
- **Provide Seating and Rest Areas:** Add more seats and relaxation zones during visitors' traffic in the entire territory of the complex to expand its space.

4. Satisfaction of needs of people with disabilities

- **Accessibility Features:** Shops should have interrelated structures with ramps, different sections for disabled persons people such as separate doors for the disabled, proper functioning of elevators and have proper and wide corridor for movement.
- **Staff Training:** The 'step-by-step' guidelines tell beneficiaries how to orientate the staff so that they could help the people with disabilities if needed.

5. Address Congestion Issues

- **Crowd Management:** The management of crowds should include considerations for the times when the library is most congested, for instance the timing of the visiting times or even restrictions on the number of visitors during the specific time.
- **Expand Spaces:** Maybe try to make some of the sectors within the complex bigger in order to allow the numbers of people streaming in to be spread out.

6. Improve Infrastructure

- **Regular Maintenance:** All the facilities should be maintained frequently for as long as the quality and safety of the facilities are to be assured.

- **Technological Development:** This can be in the form of offering portable internet services like free Wi-Fi and developing friendly sites and applications for the smart phones that will guide the visitors around the complex.

It will be beneficial to implement these recommendations to develop the Dijlah Village tourism project, to satisfy the visitors, and to increase the visitors and tourists desire to visit the project area. It will in the long run assist in the achievement of the overall aim and objectives of the project thus a sustainable success.

References:

- [1] F. I. Al-Assadi and M. H. Al-Dewachi, "The Role of Brick in Determining Features of Iraqi Architecture," in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing, 2020, p. 12018.
- [2] I. M. Al-Saffar and O. A. Al-Tameemi, "Technological strategies for recycling concrete block in Iraq," in *Journal of Physics: Conference Series*, IOP Publishing, 2021, p. 12090.
- [3] S. Hawkins, "Introduction: Access and control in digital humanities," in *Access and Control in Digital Humanities*, Routledge, 2021, pp. 1–20.
- [4] J. Marti-Henneberg, X. Franch-Auladell, and J. Solanas-Jiménez, "The use of digital tools for spatial analysis in population geography," *Front. Digit. Humanit.*, vol. 3, p. 9, 2016.
- [5] I. Hevko, O. Potapchuk, I. Lutsyk, V. Yavorska, and V. Tkachuk, "Methods building and printing 3D models historical architectural objects," in *SHS Web of Conferences*, EDP Sciences, 2020, p. 4016.
- [6] O. A. Al-tameemi and S. Abdul-Qader, "Constructive truth and creativity in contemporary Iraqi architecture," in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing, 2020, p. 12120.
- [7] O. A. Al-Tameemi and T. A. Toma, "Automation in architecture and its effect on the regeneration of traditional buildings: Al-Shawi House as a case study," in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing, 2020, p. 012027.
- [8] J. H. Al-Mandelawi and O. A. Al-Tameemi, "Role of electronic marketing in stimulating tourism in heritage areas Mutanabi street as a case study," in *AIP Conference Proceedings*, AIP Publishing, 2023.
- [9] S. ali Al-Ahbabi and H. A. S. Al-Alwan, "Enhancing the Continuity of Utilization of External Spaces at the Campus: Insights from the University of Baghdad Campus in Jadriya.," *Assoc. Arab Univ. J. Eng. Sci.*, vol. 30, no. 4, pp. 32–41, 2023.
- [10] D. M. Alzubaidy and O. A. Al-Tameemi, "Evaluating the perception of virtual reality in historical sites," in *BIO Web of Conferences*, EDP Sciences, 2024, p. 82.
- [11] D. M. Berry, "Introduction: Understanding the digital humanities," in *Understanding digital humanities*, Springer, 2012, pp. 1–20.
- [12] O. Riera Ojeda, G. Ranalli, and F. Llonch, "Sagrada Familia: Gaudi's unfinished masterpiece: geometry, construction and site: an exhibit at the Bernard and Anne Spitzer School of Architecture, City College of New York, September 2014-May 2015," (*No Title*), 2018.
- [13] P. Pauwels, R. Verstraeten, R. De Meyer, and J. Van Campenhout, "Architectural information modelling for virtual heritage application," in *International conference on virtual systems and multimedia (VSMM)*, Archaeolingua, 2008, pp. 18–23.

- [14] O. A. Al-Tameemi and A. I. A. Al-Kadhim, “Foamed concrete and traditional materials developments in Iraq,” in *AIP Conference Proceedings*, AIP Publishing, 2023.
- [15] E. B.-N. Sanders and P. J. Stappers, “Co-creation and the new landscapes of design,” *Co-design*, vol. 4, no. 1, pp. 5–18, 2008.
- [16] M. H. Al-Saffar and O. A. Al-Tameemi, “The effect of applying new facade technologies on the effective response of the building,” in *AIP Conference Proceedings*, AIP Publishing, 2023.
- [17] M. Batty, “Big data, smart cities and city planning,” *Dialogues Hum. Geogr.*, vol. 3, no. 3, pp. 274–279, 2013.
- [18] K. Marx and F. Engels, *A sagrada família: ou a crítica da Crítica crítica: contra Bruno Bauer e consortes*. Boitempo Editorial, 2015.
- [19] I. H. Witten, D. Bainbridge, and D. M. Nichols, *How to build a digital library*. Morgan Kaufmann, 2009.
- [20] D. Jingda and L. U. Ying, “Digital humanities education practice of stanford university and library support services,” *J. Libr. Inf. Sci. Agric.*, vol. 31, no. 11, p. 15, 2019.
- [21] P. Schreur, “Stanford University Libraries’ Strategic Directions,” Stanford University. [Online]. Available: <https://library.stanford.edu/news/stanford-university-libraries-strategic-directions>
- [22] G. A. de Raat *et al.*, “Predictive twin for steel bridge in The Netherlands,” in *Life-Cycle of Structures and Infrastructure Systems*, CRC Press, 2023, pp. 1003–1010.
- [23] K. Gallagher, “Famous Amsterdam canal gets a 3D-printed smart bridge.” [Online]. Available: <https://inhabitat.com/famous-amsterdam-canal-gets-a-3d-printed-smart-bridge/>
- [24] M. Batty, *The new science of cities*. MIT press, 2013.
- [25] M. H. Ayeed and O. A. Al-Tameemi, “Technologies Of Sustainability in Large Banks Buildings,” in *IOP Conference Series: Earth and Environmental Science*, IOP Publishing, 2022, p. 12099.
- [26] digits home, “Dijlah Tourist Village.” [Online]. Available: <https://digits-home.com/dijlah-tourist-village/>
- [27] A’ Design Award Iron Winner, “Dijlah Village Complex Baghdad.” [Online]. Available: <https://www.archilovers.com/projects/285190/dijlah-village-complex-baghdad.html#info>