

ADVANCED ARCHITECTURAL DESCRIPTIONS OF AL-ANDALUS ISLAMIC PALACES: DEVELOPMENT OF A KNOWLEDGE-BASED DESCRIPTIVE FRAMEWORK

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Abstract

Architectural design theories developed during the last decades of the 20th century - including Environmental Psychology and Pattern Theories - aimed to improve the quality of the built environment while centred on the experience of users. However, their approaches of analytical methodologies are not usually applied to understand and comprehend historic buildings from a wider architectural perspective. This study aims to deepen the analysis of historic buildings by advancing their depictions using concepts and ideas mainly established in pattern theories and contemporary best practices, in order to facilitate how modern designers may learn from the significant buildings of the past. To achieve this, a knowledge-based descriptive framework has been developed; this tool serves to enrich the architectural description of a building by including both qualitative and quantitative details, abstract and as-built characteristics, and spatial patterns which are inherent to architectural designs. Four historical palatial complexes erected in the Iberian Peninsula during the Islamic rule in al-Andalus have been selected to demonstrate the practical application and validity of this tool. The information collected through such a descriptive tool adds a layer of quantitative information that enriches the depiction of the historic buildings studied. An organized display of the resulting data provides for comparative analysis and also serves as a way to develop contemporary architectural proposals which reflect distinctive features of significant historical buildings.

Keywords: *Architectural descriptions; al-Andalus; Islamic palaces; pattern theory; descriptive framework; design process.*

INTRODUCTION

Architectural design theories developed during the last decades of the 20th century - including the area of environmental psychology and pattern theories - aimed to improve the quality of the built environment focusing on the experience of users. However, their approaches and analytical methodologies are not usually applied to understand and comprehend historic buildings from a wider architectural perspective.

In the world of architectural design, these theories and their practical applications have contributed to systematize the design process – from the abstract level at which the designer starts to conceptualize a design proposal to specific physical forms – by taking into account drivers such as the final user, the identification of recurrent spatial entities, or the integration of numerical information. The result is the basis for less subjective or more impartial design methods. This aligns with the professional architectural contemporary approaches as the design process guidance

provided by the Royal Institute of British Architects (RIBA) and the American Institute of Architects (AIA).

Methodology

This study aims to deepen the analysis of historic buildings by enriching their depictions using concepts and ideas mainly established in pattern theories and contemporary best practices, in order to facilitate how modern designers look at and learn from significant buildings from the past. To achieve this, a descriptive framework is developed. This knowledge-based descriptive tool enriches the architectural understanding of the building to which is applied by including qualitative and quantitative details, abstract and as-built characteristics, spatial patterns, design intent and actual experience. This proposed framework allows to complete a concise analysis of a building by looking at key groups of architectural categories – which have been selected and articulated based on the identification of architectural patterns and typological characteristics - and then by applying simple arithmetic analysis and a set of rating criteria in order to get parametrical and numerical data of the building being studied.

A specific group of historic buildings have been selected for the application and validation of this tool: four palatial complexes erected in the Iberian Peninsula during the Islamic rulings in *al-Andalus* are the case studies included in this study. Although, they belong to different historic periods and trends, yet, they share commonalities in respect to their architectural programme and form. Therefore, to a certain extent they form a distinctive type. The information collected through the descriptive tool adds a layer of quantitative data – derived from knowledge-based analysis of the categories - that enriches the depiction of the historic buildings studied. An organized display of the resulting data provides for comparative analysis of the case studies and also serves as a way to develop contemporary architectural proposals which reflect distinctive features of these historical buildings. The applicability of this framework and approach has been demonstrated for the selected Andalusian Islamic palaces. The comparative analysis for these palaces provides a relevant practical reference for modern design proposals in the areas of residential, hospitality and recreational architecture, taking into account distinctive characteristics of these buildings.

Historically, these palaces are not directly connected and so in a strict typological sense are distinct. Notwithstanding historic or typological differences, this tool nonetheless deepens the development of architectural descriptions by providing a structured and systematic way to depict, assess and compare contemporary or historical buildings at abstract as well as at specific tangible levels.

THE GAP OF ANALYSING HISTORIC BUILDINGS FROM A PAST PERSPECTIVE

In the middle decades of the 20th century a collection of distinctive approaches originating from different fields were systematically integrated and formulated, initiating a new area of research – the environmental psychology – into the domains of design, psychology and anthropology. The focus of this approach was study the relationship between the human behaviour and the environment, and their reciprocal influence. The understanding of objects, furniture, spaces, buildings and cities as elements of the artificial or built environment and how they influence and determine the way people act – mainly in their facet as users of those elements – set the basis for new methodologies in the practices of urbanism, architecture and interior and industrial design. These user-centered approaches have been described as a reaction against negative egocentric and arbitrary attitudes performed by designers (Bannes & Boniuto, 2002; Zeisel, 1984). The contribution of environmental psychology as necessary in the fields of design and engineering has been also observed repeatedly (Canter & Lee, 1974).

In this context is where Christopher Alexander and his team developed their pattern theories in order to systematize the subjective and creative process of architectural design. At the core of his methodology, Alexander focuses on identifying sets of recurrent spatial entities – patterns – which form more complex spaces by the relationship and interconnections among them. In his book ‘A Pattern Language’ (Alexander I.S.K., 1977), the author describes more than two hundred and fifty spatial patterns, displaying a sorted set of definitions, key design characteristics, main relationships with other patterns and sometimes including measurable and quantitative information.

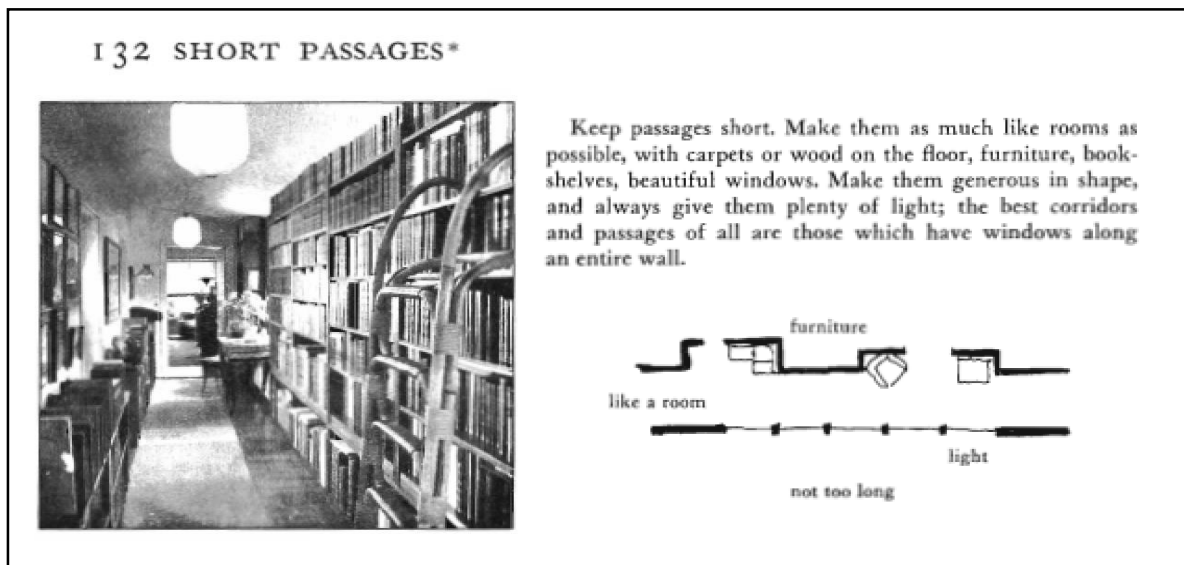


Figure 1. Extracts from one of the architectural patterns identified by Alexander in his methodology (Source: Alexander I.S.K., 1977).

In relation to these efforts of systematizing and making the architectural design process transmittable and comprehensive to all the parties involved, stand the different practice guidance and project outlines issued by contemporary professional bodies. Documents published by the RIBA and the AIA are international references in the world of modern architectural practice (see figure 2). They explain the different stages of the architectural design, from conception to its materialization as a built reality, including the key actors, drivers, objectives and tasks required along the process.

However, and despite accounting key design drivers, this current perspectives and approaches are not usually considered in surveys of architecture or historic descriptions of buildings and monuments. Regarding this crucial gap, the following specific considerations related to the architectural knowledge of historic buildings can be highlighted:

- Historic and artistic descriptions should incorporate all the ancillary spaces or ‘back of house areas’, and not just the monumental spaces – what Louis Kahn defined as ‘servant spaces’, opposed to ‘served spaces’ (Farrelly, 2012, p. 128); without these areas the main spaces could not perform properly and the full design solution for such historic example is partially missing.
- Quantitative data is not commonly displayed when describing historic buildings within surveys of art. The Best Practice AIA document, within the schematic design phase, reads for the architectural programme: ‘It should include estimated square footage of each usage type’ (AIA Knowledge Resources Staff, 2007). Not many historic studies display tables or usage zone, drawings that include colours and figures for the different building areas

described. Big assumptions about the space use and its architecture will always be required and these will probably be historically imprecise. However, the sizes and functions of the different building spaces depict its essence.

- The mapping of defined spatial patterns or recurrent architectural entities in historic buildings help to articulate the specific design solution applied to the building, identify its distinctive spaces and features and clarify the essence of such architectural type; consequently, the building can be understood at an abstract level and its design qualities applied or adapted to other related instances or contemporary design requirements.

The RIBA Plan of Work 2013 organises the process of briefing, designing, constructing, maintaining, operating and using building projects into a number of key stages. The content of stages may vary or overlap to suit specific project requirements. The RIBA Plan of Work 2013 should not be used solely as guidance for the preparation of detailed professional services contracts and building contracts.

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Stages	0	1	2	3	4	5	6	7
Tasks	Strategic Definition	Preparation and Brief	Concept Design	Developed Design	Technical Design	Construction	Handover and Close Out	In Use
Core Objectives	Identify client's Business Case and Strategic Brief and other core project requirements.	Develop Project Objectives, including Quality Objectives and Project Outcomes, Sustainability Aspirations, Project Budget, other parameters or constraints and develop Initial Project Brief. Undertake Feasibility Studies and review of Site Information.	Prepare Concept Design, including outline proposals for structural design, building services systems, outline specifications and preliminary Cost Information along with relevant Project Strategies in accordance with Design Programme. Agree allocation to brief and issue Final Project Brief.	Prepare Developed Design, including coordinated and specified proposals for structural design, building services systems, outline specifications, outline Information and Project Strategies in accordance with Design Programme.	Prepare Technical Design in accordance with Design Responsibility Matrix and Project Strategies to include detailed structural and specialist subcontractor design and specifications, in accordance with Design Programme.	Offsite manufacturing and onsite Construction in accordance with Construction Programme and resolution of Design Queries from site as they arise.	Handover of building and conclusion of Building Contract.	Understand In Use services in accordance with Schedule of Services.
Procurement <i>*variable task bar</i>	Initial considerations for assembling the project team.	Prepare Project Roles Table and Contractual Brief and continue assembling the project team.	The procurement strategy does not fundamentally alter the progression of the design of the brief or design through a given stage, however, Information Exchanges will vary depending on the selected procurement route or Building Contract. A bespoke RIBA Plan of Work 2013 will set out the specific tendering and procurement activities that will occur at each stage in relation to the chosen procurement route.			Administration of Building Contract, including regular site inspections and review of progress.	Conclude administration of Building Contract.	
Programme <i>*variable task bar</i>	Establish Project Programme.	Review Project Programme.	Review Project Programme.	The programme route may dictate the Project Programme and may result in certain stages overlapping or being undertaken concurrently. A bespoke RIBA Plan of Work 2013 will clarify the stage overlaps. The Project Programme will set out the specific stage dates and detailed programme durations.				
(Town) Planning <i>*variable task bar</i>	Pre-application discussions.	Pre-application discussions.	Planning applications are typically made using the Stage 3 output. A bespoke RIBA Plan of Work 2013 will identify when the planning application is to be made.					
Suggested Key Support Tasks	Review Feedback from previous projects.	Prepare Handover Strategy and Risk Assessments, Agree Schedule of Services, Design Responsibility Matrix and Information Exchanges and prepare Project Execution Plan including Technology and Communication Strategies and consideration of Common Standards to be used.	Prepare Sustainability Strategy, Maintenance and Operational Strategy and review Handover Strategy and Risk Assessments. Undertake third party consultations as required and any Research and Development aspects. Review and update Project Execution Plan, including Change Control Procedures.	Review and update Sustainability, Maintenance and Operational and Handover Strategies and Risk Assessments. Undertake third party consultations as required and any Research and Development aspects. Review and update Project Execution Plan, including Change Control Procedures.	Review and update Sustainability, Maintenance and Operational Strategies and Risk Assessments. Prepare and submit Building Regulations submission and any other third party submissions requiring consent. Review and update Project Execution Plan, including Change Control Procedures. Review Construction Strategy, including site sequencing and update Health and Safety Strategy.	Review and update Sustainability Strategy and implement Handover Strategy, including agreement of information required for commissioning, training, handover, asset management, future monitoring and maintenance and ongoing consultation of the construction Information. Update Construction and Health and Safety Strategies.	Carry out activities listed in Handover Strategy including Feedback for use during the future life of the building on future projects. Updating of Project Information as required.	Conclude activities listed in Handover Strategy including Post-occupancy Evaluation, review Project Performance, Project Outcomes and Research and Development aspects. Updating of Project Information as required, in response to ongoing client Feedback until the end of the building life.
Sustainability Checkpoints	Sustainability Checkpoint – 0	Sustainability Checkpoint – 1	Sustainability Checkpoint – 2	Sustainability Checkpoint – 3	Sustainability Checkpoint – 4	Sustainability Checkpoint – 5	Sustainability Checkpoint – 6	Sustainability Checkpoint – 7
Information Exchanges (at stage completion)	Strategic Brief.	Initial Project Brief.	Concept Design including outline structural and building services design, associated Project Strategies, preliminary Cost Information and Final Project Brief.	Developed Design, including the coordinated structural and building services design and updated Cost Information.	Completed Technical Design of the project.	As-constructed information.	Updated As-constructed information.	As-constructed information updated in response to ongoing client Feedback and maintenance or operational developments.
UK Government Information Exchanges	Not required.	Required.	Required.	Required.	Not required.	Not required.	Required.	As required.

**variable task bar – in creating a bespoke project or practice specific RIBA Plan of Work 2013 via www.ribaplanoofwork.com a specific bar is selected from a number of options.*

Figure 2. Definition, sequence and documentation of the architectural project stages (Source: RIBA, 2013).

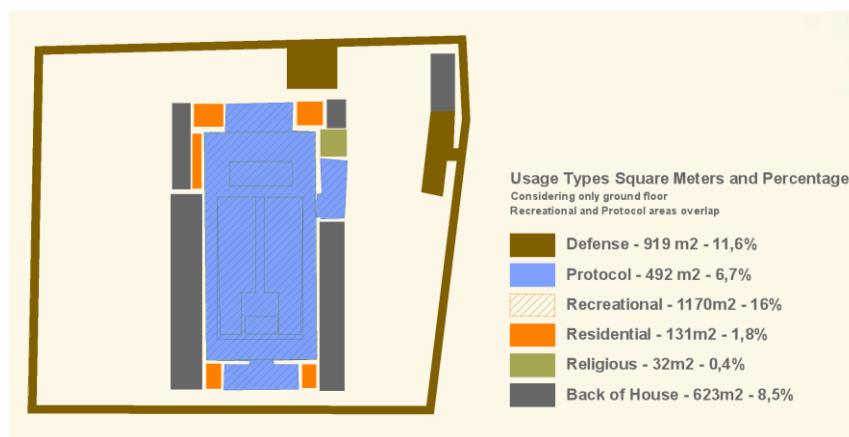


Figure 3. Aljafería Palace plan scheme, showing colour-coded usage types with square meters and percentage (Source: Authors).

By taking into account these modern perspectives, a systematic set of entities to describe buildings (Alexander, 1977) and a more objective and less partial view on the building design – by considering its requirements, drivers, programme and functions can be assessed. The integration of quantitative data provides neutral reference points/parameters to relate and compare diverse design proposals.

A KNOWLEDGE-BASED FRAMEWORK

The Context and Positioning of the Descriptive Framework: Architectural Descriptions Along the Design Project Stages

Various approaches to architectural descriptions developed in the fields of architecture theory aim to answer a group of key questions regarding a building. This is the case of the checklist included in the book *Understanding Architecture: An Introduction to Architecture and Architectural History* by Conway (2006), which is considered by its authors the essential outset of most architectural studies. Table 1 indicates which of these key questions have been directly or indirectly addressed in the descriptive framework developed in this study. For contemporary examples the answers to these twelve questions formulate a practical outline description of a particular built form. However, when referring to historic buildings, some - and sometimes most - of these questions are difficult to answer. Thus, different approaches that consider multiple sources are required.

Table 1: Questions checklist for basic architectural descriptions (Source: Authors).

Basic Questions Checklist	Addressed in the descriptive framework developed in this research	Comments on availability of information for this framework
1. What was the date of the buildings?	✓	Approximate dates
2. Who was the patron or client?	✓	Main ruler's references if available
3. What was the brief of the commission?	✗	Inferred indirectly
4. Who was the architect/ or builder?	✗	Sometimes available
5. What was the cost of the building and what have been the costs of use and maintenance?	✗	Scarce sources
6. What was its original function?	✓	Inferred indirectly
7. Which parts are original and which are alterations?	✗	Sometimes difficult to identify
8. What are the materials and methods of construction?	✓	
9. What is the form and style and what its meaning?	✓	
10. What was the location? Has the character of the original site and surroundings changed?	✓	
11. What were the responses to the building at the time of its construction?	✗	Difficult due to lack of sources available
12. What was the social, cultural, technological, economic and political context in which the building was constructed?	✓	

The above set of questions provides a quick overview that includes some of the main actors and drivers that have been included within the overall context where the framework has been positioned in the design domain. This positioning is represented in the following graphic, which displays simultaneously the different levels of activities/information along the project stages when developing a design (see figure 4). The middle part of the graphic represents the arena of architectural descriptions encompassing different activities and information packages along the project stages. From top to bottom this represents the different layers of abstraction: from the top intangible level – related to thinking activities, knowledge base and human intelligence – to the bottom tangible and quantitative level which includes packages that require less thinking and inferring processes than the upper ones. Notice that the progression: intelligence – knowledge – information – data indirectly expresses the movement from actions that must be performed by humans towards more artificially or mechanically aided activities. These descriptions help to bridge the gap between the conceptual level, represented on the top of the graphic, and the physical level where the building is materialized (see figure 4). Within this context of architectural descriptions - and looking at it via a contemporary lense - the conceptual framework developed for this study is positioned within the definition and design stages, as it aims to be a tool that facilitates and completes the designer’s activities, while aligning them with the client’s requests before the building gets materialized and erected. Such a tool expands downwards from the knowledge-base level towards the data level in order to combine qualitative and quantitative facets in the description (see figure 5).

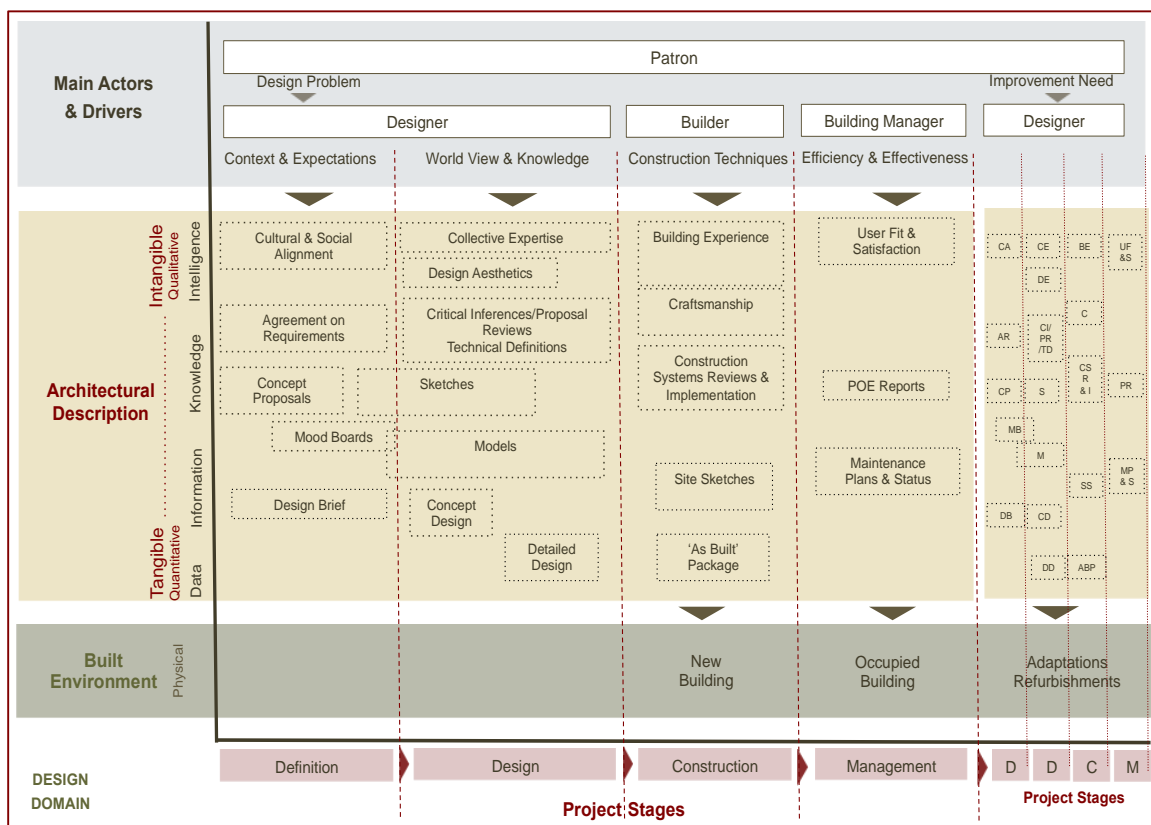


Figure 4. Architectural descriptions deal at different levels of abstraction along the stages when developing a design to achieve a material reality that satisfies the patrons’ requests (Source: Authors)

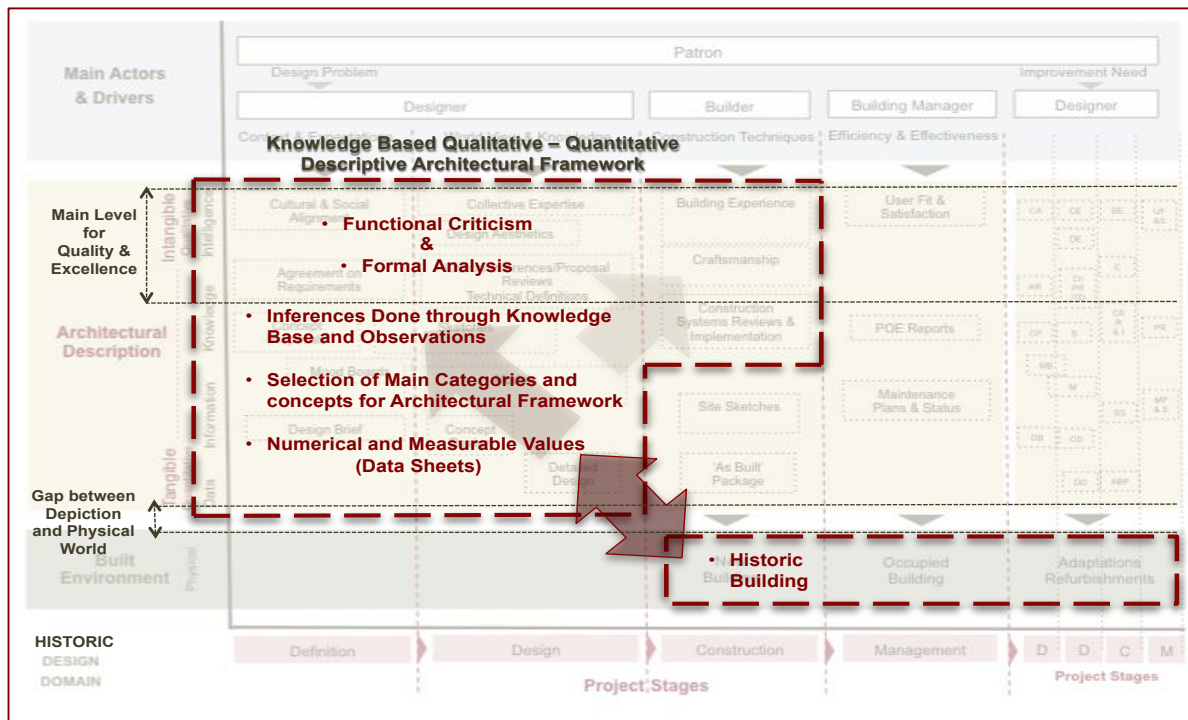


Figure 5. Positioning of the developed descriptive framework - including both qualitative and quantitative sides - within the context of architectural descriptions and indicating the relevance for historic buildings (Source: Authors).

The Descriptive Framework: Integration of Qualitative and Quantitative Facets

Within the complex context of the design domain, and in particular in the case of describing the built environment, either blurred or well-formulated conceptual connections happen along the project stages. The intention in this study is to complement the qualitative side of the framework with quantitative data in order to provide certain structured objective information about the building being described and furthermore, to investigate how the inclusion of a parametrical level of information affects the understanding and notion of spatial patterns in this architectural context.

Figure 6 represents the multi-layered nature of architectural descriptions and shows the main five levels that the developed tool covers, moving from a high conceptual stage, level 0 - abstraction – down towards more detailed packages of information, level 4 – concretion. The left hand side indicates the key intellectual activities required for mapping the information between different levels – the double arrows express the bi-directional essence of the design process. At the right hand side there are different classes or families of entities, typical for each level, from which the main actors choose to progress the design.

The first step in developing the architectural descriptive framework addresses the need to combine the wide and mainly designer-orientated approach developed in the pattern language of Alexander with key typological elements identified in relevant examples of the building type to be described. In this particular case the application of the descriptive tool is to four Islamic palaces built in the Iberian Peninsula, therefore the type analysed is 'Andalusian Islamic palaces'. The result of this combination is reflected in the architectural patterns listed in the table included below.

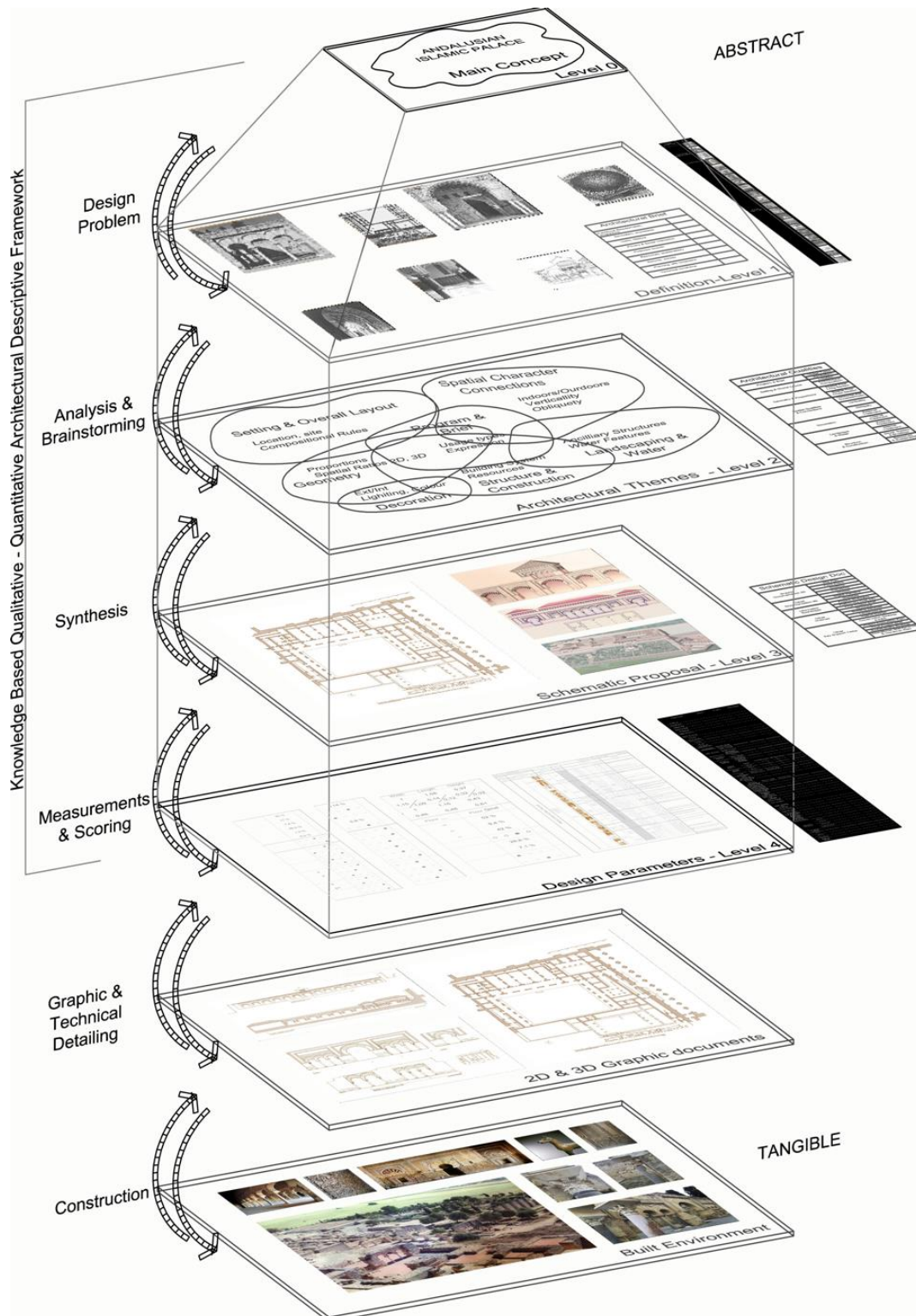





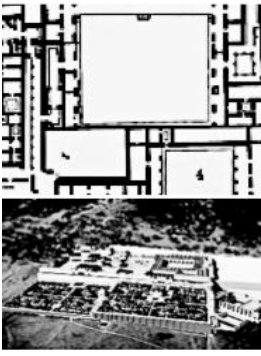











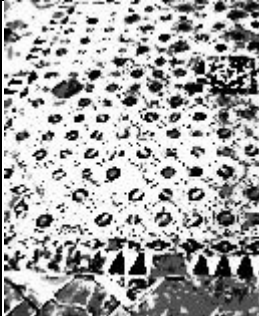
Figure 6. The different levels of information that form the architectural description (Source: Authors).





Table 2. A Pattern Language analysis toward typological elements of Islamic Palaces in Iberian Peninsula (source: Authors).


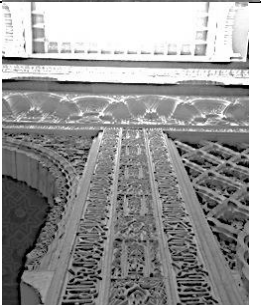
Pattern Name	Visual Reference	Main Problem/Requirement	Comments/ Other Considerations	Other References
Men and Women Quarters including <i>Harem</i> + Intimacy Gradient		For an architect such as Alexander, total gender segregation is a distortion Strong link with social conventions Spaces to blend men's and women's instincts Layout to address sequence of privacy, being physically most accessible the most public	In certain situations, gender segregation is a core requirement in Islam. Medieval Andalusian Islamic palaces included only-women private areas with selected access to men – i.e. dignitary, eunuchs	Alexander (27) Alexander (127)
Main Gateways		Gateways mark and identify crossing points of enclosed areas. They are solid entities	In medieval complexes the importance of gates was highlighted due to their defensive and symbolic role.	Alexander (53)
High Places + Site Repair + Control over the Scenery		Human instinct is to choose rise locations to look down and survey the world Building can be erected in land with 'poor' condition for use, not the best, so these areas, free of constructions, can be used and enjoyed as open spaces	Defensive requirements explained high locations but also representative and symbolic meanings of power Consider also urban/low locations – as <i>Alcázar</i> in Sevilla Landscaping and good treatment of surroundings: quality long-distance of land due to agricultural	Alexander (62) (104) Almagro (375)
Pools and Streams		A basic and psychological human need is to be in contact with water	Visual and sound effects Incorporation not only to exterior but also to transition and interior spaces. Verticality and reflections enrich the space perception Strong symbolic meaning of water in Islam	Alexander (64) Almagro (380) Manzano (5)

Pattern Name	Visual Reference	Main Problem/Requirement	Comments/ Other Considerations	Other References
Building Complex + Circulation Realms + Main Building		There should be differentiation in the building to address the various institutions, groups, subgroups, activities, etc. Link to complex palace life groups Sequence of marked realms to set the layout of the building complex. Hierarchy required, with the most important part of the building marked out physically	Number of stories – height Collection of smaller buildings connected by patios, arcades, paths, walls... Flexible and adaptable system by aggregation of courtyards as articulation spaces	Alexander (95) (98) (99)
South Facing Outdoors + Positive Outdoor Space + Hierarchy of Open Space + Courtyards which live + Something roughly in the middle + Sunny Place		Open space to be sunny Cannot be shapeless, it needs a degree of enclosure. Define in it smaller spot with the back protected Views out of it; several openings, with porches, and paths crossing it Need to 'land-mark' open space with a feature	Settings are marked within a courtyard Considerations on how the sun moves Variety achieved by Islamic decoration and integration of vegetation, water, fabrics, etc.	Alexander (105) (106) (114) (115) (126) Almagro (379) Manzano (5)
Entrance Transition + Arcades + Portico-hall + Arcades + Interior Windows/ Threshold/ Thickness/		Transition between exterior and interior: change of light, sound, direction, surface, level and viewpoint, etc. Internal windows create spatial realms within the indoor spaces	Diagonal perspectives and views, relationship with spatial effects created by sequences of <i>riwaqs</i> in mosques Construction systems and decoration techniques are well integrated and enhance the architectural concept	Alexander (112) (119) (194) Almagro (377)
Portico 'diaphragm' + Arches		Linear structural element that organizes the transition between main spaces	Evolution of the adjacent rooms to this pattern are explained in Ana Almagro's research Relevance of mobile/furniture elements such as door leaves, screen etc. to fully understand the space connection	Almagro (378) Manzano (8)

Pattern Name	Visual Reference	Main Problem/Requirement	Comments/ Other Considerations	Other References
Entrance Room + Bent Entrance + A place to wait		An area that straddles the boundary between outdoor and indoors	Bent entrances with defensive role but also typical from residential Islamic architecture for privacy purposes: richer spaces developed around them	Alexander (130) Almagro (150)
The Flow through Rooms + Alcoves + Elongated Halls		Avoid the use of enclosed corridors, better to move through interconnected rooms	Relevance of mobile/furniture pieces – curtains, doors, screens - to manage the connection between the main rooms and the alcoves The privacy and enclosed character of alcoves is translated into the physical appearance of the elevation in exterior corners where no windows are shown	Alexander (131) (179) Manzano (3) Manzano
Bathing Room		Rudofsky says that 'cleaning' is just one part of the whole bathing experience Relations to body pleasure and relaxation Relevant cross-culture considerations	Distinctive and clear sequence and use of spaces; room were also multifunctional Technologically and sustainably advanced	Alexander (144) Almagro
Building Edge + The Shape of Indoor Space + Thick Walls		Treatment of the edge as a 'place' with thickness to host life. Easier in historic stone/brick buildings. Today 'crystal boxes' only related to the means of their production, not human comfort of scale, although improvement of views and light levels Clash with construction system	Relevant translation of this pattern into the façade look and composition in Andalusian Islamic examples Contribution to the distinctive gradient and buffering of privacy from the exterior to the interior of the building Strong symbolic function	Alexander (160) (191) (197) Paricio

Pattern Name	Visual Reference	Main Problem/Requirement	Comments/ Other Considerations	Other References
<p>Outdoor Room/Garden + Fruit Trees + Tree Places + Garden Growing Wild + Garden Wall + Raised Flowers</p>		<p>Sunken green beds to enjoy the top of the trees (slight climbing plant-effect)</p> <p>Priority of comfort effect: shade, temperature, smell, aesthetics, food provision, etc. through the managed use of vegetation</p>	<p>Integration in courtyards is paramount. They seem designed simultaneously, although they also incorporate good grade of change and adaptation – what we see today a probably totally different variation of the original proposal</p> <p>Wide range of species, innovative approach</p>	<p>Alexander (163) (170, 172-174) Almagro (379) Manzano (5)</p>
<p>Ceiling Height Variety + Qubba + Roof Layout</p>		<p>Vertical elaboration of the space</p> <p>Symbolism in the throne room and relationship with Quranic descriptions of Heaven (<i>Qubba</i> as in religious buildings the domes)</p>	<p>Richness in terms of section. More elaborated options when these patterns are combined – for example by increasing the <i>qubba</i> volumes into upper floors, like in <i>Alcázares</i> in Sevilla</p> <p>Variety in the way inner ceiling volumes are translated into external shapes (i.e. internal domes or <i>artesonados</i> into octagonal pointed roofs)</p> <p>Dematerialization of ceilings by high level of decorations, like in <i>Nazarí</i> examples</p>	<p>Alexander (190) (209) Manzano (1)</p>
<p>Efficient Structure</p>		<p>In historic building the architectural structure usually implies: Continuous material working in compression, rectangles roughly vaulted, transmission of loads down with high continuity</p>	<p>Gypsum-brick and stone construction systems request certain high and thickness that dictate proportion of spaces and solids (seen in terms of section)</p> <p>Adaptable and modular system based on human-scale elements, which facilitates adaptations, demolitions, etc.</p>	<p>Alexander (206) Paricio</p>
<p>Good Materials + Soft Tile and Brick</p>		<p>Adequate materials. Good ones are available, not expensive and easy to work and adapt</p> <p>Relationship to the symbolic role of architecture in Alexander</p> <p>Materials that wear with time and show marks as an expression of honesty</p>	<p>High levels of craftsmanship and work specialisation translates into high quality of execution</p> <p>Quality and luxury as a symbol of power an</p> <p>Speed of construction according to the patron's needs</p>	<p>Alexander (207) (248) Paricio Manzano</p>

Pattern Name	Visual Reference	Main Problem/Requirement	Comments/ Other Considerations	Other References
Columns at the Corners + Box Columns + Column place + Column connections		Modern buildings have more clashing construction system than historic buildings as they separate structure and walls: In Islamic palaces this separation is used as an effect to enrich space	Important role of decoration and "outer" layers to smoothen the transitions between structural elements, like in column capitals, <i>basas</i> , <i>Muqarnas</i> for corner solutions under the dome supports or under arches etc. play a relevant composition role	Alexander (212) (216) (226) (227)
Qubba + Internal Space		Vertical elaboration of the space Symbolism in the throne room and relationship with Quranic descriptions of Heaven (<i>Qubba</i> as in religious buildings the domes) One of the few distinctive rounded shapes/volumes in Islamic architecture	Vertically and centrality of the space. Reflection of the ceiling design all the way down to the floor finishes, coherence of the architecture and the decorative motifs Distinctive regional craftsmanship skill of <i>artesonado</i> and wooden decoration in Andalusian Islamic examples	Manzano (1) Almagro (377)
Window Place + Natural Doors and Windows + Low sill + Deep Reveals + Frames and thickened Edges + Bay Window + Solid doors in Palaces		Setting in the Alhambra customized and precise translated for example in a non-modular location for the openings, while keeping coherence Skilled use of light, management of the glare. Splayed openings. Metallic big doors of Medina Azahara, with scenography effect	Integration of spaces to sit, stay, look outwards, within the built construction due to the wall thickness (window sills function like seats) In a smaller scale the pattern of the transition between inside and outside happens, reinforced also by decoration	Alexander (180) (221) (225) (237) Almagro (Mirador) Paricio
Duct space + Radiant Heat + all other installations		In contemporary practice, consider the relevance of integrating 'serving spaces' in the design right from the schematic stages	Multifunction character of 'serving spaces'. Understanding of the size and layout of serving spaces in monuments and historic buildings	Alexander (229-230)

Pattern Name	Visual Reference	Main Problem/Requirement	Comments/ Other Considerations	Other References
Floor surface + Soft Inside walls + Paving with cracks between the stones		Surface to be hard but comfortable: terracotta + rugs Soft plaster inside walls. Outdoor pavements adaptable and weathering properly.	Craftsmanship: strongly linked to quality of the decoration, small pieces that address better temperature movements, replacements, maintenance etc.	Alexander (233) (235) (247) Paricio
Ornament + Warm Colours + From Substantial to Accidental		Instinct to decorate surroundings. Find edges and transitions that need emphasis: Role of decoration and calligraphy in Islam Natural colours	Adequate relationship between design, level of decoration and material used (i.e. gypsum, wood).	Alexander (249) Almagro (381)

The next step in the process of developing the tool is the incorporation of an overarching structure or hierarchy plus a systematic phased methodology to connect the attributes and spatial entities identified as recurrent patterns with the higher level of abstraction represented by the design concept. This is indirectly supported on both contemporary design practice and the definition of architectural logic explained by Mitchell in his book *The Logic of Architecture. Design, Computation and Cognition* (1990).

Five different levels of information – from 0 to 4 – are included in the description, being 0 the more abstract one and 4 the more concrete. Hence, and adapted to type selected, ‘level 0’ is the ‘Main Concept’ - or the initial request that the patron needs to have materialized – that is, an ‘Andalusian Islamic Palace’. When viewed from a logic perspective this step might look simple, redundant or even obvious, but the mere fact of labelling the initial design request aids and facilitates clarity of mind.

‘Level 1’ is called ‘Definition and Requirements’: it includes the core designation of the building described: Users, activities, functions and a whole imagery are inferred from this meaning, and in a way, this is a short summary of the essence of the concept. Then this level includes two main dimensions that, for many theorists, serve to explain architecture: its functional dimension – what is accomplished, for example hosting activities or sheltering - and its formal dimension – its physical expression. Finally, within this definition level, a selected group of ‘visual tokens’ is included: These images aim to spark - and at the same time filter - the potential imagery related to the conceptual world by creating a common field of references for the main actors involved in the design process. These images are real photos – from real built examples – taken by the authors from direct observations during site visits to some representative Islamic palaces.

‘Level 2’ of the description is the ‘Architectural Themes’: under the realm of what has been called ‘architectural themes’ – understood as lines of thought or ‘threads’ that set out in more detail the main concept - the description encompasses seven aspects in which key conditions of a

building must be enunciated for its depiction. They are related to each other and they cover both the programmatic and formal compositional sides of the building.

Table 3. The architectural aspects and their facets (source: Authors).

Level 2 – Architectural Themes	
Architectural Aspects	Facets
Program and Brief	Usage Types
	Symbolism
Setting and Overall Layout	Location
	Architectural Composition
Geometry and Proportions	Spatial Proportions Longitudinal Section
	Spatial Proportions Transversal Section
Spatial Character and Spatial Connections	Horizontal Ratios of Covered and Open Spaces
	Verticality
	Obliquity
Decoration	External Treatment
	Internal Treatment
Landscaping and Water	Natural Texture and Water Features
Structure and Construction	Structural System and Envelope
	Resources and Sustainability

Both the aspects and the themes have been selected by drawing on pattern design methodologies and considering the crystallization of the design stages in current architectural practice: the top of the list are derived from the functional requirements while the bottom ones are more detailed perceptual attributes taking into account the materialization and expression of the shape in the design and the subsequent construction process.

'Level 3' of the descriptive framework is the 'Schematic Proposal': this is understood as each of the particular design options that illustrate a specific solution. It is a synthetic intellectual exercise where, through the knowledge-base and expertise of the main actors and considering the main factors that lead the design, the spatial entities – or architectural patterns - are combined to accomplish what was initially required for the building. Although not in full detail, the concept at this stage can be visualized, recognized, and identified from other suitable solutions: at this level it is then possible to produce a set of documents such as site plans, floors, sections, elevations, 3D images, and coherent outlines for the structure, the building services, the interior design and the landscaping as well as initial construction cost estimates. This set of information implicitly depicts a precise option for the different facets listed in level 2. It is common practice, and in the past this was probably also the case, to propose different schemes for the patron to choose from.

The final layer of the descriptive tool – 'Level 4' - covers the 'Design Parameters', which is a list of measurable features that translates the facets included in the previous level into a figure or rating score in a summarized and concise way. This tier of data constitutes the more explicit quantitative information included in the framework.

It is a specific set of 53 values that depict the particular proposal or building that is being studied. However, as the nature of the data varies, around 45% of the parameters are specific figures such as ratios or percentages that can be obtained directly from the analysis of the physical form of the building and its graphic representation (such as photographs, site sketches taken from the building remains and plans, elevations and sections that represents it two-dimensionally). They are obtained through mathematical operations reinforcing the relevance of the empirical observation and are a basis for including objective, unbiased information in the descriptive model. The other 55% of the data are scores or values that require a certain level of human interpretation and intellectual valuation in order to assign the value to the parameter – these ranges from a ‘low/medium/high/very high’ scale. It is recognized a level of subjectivity in the personal assessment required to complete these scores.

However, the use of a pre-defined grading system drawing on related professional knowledge and experience aids consistency and objectivity, and also keep this set of information concise and manageable. Subjectivity in these scores can be reduced by combining inputs from a number of different assessors. Furthermore, the future broader development of such a descriptive tool could apply mathematical models that measure in rigorous way parameters such as lighting, colour ranges, and diagonal views. Such a computational analysis could in practice enhance the robustness of this descriptive level.

All these layers of information have been collated into a one-page datasheet format in figure 7. According to the aim of this study it displays a concise and demarcated analysis of the building that integrates both abstract and qualitative material with parametrical data. Taking into account the overall nature and characteristics of the descriptive framework set out above, which stretches from conceptual through to specific design levels, this can be categorized as a ‘knowledge-based, quantitative and qualitative descriptive framework’.

The next section outlines the practical application of the framework to demonstrate the validity of this knowledge-based tool on the four selected case studies, representative buildings of the Andalusian Islamic palatial type.

Case Study:		Location:		Date/Dynasty:		Patron/Client:								
Level 0 Concept	Level 1 Definition & Requirements			Level 2 Architectural Themes		Level 3 Schematic Proposal	Level 4 Design Parameters			Interpretations, Observations				
Main Concept	Essential Designation	Design Dimensions	Visual Tokens	Aspects	Facets	(Specific Schematic Design State)	Parameters	Score 1	Score 2	Notes				
								L	M	H	VH			
ANDALUSIAN ISLAMIC PALACE	Safe and representative residence with protocol spaces built in the al-Andalus context	Functional Requirements	Privacy Circuit	Programme & Brief	Usage Types	Information level encompassed by the specific design proposal	Protocol							
			Main Uses				Private Res.							
			Auxiliary Uses				Defensive							
							Recreational							
							Religious							
			Back of House											
		Formal Expression		Setting & Overall Layout	Surroundings & Layout		Architectural Composition	Location	Urban					
					Location & Views			Rural						
					Dates			Dominant Location & Views						
					Entrances			Dominant Axis & Symm.	Marked Access					
					Main Spaces			Symmetry						
				Altered Spaces	Geometry & Proportions		Spatial Prop. Long. Section	Spatial Prop. Trans. Section	Horizontal Ratios of Covered/Open Spaces	Main Spaces	Halls / Qubbas			
				Covered Areas						Wings / Alcoves				
				Open Spaces						Balconies / Bay Windows				
				Disruptive Eoc						Articulating Spaces	Patios			
Indoor/Outdoor	Surprise Effects			Main Lobbies/ Gate, Access										
City	Decorative	External Treatment	Internal Treatment	Spatial Qualities & Connections	Verticality	Crosswise Accesses	Diagonal Views	Floors	Floor __	Floor __				
Decorations											% Covered Area			
Light Gradient											% Covered with Open Sides			
Colour Features											% Open Spaces			
Water Features											Vertical Axis Dominance Index			
Construction System	Structure & Construction	Structural System & Envelope	Resources & Sustainability		Obliquity	External Features	Colour Range	Light Gradient	% Ext. Decor. Area / Surfaces					
Covering Layers											% Int. Decor. Area / Surfaces			
											Internal Features			
											Colour Range			
											Light Gradient			
	Landscaping & Water	Natural Texture & Water Features				Crosswise Accesses	Diagonal Views	Floors	Floor __	Floor __				
											% Volume Vegetal Elements			
											Ancillary Structures			
											Surface Treatments			
											% Water/ Volume Room			
	Structure & Construction	Structural System & Envelope				Structural Elements	Covering Layers	Cost	Speed	Extensions				
											Veg&Water integration in design			
											Arches			
											Columns			
											Bearing Walls			
	Domes													
	Roof Struc.													
	Structure & Construction	Structural System & Envelope					Material Reuse							

Figure 7. The one-page datasheet template that summarizes the architectural facets included in the descriptive framework (Source: Authors).

APPLICATION OF THE DESCRIPTIVE FRAMEWORK

The validation of this tool and its specific applicability is addressed by mapping the architectural descriptive and design context explained above into a historic situation of four case studies of Andalusian Islamic palaces: a) Medina Azahara, b) La Aljafería, c) Alcázares of Sevilla and d) Alhambra. For this application, the built remains and graphic architectural documentation available for these palaces form the main input.

In historical cases the main challenge is the absence of the actual main actors and therefore an inability to complete the intangible level of the descriptions.

Case Study A: Dar al-Yund - Army House (Archaeological complex of Medina Azahara)

The area demarcated for the spatial study includes the spaces articulated around the main courtyard of the Dar al-Yund, which represents the main protocol zone of the complex, measuring around 16,256 m². The reason for focusing the study on this specific zone is the distinctiveness of the ceremonial spaces. However, the estimation of the different percentages for the usage types included in the metrics embrace a bigger area that includes the Reception – Salón Rico and its gardens adjacent to the South side, as well as the congregational mosque in the South East – with an approximate area of 43,060 m².



Figure 8: Plan of Medina Azahara archaeological site: The yellow line marks out the total area excavated, the red line demarcates the area considered for the usage types while the blue line marks the parts considered for the spatial study (Source: Authors).

Observations:

Program and Setting

The concept of *villa rustica* - as described by Dickie (1992) - explains the high percentage of recreational spaces; this concept can also explain the balance between the rural and urban character of the setting. The leisure gardened areas contrast with the austere but splendid character of the protocol main court studied – as shown by the figures related to landscaping and water – more in line with the military nature of the space.

Overall Layout, Spatial Character and Decoration

In terms of its formal expression the spaces analysed follow orthogonal arrangements around squared proportional courtyards related to Roman/Byzantine traditions but combining specific Islamic patterns: the basilica halls are more related to the spatial reality produced by the parallel arcades - *riwaqs* - of mosques, as indicated by Almagro (2008) and the top endings along the main façades with crenelations can be considered a distinctive feature from such merging. The availability of empty spaces around the building - also due to its new foundation - explains that figures such as the ration between open and covered areas are not very high: spaces were not significantly dense. Certain iconic architectural elements such as the colourful 'column & arches' pattern appears all around the building.

Case Study B: Aljafería Palace (under the Hudí dynasty)

Since this sample has gone through many adaptations over the centuries - becoming a complex example from a stylistic point of view - the study focuses on the palace areas that, according to the hypothesis of Almagro (2005, 136), better represent its 'most Islamic' period. The area for the spatial study includes the space delimited by the external defensive wall - around 7,293m². Being this the simplest of the examples analysed, the central core - which stands for approximately a third of the total area, and lacks upper floors - encompasses a variety of usages in a compact layout.

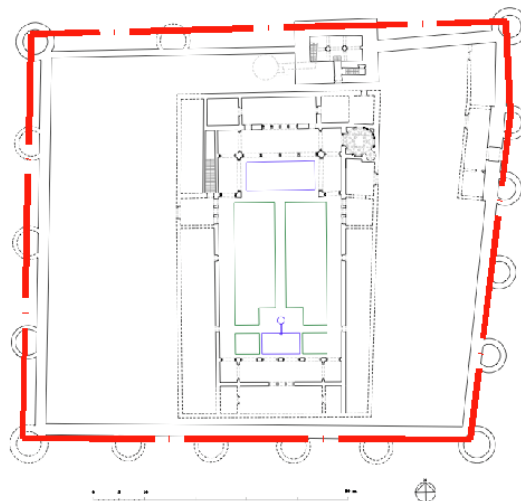


Figure 9. Plan of the Aljafería Palace: The red line demarcates the area considered for both the usage types and the spatial patterns studied (Source: Authors).

Observations:

Program, Setting and Symbolism

The multifunctional character of the spaces and the frequent overlapping of usages, the compact nature and the scale of the building, are probably consequence of the efficiency sought by a patron that needed quick statement of power but with limited resources. Dense built-up areas around the main articulating space - the Patio de Santa Isabel - highlight this condition; its suburban location responds to a defensive priority, which is also expressed by the extremely low percentage of openings towards the exterior (3.5%).

Regarding the Overall Layout, Spatial Character and Decoration

Formal/typological references and connections to existing examples of desert summer palaces located in Syria, Jordan and Iraq from the 8th and 9th centuries can be found. The strong visual effect of architectural-decorative elements such as the multi-lobulated arches in the main protocol rooms seem coherent with the requirement of representing political legitimacy: although the internal decorated areas count for less than a fifth of the space – around 19% - the visual impact of these components is very strong. Derived from the challenge of limited volume and material resources, there is a complexity developed in the spaces overlooking the courtyard. This brings an oblique spatial character and cross views that enrich the general perception. Despite the low percentages of gardened area and water features, these elements play a relevant role in such complex environment.

Case Study C: Patio de las Doncellas, Alcázares of Sevilla (recreational areas)

For the purposes of different usage percentages, an area of around 12,095 m² has been considered, which includes the Puerta del León, Puerta and Patio de la Montería, Cuarto del Yeso, Sala de la Justicia, Patio del Crucero, Cuarto del Caracol, Cuarto Real, Cuarto de la Montería and Casa de la Contratación. The spatial analysis encloses a zone of around 2,170 m² articulated around the Patio de las Doncellas, which was mainly used for private and recreation purposes. Although, the main nature of the complex is still kept in its current built form, at that stage only specific parts of the building had an upper floor built on, which means that the main proportions of the courtyard were different – less vertical in the original.

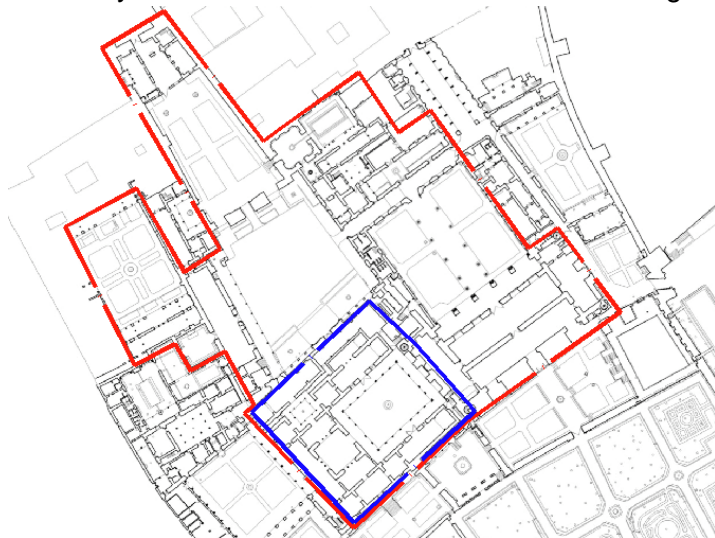


Figure 10: Plan of the Alcázares complex in Sevilla: The red line demarcates the area considered for the usage types and the blue one outlines the main extensions carried out by King Peter I of Castilla (Source: Authors).

Observations:

Program and Brief

A distinctive factor in the medieval Christian context - the relationship between the king and the feudal court – explains the requirement from the ruler of increasing the capacity of the protocol spaces to receive and address wider social groups in his headquarters; bigger constructions as well as spatial development in terms of high are present: transformation of existing recreational areas into official spaces, like the Patio del Crucero, the development of the upper floors not only for private use but including throne halls – such as the second dome – *qubba* - built in the upper level of the complex – or balconies to address the people from a higher level, are all features of

the built environment that reflect the adaptation of simpler spatial patterns. The densification of the spaces justifies the high percentage of openings towards outdoor private areas (52% of openings in the courtyard façades).

Overall Layout, Spatial Character and Decoration

From a formal point of view, this building can be considered a ‘hybrid’ between the Andalusian Islamic type and the gothic style: The four porches around every side of the courtyard and its corner solution, or the slim proportions of certain structural elements are distinctive features resulting of this integration. Because of its urban location, specific spatial constrains due to pre-existing urban elements around the complex implied a higher complexity regarding the layout: Some patterns, such as noticeable tall domes – *qubba* - volumes or sunken gardens contribute to the verticality of the spaces. The general scale though is not very big, increasing the perception of distinct elements –like the vegetal volumes in the patio – in relationship to the overall space. Finally, a remarkable value for the internal decoration parameter, which reaches a 77.2% in the throne hall and adjacent rooms combined with their bulky volumetric look, comprise a meaning of power and wealth from the ruler towards his surrounding circles.

Case Study D: Patio de Comares - Alhambra Palace

An area of around 6,434m² has been considered for the purposes of different usage percentages, which includes the Menxuar, Patio del Cuarto Dorado, Patio de la Reja, Palacio de Comares, the Baths, Patio de Lindaraja and the Palacio de los Leones, in an attempt to focus on the main buildings existing during the Nazarí dynasty and ignoring the big contributions carried out later by the emperor Charles V. The zone demarcated for the spatial analysis encloses an area of around 1,900 m² articulated around the Patio de Comares, a protocol and symbolic pre-stage before the meeting with the sultan in his main throne room, hosted inside the volume of the Comares Tower. The current access and itineraries along the spaces have been highly modified from what probably was their original layout.

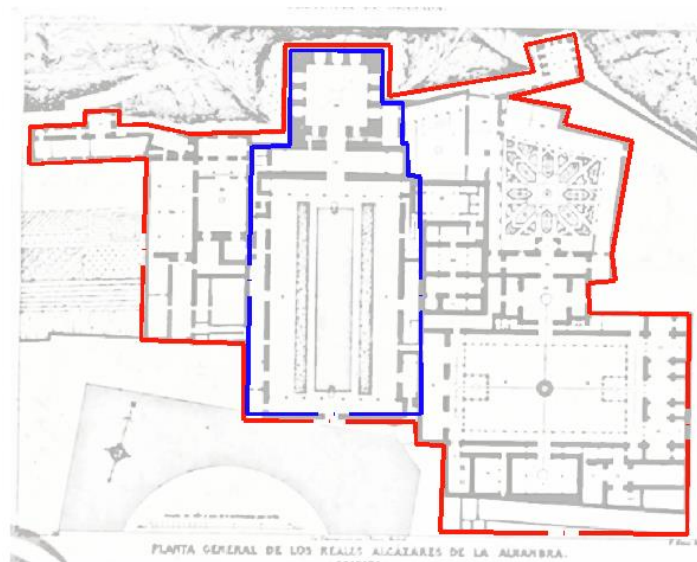


Figure 11. Plan of the Alhambra complex in Granada: The red line demarcates the area considered for the usage types and the blue one outlines the main spaces organized around the Patio de Comares (Source: Authors).

Observations

Program and Setting

Regarding the usage types in this complex, the concept of *villa rustica* mentioned in the Medina Azahara case study can be identified here (the recreational use counts for almost 40% of the area analysed). However, the geographical constraints of the setting plus the defensive requirements imply a small city version of this idea, and is represented in a very high degree by the Palacio de los Leones which ultimately worked like an urban villa 'conducive to relaxation' (Dickie, 1992).

Layout, Geometry and Spatial Qualities

The layout of the spaces around the courtyard portrait a strong contrast between the long façades and the short ones: the latter produce a remarkable compression of the space that then suddenly expands - vertically and in width - inside the Comares hall. The ratio proportions of the north nave (0.14 in length and 0.32 in height) and the Sala de la Barca (1.16 in length and 0.43 in height) illustrate this effect when compared to the Comares hall (0.48 and 0.81). It is noticeable the richness and variety of the spatial patterns articulated along the sequence of this three spaces, shown in terms on section in the longitudinal sections developed by López Reche (1967).

Architectural Composition and Decoration

Drawing on the richness and contrast mentioned above, the formal difference between the appearance of the Comares tower and the delicate portico on the north nave expresses this disparity. In this example, it is also significant the difficulty to establish graphically the external façades for the area of study; this fact highlights the relevance of the courtyards as real organizers of the spaces around them, as well as the pragmatic and adaptable attitude of the main actors involved when undertaking extensions and updates in the building.

The rates obtained for the internal decoration of the main spaces (76% in the Comares hall and adjacent spaces) recall the attention to the refined way ornaments were developed in these palatial complexes, where it almost plays the role of a texture integrated in the architectural volumes but can also be admired at a short distance. The limits between the main structure of the building, its secondary elements and the layers of ornamentation get blurred (the 'covering layers' parameter scores 'very high'), illustrating a high level of integration between conceptual appearance, architecture, interior design and craftsmanship.

CONCLUSION

This study has identified gaps in the contemporary architectural design approach and the nature of architectural descriptions, including relating to the wider design intent and functionality, knowledge-based factors, and incomplete use of qualitative and quantitative data. In order to address these gaps, an advanced descriptive framework which integrates qualitative and quantitative data has been developed. This serves to deepen the analysis of historic buildings by enriching their depictions using concepts and ideas mainly established in pattern theories and contemporary best practices. Such a framework helps modern designers to look at and learn from architecturally significant buildings from the past.

The practical application of this framework has been demonstrated for four case studies of Al-Andalus palaces. As the functionality of such palaces covers residential, hospitality and recreational aspects, this framework is relevant for architectural designs addressing these areas. Specific contributions of such an advanced descriptive framework to the architectural knowledge of historic buildings include:

- Regarding the architectural programme of the buildings, the framework explicitly addresses the ancillary spaces – or back of house areas – helping understand how the main spaces can perform properly. Such understanding is important as these auxiliary

areas need to be considered when recreating the dynamics of use within historic buildings, and to suggest valid solutions for contemporary designs when dealing with auxiliary spaces, which are not always integrated from the concept stages.

- Even though quantitative data is not commonly displayed when describing historic buildings within surveys of art, the mere exercise to assign main functions to each archaeological remain/space can help understand better the relationships of the different usage types in the building through their proportionality and percentage or through their vicinity and location within the main building layout.
- The identification and mapping of the different spatial patterns or recurrent architectural entities in historic buildings - which express the specific design solution applied to the building – facilitate in today’s architectural practice the alignment between the client’s requests and the designer’s proposal as the essence of a similar building type, better understood by the parties. Such identification, which in this study is mainly represented by the preliminary stages of the framework’s development, forms the research activity that contemporary designers should take in order to deepen the understanding of representative historic building types.

The process of completing the information fields and parameters included in the descriptive framework, requires a critical thinking: moving between the different levels of abstraction/information requires re-consideration of basic issues that sometimes are taken for granted when practising design disciplines – for example, the evaluation of the facade ‘potential decor-able areas’ in a room: how different proposals could look like when assigning a variety of values from 0% to 100% to this parameter; or by understanding the range of such values in existing built examples. Justifying why a ‘low, medium, high or very high’ rate has been given to specific parameters helps reflection on decisions taken regarding basic design solutions.

Finally, the comparison or extrapolation of data between buildings erected in different times can also be a catalyst for reflections on the excellence and quality of specific designs understating how; even with similar numerical values for the same parameters, some of these buildings are viewed as works of art while others are essentially pastiches. The deeper understating of architectural patterns, its identification and combination can offer some light when assessing how adequate a design is. Figure 12 illustrates this comparative use of the descriptive tool demonstrating a new building looking similar in appearance to the Alhambra Palace. The analysis represents certain characteristics of key Islamic buildings, such as the external colour, specific architectural features or decorative motifs. While the spatial characteristics show a range of totally different patterns: for example, the transitional spaces between interior and exterior, the opening distributions, or the texture, weight and ensemble of the construction materials.



Figure 12. New buildings - like the Alhambra Palace Hotel in Granada (Source: Authors).

The descriptive framework set out here is a tool that requires a 'thinking' rather than a 'mechanical mind' to interpret the design requirements and parameters and apply the results in an effective and aesthetically pleasing way: The quality and excellence of design – in particular the upper layers at the intangible level – relies on human intelligence and expertise to synthesize and translate the requirements into the right architectural patterns. Good design cannot yet be delegated to machines. It is not an individualistic approach but rather the 'collective expertise' and cooperative activity of all the actors involved that is required to translate concepts into architectural works of art and quality.

The case studies of Al-Andalus palaces used in this study are not directly connected historically and so in a strict typological sense are distinct. Notwithstanding historic or typological differences, this tool nonetheless deepens the development of historical architectural descriptions by providing a structured and systematic way to depict, assess and compare these buildings at an abstract as well as at specific, tangible levels. For both historical and contemporary buildings, this descriptive framework provides a basis to develop comparative data according to a standard structure and format. The resulting comparative data, whether drawn from historical or contemporary signature buildings, provides a relevant practical reference for modern architectural designs.

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