

## **Composition and Design Elements and Principles of the Organisms with a Central Plan in Iran**

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### **ABSTRACT**

The theoretical problem to which this paper aims to answer is the one that gives continuity to the contemporary design for the traditional central spaces, within the area of Persian influence. Through the analysis of the updates of this cultural area, this writing aims to provide a theoretical support to the understanding of those traditional rules underlying the design of some representative historical architectures.

Through a selective process of samples of buildings with a strong architectural and historical definition, and extrapolating some of the rules that can be a support for an improvement in the field of the architectural design within all the area with Mediterranean influences (that is historically marked by a plastic vocation), this paper aims to support and upgrade as possible the contemporary design, through the study of the vast and still unknown architectural heritage.

It is intended to work by tracing the logical process which involved the design and composition of the buildings with a central plan. Thus, the reading is carried out with the approach of the architect–designer, following the idea that a building is not just distribution, form or structure but a whole, in which such single aspects must work together to give quality and definition to the building itself.

In fact to date, even if the need for central spaces has generated some interesting changes, essential to adapt these forms to different needs of time and function, the precepts that regulate the composition changes for these spaces is still not investigated as a whole: forms, paths and stylistic rules are often extrapolated and discussed as self-standing issues, as not involved to the same extent within the creation of the building.

**KEYWORDS:** Persian architecture – organisms with central plan – composition - design

### **1 INTRODUCTION**

The organisms studied within this paper can all be identified as organisms with a central plan, featured by the needs of specialization, and thus joining different families of buildings. In fact, within the current typological terminology, central plan is defining different architectures belonging to various families of buildings with respect to their plan, always based on a certain idea of centrality. Therefore, under a typological profile, can be defined with a central plan an architecture whose planimetric system allows for the identification of a center (node) as the result of the intersection of a variable number of

directed lines embodying the axes of symmetry of the plan itself.

This paper will always deal with buildings that can be defined as nodal<sup>1</sup> since, the central room becomes a spatial, constructional and functional node that unifies the entire organism. In this way it is possible to hold together several architectures that, although responsive to different needs, appear to be designed by geometric central shapes as the square, the hexagon and the octagon: all polygons identified by a symmetry with respect to a certain number of axes passing through the center. Again, this makes it possible to identify, within the composition of these organisms, the different expressive methods as well as the potential (more or less organic), with respect to the aggregative solutions. Each of the polygonal shape just mentioned can be associated to a certain idea of centrality.

## 2 THE READING OF THE ORGANISMS

Thus, through the use of geometry the building starts to become the type and be translated into axes, lines and spaces.<sup>2</sup>

The central space becomes the first common matrix defining the type we are interested with. A further important common matrix is the presence of a ribbed covering.<sup>3</sup> This last requirement allows us to highlight the presence of a certain kind of covering as a distinctive element that summarizes the architectural structure, intended to be both the expression of the distribution system as well as that of the static-constructive one. The presence of such kind of roofs becomes a focus thus sublimating the concept of node, generally overlaying with the geometric center of the organism and the origin of the horizontal axes that define the space. Finally, the existence within these coverings of arches and ribs becomes the last important topic since, according to local variations; it has favored the emergence of new interesting types over time.

In spite of this study, the Iranian type with a central plan seems to be very clear: the organisms that include several functions are designed as the more organic ones, showing a process that implies a composition with elements and structures organized to create more interrelated systems.

Progressively, the mutual influence and the interaction among the parts provides a high degree of necessity that, together with the implementation of the functions, leads to the creation of more complex buildings.

The input for the starting of the process is the progressive specification of functions, which leads inside a room, and thus indoor, activities that were previously performed outside.

Exactly from this specialization the most of the shots required for the update derive, as necessary to make those organisms to become the end point of a process that led towards the identification of different types for the central space.

The correspondence between each specialized phase of the organism and the incoming of new ideals is evident, allowing to consider each one as a typological mutation, within the frame of a unique process. Each phase thus emphasize the achievement of a balance, reached through innumerable changes and characterized by continuous partial increments, derived by the crisis of previous conceptions.

The need to have more spaces and routes implies the creation of further rooms, aggregated to the central one in a way that, since the elements that constitute the space and the structure of a building considered as an *organism* have to be linked by a relationship of complementarity, emphasizes the sense of unity of the whole building.

Therefore, it is important to highlight the close connection between a space and the routes inside

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<sup>1</sup> This means specialized buildings marked by a hierarchically dominant room with respect to the other associated ones.

<sup>2</sup> A *type* can be defined as the set of rules, conventions and customs related to a common matrix, acquired, transmitted and consumed in the building process and rooted in the experience of constructing buildings.

<sup>3</sup> Therefore, returning all the analyzed buildings to the archetypal forms of architecture and bringing them back to the anthropic gestures of appropriation of space, they can be firstly assimilated with the covering need.

of it, intended to be not only as the identification of the spontaneous motion of the users of the building itself, as well as the code of the motions occurred over time through the systematic iteration that generates the geometric path. Thus the axes are formed, through the progressive *geometrization* of the routes within the elementary architectural organism and generated by the consolidation of ritual actions.<sup>4</sup>

In the analyzed central plan buildings the composition of the main space is derived either from squared or polygonal shapes, with a preference for the octagonal and dodecagonal ones that led to the use of multiple lines of symmetry and are therefore connoted by a stronger centrality, thus allowing most of the times to speak about *polar* organisms.<sup>5</sup>

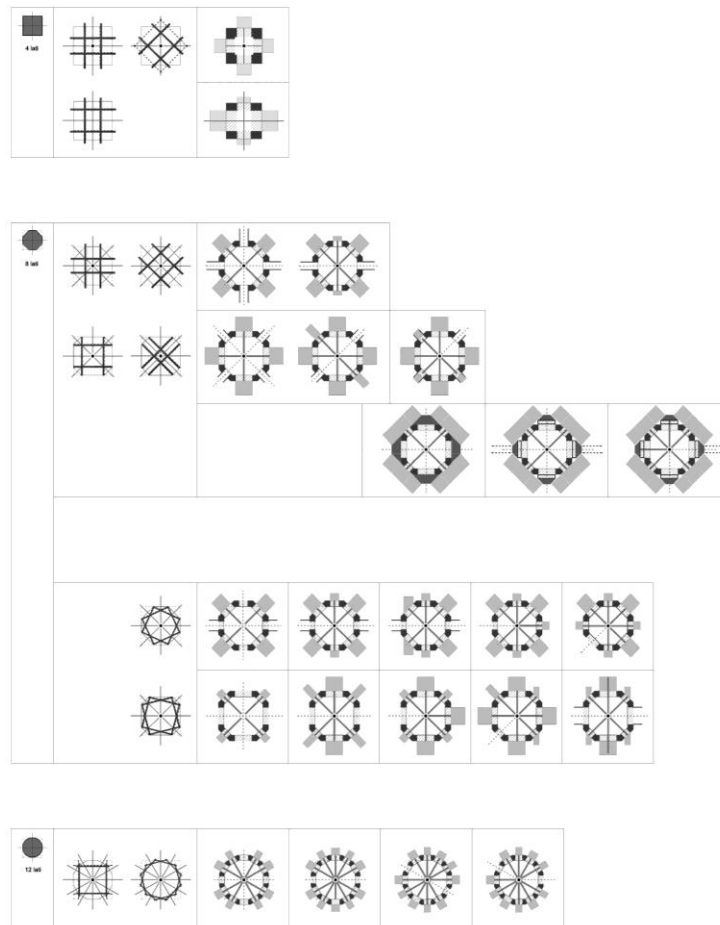


Figure 1: Scheme of the different kind of plans, developed on the basis of squared, octagonal and dodecagonal polygonal shapes. Drawings by the author

<sup>4</sup> The *axes* can in general be divided into *passing axes* if they are structuring a route with two entrances, or *reaching axis* when termination on an element that determines a polarity within the building. The *nodal axes*, along which the main fluxes of movement occur, individuates the center of the overall geometry that unifies structure and function into one constructive action. Along its direction the *axes* establishes a sequence of elementary structures.

The *polar axes* is an exception to this definition because it does not match with the geometric expression of a real movement but it is the abstract representation of a vertical unreal motion. In an organism defined as polar, the elements composing the bearing structure are generally located at the ends of what we can call dividing line and that, if corresponding to a line of overturning of a surface, can also be named line of specularity.

<sup>5</sup> Strappa, G. 1995. Op. cit.

This definition is confirmed by the presence of a prevailing vault as covering. In particular, this analysis provides knowledge of the organisms marked by the presence of any kind of ribs within the coverings.<sup>6</sup>

In order to provide a comprehensive study, the topics like technology or stylistic features are analyzed overall in their relationships, since in the architectural organism such aspects must be linked together to contribute to the same purpose: to give quality and definition to the building itself. Rather, since the building is not just the expression of form, distribution or structure but the synthesis of all of these things, it can be read through its components.

In such an organism, the mutual implication between the parts and the whole, leads the components at each scale to be conditioned by the smaller ones and thus conditions the larger ones. If the building is intended as the synthesis of certain components differentiated by scale, to talk about an organized use of the spaces necessarily involves the knowledge of the structures and the materials that define them.

Vice versa, speaking about structures or materials involves a deep knowledge of their purpose. Let's introduce the idea of an *organism* as the manifestation of a *whole*, through all the components combined together to determine the final outcome of the architecture.<sup>7</sup>

The adopted analysis is basing on the Muratorian School method which considers *to read* the organisms by identifying their components,<sup>8</sup> defined to be as the necessary and sufficient components for the existence of the building itself, according to the logical process of its practical execution in the construction site.

Starting from the identification of the single constructive components, through their aggregation in horizontal and vertical structural elements and their connection generating systems intended for a use, the correlation of these into a whole, which is definitively the building, is investigated.

This reading offers a certain knowledge, as well as the identification of some parameters, that can be used for a qualitative judgment of the building (object), concerning architecture and thus its composition.

In the end, if possible, from the systematic comparison of the components concerning the reading scale, the reconstruction of the typological process follows, identified by significant upgrade steps.<sup>9</sup> Thus, through his study it is possible to recover the constant element inside the typological process of the building types and moreover the potentialities for its critical development, in spite of the need for renovation related to historical reasons or practices that, as the consequence of changing points of view and evaluation criteria leads to successive variations within the organism-building.

According to cycles of refinement or crisis, of specialization or de-specialization, a relatively autonomous typological process can be rebuilt for each one of the components. Therefore, even if a given building-organism seems identifiable as a type from a certain moment on, the process that defines the type itself can be reconstructed, through the study of the specialization of the single components.

The functional aspect in the different phases of the specialization allows the initial organism, constituted by a box-shaped plan without dialogue internal-external (between more aggregated spaces), to finally develop an open system which incorporates aggregated spaces and, accordingly, additional functions.

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<sup>6</sup> This statement refers to the difference existing in Iran between the vaults with ribs intersecting in the center and the ribs intersecting near the shoulders.

<sup>7</sup> It can be defined as the set of certain elements that contribute unitarily to the same goal which are put together in a relationship of necessity.

<sup>8</sup> Ameri, M. 1981. Op. cit.

<sup>9</sup> If a typological process cannot be identified as the expression of a *type* with its variants and variations, the evolutionary potentiality of the primary connection of a predetermined model or solution with the practical and functional needs is in any case clearly traceable.

The first organism, realized as prototypes of the most immediate answer to necessities of function and fruition, finds its best expression in the *gonbad khanè* that is, more generally, the domed room within mausoleums or mosques.

This room, being just a representative prayer space, expresses this uniqueness of function through a strong closure. Therefore, the dominant role is underlined by the presence of a rising dome that clearly creates a subordination of the surrounding added spaces.



Figure 2: Friday Mosque of Isfahan. Scheme of the plan with the identification of the *gonbad khanè*.  
Drawings by the author

Since Timurid period, the need to guest more believers inside the buildings, or to give them magnificence, led towards a partial opening of the central space, creating a direct relation between the *gonbad khanè* and the surrounding rooms.<sup>10</sup> Further functional additions influence the definition of kind of organisms, such as the *hammam*, in which the fruition paths assume particular importance, thus affecting the spatial composition and aggregation. These necessities, while producing the principal variations within very articulate but well organized buildings, led to a complete separation between the walking path and the resting places.

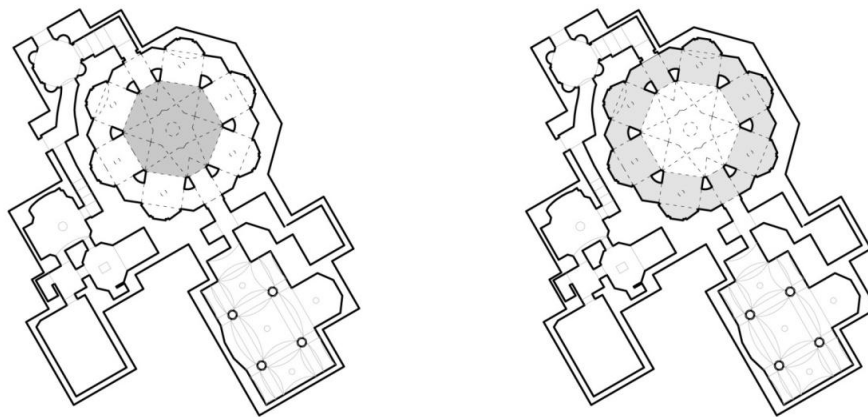


Figure 3: Hammam Khan, Esfahan. Scheme, within the octagonal plan, of the spaces for resting and the walking areas. Drawings by the author

<sup>10</sup> Always, the annexation is realized by a simple flanking of spaces and the open character of the central compartment is marked only by its partial opening.

Gradually, by introducing more functions within the same space, these central rooms are realized with higher degrees of complexity.

Often the kind of buildings interested by this process are commercial ones, related to the public life, and find their first answer in the spaces called *chaharsuq*, related with the primary act to cover an used space. It represents the first practical response to the need to create a *place*, which adequately responds to a variety of needs. However it can't be considered as an organism but rather only a node or pole, since it doesn't implies fruition or distributive features while inserted in the paths of an organic and bigger system, such as the *bazaar*.

Subsequent adjustment, are realizing further aggregations of commercial spaces, and lead towards the creation of a *type* that finds its best expression with the commercial buildings called *timchè*, able to carry different needs within a single space.

Within these organisms, the presence of more functions is expressed by a series of niches before, and by polygonal shapes whit a bearing system with pillars and arches then.

In the last stages, due to less possible aggregative solutions it offers, the use of the squared plan is almost zero.<sup>11</sup> In most cases, these buildings realize polar organisms with an octagonal plan. The composition, related to the intersection between two or four reaching axes, is identified by the presence of the covering raising over the adjacent ones and further emphasized by the presence of a pool in the middle of the floor.

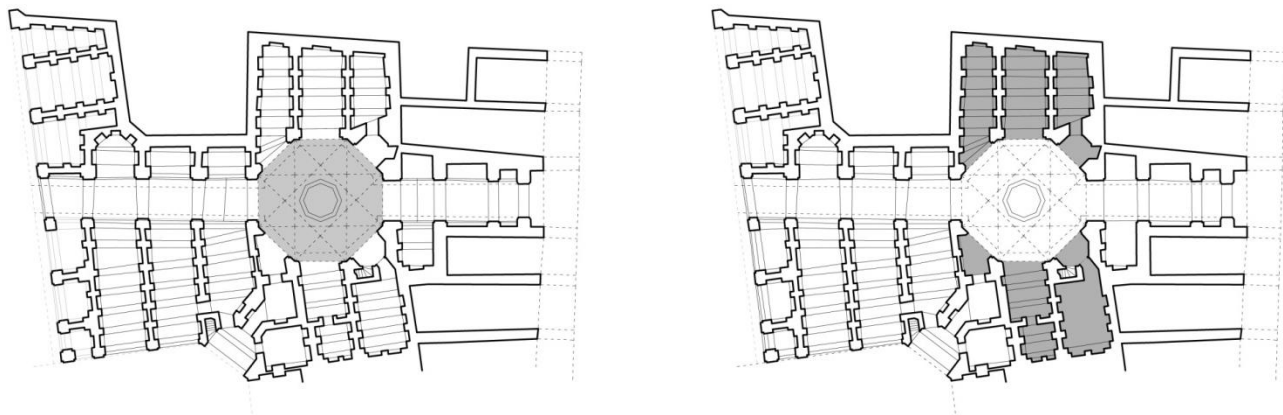


Figure 4: Timchè Haj Karim, Bazaar of Esfahan. Prototype of a more complex kind of octagonal plan. Identification of the central space and of the primary added spaces. Drawings by the author.

To confirm the sense of a “polar plan,” the structural components are located at the ends of the dividing lines. Some of these dividing lines are corresponding with the lines of specularity, identifying a set of equivalent reaching axes and articulating the composition of the space.

Often, the reaching axes verify the equivalence; on the other hand, the walking axes are often affected by the onset of functional tensions that generate the creation of secondary rooms. The secondary rooms, always added to the principal one maintaining intact their geometric variable shapes, are always placed speculatively with respect to the principal axes.

During the final phases, the plan results open, by means of the pillars in correspondence of the reaching lines, and ideally delimited by the projections of the arches in the aggregative points. Although it is possible to consider the previous as rules for the aggregation and composition of the spaces, positional and functional needs create considerable and heterogeneous variations, related to the

<sup>11</sup> However, during the Timurid period, the square create regular grids projected also at the level of the covering through the use of the ribs within it. In these cases, the organization of the organism is not always radial, but rather realized by simple flanking rooms.

total incorporation of such buildings within the commercial streets of the *bazaar*.

### 3 CONCLUSION

In light of this reading the Iranian matrices of elementary organism with a central plan result clear. Even with the availability of a significant amount of positional variations the aggregative rules that govern the composition emerged to be particularly regular: it can be always identified a central space with a pure polygonal form around which it is developed a series of spaces.

At first, these further spaces are considered as expansions of the central one; in a second moment, due to the emergence of new tensions at the intersection between two nodal axes (the main and the secondary), are strongly hierarchized.

In these cases, the spatial layout, the walking and the static systems and the serial order of the rooms, all coincide with the functional needs, requiring an extremely clear distributive organization.

Even if there are antinodal rooms at the intersection of the paths, they are nodes at the smaller scale of the elements. Once again, the vault underlines the nodal axuality, allowing the central room to become a nodal space. The almost mechanic operation to put a vault on a consolidate polygonal plan is demonstrated by the repetition of an innovative solution of transition between the piers and the set of the covering: the connection between the circle and the squared base of the load-bearing masonry walls is always facilitated by the use of the vault with cross-ribs with a free center itself, that creates certain transitions similar to ribbed pendentives.<sup>12</sup>

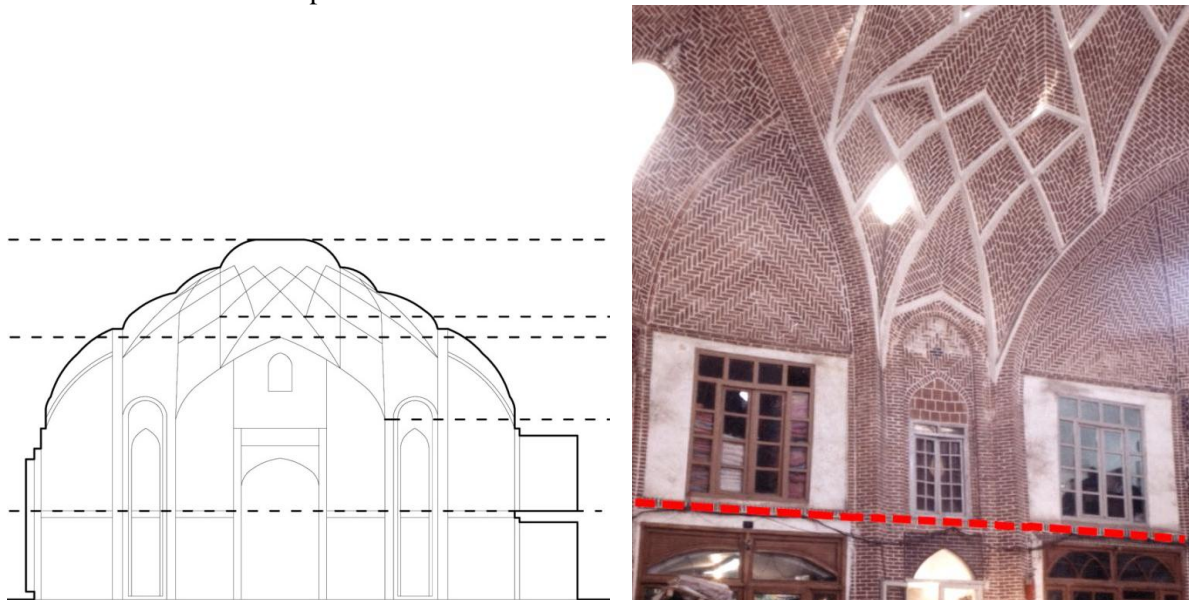


Figure 5: Timchè Haj Mohammad Qoli, Bazaar of Tabriz. Identification of the transition by means of the ribbed vault. Drawings by the author

This solution, from the analysis already carried out, situates these organisms within the definition of “polar” ones, by means of the piers that are projecting to the ground the path of the forces, along the

<sup>12</sup> Further information about this topics are part of the PhD research conducted by the author within the Course of Architectural Design for the Mediterranean Countries and discussed in 2013.

entire structure of the building.

The aggregation of the accessory spaces, progressively generates complex organisms within the commercial areas of the *bazaar* that, while defining subordinated series of spaces, considers the central one to maintain a strong character of centrality and polarity. In contrast, the open character realized by the means of the pillars as bearing system, led towards an idea of aggregation that, basing on the traditional spaces with diaphragms of arches, creates a number of highly serial variations.

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