

Shaping Space: The Impact of Socio-cultural Practices on the Spatial Organization of Kharanaq Fort, Yazd, Iran

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ABSTRACT

Kharanaq Fort, a historic castle in Yazd, Iran, stands as a testament to the adaptive evolution of spatial organization shaped by centuries of socio-cultural transformation. This study aims to identify the impact of socio-cultural configuration of the community on the formation of the physical structure and the spatial organization of the fortress of Kharanaq village. From this perspective, the study questions whether social construct, cultural patterns and financial conditions have been effective in shaping the physical character of the fort or not, and if so, to what extent it has influenced the architectural characteristic of the fort; A fort that, in addition to its long history, it is also considered as one of the few completely inhabited forts (without a governing system) in Yazd and even Iran. The aim of this research is to introduce a unique example of vernacular architecture in Iran and delve into its deeper socio-cultural context, while addressing the mutual influence of the residents' socio-cultural behaviours and beliefs on the spatial organisation and the architectural characteristics of the fort. The data presented in this study is the result of extensive field works and visits of the village and the fort as well as, historical recourses available about the fort. Drawing on insights from archaeological excavations, field research, historical studies, and critical analysis of available texts, this article concludes that the fort's physical structure—shaped historically through a coherent design centred around a core nucleus—was essentially influenced by underlying social, cultural, and religious principles. Therefore, fully understanding its architecture requires a deep awareness of these guiding concepts, as the physical and conceptual elements are inseparably intertwined.

Introduction

In Iran, forts located in both urban and rural settings represent prominent examples of vernacular architecture, reflecting regionally distinct designs and construction techniques across diverse landscapes. Notable examples include the historic Bam Citadel, Morcheh Khort Citadel, and Narin Qala in Meybod. Forts predominantly were established for military and defence purposes in the form of fortifications, and they include features such as towers, ramparts, and moats. Additionally, forts in Iran used to serve varied purposes: some functioned as governmental centres, others as mixed-use residential and administrative complexes, and some were purely residential with no governing structures. Kharanaq Fort has been a residential fortress for the public as well as, the local community and there has not been a separate section for a governing authority in the spatial structure of the fort.

Kharanaq Castle is valuable not only for the insights it offers today but also as a testament to the lives and problem-solving efforts of the people who once inhabited it. This research attempts to briefly introduce the structure of the fortress of Kharanaq, an understanding of its inhabitants' life, their cultural values and social ideologies and their impact on the formation of the special shape of the fort.

Research questions

- 1- What factors have been effective in the development of the coherent architectural characteristics of Kharanaq fort and how can we look for the concepts behind its formation?
- 2- Is it possible to achieve these concepts with field observations, relying only on physical observations and with limited behavioural information?
- 3- Have social concepts, cultural values and financial conditions been effective in the spatial formation of the fort or not, and if it was, to what extent has it influenced the physical form and architecture of the castle?

Methodology

This research employs a qualitative approach to examine the influence of socio-cultural practices on the spatial organization and physical structure of Kharanaq Fort. The study integrates multiple methods, including field observations, historical document analysis, and insights from archaeological excavations. Extensive fieldwork involved mapping and documenting the fort's physical structure, while historical texts provided context about its evolution and socio-cultural significance. The research also incorporates a critical analysis of architectural features to identify the influence of cultural, social, and financial factors on the design and organization of the fort. By synthesizing data from various sources, the study ensures a comprehensive understanding of the fort's architecture within its socio-cultural framework.

Case study:

Kharanaq is a village in the Ardakan county of Yazd province. It is situated along with the Ardakan-Tabas highway. Kharanq Heights in the west of the village is one of the three important and high mountain ranges of the province. Kharanaq village predates the city of Yazd and was historically inhabited by Zoroastrians (Shahzadi, 1995, 5). According to the surviving reports from historians, in the year 24 AH, which coincides with the twelfth year of the reign of Yazdgerd, one of the oldest settlements in the region was Kharanaq, known as Kharanaq Village now (Khademzadeh, 2001, 5).

Kharanaq Fort is one of the largest rural residential castles in Yazd province, standing on top of a hill dating back to the Sassanid era. This castle is one of those collections that have signs of resistance to preserve existence and authenticity. The area of this castle is about 1.1 hectare, and it is surrounded by fences that strengthen it. This ancient structure has more than 80 houses, most of which are two or three stories, designed and built according to the financial ability and social status of its inhabitants (Figure 1). Today, the fort is largely deserted, with only occasional visits from former residents who sometimes use their old homes as storage. Particularly, until the early 2000s, two families—one of whom resided there seasonally—continued to live within the fort (Arman, 2013).



Figure 1: Kharanaq Fort on the top of Sasanid hilltop (Source: authors' own construct)



Figure 2: Location of Kharanaq Fort (Source: authors' own construct)

Background

The origin and exact time of the construction of Kharanaq village-fort remains largely unknown while archaeological studies could provide more insight into its age, no such research has been conducted so far. Residents of Kharanaq believe that the history of the fort dates back to before Islam and its original inhabitants were Zoroastrians. Among the historical references, Mostofi

Bafqi mentioned the oldest age for the fort, and it is more than 4000 years old (Mostofi Bafghi 1961, 65). Sepehri Ardakani mentions the construction of Kharanaq and two other areas in this region to the time of generals of Alexander the Great; therefore, based on this source, the oldest core of the village can be dated to about 2300 years ago (Sepehri Ardakani 1969).

Factors Influencing the Location and Formation of Kharanaq Fort:

Determining the true origins of Kharanaq fort relies on recognition of the reasons for its formation. This means that the establishment of a settlement in a particular location can be driven by multiple, simultaneous factors. Although Kharanaq region is a dry land located on the edge of the central desert of Iran and in recent times, it has always faced a severe lack of water for economic activities (especially agriculture), it is situated in the catchment area of the Grand Desert, where water could be supplied through underground channels known as 'qanats'.

One of the main factors in the formation of the village-fort and the settlement of the population in this locality was the existence of rich underground water resources. The hardworking residents brought water from the ground to the surface by digging numerous wells and creating canals. The population size, types of activities, livelihoods, and other practices in the area have historically been closely tied to the irrigation capacities of local canals. When irrigation levels increase, more land becomes available for cultivation, thereby supporting a larger, more settled population. Additionally, the hilltop location enhances security by offering a clear view of the surroundings and making access from outside the castle to the interior more difficult. The soil of this hill is strong and of a special kind which in local language is called "Golmore" or "Chilo". Although this type of soil is very resistant to compressive force, it can be scraped even with manual tools. This unique quality of the soil has enabled an integration of architecture with the natural landscape.

Spatial evolution of Kharanaq Fort over time:

Kharanaq Castle during its lifetime, or in other words at least part of its history, which is recognizable to us, did not undergo major changes internally; rather, its evolution has largely affected its external structure, and the internal changes have been limited to modifications aimed at adapting to changes in everyday life. The castle's physical and social systems were so well-defined, regulated, and inherently powerful that they resisted both infiltration and integration with new lifestyles and behaviours. Consequently, even as the castle gradually became depopulated, its authenticity and architectural essence remained intact.

The first factor that caused residents to leave the fort was the establishment of relative security around the fort during the first Pahlavi period (Arman, 2013). Due to this issue, the inhabitants of the castle started to build new houses around the castle in search of qualities that could not be achieved inside the castle. This intra-village migration started around 1940s with a natural speed and due to the usual need felt by the residents. Inhabitants began constructing houses that not only retained many qualities and characteristics of the castle's architecture but, also sought to incorporate features that were unattainable within the fortress. These new homes, significantly larger than their predecessors, featured spacious courtyards, porches, and numerous rooms, reflecting this aspiration. Typically, one or two stories high, the houses were designed with rooms arranged either around or along one side of the main courtyard (Figure 2, A & B).

The second stage of migration from the fort took place after the Islamic revolution around 1980s, due to the deterioration of the fort, the increase in population and the lack of space within the fort. Residents, on behalf of Kharanaq governorate and with the support of Jihad forces were encouraged to take loans to leave the fort and build new houses. In these houses, attempts to build houses like modern houses in cities can be seen. These houses are placed next to each other in the

west of the old Yazd-Tabas thoroughfare based on an urban grid, and there are few traces of the elegance of the castle houses or even traditional desert houses (Figure 2, C & D). The rapid second wave of emigration from the fort, influenced by external pressures, led to its abandonment. As a result, a poorly integrated and low-quality development emerged across the road, creating a texture that felt alien to the original environment.

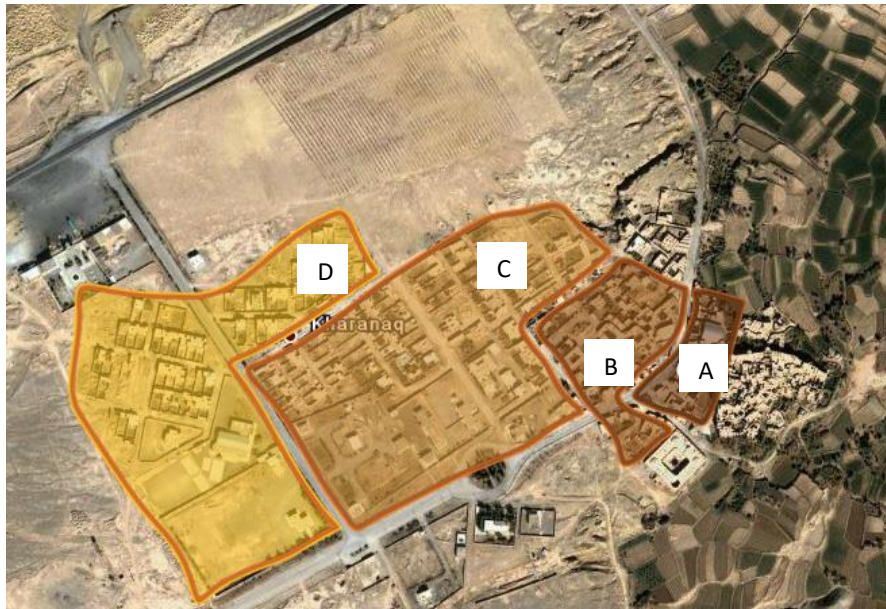


Figure 3: Physical development of the village after migration (Source: authors' own construct)

Macro analysis of physical structure of Kharanaq Fort

Although Kharanaq Castle developed gradually over time, it still exhibits a thoughtfully designed urban structure. All public spaces are placed next to each other and in a single place, in the central core of the castle. The arrangement of these spaces suggests that the castle may have been constructed according to a pre-established master plan, with its central core intentionally designated for adjoining public spaces. The arrangement of these spaces is such that the main pathways of the castle run alongside the mosque and the Hosseiniyeh¹, converging both in plan and section. The mill and the bathhouse are positioned next to these two, downstream from the Hosseiniyeh. The area between the public spaces and the residential quarters is filled with a series of residential units, with the passages serving as the spaces between these rooms. The castle had a different scale than what we consider for houses today. The fort was actually a house in which each family had from one to several rooms. The scale of the house and the castle were comparable, and the concepts of privacy and public space were defined differently than they are today. To better describe the architectural features of the castle, its overall structure can be divided into three categories: passages and gates, public spaces and residential units.

Passages and gates:

The establishment of communication routes at various levels within the castle has contributed to the complexity of its architectural layout. In fact, these alleys in many cases functioned as

¹ Hosseiniyeh is communal space in Iran dedicated to religious gatherings and rituals, particularly during Muharram, commemorating the martyrdom of Imam Hossein.

corridors between rooms and were semi-private spaces; nonetheless, the main passageways of the fort have a general function, which is connecting the central core of the fort (which includes public spaces such as the mosque, the hall and the bathhouse) to the surrounding residential quarters. These passages had different names based on their characteristics and function. Wolf passage (Gorg) is one of the most prominent of these alleys. Other alleys in the castle are known as “Daredezuk”, “Sarmil” and “Tariki (darkness)” (Davarpanah 2004, 18). (Figure 4)

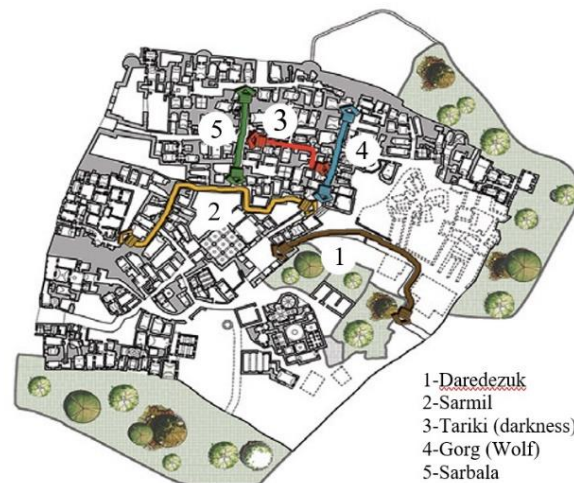


Figure 4: Passages inside the fort (Source: authors’ own construct)

The passages inside the castle are very narrow, with high and winding walls, dead ends or open and generally roofed. Being narrow, long and roofed has made these passages dark and scary. For this reason, in some places, openings can be seen in the roof of the passages, which had the task of providing light and ventilation for the passage. The narrowness of the passages can be due to several key factors. Primarily, they help less consumption of the area, thereby optimizing the land available for housing infrastructure. The second reason is the adaptation to environmental conditions. Narrow, covered passageways minimize heat exchange with the external environment, particularly during the summer months which, suits the hot and arid climate of Kharanaq. There is also a third factor and that is the proximity of social relations, which has resulted in greater security of the fort in the case of intruders and bandits. Moreover, narrow and roofed passages can play the role in strengthening and stability against the thrust forces caused by the roofs of the houses.

In the past, Kharanaq Fort had only two gates: the northern and main gate of the castle called "Darwaza Bala" which currently, is the only gate that has remained almost intact, and the eastern gate called "Lower Gate" in the vicinity of fields and gardens. With the passage of time and according to the need, two more gates were added for the ease in commuting; one in the west of the castle, called "Khalu Gate" and the other next to the lower gate in the south of the castle, called "Reza Khan Gate". Around a century ago, another gate was built by the residents in the southwest part of the castle, which is considered today as the main communication passage between the historical castle and the village (Ibid. 23).

Public space:

Mosque, Hosseiniyeh (religious communal space), bath, two mills, washroom and Bait al-Maqdis mosque are among the public spaces inside the castle (figure 5). The mosque with a distinctive minaret is located among the houses of the fort, next to Hosseiniyeh, and has a square nave with nine divisions and a small courtyard. This building is built on two floors in such a way that it has distinct access for men and women from two different levels. Hosseiniyeh is another public space with a square geometry that is located near the southern side of the mosque with a relatively large difference in height. This space was mainly used during the month of Muharram for processions and at times as a grand public gathering space.

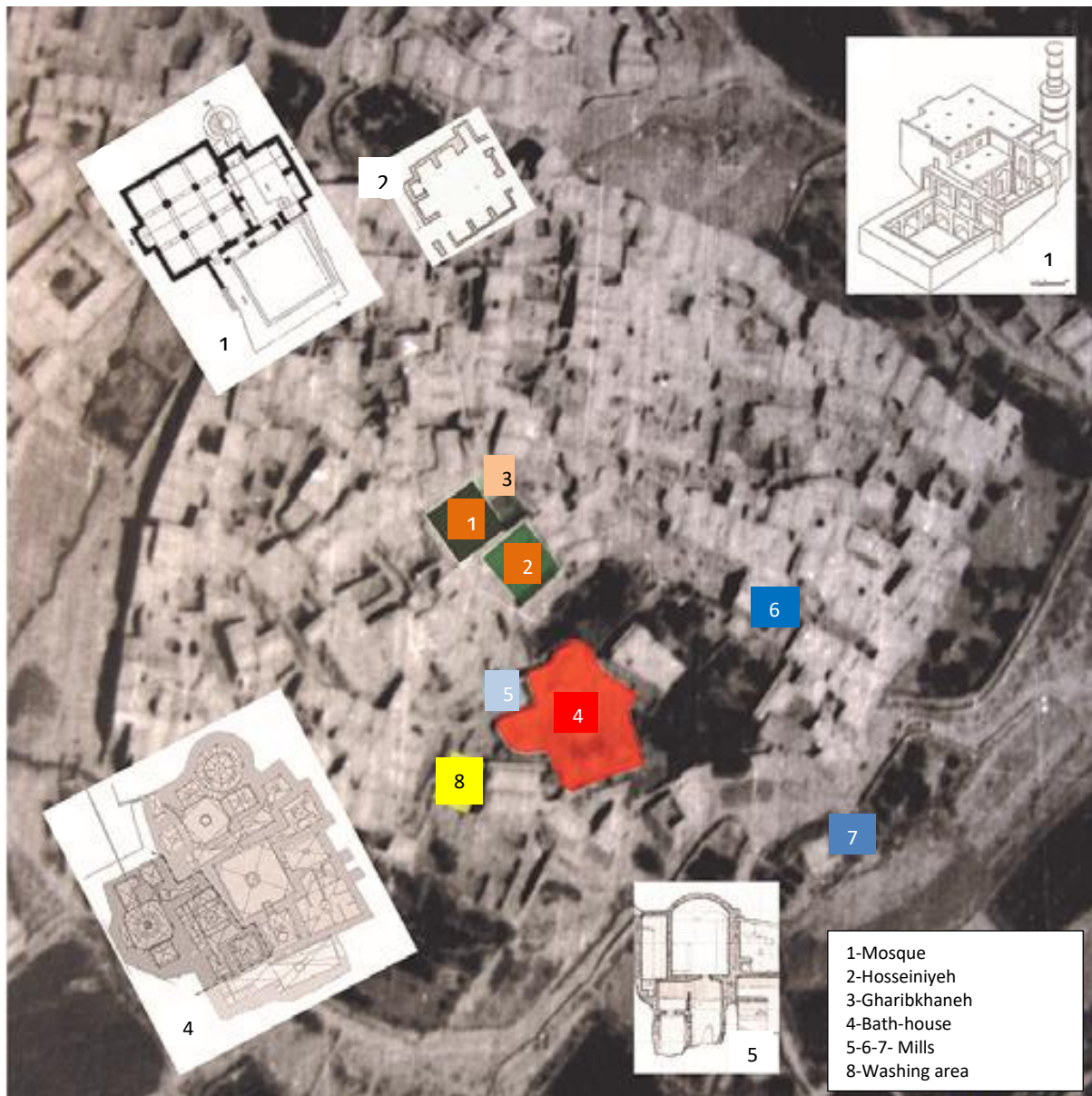


Figure 5: Major public spaces of Kharanaq Fort (Source: authors ‘own construct)

Residential quarters:

The fortress of Kharanaq stands out among similar examples due to its distinctive residential layout. This unique spatial organization can largely be attributed to the prevailing culture and social relationships among its inhabitants, who served as both its builders as well as users. Cultural

factors have significantly shaped the design and arrangement of the interior spaces within the castle, specifically residential quarters. The entire fort can be conceptualized as a single, unified dwelling, where the passageways function as its corridors, and the various rooms are organized around these corridors. These interconnected spaces reflect a communal living arrangement, as each resident did not simply inhabit a room belonging solely to their immediate family but instead lived within a broader, collectively governed system. The castle itself was thus designed to support a larger biological and social group. The rooms themselves do not have specific orientations and are formed in different directions depending on the direction of the abutting passage. The rooms belonging to a family were generally on a same level; however, the residential units were organized in a way that allowed for expansion both horizontally and vertically.

The residential quarters of the castle exhibit several variations in spatial formation. These include the arrangement of spaces adjacent to passageways, which are spread across one or two floors; the configuration of rooms surrounding a central courtyard, also on one or two floors; and the organization of spaces as interconnected neighbourhood units, forming a cohesive residential structure. These diverse spatial arrangements reflect the adaptive nature of the castle's design in response to both social and environmental factors (figure 6 & 7).



Figure 6: A view of inside of the yard of a house in the fort (Aghaeimeybodi & Andaroodi, 2021)

Figure 7: Three floor houses of Kharanaq fort (Ibid, 2021)

Social, Cultural, and Economic Structures of the Castle's Inhabitants

The fortress in Kharanaq captivates the attention of every observer, not only due to its architectural significance but also its role within the traditional habitat. Serving as the central core of Kharanaq village, the castle holds particular importance in terms of its social dynamics, which take precedence over its physical attributes. These behavioural patterns are so intertwined with the body that the change of each influences the other and disrupts the relationship between them.

In Kharanaq Fort, the concept and scale of home, family, and neighbourhood are different from what we understand today. There is no specific neighbourhood as per today's standards, and the structure of the castle is unified as a whole. The whole fort can be considered a neighbourhood, where people have lived in a communal and expansive manner, making the boundaries between spaces indistinct, however, they had rules and regulations to protect their privacy too. The fort is, in fact, a large house with two, three or even more entrance doors, where each resident has from one to several rooms, and passages are corridors between the rooms; With this advantage over the house that has strong gathering spaces such as a mosque, Hosseiniyeh and Qatilgah, service spaces such as baths and washrooms, work spaces and provision of life necessities such as gardens and

mills. The formation of these spaces together and in the central core gives the residents the possibility of wider and freer communication, and thus their interactions with each other have been easier. This means that for the residents, communication with each other and interaction was of high importance, and the residents had designed special spaces for it. Among these spaces is "Gharuk" (an indentation in the ground and near the minaret of the mosque) where women would gather in winter due to its sun protection and spin, weave and talk with each other. "Qatilgah" is also a playground where residents gather to do daily work and mostly to have fun and socialize. As the name suggests, the "laundry room" is a place to wash clothes, and on certain days when the water is flowing, the residents gather and talk in addition to washing.

In addition to gathering at the scale of the castle as a residential city, the residents also exchanged and communicated with each other at the scale of the residential units. This has been done through the formation of special places or spaces. Among these spaces are "kitchens" which in many cases were shared by several families and there was no separate kitchen for each family. In addition to reducing the occupancy level of the building, this has created a place for residents to talk and exchange their thoughts (figure 8).

Among other spaces that have met this need are rooftops. In desert architecture, the roof always has its own unique spatial definition. During the day, they function as a place of passage, a connection between spaces and as the access to some houses as well as other uses, and in the evenings, as a place to hang out and perform group activities, and at night, as a cool place to rest and sleep. Especially in this castle, due to the special and unique formation of the spaces, the roofs are basically a diverse and attractive space (figure 9).



Figure 8: A view of a kitchen (Source: authors' own construct)

Figure 9: A view of a rooftop (Source: authors' own construct)

On a more detailed scale, it can be pointed out that there are holes in the walls of the houses called "dareecheh", which were the means of communication between two adjacent houses or to exchange goods or other things. Even at the family level, the arrangement of equipment and preparations reflects the intention of fostering gatherings. For example, placing a stove on the floor of the winter room in some houses demonstrates the residents' effort to create a space that serves multiple purposes. Beyond cooking, the stove becomes a focal point where a table and quilt can be placed over it, allowing family members to sit around, converse, and stay warm during winter. (If the sole purpose were cooking, the stove would likely be positioned in a corner for convenience and to minimize crowding). As discussed, the inhabitants shaped the spaces of the castle both at the macro scale of the castle's overall structure and the micro scale of its individual units. In doing so, they not only addressed functional requirements but also accounted for various social needs, including fostering interaction and communication among residents.

Security:

Security is one of the most important influential concepts in the formation of the body of the castle. Perhaps the most important reason for the formation of such a complex body and the confinement of houses and other spaces in towers, fences, gates and sometimes ditches is the insecurity and chaos of a turbulent period of Iranian history. These conditions and the special and defenceless terrain of this area would have prompted the residents to consider a special place for situating the castle. This is the reason why, as mentioned, the castle was built on a hill overlooking the surrounding plains, and because the village was exposed to attacks by bandits, even with the increase in population, the residents did not leave it, and the castle underwent continuous development and densification. Therefore, the castle has clay and mud fences distributed throughout, giving it a very dense texture.

The passages in the fort are so narrow that sometimes their width hardly reaches one meter. Most of the passages are covered and without light and are so winding that they cause confusion for the outsiders. One of the most significant of these pathways is the Passage of "Darkness" and "Wolf." According to the residents, the dark and twisting nature of the "Darkness" passage disorients thieves, ultimately leading them into the adjacent dead-end known as the "Wolf," where they used to become trapped (figure 10).



Figure 10: The passage of Darkness (Tariki) (Source: authors' own construct)

In many parts, residential spaces have been formed on the roofs of the passages, and one of the results of such arrangement is the closeness of social relations and, as a result, creating more security. The structure of the castle is designed in such a way that, during times of danger—whether under siege or facing an invasion by bandits—it can sustain essential needs, support ongoing daily life, facilitate self-defence, and enable the expulsion of intruders. According to the residents of the village, there was an underground path from under the minaret of the mosque to the opening of the Qanat, through which the residents had access to water when the fort was surrounded by bandits. On the other hand, it made it possible to connect the castle with the outside secretly, when needed. Another noteworthy point is the presence of an outsider in the village. When a stranger entered the fort, after investigating and making sure that there was no conspiracy, the traveller was taken to the stranger's room (called "Ghareeb-khaneh") for security purposes only through the east gate (Shahzadi 1995, 25). Additionally, the builders placed a significant emphasis on privacy and formation of distinct spaces based on gender. As mentioned earlier, for instance, "Qatilgah" was a multi-purpose common space for various leisure activities and public gatherings, however, access was limited to men or women at different times (Davaranah, 2004, 23).

Cultural behaviours (beliefs, traditions and customs):

In the development of any architectural complex, one of the most significant influencing factors is the religious beliefs of its residents. This influence is expressed in two primary ways: first, through the creation of religious spaces that facilitate religious activities, and second, through the impact these beliefs have on the design and organization of non-religious spaces.

Based on the first approach, the religious places of the fort, such as the mosque, Hosseiniyeh, Zou-qiblatain Mosque and the Ghareeb-khaneh chamber, as religious spaces, are formed in such a way that the expected performance of them is done in the best possible way. However, the second approach has had a more profound influence on the spatial organization of the fort. The inhabitants' belief in deep spiritual concepts is evident not only in the overall structure of the castle but also in its individual components and private spaces. Adherence to the property system, the endowment system, and a commitment to the balanced use of resources—avoiding both excessive and minimal exploitation—have significantly contributed to shaping a distinctive contextual form and spatial organisation of the fort.

Ownership system:

Many spaces of the fort, in various scales, have been owned jointly and this has caused the creation of a kind of polycentric society in the castle: among them, are some water tanks, workshops and kitchens. Additionally, the organic texture and the gradual, layer-by-layer formation of the houses in Kharanaq Fort have shaped its ownership system in a unique manner, where ownership is defined not by land, but by space. This means that ownership is attributed to a room itself, rather than the land on which it stands, similar to the ownership structure seen in modern apartments.

Waqf and endowment system:

This system was established to deal with the management of the public and common places. Like many other traditional architectural practices, in this fort, land and water were allocated for specific tasks, including the protection of public spaces. In this system, individuals who utilized these resources were expected to fulfil the corresponding duties in return. Notable examples are, the endowment of the mosque and bathhouse, the endowment of qanat and water passage cleaning, the endowment of mosque lighting, the endowment of mosque fuel, and the endowment of darkness alley lighting. In addition to organizing public responsibilities and making it possible to define duties in a rotational manner, this system has created a kind of public attention and moral obligation in the residents towards the upkeep of the fort.

Another noteworthy point is the maximum use of resources, including water, by the residents. Water has always been equal to life in the desert. The use of qanat water in the fort has been done with great vigilance and in an informative manner. The qanat reaches the ground between the caravanserai and the fort, and the locals call that place "the source of the qanat". After that, qanat enters the fort from the south side by passing through the small outer garden. At first, by passing through the reservoir, it provided drinking water to the residents, and after passing through the place of washing dishes and laundry, it entered the mill, and then the public bath. The water track finally, after passing through the fodder washing place and the drinking water place for the animals, it went out from the eastern side of the castle and towards the gardens and fields. This indicates that the movement of water has significantly influenced the spatial arrangement of the fort, as well as the order of their placement along the water pathway. Additionally, every effort was made to maximize water utilization while minimizing waste, with considerable attention given to public health.

Approaches to Livelihood and Finances:

As previously mentioned, Kharanaq Fort served not only as a residential space but, also as a hub of social activities, gatherings, and community engagement. Additionally, it functioned as a centre for commerce and the provision of essential goods. The livelihood of the castle's residents primarily depended on agricultural work in the fields and gardens located outside the castle, to its north and east, at a differing elevation. Residents usually worked on the fields during the day and came to the castle to rest at night, except at the time they were forced not to leave the castle due to security reasons. Considering the gardens within the castle and those adjacent to its walls, these spaces were designed to address such necessities. Consequently, the arrangement of spaces within the castle ensured that, even during periods of closure, the residents' needs—particularly subsistence requirements—could be met from within the castle itself.

The warehouse (or excreta tank) is a space closely linked to the primary economic activity of the residents—farming. Situated beneath the toilets in the houses, this space collects waste, which, once filled, is transported to the agricultural fields and used as fertilizer. Remarkably, this system is functional even in multi-story buildings, with the waste being channelled to the ground floor through the installation of ducts (Figure 11).

In addition to the agricultural fields and gardens, two mills inside the castle are another way to provide livelihood needs, in addition to keeping livestock and poultry. Stables and coops (Kuz in local language) are spaces that are used to keep livestock and poultry, respectively. The barn is generally located on the lowest level of the house (of course, it is worth noting that examples were also found where the barn was located on the second floor) and the kuz was generally located under the stairs and sometimes in other parts of a house (figure 12).

In addition to the collective and interdependent livelihoods practiced in Kharanaq, each resident individually engaged in economic activities within their homes. Many households, following a similar pattern, operated textile and carpet weaving workshops, emphasizing individual economic pursuits (figure 13).

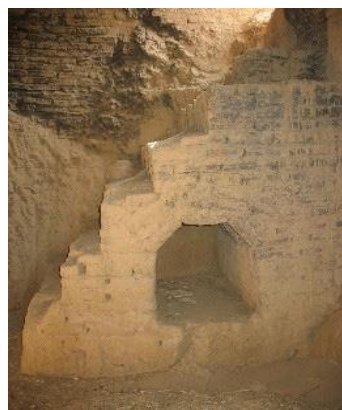


Figure 11 (left): Ventilation technique inside the living spaces

Figure 12 (middle): Kuz

Figure 13 (right): carpet weaving area inside a house

All that has been mentioned in this section, from different social, cultural and livelihood dimensions, is a set of needs and patterns that the residents have used to shape the physical structure and spatial organisation of the Kharanaq Fort.

Conclusion

This research aimed to provide a concise introduction to a lesser-known member of the Iranian architectural heritage that has been largely overlooked until now. The findings reveal that the spatial organization and architectural characteristics of Kharanaq Fort are deeply rooted in the socio-cultural practices, beliefs, and economic conditions of its inhabitants. The fort's design reflects a cohesive integration of functional needs with cultural and religious principles, demonstrating a dynamic interplay between social structures and physical space. This unique vernacular architecture not only accommodated daily life but also preserved the community's traditions and values over centuries. The research underscores the importance of considering socio-cultural contexts in architectural studies, highlighting Kharanaq Fort as a remarkable example of adaptive and community-driven design within Iran's rich architectural heritage.

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