Understanding The Meanings of Built Environment Within Urban
Educational Environments: A Critical Analysis of the Qatar
University Campus

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**ABSTRACT**

This dissertation focuses on examining the significance of the Qatar University campus as designed by its architect Kamal El Kafrawi. The study takes on a multi-perspective view. The underlying and unifying approach is based on Amos Rapoport’s concept of the meaning of the built environment. Rapoport is an architect and scholar, and founder of the field of Environment-Behavior Studies (EBS). Rapoport’s early work contrasts ‘high culture’ design by architects that tends to be self-referential with ‘vernacular’ buildings by non-architects that respond and speak directly to its users. However, I propose to consider El Kafrawi’s approach as an exemplary case of bringing both of those aspects together to create an environment that allows buildings (primarily students and faculty) to unfold layers of meaningfulness that the architect intended through a very culturally-sensitive design.

This study thus seeks to unearth the meanings associated with the various spaces of the campus areas as built by El Kafrawi and as perceived by its users. The purpose of the project is

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to find answers to the question, “In what ways and on what basis do people react with their environments, and what meanings and character do those environments develop?”

Rapoport stresses the meaningfulness of an environment as a key factor that allows inhabitants to feel connected to a place. Author Norberg-Schulz conceptualizes the meaningfulness of the built environment through his theory of *Genius Loci* as a place with meaning, identity, and history providing a phenomenal or total architectural experience. As per the author, if we consider the physical and symbolic values of the environment, it leads to engagement of human senses at a holistic level - the constructing and construing of architecture.

Rapoport outlines a direct approach for the analysis and study of a built environment starting with an assumption that social and cultural factors are the most influential in a built environment. Based on the same concept, the study will critically look at the built environment as designed by El Kafrawi, whether it provides a harmonious blend of culture, traditions, religion, and technology, and whether the amalgamation gives the campus a special meaning and character worthy of the concept of *genius loci*. Thus, the study aims to unearth the meanings of the thoughtfully designed campus buildings to expose the underlying meaningfulness of the built environment.

Rapoport has conducted various studies on the relationships between culture and architecture, notably concerning the influence of environment and behavior, leading to finding the meanings of the environment. He has sought to construct a unified theory on this subject. Rapoport's methods and views will be utilized to identify and investigate the context of this relationship. Based on Rapoport’s model, the study will use a three-step approach consisting of

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dismantling, analyzing, and synthesizing. Firstly, the concepts of culture and the built environment will be identified and dismantled into variables and components according to Rapoport’s approach. Then the relationship of these variables with the components and the relationships between the components will be analyzed. Finally, the dismantled and analyzed variables will be gathered and synthesized. Their interrelationships and their ties will be established to understand the significant linkages between forms and their cultural contexts. Integrated with this methodology, the study will look at the meanings of individual design elements from various perspectives and then their integration as a whole to form the character of the built environment.
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GENERAL AUDIENCE ABSTRACT

This dissertation explores the Qatar University campus and its significance as designed by architect Kamal El Kafrawi, using a multi-perspective approach based on Amos Rapoport’s concept of the meaning of the built environment. Rapoport’s idea is that the true meaningfulness of a building is discovered through living with it. The study aims to show how ‘living with’ the Qatar campus allows inhabitants of the buildings (mainly students and faculty) to unfold layers of meaningfulness that the architect intended in the design of the campus through a very culturally-sensitive design.

The study seeks to unearth the meanings associated with the various spaces of the campus areas as built by El Kafrawi and as perceived by its users. The purpose of the project is to find answers to the question, “In what ways and on what basis do people react with their environments, and what meanings and character do those environments develop?” Rapoport’s methods and views will be utilized to identify and investigate the context of this relationship.

The study will use a three-step approach consisting of dismantling of the designed spaces of the campus, analyzing them, and synthesizing the findings to understand the significant linkages between the designed forms and their cultural contexts. Integrated with this
methodology, the study will look at the meanings of these design elements from various perspectives and then their integration as a whole to form the character of the Qatar University Campus.

Overall, the dissertation examines how the Qatar University campus reflects a fusion of both contemporary practices and traditional culture through El Kafrawi’s approach, bringing together both aspects to create an environment that reflects the meanings and character of the built environment in a culturally-sensitive way. The study aims to contribute to the understanding of the relationship between culture and architecture and how this relationship can be utilized to create a meaningful built environment.
DEDICATIONS

This dissertation is dedicated to my dear children, who have given me the courage and strength to overcome every obstacle and challenge. Your love and support have been my greatest source of inspiration, and I am forever grateful for your unwavering faith in me.
Completing a PhD is a long and challenging journey, and it would not have been possible without the support and guidance of many people along the way. I would like to take this opportunity to express my sincere gratitude to all those who have contributed to this dissertation, in ways big and small.

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CHAPTER 1

INTRODUCTION

1.1 QATAR AS EVOLVING CITY

Qatar is a peninsular country in the middle east with harsh desert topography and a lengthy Arab Gulf coastline with beaches and sand, as shown in Figure 1. Based on the laws, principles, and concepts of Islam, it is an Islamic state.

Figure 1. Map of Qatar.

The sovereign, independent state of Qatar has Doha as its capital and the largest city as shown in Figure 1 below. Doha also acts as the administrative and economic hub of the country housing more than 80% of the nation’s population. Established in 1825, old Doha endured three

3 Djamel Boussaa, “Rehabilitation as a Catalyst of Sustaining a Living Heritage: The Case of Souk Waqif in Doha, Qatar,” Art and Design Review 02, no. 03 (2014), 64.
4 “Qatar,” Ministry of foreign affairs.
bombings, but in a war against the Al-Khalifas of Bahrain near Fuweirat in 1847, it lost thousands of heritage monuments, including culturally rich ancient towns, mosques, villages, traditional residences, and settlements. This resulted in a big loss of Qatar’s historic buildings and traditional surroundings.

After its independence in 1971 from Britain, Qatar grew as one of the world's major producers of oil and gas. With large profits generated by petroleum resources, the culturally rich city of the Arab world – Qatar, home to many traditional forms of architecture, including mosques, traditional houses, villages, watchtowers, and settlements, saw the architecture in the Arab region changed dramatically, led by technological advancements and forced speed of modernization resulting in significant fundamental changes to the architecture.

Figure 2. Right: Shows old Doha in 1940.
Figure 3. Left: Shows the extent and expanse of development of Qatar after its independence from Britain.

Doha, as the capital of the new state, saw an explosion of new development in the fields of construction, health, education, and engineering, attracting thousands of foreign experts and workers. An extraordinary expansion scattered throughout the new city was experienced by
Doha’s tourism, finance, banking, and sports. This was clearly evident by the number of high-rise towers, modern malls, hotels, shopping complexes, and seats of power. Development of mega commercial, leisure, tourist, and retail centers extending beyond the peninsula totally transformed the character of the city. As shown in Figure 3 above, the extent of various conurbations of the physical development in Doha led to further destruction of its remaining historic fabric. Unfortunately, in the early years following independence, redevelopment was considered as national pride for which demolition was seen as a necessary process.

This rapid growth in Qatar, thus, resulted in a notable loss of heritage resources and an unfortunate decrease in the historic constructed fiber of the country. It is only recently that the sudden disappearance of Doha’s traditional and vernacular became an issue, leading to the focus on heritage preservation. “Heritage plays an important role for societies as it links people with their history and provides them a sense of identity.” The economic worth of heritage resources in once culturally rich Qatar got identified due to its impact on tourism. Because of the rapid economic growth rate and the lack of concentrated efforts, only a counted few heritage resources survived to serve as pivots of preservation. What remained was just a memory of the Arab’s historic wealth deeply embedded in the ‘memories’ of the natives who had inhabited the place for generations who witnessed this loss of wealth to the modern developments. The primary rationale for preserving these remaining historical centers came with the thought that they serve as the foundation to the culture, character, and identity of the city. As a result, preserving urban heritage got identified as crucial not just for city planning but also for preserving aspects of local identity.

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1.2 CULTURE AND TRADITION OF QATAR

Traditionally, the architecture of the city of Qatar was developed to meet many social factors, such as religion, privacy, and the extended family. Furthermore, the climate was seen to have a significant impact, defining the overall shape, façade, and openings of the buildings as well as material choices and other factors. Addressing the harsh environment of Qatar, its traditional architecture took on a wide variety of styles. It also became a basis of Qatari identity in terms of domestic and urban social interactions.

Architecture as a discipline is not only associated with buildings but strongly reflects the history and characteristics of civilizations and people. “Traditional architecture has the charm of creating strong links between buildings and their context, both physically and culturally.”

It is said that built structures reflect a city's identity, shape, and image, reflecting its traditions. The concept of traditions and identity, as reflected in Qatari architecture were a result from the shared behaviors of the region based on concepts of Islam. The architecture of Qatar cities was traditionally based on mosques, suq, or marketplaces, palaces, and houses and its constructed parts reflecting the aspects of Islamic architecture. The primary built unit of the city - the traditional house was built with a solid wall, lacking any openings, facing the street. If any, windows on these external walls were small and often screened. The house was divided into zones with varying degrees of privacy: private, semi-private, semi-public, and public. Even among the family members, spaces were and still are divided into male and female zones.

Islam's architecture has unique elements and features that distinguish it apart from all other architectural styles. It has an emphasis on internal space rather than outwardly focus on the

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facade. One significant element of Islamic architecture is the use of the courtyard as a central element. Traditionally, the courtyard home is never considered complete. As a result, when and as the family expands, so does the house around that central courtyard, representing the accumulation of generations' history, growth, and family structure.

It has been acknowledged that human settlement are formed socially by the acts and behaviors of individuals. As identified by Knox and Pinch, “They are created by people, and they draw their character from the people who inhabit them.” The establishment of human settlements has been characterized as a process that ceaselessly happens in time. People in each period inherit the traditions, characteristics, and properties from the past, which constrain, steer and direct their present and future actions and the development path. People modify and change their environments at any given time or period in reaction to social, economic, demographic, technological, and cultural forces, and to satisfy their needs. Rapoport emphasizes the same by saying that “man is the culture bearer, constantly changing the natural environment to make consciously explicit that which he implicitly is. This change is the main evidence of man's continuing evolution. From the perspective of cultural evolution, man is his man-made environment.”

The focus of this research is on studying and analyzing the uniquely designed environment of the Qatar University Campus by evaluating the same actions and behaviors of the inhabitants, their relation to the traditional fabric, their inheritance, and the evolution as per their needs.

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After the freedom from the British in 1971, master planning project of Doha as the capital city was initiated. For this planning process, several multinational companies and consultancies got involved. Ultimately, it was the American planning consultancy of William L. Pereira, who was commissioned in 1975 by the Ministry for the development of the master plan of West Bay District, the northern district of Doha. The development of Qatar University was formulated in this northern district.

Participation and guidance of UNESCO were sought for the planning of the prestigious new academic institution for the state of Qatar. UNESCO conducted the necessary preliminary studies to gauge all the requirements for a higher education institution that incorporated the supporting facilities for the state. This led to the commissioning of Paris-based Egyptian architect Kamal El Kafrawi for the design of the Qatar University campus. Kafrawi was asked to devise detailed requirements along with a proposal of a master plan of a modern higher institution campus with a style in tune with the boundaries as laid out by the Ministry (Details provided in chapter 3: Project site and Program for details of the campus, page 87).

I believe that understanding the unique architecture of the Qatar University campus as designed by its architect Kamal El Kafrawi is only possible through understanding the relationships that exist between the identity of Qatari people, traditional architectural construction, and the local cultural and social settings. Thus, this research is an attempt to identify, analyze, and evaluate the design theories and methodologies implemented by architect Kamal El Kafrawi in the design of Qatar University campus spaces. Based on Amos Rapoort’s methods and views, the specially designed elements and spaces will be analyzed in the context of analytical design elements such as environmental factors, sensory-stimuli relationships, cultural challenges, as well as meanings of these components gathered through history and tradition.
CHAPTER 2

BASIS OF THEORIES USED FOR EXPERIENCE AND MEANING IN ARCHITECTURE

2.1 SCOPE, METHODOLOGY, AND HYPOTHESIS:

The study to evaluate and analyze meanings of the built spaces in Qatar University will be based on the following concepts, thoughts, and ideas.

The study will aim at understanding and analyzing the architect’s design theories in the design of spaces of the Qatar campus amid all the challenges and conflicts he faced. In this proposed study, the qualitative methodology will be utilized and integrated into the findings. Rapoport’s concepts of factors and variables that constitute and impact the designed environments and give them meanings will be analyzed. Analysis of the relevant literature to establish an understanding of the scientific conception of architectural discourse in relation to sensory perception, spatial engagement, and meanings that lend the environment its character will be conducted. A qualitative examination of the design methodologies and elements of the campus design considered under Rapoport’s concept and based on previous architectural research on Qatar University will also be conducted.

Through a review of the literature, architectural research, and additional information collected from precedent, a perusal of the architect’s design philosophy will also be conducted considering the various methodologies, challenging cultural, environmental, technological, and climatic factors that the architect had to consider in the design of the campus.

All the methodologies will be conjoined with user experience and research data from previous studies wherever available. Within this framework, observation of behavior
methodology will also be used along with historical and cross-cultural analysis, as well as analysis of trace patterns, regularities, and constants. Written and pictorial material unconsciously produced to evaluate environments will also be referred to. Travel descriptions, illustrations, articles, papers, newspaper and magazine reports, and UNESCO’s reports on the campus will also be referred to. As Rapoport says, “such material tends to show how people see environments, how they feel about them, what they like or dislike about them, and which attitudes seem to be self-evident.”

Based on Rapoport’s concept, the study assumes that the campus designed by El Kafrawi displays an expression of culture, religion, tradition, and synthesis of technology. It will be based on the hypothesis that the built environment as designed by El Kafrawi encompasses the culture, traditions, religion, technology, and functions integrated in a way that gives the campus a rich meaning or characteristic, leading to the concept of genius loci and a distinct symbolic character.

Culture has been described as a broad concept with numerous definitions, as detailed in the chapter titled “Concepts of Culture & Environment on page 17” below. This concept, as well as its connections to other subjects and concepts, will be examined from various perspectives. However, gaining an objective and understanding requires the use of a suitable framework and method. In order to get to the basis of what it means and how it connects to the environment, Rapoport suggests the methodology of dismantling the concept that constitutes and makes up “culture” and breaking it down into its components. The concepts of culture and built environment pertaining to the campus will be dismantled into variables and components in an ethnic frame, encompassing cohesion, based on historical and traditional contexts. Then the relationship of the variables and the relationship between the components will be analyzed with

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respect to the design methodologies as deployed by Kafrawi and vice versa. Finally, the
associations and meanings gathered from the analysis of different components will be
synthesized and gathered in the overall setting and layout of the campus. Their interrelationships
and their ties will be established to understand the significant linkages between forms and their
cultural contexts. Integrated with this methodology, the study will look at the meanings of design
elements individually and then their integration as a whole to infer the character of the built
environment based on social and cultural variables, concept of the spirit or special character of
the place, and the impact on senses.

Each of the variables will be analyzed from the perspective of all the components and
factors which are engulfed into and associated with the definition of culture - religion, tradition,
values, ideals, images, schemata, meanings, norms, standards, rules, and expectations on one
axis, cross-examined with the concepts of organization of space, the system of settings, cultural
landscape, environment, and technology on the other axis.

A multi-directional approach will thus be taken to fully comprehend the built
environment of the campus. The analysis will be viewed as a system of activities and cues, as
listened by Rapoport, in these variables to analyze the various linkages to cultural factors, including
structure, social networks, identity, tradition, lifestyle, vision, sound, climate, and activity
systems to conclude whether Qatar University campus fits the concept of a meaningful
environment.

As per Rapoport, all these elements and characters provide the essential cues that lead to
meanings which are the fundamental mechanisms that link people with their environment and
behavior. Then the study will delve into how traditional concepts incorporate various elements of
culture and modern technology using the suggested mechanisms (perception, behavior, action, and evaluation) as described by Rapoport.\textsuperscript{12}

The questions that Rapoport has tried to answer with his work are what this research will seek to answer as well:

- “What does the built environment have for the inhabitants and the users...since meanings, like the environments that communicate them, are culture-specific and hence culturally variable?
- Does the built environment express society’s cultural interpretation of place with its meaningful landscape?
- Is the built environment understood as the sum of all physical as well as symbolic values in nature and the human environment catering to a holistic engagement of all the senses?”\textsuperscript{13}

Using Rapoport’s premise that true meaningfulness in the built environment is discovered by living with buildings, this study will aim to show how each of the components characterized above allows inhabitants of the buildings (primarily students and faculty) to unfold layers of meaningfulness intended by the architect through culturally-sensitive design. For example, an important element of this is the ability for inhabitants to change their environment for their immediate needs as they see fit. Numerous ways will be identified in which El Kafrawi anticipates and accommodates inhabitants by allowing for adjustable elements such as sun and wind screens. A related concept is ‘loose-fit’ – a generosity in architecture that allows for and invites appropriate uses, but is open-ended enough not to force a singular form of use. This can

\textsuperscript{13} Rapoport, \textit{The Meaning of the Built}, 21.
be seen, for example, in how the octagonal space units can be configured in many different ways for different learning situations as varied as group discussions and formal lectures. Another important aspect of a meaningful environment is its sensory richness that is available to all the human senses, which, if put all together, makes the space into a *Genius Loci*, the concept introduced by Norberg-Schulz. Rapoport explains that the meaningfulness of the environment is the key factor that allows inhabitants to feel connected to a place, and this quality of ‘at-home-ness’ increases human well-being across many dimensions, such as physical and mental health as well as increased social harmony. This study will hence aim to probe, unearth, analyze, and assemble all these meanings of the exclusive environment of the Qatar University campus.

2.2  **RESEARCH CONCEPTS:**

2.2.1  **AMOS RAPOPORT - the concept of ENVIRONMENT-behavior STUDIES and framework of Research**

Amos Rapoport, an Australian architect and scholar, was born on 28 March 1929 in Warsaw, Poland. In 1939, he and his family fled the Nazis taking refuge in Shanghai and eventually Australia, where he got his Bachelor of Architecture degree. He is the founder of Environment Behavior studies and his work has largely concentrated on the role of cultural variables, cross-cultural studies, theory development, and the creation of a synthesis of these elements. Environment behavior studies focus on exploring human and environmental dimensions of well-being in built environments. Amos Rapoport has dedicated much of his career to integrating cultural anthropological notions such as culture, worldview, values, ethos, and activity regions into the vernacular of Environment-Behavior Studies (EBS). He has shown
the relevance of cross-cultural research in finding the relationship between these notions to the constructed form, arguing that we cannot create context-specific architecture unless we comprehend culture or even effectively communicate different meanings unless we comprehend culture.\textsuperscript{14} He has documented the importance of cross-cultural research as a means of uncovering the relationship of these concepts to built form and has argued that without understanding culture, we cannot create contextually appropriate architecture, much less communicate any meanings.\textsuperscript{15} He was a professor at the University of Wisconsin-Milwaukee until he retired; he has published several essays on vernacular architecture and lessons that are useful for contemporary architects. Rapoport’s work on the concept of Environment Behavior Studies explores the human and environmental dimensions of the built environments contrasting the work of architects classified as based on ‘culture’ with the ‘vernacular’ of the non-architects as it responds to the users. I propose to consider El Kafrawi’s approach in this research as an exemplary case of bringing both of the aspects together to create an environment that reflects a fusion of both contemporary and traditional culture.

To fully comprehend the culture or the environment of the built spaces, people need to see, observe, listen, understand, and internalize the practices, social values, tradition, and context of the place to be able to derive any meanings. I will also make an attempt to identify these meanings within the campus spaces through the use of Rapoport’s EBS model.

According to Rapoport, the criteria for a design, what to design and why - is based on an understanding of man-environment interaction, the specifics of which are dealt with through the following three questions:


(1) How do people shape their environment?

(2) How and to what extent does the physical environment affect people, i.e., how important is the designed environment and in what contexts?

(3) What mechanisms link people and environments in this two-way interaction?

As per Rapoport, in environmental studies, culture is a very significant term. The built environment, in its largest sense, acts as a small element and a subdivision of the culture encompassing social and economic factors, which in turn influence human behavior, hence leading to the development of culture. The background of culture and the built environment must be understood. Rapoport thinks it is highly convenient and effective to abstract concepts, dismantle them by separating them into variables and components, examining their appearances and communication methods (analysis), and synthesizing and then combining them.

To unearth the meanings of spaces designed by El Kafrawi, this research will be based on Rapoport’s approach of ‘learning through analysis.’ In the four different approaches suggested by Rapoport, he has characterized the environment in a complimentary, but integrated form.

First, the environment may be understood as: the organization, the time, the meaning, and the communication.

Second, as a system of setting;

Third, as the cultural landscape; and

Finally, consisting of fixed, semi-fixed, and non-fixed elements.

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2.2.2 Analogy of a House - The Basic Unit

Leon Battista Alberti drew an analogy between a house as a small city, with parts of the house considered as miniature buildings, and the city as a large house drawing on the basic relationships between parts to the whole. The basic house form unit could thus be considered as individual, referring to itself, and collective, referring analogically to the bigger city, representing a unit, and the city being represented by various modules of the basic unit. In the socially created urban pattern, the house is the smallest urban unit. Alberti defined house as an aggregation of rooms. Each room could be considered a building or an independent cell or module that multiplies as required and is connected to other rooms to form the house as a whole. What is characteristic of this formulation is that each room lays out a condition for the next. If every room in the house provides the ground for the next, can we imagine a city whereby the basic house unit provides the ground for the next built structure? Rapoport also took the concept of the house as the basic unit, the basic architectural space, the study of which is imperative to understand the built form. “…the constancy of need, the territorial instinct, and the relation of house to settlement - helps our understanding of the built form.”

In its basic form, architecture could be described as the designing of spaces to fulfill certain functions based on the users' needs. The needs of the users, in turn, are based on their activities, which are well defined by their culture, for their beliefs and practices give shape to their living and gathering spaces. Thus, architecture becomes a direct expression of culture first seen in the dwelling - the basic house form of a place. In 1966 in *The Architecture of the City*, on the same concept, Aldo Rossi also developed a theoretical framework for the typology of

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buildings and their relationship to the city, “the study of the individual dwelling offers one of the best means of studying the city and vice versa.”

The same general concept of house as the basic unit could thus also be applied to study other forms and groups of buildings as well as the city. In a society that has built its identity, the basic housing unit is what projects a true expression of culture. It is this housing unit that projects the true expressions of people occupying it, a physical expression of their needs, beliefs, and aspirations, and a physical expression of the way in which traditional values are reproduced by society. The behaviors we are accustomed to and have been taught are the factors that determine the kind of spaces live in. While the exterior of house communicates with the outside world, the space within is where hospitality is shown, where values and customs are shared with visitors. It is the cultural norms, beliefs, ideologies, traditions, and economic status that define the key typology of the basic dwelling design. After the key elements are adhered to, then other factors like topography, climate, natural patterns, and location come into play. Thus, as part of their cultural expression, every civilization develops a unique way of putting together elements or components of a set. The smallest urban unit, hence, becomes a true and realistic expression of the reproduction of these values by the society.

Following the same inquisitive approach, this study will consider Alberti’s and Rapoport’s concepts of a house translated into the scale and format of an institution - the Qatar campus is made up of an amalgamation of basic housing units. Rapoport intensively theorized the spatial disposition of house and culture. He established the influence of culture and culture-based human on architectural form based on the condition that culture and built environment are equivalent units. In some cases, though, Rapoport did clarify the concept being useless as well since culture is an excessively broad and abstract concept covering a wide range

of human phenomena. In that case, he suggested dismantling and studying even abstract concepts to establish the interrelationships and deduce meanings. He explained that it is the collective agreement defined and approved by tradition based on time, activity, and social norms that the construction of a society is based on. He argued that if and when a society renounces its traditional form, it will eventually disappear and become extinct due to the tenacious communicative powers asserted by the culture and community of acceptance and rejection. In explaining the construction of a house form, which will be applied to this research translated to the scale of the campus as explained earlier, Rapoport defined the act as the formation of a social unit of space in order to assert that house form is a result of sociocultural and physical variables. He claimed that it is valid to assert a direct and holistic relationship between built form and culture, taking into account the dynamic socio-cultural context and the effect that socio-cultural patterns assert instantly on built forms and configuration. Rapoport views a system of activities associated with the spatial arrangement of a built form for expressing the residents’ lifestyles and, therefore, the expression of aggregated culture.

In the 2005 book ‘Culture, Architecture, and Design,’ Rapoport also refers to sensory capacities as the fundamental interest of individuals, the ways in which they actively explore the environment, the way they perceive it through their senses, and the way they give it meaning. In the discussion of his 1977 book ‘Human aspects of Urban Environment,’ Rapoport puts the designer at the core of being responsible for evaluating the perceived environment to make choices that will link the environmental perception and behavior. Stressing on the importance of perception, he details that “any attempt to deal with the man-environment interaction must involve three areas- knowing something, feeling something about it, and then doing something

22 Rapoport, House Form and Culture, 46.
about it.” He further stresses that the ways in which these environments are understood and interpreted, the ways in which sensory modalities are stressed, all are highly dependent on the values, beliefs, percepts and ways of understanding the world of the individuals. These values and beliefs, in turn, come from families, social groupings large and small, institutions, cultures, and subcultures. Eventually, it adds up to people's roles, communication styles, the relative importance, and management of social networks, kinship systems, values, and a variety of other group characteristics, all of which constitute the definition of culture which, as per Rapoport, have the utmost effect on the shape of the environment - and the environment itself may, in turn, also be influenced by it.

2.3 CONCEPTS OF CULTURE & ENVIRONMENT:

Since this research is based on Rapoport’s model of EBS (Environmental Behavior Studies), which firmly rests on culture and its variables as a major influence on architecture and built form, it is deemed essential to disseminate the meaning, context, and variables of culture.

According to a number of academics, the study of culture is vital to how we perceive, inhabit, and mold our spaces. This position is expressed by Edward Hall, who claims that distinct cultures will perceive and interact with the same environment in different ways. The philosophy professor Sven Hesselgren argues that a building serves as a form of communication about personal perspectives on life. Neil Leach advanced an argument for a deeper investigation of culture and architecture to investigate how identity and significance are written into the built environment by end users. Measuring, analyzing, and making significant linkages

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to the built environment is challenging since culture is difficult to measure. According to Amos Rapoport, built spaces and culture are linked, meaning identity can be projected by those built spaces. He believes, however, that to understand the relationship between culture and the built environment, the concept of culture must be “dismantled” and broken down into its components.\textsuperscript{28} His methodology translates the intangible characteristics of culture into tangible elements. Family structures, kinship, social institutions, roles, social networks, and the like are among the various aspects of culture that may be seen as important for cultural intelligence. Culture cannot feasibly be linked to the architectural environment, but the above aspects can.\textsuperscript{29}

\textbf{2.3.1 Definition of culture:}

In order to identify the underlying meanings of community culture, common definitions must be adopted. In sources of prior research, several perspectives on the significance of "culture" can be discovered. There are 14 definitions in Webster's dictionary and 33 references for the word 'culture.' Of the 14 definitions, the meaning of the word "culture," there are two explanations for understanding the cultural context:

Webster defines culture as "\textit{Culture [is] the total pattern of human behavior and its products embodied in thought, speech, action, and artifacts and dependent upon man's capacity for learning and transmitting knowledge to succeeding generations through the use of tools, language, and systems of abstract thought. [It is] the body of customary beliefs, social forms, and material traits constituting a distinct complex of tradition of a racial, religious, or social group.}"\textsuperscript{30}

\textsuperscript{28} Rapoport, “Using ‘Culture’ in Housing Design,”, 7.
\textsuperscript{29} Dahlia Nduom, “Housing and Culture in Ghana: A Model for Research and Evidence-Based Design,” (2018), 8.
\textsuperscript{30} Merriam-Webster.com Dictionary, s.v,” culture".

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Oxford English Dictionary defines culture as “The way of life of a people, including their attitudes, values, beliefs, arts, sciences, modes of perception, and habits of thought and activity. Cultural features of forms of life are learned but are often too pervasive to be readily noticed from within.”31

In “Culture, architecture, and design,” Rapoport clarifies that the first thing to keep in mind is to consider ‘culture’ as not a ‘thing’, rather it’s an idea, a concept, and a construct: a label for various things people think, believe, and do and the manner in which they do them.32

"Culture," according to Tylor's original 1871 definition, "is the complex whole which includes knowledge, belief, art, law, morals, customs, and any other capabilities and habits acquired by man as a member of society." It's evident that it encompasses (nearly) everything that characterizes humans.

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31 Oxford English Dictionary, s.v., “culture”.
32 Rapoport, Culture, Architecture, and Design, 77.
To address the question of what exactly culture is, three classifications can be looked at as per Rapoport - those that answer the question of what culture is, those that address the question of what culture is, as well as three kinds (or categories) of definitions that raise the question of what culture does, i.e., what it is for.

Architects have addressed the attributes of culture in relation to architecture by defining "culture" concisely and verbosely. Amos Rapoport addresses socio-culture in House, Form, and Culture as "a way of life, shared group values, and 'ideal' environment."³³

In 1976, at the “IXth International Conference on the Anthropological and Ethnological Science,” participants discussed "the way cultures shape human-to-human interactions and influence people's relationships with their own creations."³⁴ The conference was organized by participants in sociology, anthropology, philology, medicine, and architecture. Robert Gutman of Rutgers University and from the University of Milwaukee-Wisconsin, Amos Rapoport, also presented their work. The paper "Analysis of culture through its cultural theories: theory and

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³³ Rapoport, House Form and Culture, 1.
method" was presented by Fernando Poyatos from Madrid. His first phrase deals with the culture definition:

“If we consider culture as a series of habits shared by members of a community, learned, but biologically conditioned, such as the means of communication (language being the basis of them all), social relations at different levels, the various activities of daily life, the products of that community and how they are utilized, the peculiar manifestations of both individual and national personalities in the cultural context, its patterns and prohibitions, and their ideas concerning their own existence and the fellow men; if we think of culture in these terms, we realize that culture is made up of a complex mesh of behaviors, and of the active or static results of those behaviors.”

The word ‘association’ helps identify the elements that make up the whole to try to develop a model to define "culture."

Out of the many listed definitions, one defines culture as the way people lead their life, the norms and rules that they follow, beliefs that they believe in, their way of life, their regular routines. The second description characterizes it as a scheme of things that are transmitted symbolically through generations as a result of the enculturation (or socialization) of children and the acculturation of immigrants. This transfer takes place not only through language, examples, and so on, but also through the built environment; the way settings are utilized. Another definition describes culture as a way of ecological adaptation, resource use, and the primary attribute that allows people exploitation of the varied ecosystems to make a living.

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36 *Merriam-Webster.com Dictionary*, s.v,"culture".
Regardless of the definitions that we choose to dwell on, Rapoport concludes that the most important factor is the specifics of the group in question.38

The culture of a region has often been observed through its visual forms. This is seen being done by archeologists through the study and search of relics left by a society - their artwork, architecture, and tools.

Archeologists also observe the culture of a region through behavioral traits - how people interact with their environment through studying relationships of origin, classification, race, environmental and social relations, and culture.

2.3.2 Purpose of culture:

To explore the doing of culture, three factors could be considered. First, culture provides a base, like a design blueprint laying down the foundations of what to follow, like DNA, or a set of assembly instructions. Secondly, it provides a framework, a system that gives meanings to the assembly components and their relationship to each other. Thirdly, the purpose of culture could be looked as providing a biological distinction between us as species.

What makes a culture unique and significant is the precise solution it offers to certain universal needs, which are expressive of one's beliefs and life philosophy, communicate with others, and offer protection from the climate and danger.39

Importance of culture is expressed by author Rapoport in his book “House form and culture” where he says - “We have, in effect, found a very strong recurring pattern: People seem to shape and interact with built environments/material culture primarily through meaning, and this seems to hold over time, cross-culturally, and in all kinds of environments, contexts, and

38 Rapoport, Culture, Architecture, and Design, 82.
39 Rapoport, House Form and Culture, 129.
situations. This tends to give one confidence that it is indeed a pattern and that meaning is a central mechanism in EBR. This means one can generalize more confidently: If humans have done something for tens of thousands of years, possibly since their emergence, and in all cultures, it must be important.”

2.3.3 Context of culture

The definition of 'context' by Webster is fairly straightforward in comparison to the long definitions of 'culture':

"The context [is] the interrelated circumstances where anything exists or takes place." 41

In many instances, the word "context" is used to quantify or place bounds on a wider subject. Again, while referring to the IXth Congress and the results, the following quotation explains quite appropriately what the context means -

“...The functional segments of the environment, with specific histories, and associations with specific activities, are probably appropriately called contexts. Thus, both environments and contexts are differentiated from surroundings by the organization of individuals. Both are organizers of behavior, but contexts are involved in the organization of specific types of behavior. Thus, a cage supplies a lion with surroundings but no environment. There is little that is "lion-like" about the behavior of a lion in a cage - its surroundings give it no scope for the emergence of any of the organism-environment behaviors that it has evolved.”

When we look at a building type which is evident in the whole of the USA, a notion above the "cage" can be seen as a cubical office and what is then "human-like" about the individual's conduct and the identity of the person and the values of the society of today. The

41 Merriam-Webster.com Dictionary, s.v.” context”.
42 Rapoport, The Mutual Interaction of People, 163.
The quotation above speaks of architecture, which is now crucial for the creation of "contextless" functional structures. Thus, cultural context can clearly be defined as the interrelated behavioral conditions within the social group of a shared geographically defined location exhibited by thought, speaking, artifacts, and actions.

Based on the literature on culture mentioned so far, one common characteristic of culture can be clearly stated- that it is defined by the behaviors of the community, which in turn makes up the culture that gets manifested in the built environments as well. If we combine culture and context, the associations that span the cultural context become visible which is what Amos Rapoport details as the most effective way to study a built environment.

### 2.3.4 Importance of culture in environmental behavior studies:

There have been several research studies to analyze the relationship between the environment and behavior (Environmental Behaviour Studies (EBS)). Culture holds importance in two ways when it comes to the study of environments and user behavior: firstly, how it comes into play in the interactions, behaviors, conduct, expectations, explanations, models, and theories of environmental behavior relationships as a whole; and secondly, related to the design of the environment, how is culture understood by specific user groups, in the given situation and in the given environment.

Rapoport stresses the importance of culture as inescapable when trying to relate to the meanings of an environment.

He elaborates that culture plays such a significant role in EBS that not giving it consideration is impossible, especially in where environmental design and built space are concerned. He gives different reasons for this significance. Firstly, it is the possession of culture that defines humans. Hence if an environment involves humans, one has to consider culture to
study it. Secondly, impacts made by similar environments could vary drastically from person to person, depending on different specifics, many being based on culture or in some way are influenced by culture. Lastly, so is the significance of culture that even the mechanisms that link environments and people are related to culture, vary with culture or are solely cultural. "First of all, the possession of culture is what is generally taken to define humans; since EBS involves humans, one must consider culture." 43

According to Rapoport, culture has a significant impact on environmental behavior while also playing a significant role on human behavior. He describes different types of environment-behavior systems in Environment Behavior Studies, as shown in the Figure 5.

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Based on the above diagram, Rapoport believes that culture is the most important aspect in all three instances. In the EBS framework, it is very important to examine the links between culture and environment. EBS is an interdisciplinary field that encompasses a wide range of knowledge. As per Rapoport, “a building is a cultural phenomenon, the formation of which is influenced by its basic culture.”\textsuperscript{44} He elaborates that not only the building as an institution is impacted by social, cultural, environmental, religious, and economic elements, its “shape” and "organization" are also influenced by its culture.\textsuperscript{45} Taking the example of home as a designed space, Gifford (1998), emphasizes that human beings, in general, prefer to live in homes that satisfy their cultural needs and behavioral patterns of that culture. The organization of the spaces must follow the standards of the philosophy of certain values.\textsuperscript{46}

\textsuperscript{44} Rapoport, \textit{Culture, Architecture, and Design}, 14.
\textsuperscript{45} Rapoport, \textit{House Form and Culture}, 46.
\textsuperscript{46} Rapoport, \textit{Culture, Architecture, and Design}, 39.
2.3.5 The cultural landscape:

The concept of "cultural landscape" is derived from the field of cultural geography. It refers to the outcomes of human interactions with the 'primeval' landscape. These cultural landscapes are characterized as an outcome of numerous separate decisions made by numerous people over numerous decades. They have such a distinct character that without anyone knowing any cue, the solo image of them is enough to identify them.

Based on the discussion so far, we can agree that some sense, if not all, of the societal identity can be uncovered by exploring and researching a community’s cultural context. It is only by identifying a culture's values and traditions that architects can begin to understand the significance within a community, behind its symbols, its myths, its music, and its rituals which form the basis of identifying a built environment.

2.3.6 Definition of the environment

Amos Rapoport describes the environment as a series of relationships between activities themselves described as things and things, between activities and people (things and people), and between the people themselves. These relationships are ordered, for they all share a pattern and structure—the environment, as per Rapoport, is not a random assembly of people and things. Neither is culture a random collection of beliefs or behaviors. Both are well defined and led by a schemata, which operate as templates, arranging not only the lives of people but their settings as well. As affirmed by Rapoport, designing environments means arranging four elements: *space, time, communication, and meaning.*

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Of a number of conceptualizations and definitions of the environment, Rapoport describes one as an ecological system with seven components: 48

(1) Perceptual, meaning the manners by which individuals perceive the world - the primary mechanism that relates environment and people.

(2) Eloquent, referring to the effects of colors, sounds, textures, smells, shapes, and symbols on humans.

(3) The aesthetic value of culture, as well as the entire system of values.

(4) Adaptive - The ability to adapt to changes in the environment.

(5) Integrative, a social grouping that is facilitated or prevented by the environment.

(6) Instruments and provisions offered by the environment are referred to as "instrumental."

(7) The broad ecological affiliation of all of these elements.

“A different formulation describes the environment as an ecological system with five components:

(1) The individual.

(2) The physical environment, including all-natural features of geography, climate, and man-made features which limit and facilitate behavior, and the "resources" of the environment.

(3) The personal environment, including individuals who are important sources of behavior control - family, friends, authority Figures, peer-group members, and so on.

(4) The suprapersonal environment, assigned to environmental characteristics that are derived from the modal personal characteristics of the residents as a result of age, class, ethnic origin, and lifestyle.

48 Rapoport, Human Aspects of Urban Form, 8.
(5) The social environment, which includes social norms and institutions.\textsuperscript{49}

Regardless of the choice of components and the multitude of models and definitions, two common characteristics stand out. Firstly, they all suggest a multiplicity of environments - a wide range of social, cultural, and physical contexts. Secondly, they imply a link that changes in the physical context (which the designer manipulates) and which affects the changes in other areas, such as psychological, social, etc.

The above definitions lead us to clearly infer that the environment consists of an orderly, and patterned sequences of associations between constituents and people in that environment. The environment has a definitive constitution, it is not just a collection of random objects that have been thrown together without any thought. It both reflects and enables human-to-human interactions and transactions. Most of the relationships in the physical environment are “primarily spatial” links to “objects and people are related spatially through separation in and by space.”\textsuperscript{50}

2.3.7 Context of built environment

Other than the definition and relationships discussed above, a built environment encompasses other qualities as well. Rapoport also stresses on the experience of the environment through one’s senses. “The organization of meaning” is another important factor, in which case the materials, forms, and details that express meaning are very important. As a result of its communicative and symbolic features, space organization also expresses meaning in the built environment. Rapoport affirms the tendency of built environment expressed through signs, forms, textures, materials etc. all of which leads to an intimate link between beliefs, social

\textsuperscript{49} Rapoport, Human Aspects of Urban Form, 8.
\textsuperscript{50} Rapoport, Human Aspects of Urban Form, 9.
relationships, and values to the built environment, all that have been described as a part of the culture. This leads to an easy finding of the system and the links with the built environment.51

“The environment is given meaning in this formulation by attaching social properties to places, things, and times. The construction of buildings, then, is a way of giving concrete expression to meaning, and the process of giving meaning occurs through forming schemata. Schemata begin with an exploration of the environment, then coding information which may be species-specific or culture-specific”52

Figure 6. The diagram above shows the meaning of the environment.

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2.4 CONCEPTS OF ISLAMIC, TRADITIONAL AND VERNACULAR ARCHITECTURE

2.4.1 Philosophy of Islamic architecture

Islam considers art a mirrored expression of its timeless ideals. It is considered a manifestation of its spiritual values, including the local thoughts of aesthetics and craftsmanship. It is reputed that in Islamic culture, art isn't made just for the sake of art, but to remind people of how beautiful God is. Both nature (which God made) and the arts (which people made) are seen as signs of God's mercy.\(^{53}\) The Islamic world of art and thought has considered the spiritual aspect the dominant factor. Thus, Muslims consider the best art as one that displays an underlying order, coherence, and unity of nature while being a part of the material world. In the article “The Quran and Sunnah as the foundation of Islamic architecture,” author Dr. Spahic Omer describes the concepts of the identity of Islamic architecture as education, guidance, inspiration, thrust, point of reference, and contentment.\(^{54}\) The architecture must address the subject of the Quran first, then duly fulfill the requirements, not only of the general circumstances but of the geography as well, and then incorporate the technology and engineering of the era. Islamic architecture is a wispy mingle of corporeal, spiritual, and cerebral dimensions interwoven with the threads of belief, principles, ethics, values, and teachings of Islam. The form has to be an enhancement and a supplement to the function. Whereas art forms in general, have to be a well-thought-out mix of sensuous and communicative fundamentals, Islam overemphasizes the spiritual dimension in addition. Seyyed Hossein Nasr explains that one must


turn to the inner dimension of Islam for the origin and power of Islamic art, for it is this inwardness, as per Nasr, that has sustained all the created art forms. This inner spirit or dimension, as per Nasr, is inextricably correlated to Islamic spirituality. He explains the connection of the word “ruh,” meaning spirit, or “ma’na,” signifying meaning to the term spirituality in Islam. Hence, it is from the inner dimension of the Islamic tradition that strength and inspiration for art forms be sought.55

According to the author of “Spiritual message of Islamic art and architecture,” architecture is considered the most important of the Islamic art forms and describes it as a hallmark of Islamic art tradition. Culture is what we do in a given community; this "doing" comprises constructing a piece of architecture and decorating its facades or interiors with the innate, intuitive, and instinctual talents that we refer to as art.56

2.4.2 The traditional and vernacular of Qatar

Diversity in unity, assimilation, and ability to adapt current cultural values with regional differentiations is one of the main aspects of the Islamic tradition, which is seen in the traditional architecture of Qatar. Qatari architecture has also developed to meet many social facets, like religion, privacy, and extended family. The climate being the other significant factor, has been defining the overall shape, facade, openings, and specifically the location and size of the buildings. Diverse forms of traditional architecture are seen in Qatar, which blend characteristics and shapes evolved in response to the challenging climate in the region. It is distinct due to the attributes and features of architecture in the Islamic world, the most remarkable aspect being inwardly focus in opposition to the facade or exterior.

Traditional Qatari architecture is also a true representation of typical architecture in an arid environment. The main character of this architecture is seen to correspond to the cultural and social needs of the community. The primary design features are the simplicity of line and form that harmonize with the natural environment. There is extensive use of patterns - vegetal, floral, mainly geometric, use of textiles, and utilization and channeling of other natural resources like the wind into local ventilation systems such as the wind towers.57

Historically, the urban development of cities and villages in Qatar held the essence of traditional Qatari architecture focusing on the formation of agglomerations of housing units. These were characterized as the social value of architecture as shown in Figure 7 below. The close proximity and cluster of buildings, separated by shaded narrow passageways, worked well with the harsh temperature conditions.58 Qatari architecture evolved in response to the need to satisfy social considerations such as religion, privacy, and extended family.

Figure 7. Shows the dense urban fabric with agglomerated housing units forming a traditional Qatari neighborhood consisting of courtyard houses.

A recent example showing the same agglomeration of units along with other Islamic building concepts is seen in the campus site of the International Islamic University located in Petaling Jaya, Gambang, Pahang, Malaysia. The campus, designed for approximately 5000 students in 2001, is imbued with intrinsic Islamic design principles of symmetry, interior courtyards decked with trees and water bodies, and the interplay of geometry. Courtyards and formal gardens are scattered throughout the clustered development, as shown in Figure 8. below, while calligraphy and geometrical shapes have been used as motifs on the screens, grilles, and reliefs.
Traditional architecture creates significant physical and cultural connections between structures and their contexts. This traditional architecture has been the basis of Qatari identity in terms of social interaction at all levels, from the household to the urban scale. The qualities and aspects of Islamic architecture distinguish it, making it unique, unlike any other architecture. Its most significant characteristic is the emphasis on interior space rather than the exterior or facade. As each extended family expands, the home expands and reflects the history, growth, and family structure over several generations. “The Arab house is never complete.”

Considering the vernacular history of Qatar, it is the sociocultural factors that are among the most prominent forces shaping the development of Qatar. In a study done to examine the extent of influence of these socio-cultural patterns, it was found that despite evolutionary changes across time and eras, socio-cultural patterns, namely, (i) privacy, (ii) gender segregation, and (iii) hospitality, remained the determining factors of the spatial form of Qatari vernacular


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houses. Vernacular architecture creates a connection between people, climate, and buildings. It indicates identity, a reflection of time, place, and culture.⁶¹

Prior to the 1960s until late 20th century, standard form of most of Qatar and Doha’s urban fabric was made up of tightly woven agglomerations of housing units separated by narrow alleyways. These alleyways provided the much-needed shading, security, and privacy. Until the introduction of mechanical air conditioning systems, thick stone walls measuring up to 0.60 meters (23.622 inches) were used for building traditional houses that provided much-needed insulation, resulting in reduction of conducted heat into the interior living spaces. The simplest version of the Gulf houses comprised of a yard enclosed with a walled single or two-story rectangular building. The courtyard wall consisted of doors and archways opening into the internal yard and roof was used in hot weather for sleeping. There was typically a screening wall near the door to hide the view of the inside from the outside. Exterior walls were built with no or minimal windows for privacy and to help reduce the conduction of heat to keep the interiors cool. Internal windows facing the courtyard were additionally shaded by the wide ailed verandah, which effectively led to minimizing solar gain. A traditional form of wind towers, called Badgir or Malqaf, in conjunction with wall vents and interior yards, were used to channel air to cool the inside living spaces. The open yard further helped in promoting air circulation around the building. Horizontal openings around the base of walls and air gaps near the roof in the form of screens created a cooling breeze furthering the air circulation. In addition, pierced and carved gypsum panels acted as decorative elements, as well as promoting the air flow even further within the spaces. This rectangular wall enclosure with the opening in the middle came to be known as the courtyard house.

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⁶¹ Al-Mohannadi and Furlan, “The Syntax of the Qatari”, 1.

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2.4.3 Courtyard house

The template of the courtyard house in the Gulf region is said to have roots in the 19th century with the data collected from Muharraq and excavations at the 18th century Zubarah. Further deeper regional connections stretch as far back as the Bronze Age. Arab nomads, used to relocating their tents around a central open space for protection and shelter, later modified the courtyard home architecture. Thus, the open central space of a courtyard house came to be as a result of a number of historical urban developments in accordance with a set of shared socio-cultural and environmental needs. Vitruvius, in his book VI, also describes the Roman atrium houses and Greek peristyle courtyard houses, explaining the placement, purpose, and exposure of different rooms around the central openings based on construction principles, convenience, symmetry, privacy, and practices for each region suited to the “quarters of the sky,” as shown in the plans below (Figure 9, Figure 10 and Figure 11.).

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63 Al-Mohannadi and Furlan, “The Syntax of the Qatari”, 5.
Figure 9 above shows the plan of a typical Roman house.

Figure 10 above shows the Greek house at Delos.

Figure 11 above shows Becker’s plan of Vitruvius' Greek house.

In the article, *The Meaning and Significance of the Garden and Courtyard in Arab-Muslim Traditions*, author Hossam Mahdy elaborates on the origin of the typology of the Arab house form. Describing ‘ma’wa’ or ‘maskan’ as the Arabic equivalent of the English word ‘shelter’, the author emphasizes the importance of the wall as the most basic form of the house in the Arab region. He emphasizes this importance because of the common Arabic word for house - ‘dar’, which means to encircle or enclose. “Wall in the form of encircle or enclosure has been important starting from pre-Islam Arabs for privacy and defense, later emphasized and enhanced even more by the sophisticated Islamic social and legal system for a built environment reflecting
the hierarchy of privacy, as well as a protocol for private-public relationships within a community.”

The early nomadic Arabs built their enclosures with a wall built out of stone or earth or a fence made of palm fronds. Inside that enclosure, they pitched tents or built simple rooms along the enclosing wall, leaving the central open space to form a courtyard. The simplest and most basic Arab form remained mainly an enclosing wall even after the expansion of the region and the religion, not only for the houses, but for all the structures since the wall acted as a protection from the sand storms of the region and the moving sand dunes. Not only was this concept enforced with the advent of Islam, but the Islamic vision for gardens further strengthened the notion of walled enclosure/garden in the Arab and Muslim cultures for the same reasons: privacy, defense, and environment. “All Qur’anic descriptions of gardens either in heaven or on earth are hidden or protected, and exclusive for those who are allowed to enter and from whom the gates will open: “Everlasting Gardens, all its gates are open for them. Therein they will recline; therein, they will call for abundant fruits and drinks. And with them are those of modest gaze, companions.”

Fusing the concept of courtyard and garden, Leslie Geddes-Brown writes, “I see a proper walled garden as combining at least three of four main considerations. These are the four Ps: privacy, protection, practicality, and pleasure.” The same considerations are combined in the Arab-Muslim courtyard - fundamental space and “the heart of the house.” The courtyard of a house may be a garden, and a garden may be the courtyard of a house.

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Author Hossam Mahdy further gives the most basic and generic definition of the courtyard as “an unroofed area that is completely or partially enclosed by walls or buildings, typically one forming part of a house”, which is the case for the traditional built environment for the Arab-Muslims with walled gardens and houses as introverted courtyard buildings. These courtyards and gardens share the continuously shifting awareness and perception of space through time. As Hunt describes it, “Nowhere in any fine garden is the visitor permitted an adequate view of the whole – the process of understanding even the smallest territory and its changes through the hour and season militate against that, except in the more generous spaces of our minds and memories.” Clark highlights the fusion of the courtyard and garden eloquently: “Integral to the Muslim idea of a paradise garden on earth is that it is a private place, hidden away from the world and from people, a place for prayer and contemplation. In the same way, the privacy of the courtyard house corresponds to the private interior world of the family. The courtyard is itself a kind of paradise garden in miniature since it represents the inward, contemplative aspect of man.”

Thus, gardens and courtyards became Islamic symbols of thought representing paradise in the material world. “In the garden of the traditional Islamic buildings, there is a diversity in unity as well as being a coordinated series of rationality, refreshing and eye-catching of the plant and water, light and shadow, space and landscape architecture which have been shaped based on geometry.”

Aerial photographs of the vertical and oblique views of the city of Doha taken in 1947 by Hunting Aerosurveys Ltd, as shown in the Figure 12 below show the traditional populated

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70 Mandy, “The Meaning and Significance of”, 3.
neighborhoods, sharing thick mud walls and tightly packed, mostly single-story courtyard houses separated by narrow alleyways.\textsuperscript{73}

\textsuperscript{73} Eddisford and Carter, “The Vernacular Architecture of Doha”, 10.
Figure 12A. Aerial image of Doha in 1947 taken by Hunting Aerosurveys Ltd.

Figure 12B. Shows the compact urban fabric of a traditional Iranian city, Yazd, made possible by courtyard dwellings, allowing social clustering (kinship), close packing, direct connections, and narrow shaded lanes.

The open-air courtyard of the traditional Qatari house was surrounded by interior space that physically and socially reflected the heart of the housing unit. The enclosed form hid the
internal constituent parts for protection. The courtyard house is identified as a true and simple depiction of the Islamic culture that puts the protection of the family at the core of its philosophy. In “What is Islamic architecture”, Ernst J. Grube writes that the dominant form of true Islamic architecture is its hidden interior. In other words, it is the architecture that must be experienced by being entered and seen from within.”

The importance of the courtyard house has been accentuated by Vittorio Gregotti as a quintessential work of architecture, “the enclosure not only establishes a specific relationship with a specific place, but is the principle by which a human group states its very relationship with nature and the cosmos. In addition, the enclosure is the form of the thing; how it presents itself to the outside world; how it reveals itself.”

The sacred significance of the courtyard house has been much written about. For example, it has been suggested that “the courtyard of an Arab house evokes the Garden of Eden.” Gottfried Semper suggested courtyard as an enclosure, especially for a Mediterranean agricultural society that has to endure struggle to get harvest from the grudging soil, protecting it from the elements; “G. Buti used linguistics to tie it to Indo-European nomadic people. The type is, however, a generic domestic form of residence which independently evolved in various places from the Egyptian-Sumerian civilization to the Mediterranean, Asia Minor, and right up to the Indus Valley.” Thus the courtyard house is an outcome of multiple factor cultural inheritance dating back to the Bronze Age - a form that has endured in the form of classical Roman atrium houses and the Greek Andron houses in the Mediterranean basin. These traditional houses provided for privacy in the crowded urban development, especially for the women of the house, protecting them and separating them from

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74 Jaidah and Bourennane, The History of QATARI Architecture, 11.
76 Jayyusi, The City in the Islamic World, 852.
77 Jayyusi, The City in the Islamic World, 852.
external public affairs. They provided shaded gathering and circulation spaces with the internal yards forming the heart of family life for a range of activities.

In hot, arid climates, the open-air internal courtyard plays a vital role as a climate modifier. It enables outdoor activities while providing wind and sun protection, as well as protection from harsh weather conditions such as hot winds and sand.

One-story angle-shaped block with a central open space and a form of boundary wall defines the standard schematic composition of the courtyard house referred to Figure 13. According to the authors of a journal titled “Privacy, Modesty, Hospitality, and the Design of Muslim Homes: A Literature Review,” based on the theory of home environments, “the design of traditional Muslim homes is subject to guidelines from principles outlined in Islamic Sharia Law, which are derived from the Quran as well as hadiths and sunnah.” As listed above, the authors enforce three principle criteria for the spatial organization of a Muslim home: modesty, privacy, and hospitality.

Figure 13. Showing the sense of space planning in traditional vs. western housing.

The traditional Qatari form of the house is described as made up of four elements. The first is the courtyard, which serves as the central focus of family life. It is open to the sky and serves as a source of cooling and sunlight. The courtyard traditionally has been seen as a private space where women may perform household tasks such as washing, prepping, and cooking. It is also a social place for families to gather. The number of courtyards typically ranges from one to four, depending on the size and wealth of the family. The second element is the number of spaces that surround the courtyard. Aside from the kitchen, stores, and animal stall, all rooms are multi-functional, their use dependent on weather, time of the day, and year. Aligning with the concept of gardens, courtyards with trees and water fountains provided shade in the hot climate. They also provided a life away from the gaze of public. Within the sanctuary of the courtyard and the house around it, decorations and displays portrayed wealth in contrast to the plain exteriors as shown to the outer world. In the paper, “concept of the ‘Islamic house’; a case study of the early Muslims house,” the authors compare the vividness of courtyards in an Islamic house to the inner richness with an unpretentious outward appearance emphasized in the Quran. Not only did this design concept give adequate illumination and the requisite ventilation to the house, but it also cut down on the exterior noise. Additionally, it provided relief from the intense summer heat while trapping the warmth in winters. The massiveness of wall and roof structures worked as a "thermo-flask" to protect inner spaces from climatic fluctuations. Courtyard dwellings, widespread in hot and arid areas, indicate rigid territoriality and attempt to introduce private space for sociability.

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2.4.4 Water in courtyards: symbolic in Islamic architecture

The relationship between natural elements and Islam is based on utmost respect since Islam considers nature and its elements as a manifestation of the Supreme Being. The advent of Islam happened in the Arabian peninsula, where most of the geography was desert. The pre-Islamic Arab tribes thus faced harsh desert travel, searching for water resources to establish their territories. This scarcity of water and the arid land instilled a deep value for the precious water in the Arabs. Further importance of water in a Muslim’s life stemmed from the description in Quran, where water is described both in a physical and a symbolic form. The word ‘ma’aa’, meaning water in Arabic, appears many times in the Quran. “The Quran describes water as an expression of Allah's mercy and power. The holy Quran alludes to His mercy and majesty and how He creates and sustains things from water. It says, “He made all living things from water. ...” (24:45).” As per Quran, water forms life on earth, circumscribing all the living forms, including the valleys and rivers that got created by water to sustain life on earth. In Islam, water endures life and ensures its continuity, thus becoming an integral part of Islamic beliefs and religion.

For Islamic architects, beauty lay in spirituality. The traditional Islamic architect in traditional Islamic buildings would see architecture beyond the body. His duty was the induction of symbolic meanings. Since Islam was considered not only a religion, but a way of life, the underlying thought that design elements needed to emanate from Islamic rules was well understood and represented. “In their perspective, a building was a tool to induce spiritual concepts.” Thus, “symbols” became one of the effective ways for the spiritual understanding

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83 Zarghami and Fatourehchi, “The Symbolic Role of Water”, 121.
of creations in architecture. Symbols became the signs which could be analyzed along with having a spiritual understanding that went beyond their impact. “In fact, symbols are means to form a mental content.”

Talking of the symbolic role of water based on spirituality, authors describe water as one of the important symbols in the Islamic religious concepts, literature, art, culture, and architecture. “The architects of this period were quite consciously trying to dominate nature.” Where water met the functional needs and aesthetic values in Islamic architecture, it also emanated the Islamic teachings of tolerance urging its conservation.

The holiness of water has been described by poets and mystics. Islamic architecture utilized water for both symbolic (spiritual purity) and practical (to combat harsh weather) forms defining it as source of life. Source of all love is the life water that grants eternity to the one who consumes it. “The ponds located in the middle of the mosques' yards are based on the spiritual symbolism of Shiat which considers mosques as a real entrance to the high world. Therefore, the mosque is the spiritual agency of heaven and the pond inside its yard is a door to the other world.” Water, considered as the life-giving feature became a central part of the architecture of houses, palaces, and gardens.

The representation of water in Islamic architecture was done in various forms as described below:

Flowing state: as seen in the Islamic gardens to bring freshness, vitality, and movement. The movement of water in the garden was considered a sign of human moving through this transient

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84 Zarghami and Fatourehchi, “The Symbolic Role of Water”, 121.
85 Zarghami and Fatourehchi, “The Symbolic Role of Water”, 123.
86 Zarghami and Fatourehchi, “The Symbolic Role of Water”, 123.
87 Zarghami and Fatourehchi, “The Symbolic Role of Water”, 123.
world. It represented the streams of paradise on one hand while signifying movement from nothing in this life to everything beyond.\textsuperscript{88}

\textit{Eruptions state}: as seen in the form of fountains in traditional houses and palaces. Water fountains represented light, cleanliness, and purity. They were considered one of the most important elements that Islam associated with beauty, tranquility, and nature. The reflection of sunlight on the turbulent, and deep, pond signified the challenging battle between light and dark. Thus, the role of water, in this case, was not to reflect the structural elements, but in a spiritual dimension.\textsuperscript{89}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{light-reflection-water.jpg}
\caption{The reflection of light in water.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{light-and-water.jpg}
\caption{Showing light and water in traditional Islamic buildings.}
\end{figure}

\textit{Reflection state}: used to signify reflection of spirituality and Islamic beliefs in addition to the architectural elements as seen in the front pond of Chehel Sotoun Palace in Isfahan. The intention in Chehel Sotoun was to achieve a representation of a total of 40 pillars with the original 20 in place and the rest through reflection because of the sacred number 40 as shown in Figure 16 below.

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{chehel-sotoun-palace.jpg}
\caption{Chehel Sotoun Palace in Isfahan.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.4\textwidth]{40-pillars.jpg}
\caption{A representation of 40 pillars.}
\end{figure}

\textsuperscript{88} Zarghami and Fatourehchi, “The Symbolic Role of Water”, 124.
\textsuperscript{89} Zarghami and Fatourehchi, “The Symbolic Role of Water”, 124.
**Figure 16.** Showing the reflections in the front pond of Chehel Sotoun Palace in Isfahan.

*Stagnant state:* signifying silence and peace as seen in the Imam Mosque's pond of Esfahan. The vast reflection of the sky in the pond signifies the connection between material and spiritual world by providing a glimpse of heaven on earth. It signifies worshippers entering heaven as they step inside the mosque complex as shown in Figure 17 below.

**Figure 17.** Showing the reflection of the water in Shah Mosque.

“The most important spiritual aspects of water are to reflect the other world which is all pure, clear, and transparent.”

90 Specifically located in the middle of spaces, including traditional

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90 Zarghami and Fatourechhi, “The Symbolic Role of Water”, 126.
houses, it is considered to represent paradise, a symbol of purity, serenity, brightness, and light as a manifestation of the Supreme Being’s holiness.

Thus, for the traditional Muslim designer, water represented the origin of life and he worked towards giving the water structure a cosmic symbol. Symbolic connotations were incorporated in designs of different shapes of fountains. Predominantly, the fountains were square in form as a symbolic reference to the surrounding land. The interior was often in the shape of an octagon, symbolic of paradise, and representing the bearers of the throne of the most gracious for the Almighty: "And he carries the throne of your Lord over them on the day eight."91 Hollow or concaved triangular shapes cornered the square making the whole formation resemble a dome placed over muqarna of the mosque symbolic to the dome of the sky.

Whether to add moisture to the dry surroundings, to moderate the temperature, as ponds and water bodies housing colorful fish, to invite colorful lively birds, for irrigation purposes, and to create a natural melody chiming with the rhythm of the surroundings resulting in a sweet symphony, various reasons have been cited by researchers for the use of water fountains in Islamic architecture. Around 15th century onwards, fountains are said to become an important part of the Islamic traditional architecture, not only of the indoor private dwellings, but also of outdoor public spaces, decorating the courtyards and squares, reflecting the architectural taste and styles of the time.92

Describing a traditional Islamic courtyard house, Will Durant noted in his description, "The houses of the poor were then as they are now rectangular buildings standing up from mud

adhered to mud, with a roof of a mixture of mud, plant sticks, tree branches, palm sap, and straw. *This type includes an open inner courtyard with a fountain and a tree at times, and it sometimes contained a range of wooden pillars and a roofed portico between the courtyard and the rooms.*"^{93}

Figure 18. Shows the courtyard of a traditional house in Andalusia that represents the core of the traditional Islamic house and it includes a water element and trees.

Figure 20. Left: Showing the peristyle of the house of the Vettii at Pompeii.

Figure 19. Right: Showing the plan of the house of the Vettii, Pompeii.

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^{93} Mahmoud, “Water Fountains in the Islamic”, 37.
Figure 21. Shows how even an early courtyard house had a small water feature.

2.4.5 State of Architectural Heritage of Qatar

Once the agreement of oil exploration in Qatar was signed in 1932, the struggling and staggering economy of the medium-sized port of Doha saw a dramatic rescue by the wealth brought by oil. The new wealth also exposed Qatar to modern development, construction, and materials, allowing piped water and electricity into the new building types. This, in turn, led to rapid expansion as people explored new opportunities, moving from the villages and deserts of Qatar, and from outside Qatar, into Doha.\textsuperscript{18} Further encouragement to move came from the formal introduction of the policy of public housing provision for the native Qatari population in 1964 stirring up Qataris to move from traditional houses (of both pre-oil and post-oil date) in the center of the city to modern western-style houses in zoned developments on the edge of the city.

Under this mask of modernization, the architectural heritage endured for centuries because of its geometrical, technological, and constructive principles that worked magnificently
for society got disfigured and disregarded. Buildings that were built traditionally were being discarded with the notion that they represented poverty and underdevelopment. The irony lay in the thinking that replacing old dwellings with new modern ones reflected change, progress, and advancement. The innovation was misplaced because the new housing dependent on mechanical systems were more costly, less well-built, and compromised on the traditional values as it required many user adjustments to attain modern comfort. The spatial form of traditional Qatari houses transformed into modern models because of all the foreign investments, with which came the state’s administrative development, western standards and methods of construction, and other transformative socio-economic factors. “For the sake of progress and fast modernization, buildings were built in and around historic areas, without any link with the local cultural values. In these new hybrid environments, people cannot identify themselves and cannot be identified; they have become strangers in their localities.”94 Qatar’s spatial form of housing saw the transformation and a paradigm shift of the traditional courtyard house transforming into a multi-story modern villa marking a hiatus in the evolution of house form.95 The new contemporary villa was based on an extroverted housing typology, contrary to the traditional introverted thought. It was designed without regard to the local context with a box-like structure, though still retaining the exterior wall as an enclosure, as shown in Figure 22 below.

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Figure 22. Transformation of the housing types in Doha.

As per a typological study done on the housing of the Gulf cities, including Doha, the internal spatial organization of a modern villa is in stark contrast to the traditional typology of courtyard houses. Whereas the courtyard house was totally closed to the outside and opened only on the inside, the modern villa was built oriented outward, opening up to the surrounding yard or outdoor space, as shown in Figure 22 above. These modern houses and villas lacked alignment with the Islamic Arab concepts of space and order see Figure 24 below, even though the sociocultural pattern of privacy to a certain extent was preserved, for example, the internal courtyard space was replaced by a living room or a salon area that “acted as a circulation space on the ground floor to which all other rooms had access.”

Evolving societies should, of course, reap the advantages of modern technological developments. Still, understanding and recognizing the underlying difference in how societies and cultures have already fashioned their living space can offer insights into how new elements can be efficiently integrated. Architecture in the Middle East has not just been the appearance of minarets and arches. The architecture has been built with a thorough understanding of the local environment and materials. Rapoport intricately explains the importance of vernacular integrated with the modern of the advancing societies comparing traditional African village with the new
townships of Africa. Acknowledging the higher physical standards of the thoughtful new townships, he compared responses of their marked dullness and monotony to the charm and vitality, and character of the traditional forms. Not only visually, the functionality of the traditional villages gathered a much more enthusiastic response even by the most lay observers. Rapoport attributes this marked comparison and response to the overall unity of the traditional village evoked by unity of site, harmony with the natural landscape, and fitting the purpose. By using examples from various settlements, Rapoport asserts that no matter how many technologies are integrated into the built environments by the architects to provide modern comforts, it is the locale, tradition, and natural setting that holds a crucial place for the experience of that environment.

Qatar's vernacular architecture shows the harmony between the needs of its people, the availability of building techniques, resources, and the physical environment. In the past, the characteristics of a traditional Qatari house were limited to the specific architectural elements that expressed this intimate connection. The conceptual ideas of simplicity, passive low-energy design, and solidity described the typical qualities of Qatari traditional urban design and architecture. These characteristics marked the identity of Qatari vernacular architecture.

In 2008, Qatar's National Vision 2030 made an announcement- “Despite rapid economic and social gains, as well as political change, Qatar has maintained its cultural and traditional values as an Arab and Islamic nation.” Qatar's National Development Strategy, released in 2011 outlines the necessity of preserving the nation's traditions. It states, “The primary, persistent challenge is to maintain this balance between modern life and the country’s cultural

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An essential component of sustainable development as both a spatial and social experience is culture.\(^{99}\)

One way the state has been working to fulfill its goals of conserving heritage has been through the establishment of cultural institutions, festivals, museums, and heritage projects through preservation and remediation. Heritage programs aim to offer Qatari a sense that they will still connect in their region and that the culture still relates to them.

In 1975, the first national museum in Qatar was established. Recent years have seen more emphasis on the development of a strong cultural identity in Qatar, which has been initiated through heritage developments. In 2005, The National Museums Authority of Qatar came into being whose heritage conservation initiatives have focused on rebuilding historical buildings such as exhibitions of local architecture from the nineteenth and twentieth centuries through the rebuilding of the pearl merchants’ residences, the establishment of museums including the Museum of Islamic Art, Mathaf: The Arab Museum of Modern Art, and the National Museum of Qatar. Out of the numerous initiatives, a recent Qatari heritage project included the restoration of the traditional market called Souq Waqif in 2004. Other projects include restoration of another traditional market known as Souq Al-Wakrah in 2008, the yearly creation of cultural festivals such as the Traditional Doha Festival since 2011, and the ceremonies of National Day which started in 2007.\(^{100}\)

The conservation efforts in the historic cities of the Arab world are leading to conflicts between the preservation of heritage and the demands for modern development. This has led to surfacing of sustainable development policies in effort to counter the consequences of


\(^{100}\) Boussaa, “Urban Regeneration, Sustainability and Urban”, 3.
diminishing fabric. In the 12th general assembly of the International Council on Monuments and Sites, two interrelated urgent issues were brought up in the context of sustainable development: cultural tourism and the preservation of historic towns and cities. These two issues emphasized the certitude that historic resources pertain to humanity and are non-renewable. According to the World Tourism Organization, natural and cultural heritage resources are the chosen travel preferred by people. Cultural tourism, in turn, helps in dispersing traditional and distinct cultures, especially in the historical context. The rich urban heritage of Qatar is also being recognized as a valuable resource for future development. A common notion relates ‘urban heritage’ exclusively to historical structures and ‘monuments’ like mosques, forts, palaces, watchtowers, etc., not considering the important non-tangible elements such as traditions, customs, and beliefs. It is, in fact, these elements that play the most significant role in the articulation of spaces in the built environment, whether strengthening and enhancing the sense of pride and identity, or totally losing the local spirit if not handled thoughtfully.

In the historic cities of the Arab world, public marketplaces known as souks (also spelled as souqs) form the nuclei in central urban centers. They contain the majority of the architectural and historical fabric of a place and are the hub of all economic, cultural, and residential activities. Also known as “bazaar, the souk, with its unique architecture and communal function, is said to have deep historical roots, and cultural significance, linking it intrinsically to architecture and the sense of place.” In the organization of most Islamic cities where the mosque existed at the core, the souk coexisted and became one of the main elements that supported the economy of Gulf countries based on trading, fishing, pearling, local crafts, and

shipbuilding before the oil revolution. El Kafully also referred to *suqs*, in addition to his other case study buildings, as relevant for tracing the local character, and architectural traditions.

Most of the heritage players recognize the sustainability of historic cities like Qatar due to their unique characteristics and rich heritage; at the same time, they also realize that such places cannot reproduce themselves without some intervention. “*In order for the built heritage to be incorporated into the aim of establishing a sustainable society, the ‘static’ goal to protect must be married to the managed ‘process’ of change within a community framework of planning and negotiation, which in turn is dependent on relative values that are placed on heritage assets and the priorities of society.*”\(^{103}\)

One such rehabilitation project was that of Souk Waqif, one of the last surviving historic urban space in Doha, with roots sunk deep in the history of Qatar. The origins of this Souk date back to the time when Doha was a village. At the time, the inhabitants of Doha would gather on the banks of the river (Msheirib wadi) to buy and sell goods. In 1850, Ottomans built a Turkish fort, Al Koot, adjacent to Souk Waqif to control Doha and to secure Souk Waqif from thieves since most of the prominent traders lived in the souk (see Figure 25).\(^{104}\) Rapid urbanization, lack of maintenance, neglect, and overcrowding resulted in the dilapidation of the souk, making it look like an urban slum in the heart of Doha. The spirit of Qatari architecture and its natives got crushed to see the plain and simple architecture and environment of Qatar transform into a dense hybrid complex. The restoration of 2003, based completely on the history of the market focused on the reconstruction of the remaining \(\frac{2}{3}\) of the original historic structures, modernization of the local infrastructure, and reviving the memory of the place. This included replacing metal sheets with traditional roofs of *danjal* and bamboo with a binding layer of clay and straw, use of

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\(^{104}\) Boussaa,"Rehabilitation as a Catalyst of Sustaining", 63.
traditional strategies to insulate the buildings against heat, replacing glass doors with traditional wooden doors and windows, and refinishing with the traditional elements. After seven years of rehabilitating, Souk Waqif was realized and recreated as a “living heritage in the middle of a global environment,” increasing the local inhabitant's pride in their past and also becoming a famous tourist attraction that displayed the beautiful fusion of traditional and modern elements.

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105 Boussaa, “Rehabilitation as a Catalyst of Sustaining”, 67.
"Urban conservation does not necessarily mean preserving a building but reviving its spirit and life. It means being flexible enough to adapt the objectives of rehabilitation to the needs of modern living while respecting the local community values. Diversity of public areas is important and essential as they ensure the sustainability of living heritage and to the way in which people interact and identify with their locality."

106 Boussaa, “Rehabilitation as a Catalyst of Sustaining”, 70.
Similarly, to preserve the efforts done by Hassan Fathy, the pioneer of sustainable architecture in encompassing the heritage and culture in the design of the village of Guarna, located in the city of Qurna, great preservation efforts are being done for its ongoing development. Where Fathy demanded a new unity between the architect, builder, and user, propagated self-help in architecture, emphasized on traditional typologies like the courtyard house, and envisioned an architecture harmonizing with Egyptian people in cities and villages and their existing conditions. For built spaces to harmonize with culture, Hassan Fathy proposed the help in designing and building by the inhabitants of those buildings, as was the case in the old African and Egyptian traditions.

2.5 Norberg Schulz's concept of Genius Loci

The idea of the spirit of a place has been prevalent in various societies for centuries. It derives from ancient and widespread beliefs of spaces occupied by gods and holy spirits who have to be appeased. This key concept of the Latin term Genius Loci, meaning spirit or guardian deity was well followed in Roman religion.

Originally thought of as a religious concept, it has been dissuaded from those sacred associations and beliefs. Some definitions describe it as “the unique, distinctive, and cherished aspects of place”. Norwegian architect, educator, author, and architectural theorist Norberg-Schulz has been a central Figure in the propagation of this concept, specifically through his book, ”Genius Loci: Towards a Phenomenology of Architecture”. Adopting a phenomenological and Heideggerian approach, Norberg-Schulz suggests, “the spaces where life occurs are places...A place is a space that has a distinct character. Since ancient times the genius loci, or spirit of place, has been recognized as the concrete reality man has to face and come to terms
with in his daily life. Architecture means to visualize the genius loci, and the task of the architect is to create meaningful places, whereby he helps man to dwell."¹⁰⁷

Norberg-Schulz defines Genius Loci as a sum of all physical and symbolic values of the environment that represents the sense people have of a place. It looks at giving the architectural structure a meaning that coincides with how a place makes people feel and why it makes people feel that way. He describes a house as a dwelling place for man, “to dwell in a house, therefore, means to inhabit the world.”¹⁰⁸ This means that the place's structure should give the man a certain feeling, which is why space (three-dimension organization or perceptual field) they occupy should have a character.

The author emphasizes the importance of a place to have meaning, identity, and history. These three aspects give a place a more phenomenal architectural experience. "Meaning" and "structure" are aspects of the same totality, both having to come together to give places an animate experience. A place with meaning is one that appeals to man's psyche and enables him to connect with the place at a cosmic level.¹⁰⁹

With the increase in urbanization, people continue to lose touch with their surrounding environment, which has resulted in the changing of the meaning of the term place, or rather placemaking in architecture. Today, the term place can be said to mean a significant territory or an expression of what is local and how it is the central focus of architectural practices. Works of art in architecture are seen as symbolic in giving the man an existential foothold that appeals to his physical and psychological needs.¹¹⁰ Thus, architecture holds a special responsibility for it has the ability to make spaces and lives of human beings rich, and full of meaning conducive to


¹⁰⁸ Schulz, Genius loci: towards a phenomenology of, 9.
¹⁰⁹ Schulz, Genius loci: towards a phenomenology of, 168.
¹¹⁰ Schulz, Genius loci: towards a phenomenology of, 8.
their emotions and senses. Sensory design in architecture respects the individual's environment while also creating a space that engages with the person’s senses, and how they think, feel, and behave.

However, character is seen as a more concrete concept than space, given how it defines a space. In fact, we can only determine the spirit of a place once it has character. In simple terms, character denotes the general atmosphere, which can be said to be the most comprehensive property. Peter Zumthor describes this character in terms of ‘atmosphere’, which he bases on the emotional sensibility of the space, on what emotions it stirs, how the building manages to move a person, and if it does, then it can be classified as quality architecture which exists because of the atmosphere it provides. Norberg-Schulz describes this character in terms of manifested environmental totalities. Spaces are seen to possess character, and this can be seen in the terms used to describe a space, like inviting, relaxing, invigorating, threatening, barren, cheerful, warm, and so on. These adjectives are the characters of that space, and all spaces have a character. In the book, “Ethics and the Built Environment” essay “Can Spirit of Place be a guide to Ethical Building?” by Isis Brook, the author identifies a range of associations to the spirit of a place like energy fields, abodes of special beings and fairies, narrative spaces with layers of history, local distinctiveness, and character – “the place appears as it is in its individuality, and panpsychism – the idea that all things, even inanimate, have their own consciousness or mind-like qualities.” In his book called “Spirit of Place”, novelist Lawrence Durrell discusses environmental determinism – environments manifestly influence behavior and culture and the important determinant of culture eventually is – the spirit of place.

111 Schulz, Genius loci: towards a phenomenology of, 153.
especially architecture is considered to be the hallmark of Islamic art tradition, motivated by religious consciousness. It is said to possess a sacred character, the sacred atmosphere where the spiritual connection or the inward experience provides “psychical contentment in a world full of corruption, and misery where the respect and dignity of man have become non-existent and where moral, religious and spiritual values have become meaningless.”

It is a space where the inner self immersed in the surroundings acknowledges love, beauty, His presence, the power of wisdom, and creativity - an inspiring force of free action.

Satirizing the lives of gentry trying to echo the landscaping schemes of Versailles for their estates in an ill-conceived way, the 18th-century English poet Alexander Pope in one of his poems encouraged landscape gardening that held a meaning and responded to nature. He advised to: “Consult the genius of the place in all”

This concept of genius loci has been a topic of debate in modern architecture. Norberg-Schulz's first interpretation of genius loci referred to the ancient notion of genius loci or 'Spirit of place' in a building. Later, Norberg-Schulz began to link experiential and psychic conceptions of "being" to "foothold" and "space," and eventually proceeded to employ the concept of genius loci towards a phenomenology of architecture. This concept defines genius loci in architecture as the process through which a sense of place manifests itself through the concept of dwelling. Norberg-Schulz utilized Heidegger's term 'dwelling' from his article 'Building Dwelling Thinking'. Furthermore, Norberg-Schulz defined genius loci as "Man dwells when he can orientate himself within and identify himself with an environment, or, he experiences the environment as meaningful"

115 Wes Jackson, Consulting the Genius of the Place: An Ecological Approach to a New Agriculture, Berkeley: Counterpoint, (2009), 42.
116 Schulz, Genius loci: towards a phenomenology of, 5.
117 Schulz, Genius loci: towards a phenomenology of, 5.
118 Schulz, Genius loci: towards a phenomenology of, 5.
Norberg-Schulz recognizes that: “The structure of a place is not a fixed, eternal state.”119 In this context, he stresses on architects constructing practical buildings and towns as not enough. Instead, they should allow their architecture to concretize genius loci following Heidegger’s suggestion of creating buildings in which people know how they belong to the place, that gathers the properties of the place helping people to dwell poetically. The gene loci thus denote what a structure is or what it wants to be and how this space appeals to those living in it as well as those looking at it.120 Thus, Schulz infers sensory designs to be a form of genius loci since they dwell on how the character of a place appeals to the basic senses of individuals experiencing it. These aspects give life to the ambiance of a place, which is commonly referred to as the atmosphere of the place.121

Ancient Romans had a lot to contribute to the field of sensory design architecture. Their buildings and structures hold a character, which makes each of them unique yet similar in a sense. Other structures outside Rome, such as the Nordic countries, had structural designs that differ from Rome, but can somehow communicate the same sense of symbolism, giving their buildings the character. From the color of the buildings to their models and facades, it is evident that these vernacular structures held some character and, as the author Norberg-Schulz says, “define and emphasize the design, giving a sense of order in the blocks and similarity of the blocks make the structures more uniform. These structures also hold relations with the external environment giving the space a more serene feeling.”122 The author exemplifies through Roman architecture, which he considers fascinating, the structures are not just idyllic, but also give the

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119 Schulz, Genius loci: towards a phenomenology of, 18.
120 Schulz, Genius loci: towards a phenomenology of, 84.
121 Schulz, Genius loci: towards a phenomenology of, 108.
122 Schulz, Genius loci: towards a phenomenology of, 145.
sense of a visually complete environment. Thus they appeal to the visual sense and psychic senses as well.

History is important because it gives places a sense of identity. The modern environment might not have a lot to offer when it comes to history and giving people a sense of identity, but settlements that humans use may help give them this sense of identification. Places like Rome that already have a lot of history and historical structures have had to modernize themselves, so that does not make them let go of their history. This is where the concept of a shared environment comes in. Economic, social, and political intentions all have ways to pay respect to the genius loci. Finding a way to bring together these concepts that make up the genius loci has made humans a lot more creative in creating a place that gives them identity, meaning, and history. Human beings being symbolic may not even realize when they are drawn to a place because of its sensory design, which makes genius loci even more fascinating.

Elaborating on the importance of culture in relation to the built environment having a meaning, Norberg-Schulz says that “a society’s approach to its heritage raises the issue of emotional links with the environment and the feeling of genius loci, or sense of a place. Derived from the Roman religion, it represents the protective spirit of a place.”

In the article, “Built heritage perception through representation of its atmosphere,” the authors state Norberg Schulz’s concept as a phenomenon that is hard to find and define since it escapes any scientific analysis due to its abstract character and internal complexity. But that does not mean that the importance of the sense of a place is underestimated because that provides one plausible way for anyone to relate to their environment eventually leading to security, sense of belonging, security, and hence an enhanced quality of life. The absence and deprivation of the

123 Schulz, Genius loci: towards a phenomenology of, 181.
urban heritage leads to severed ties to the past, history, and tradition, threatening the cultural values and identity of the built environment. Thus, even though building function or type could be associated through cultural heritage, each individual site and place could still have its own uniqueness, specificity, and character, its *genius loci*.

The way a culture views its legacy raises the question of emotional ties to the environment and a sense of genius loci or sense of place. Christian Norberg-Schulz established the foundations of an approach when he stated that each space is a result of concrete realism defining and affecting the place, as well as the specific phenomena that each space has, which are created by countless environmental aspects in which the space is located. This is related to the physical and cultural qualities of each area that change through time and are invoked when that space is recalled. As a result, this is a feature that contributes to a location's identity and allows differentiation of one place from another. Furthermore, enhancing this sense of place can be viewed as a technique for developing a sense of identity and belonging.¹²⁵

In the case of traditional indigenous associative cultural landscapes, boundaries must be defined in terms of social relationships and interactions, kinship, cultural practices, and interlinkages that connect people to their natural environments.¹²⁶ The traditions are only visible in a region if they are living, reflected through cultural landscapes, through the link and identity that people have with their environments, as well as the interconnectivity of land and water, living species, and people.

As per Schulz, in a "cultural landscape," "if the communities are organically tied to their surroundings, it suggests that they function as foci in which the environmental characteristic is generated and "explained.""127

Norberg-Schulz stresses that the only way we may be able to contribute historically and engage creatively is through the understanding of our place.128

2.6 The science and fundamentals of senses

2.6.1 Concept of senses in design

The architecture of every country is widely known to be a manifestation of its culture. It has also been widely established that architecture of the past and even to an extent in today’s world has predominantly relied on visual perception. Famous Swiss architect Le Corbusier writes that he only exists in life if he can see.129 That he is and will remain an impenitent visual since everything is in the eye and for one to understand, he needs to see clearly. Even the Greeks and the Romans designed buildings and spaces that were impressive, and close to perfection when viewed from the outside as seen in the below Figure 29.130 Whereas Greeks set the standards of beauty in buildings with order, symmetry, harmony, and proportions, Romans built even further on those aiming for visually perfect proportions and ideal beauty. The eye is constantly seeking beauty, and if we do not endeavor to gratify it by proper proportions where necessary, and thus remedy the defect of vision, work will always be clumsy and disagreeable.

127 Schulz, Genius Loci: Towards a Phenomenology of, 10.
128 Schulz, Genius Loci: Towards a Phenomenology of, 18.
Greek and Roman builders sought to “counteract the ocular deception by an adjustment of proportions.” They tilted all parts above the column of a Doric building downward just so that they would appear to be vertical when viewed from below, they inclined the columns inward, curved the stylobate floor, spaced the columns inconsistently, swelled out the column shafts, and used golden proportions with clever ocular corrections just to engage the viewer to the building and to establish a visually perfect architecture that gives a sense of wholeness, relationship of parts and the sense of beauty.

Figure 29. Ancient Greek Temple at Paestum showing the beauty of classic Greek building based on order, symmetry, harmony, repetition, and proportion achieved through ocular corrections.

It can thus be deduced that traditionally, it has predominantly been the eye of the beholder that has given all the meaning to architecture. Charles Spence, in his book, ‘Architectural Design for the Multisensory Mind’, supports this thought by saying that human beings as creatures have been visually dominant creatures. That is, most of the activities that

131 Vitruvius, Vitruvius, the Ten Books on, 84.
we do including our reasoning and how we imagine things are mostly done visually. In a research done by Finish Architect Pallasmaa almost twenty-five years ago in his work about architecture and senses which was very influential, he noted that the beauty of most designs was in the eyes of the user. “In fact, when it comes to the culture of architecture and design, we create and produce almost exclusively for one sense - the visual.” Pallasmaa writes: “The architecture of our time is turning into the retinal art of the eye. Architecture at large has become an art of the printed image fixed by the hurried eye of the camera.” Since then, we see architects following this tactic traditionally, designing items specifically for the user’s eye. Needless to say that when it comes to the culture of designs and architecture, we have produced mostly, almost exclusively as a result of just one sense - the visual, as stated by Canadian designer Bruce Mau.

If we look at the history of art, almost all art has focused on visual presentation. That is what is shown in paintings as well even though Leonardo da Vinci propagated work that would show the feelings of the soul. Thus, people got trained to perceive art mostly visually. In the early 1950s, art collectives Zero in Europe and Gutai in Japan started applying sensory design to their work. Zero, adopted an entirely new approach, gathering art forms that were capable of incorporating all five senses and their characteristics of light, sound, reflection, and visual illusions. Using the senses as the instrument, artists were able to spark a shift in perspective through their art using light, sound, space, and performance. Postmodernism and visual culture studies in the '80s and '90s gave birth to a “Pictorial turn” in art after which pictures controlled

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133 Pallasmaa, The Eyes of the Skin, 29.
the language not the other way around. These historical works, in order to activate a response in their passive viewers, used all five senses to cause sociopolitical changes to happen.  

With this shift in perspective, the audience's participation changed from being just a viewer and an observer to becoming an active and responsive participant. The aim of this shift was to use both artistic and audience sensibilities as a part of the whole experience. Additionally, the involvement of all their senses led the designers to think and implement new strategies in their work. This type of creativity was made possible only because of new methods for multisensory designs.  

Thus, architectural theory caught up with what practitioners had been trying to preach for centuries, making architecture into an experience incorporating many senses. It became an intense and multi-sensorial sensory experience, in which people can simultaneously experience the different aspects of the space. As per research, most people spend 95% of their time indoors, which makes sensual and responsive architecture even more influential. Most architecture as we know it is built only for the viewer's eye and generally prefers to neglect the non-visual senses of listening, smelling, touching, and even tasting. However, it is important to not only understand the effect of the different senses on the occupants of a building in order to design the built environments, but also the significant interactions that happen between the sensory atmosphere, climate, and the built environment. Senses cross formal cognitive boundaries – space does not need to be called “architecture” to experience it.

In *Senses: design beyond vision*, Ellen Lupton writes “The senses deliver joy as well as warnings, lighting up the body from head to toe and from inside out.” Each person has their own sensory capabilities and ways of perceiving the environment. Sensory architecture lets people interact, experience the world, and move through space in different ways. Sensory variations are very much a fundamental part of human existence that holds the responsibility of providing a great, good, or bad experience.

Lupton explains and supports the impact of sensory design on a human body “sensory design activates touch, sound, smell, taste and the wisdom of the body. The sensory design supports everyone’s opportunity to receive information, explore the world, and experience joy, wonder, and social connections, regardless of our sensory abilities.” Sensory design has an impact on materials, sound, light, and space.

In *The senses: Design beyond vision*, Lupton and Lipps detail the image as shown in Figure 30 below highlighting the factors that improve the sensory design in architecture, and how a building can enhance the sensory design of the space.

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Sight, hearing, touch, and smell guide our movements across space.\textsuperscript{141} Sensory variations form the main characteristics of the human condition. Through these variations that change across each individual's life – designers contribute to inclusive design languages. The elements of a full-bodied design language include light, color, sound, texture, movement, vibration, and smell, to name a few. An example of context that is a part of our experience of things is a dinner spoon which hugs sensory knowing. We touch and measure the object. The skin responds to materials and temperature. Our fingers are agile in detecting shape changes and can tell the difference between slight variations. Our ears prick at the sounds of our spoons hitting a table. In a similar way, sensory design is even linked with our memory from childhood as it is related to an event or a moment that happened in the past. “The senses mix with memory. From infancy, human creatures engage in countless acts of lifting, licking, touching, sniffing, throwing, dropping, hearing, balancing, and more, constantly testing the edges of physics to understand

\textsuperscript{141} Lupton and Lipps, The Senses: Design beyond Vision, 121.
(or “make sense of”) the world we were born to discover. The brain fires neurons, prunes synapses, and forges pathways. Thus meaning and memory take form.”

“The greatest value of design thinking, and the culture of architecture is the capacity for complex synthesis. The great challenge of our time is synthesis — coherence, intelligence, clarity, beauty” However, to achieve the synthesis is to create the experience for each of the senses. Then consider every sense as a path in a multifunctional aspect. As a result, synthesis and interacting factors are necessary in order to achieve the maximum emotional impact and sensory experience within the space.

2.6.2 Description and kind of senses in design

Lupton describes and states that the first sense that we gain from the environment is the sense of touch. When you connect with the physical world you are using the sense of touch. Touch is the first language we learn and the first sense we develop. It is also the third dimension of a surface that lets us know how we feel. “Touch delivers full-bodied impressions of places and things. Touch penetrates the body. It brings pain and pleasure, warnings and delight.” Describing the meaning of touch, Lupton also intrigues by saying that the touch which enables us so many sensory experiences does not have to be physical - the touch can be visual as well.

“We touch with our eyes.” For example, a classroom filled with uncomfortable furniture and bright lights, should incorporate appreciation materials such as “tactile, emotional, acoustic, and kinetic” as a sensory design approach. Hence, the sensory design can be incorporated in many ways. It is important to provide an inclusive design language, one that has

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144 Lupton and Lipps, The Senses: Design beyond Vision, 22.
146 Lupton and Lipps, The Senses: Design beyond Vision, 80.
an appeal in everyone’s eyes, for various ages, gender, and users from all walks of life; therefore, a variety of sensory methods should be used to create a full body experience in the space such as light, color, texture, sound, and movement. Recent decades have seen a growing number of architects and designers consider the function, involvement, and interaction of other senses, like sound, smell, touch (including proprioception, and kinesthetics), and even taste. “It is clearly important that we move beyond the merely visual (not to mention modular) focus in architecture that has been identified in the writings of Juhani Pallasmaa and others, to consider the contribution that is made by each of the other senses (e.g., Eberhard, 2007; Malnar & Vodvarka, 2004)” “For it is only by recognizing the fundamentally multisensory nature of perception that one can really hope to explain a number of surprising crossmodal environmental or atmospheric interactions, such as between lighting color and thermal comfort.”

According to Pallasmaa, as cited by Spence, humans encounter designs of buildings, places, and spaces through multisensory experiences. Therefore, humans scan their environments or atmospheres using their tongues, nose, skin, and ears rather than just registering architectural designs as ordinary visual images. Spence further notes that architecture is a reconciliation art between human beings and the world around them, which is reconciled through our senses. Pallasma furthers on the concept of perception saying that sensory design is classified in responsive architecture which is the unique form of design developed to interact with people. Sensory design requires architecture to be imaginative while coming up with different types of architectural developments. The architecture must place the occupant at the center of development and carefully consider how different forms of architecture will affect such an

occupant. Such imagination allows the architect to come up with unique designs that can allow the occupant to interact with the surroundings.

Lehman illustrates the importance of sensory and meaningful layout to how people respond to architecture. Responsive architecture is necessary because it connects human beings with their environment, impacting how they feel, assume, and behave. The sensory diagram is necessary for this technique because sensory design places the constructing occupant at the center, noting very cautiously how a space can impact the occupant, short or long-term.  

Figure 31. Shows the sensory diagram detailing the relationship of senses to experience of space.

In conclusion, we can analyze from Fathy, Schulz, Pallasma, and Rapoport that an architect must think about how his design will impact the senses of its user. Whether the user will be able to relate to the built environment in some way? Will the user understand the meanings portrayed and projected by the design of the built environment? Will the user have thermal comfort, visual comfort, along with design comfort in the space they are in at every part of the built environment? Designs of the built environments thus play the most significant role in the construction of a building; for example, if an architect knows how human beings react to specific
colors in specific spaces, and temperatures, and how those and other design elements conjure senses, he can come up with a design that is most conducive to the occupant's needs, keeping occupant’s overall experience as the main design focus.

2.7 Thinking Architecture

Peter Zumthor through his work set out in *Thinking Architecture* focuses on architectural creativity and knowledge in experiencing architecture. His work mainly focuses on buildings and structures that are breathtaking- architecture that appeals to one’s senses and emotions.

Zumthor mentions a story of buildings that have a “soul.” In this case, the word soul has been used to mean a structure that connects with people, whether on an emotional level or even appeals to the surrounding site's contemporary society. A building with a soul makes individuals feel more closely attached to the place and the structure, having a sense of belonging, which makes people feel a certain connection with the structure. This is to mean that a structure can be very modern and interesting, yet without sensory design, people do not feel moved or inspired, or fascinated by the building. Zumthor proceeds to refer to architecture as art in the form of buildings with a soul. He also refers to it as the character of the building.

He goes on to call architecture's form and body sensuous, clearly an aspect of sensory design. The look and feel of materials (whether wood, plastic, or cloth) in the spaces becomes very important for architecture.

Thus, as per Zumthor, something that appeals to human sensations can be referred to as beautiful. He gives the example of spatial aspects incorporating the interaction of senses and the

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156 Zumthor, *Thinking Architecture*, 43.
sense of taste explained brilliantly by Jun'ichirō Tanizaki in “In Praise of Shadows”. It is explained in a simple act of uncovering a bowl of soup: “there is a beauty in that moment between removing the lid and lifting the bowl to the mouth when one gazes at the still, silent liquid in the dark depths of the bowl, its color hardly differing from the bowl itself; what lies within the darkness one cannot distinguish, but the palm senses the gentle movements of the liquid, vapor rises from with informing droplets on the rim, and a fragrance carried upon the vapor brings a delicate anticipation .... A moment of mystery, it might almost be called, a moment of trance.”

The same depth of sensation that Tanizaki's bowl of soup offers could be provided by an architectural space that presents itself with the same fullness of experience. The human body is intimately connected to the world, through the existential space through architectural experience. Thus, ensuring that the structure appeals to human sensations is the key step in sensory design architecture. Zumthor mentions how he enjoys working with substances that relate to human sensations, which leads to special emotional moments when these substances are either appropriated or assimilated. In this statement alone, it is easy to see how Zumthor’s primary focus is on creating sensory architectural designs which appeal to human senses and can be deemed beautiful.

As per his book, Zumthor insists that a good architectural design is both sensuous and intelligent. Since architecture is concrete, there is a need to find a way to create a body (structure) that is both beautiful and sensuous.

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157 Pallasmaa, The Eyes of the Skin, 60.
158 Zumthor, Thinking Architecture, 71.
159 Zumthor, Thinking Architecture, 65
The creation of a successful structure can be experienced depending on the reality of its environment (the materials) as well as imagination.\textsuperscript{160} When designing a building, the terms place and purpose are very important. These aspects determine the sensory architectural nature of the building and what feelings exactly the architect intends to evoke when a person looks or lives or even works in the structure. The author continues to state how buildings can have a beautiful silence. This means that the building is not a representation of anything else, it just is. This is not to be confused with lacking imagination. In fact, a building just being a building is beautiful in itself. The sensory design also involves looking at the place and the purpose of a building so that the architect can know what sensation they wish to give to the public when they take a look at the building. This is seen in Zumthor's buildings, which typically have beautiful minimalist details; architectural materials such as concrete, wood, glass, and stone play an important role in shaping the relationship between the building and its inhabitants. One of his buildings is Theme Vals (the thermal Bath), Zumthor's approach to design is defined by his twin concern with a person's direct sensory experience of architecture and the materials. He claims that "all design work starts from the premise of this physical, objective sensuousness of architecture, of its materials. To experience architecture in a concrete way means to touch, see, hear, and smell it"\textsuperscript{161}

\textsuperscript{160} Zumthor, Thinking Architecture, 51-56.
\textsuperscript{161} Zumthor, Thinking Architecture, 66.
Figure 32. Shows how the Therme Vals hotel and spa that gives a complete sensory experience designed over thermal springs in the Graubunden Canton in Switzerland.

Therme Vals (the thermal bath), was created for guests to relax and rediscover the ancient bathing benefits. Zumthor contrasted open and closed spaces with light and shade, combined with linear components to provide a highly sensual and therapeutic experience. The internal space's underlying causal layout is a precisely modeled circulation that guides bathers to certain planned places while allowing them to explore other regions on their own. The perception of the users is kept under control. It either guarantees or denies a point of view. Zumthor said about the Therme Vals as “The meander, as we call it, is a designed negative space between the blocks, a space that connects everything as it flows throughout the entire building, creating a peacefully pulsating rhythm. Moving around this space means making discoveries. You are walking as if in the woods. Everyone there is looking for a path of their own.”

Thus, Zumthor as a sensory design architect focuses on turning his imagination into reality with buildings. Not only does he take passion in his work, but also has been educating people on sensory architectural designs. He propagates that buildings should bridge the gap between imagination and reality.

2.8 Eyes of the Skin: Architecture and the Senses

In the book *The Eyes of the Skin: Architecture and the Senses*, the author Juhani Pallasmaa talks about the importance of the five human senses responsible for the art of shaping buildings. He conceptualizes a circuit between the dominant visual sense and rest of the suppressed senses. Pallasmaa explains the focused vision and how space confronts us and our senses in terms of regular use as “all the senses are an expansion of the tactile sense.” After the invention of perspective during the Renaissance, the eye became the focal point of experiences of the perceptual world and of the concept of self. At that point, “even the perspectival representation itself became a symbolic form, one which not only describes but also conditions perception.” As per Pallasmaa, the privileged senses of vision and sound, dominate all other senses considered as the remnants of rest of the senses usually subdued with the code of culture. Acknowledging the dominance of vision over other senses, Pallasmaa stresses on the criticality of the role of vision in relationship to other subdued senses for understanding and practicing the art of architecture. Pallasmaa says that “Architecture, as with all art, is fundamentally confronted with questions of human existence in space and time, it expresses and relates man’s being in the world.”

Talking of the focused vision being the interest of architectural theorists, Pallasmaa stresses the fundamental importance of peripheral vision in experiencing architecture for it is the peripheral vision as per Pallasmaa that “enfolds the subject in space. A forest context, and richly molded architectural space, provide ample stimuli for peripheral vision, and these settings center us in the very space. In fact, there is medical evidence that peripheral vision has a higher

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164 Pallasmaa, *The Eyes of the Skin*, 16.
165 Pallasmaa, *The Eyes of the Skin*, 16.
166 Pallasmaa, *The Eyes of the Skin*, 16.
Furthering the importance of peripheral vision in the context of experiencing space, Pallasmaa explains that it is this peripheral vision that makes us emotionally connected to the natural and historical settings making us feel ‘at home’, identifying with and in harmony with those spaces, unlike others that make us feel like outsiders. “Peripheral vision integrates us with space, while focused vision pushes us out of space, making us mere spectators."  

It is through the art of the eye that several thought-provoking structures were developed in the world of architecture. The vision enlightens us to use the available space to construct eye-appealing structures and to develop cities and other infrastructures within infinite space and endless time. People relate to space and time through architecture, and it is the role and aim of architecture to shape that space for its inhabitants. The spaces are perceived through a combination of shapes, textures, colors, and materials. A strong architectural experience will integrate the coherence of physical spaces with human existential experience through the involvement of the senses. Different senses influence how people interact and behave about space and architecture. The author states the dominance of hearing in cultures of the past followed by the senses of smell, taste, and touch as the influences on behavior and communication. Throughout the history of the world, people orally communicated to express their desires in developing art and architecture before the dramatic shift in thinking leading to visual perception as the leading influence. Drawing grew more common in the 13th century as conceptual, working, and record drawings improved. Villard de Honnecourt, a skilled builder from this period, wrote one of the first and most complete medieval drawing books. Designs

169 Pallasmaa, *The Eyes of the Skin*, 17.
were created as black and grey drawings and instructional sketches for workers, rather than
detailed drawings. The movement of using color in designs began in late-seventeenth-century in
France when a fusion of art and architecture motivated designers to use color to symbolize
numerous norms in their plans. Engineers and architects collaborated closely under the pressure
of Louis XIV to produce colorful symbols that could be read by workers to indicate which
material to use and where to grow trees for landscape architects. Simultaneously, in Belgium,
watercolors and other ways of painting were improved, and the first photo-realistic renderings
were employed in construction. The drawings thus became major influences of the institutional
changes in the way architects were trained, remaking them as visions rather than structural
laborers. The sense of sight became hegemony in defining the architectural world, to define
what actions people take in space, and developing art and architecture. The eyes cannot operate
independently from the senses of hearing and touch for it is the sense of sight that enables the
integration and even reinforcement of other senses that determines what the body desires in
individual spaces.

With the interaction and interdependence of all these senses, the experience of a space
gets defined by the constant interaction of the senses with the stimulation provided by the
elements of the designed space. “Architecture is essentially an extension of nature into the
man-made realm, providing the ground for perception and the horizon of experiencing and
understanding the world.” The eye and other senses measure the multi-sensory aspects of
architecture such as space, scale, and matter. There is no architecture without the input of vision,

170 Kaley Overstreet, “Which Came First, the Drawing or the Building? Understanding the World's First
Architectural Processes”, (ArchDaily, May 8, 2020),
171 Pallasmaa, *The Eyes of the Skin*, 41.
touch, oral, and hearing senses and it should be the aim of architecture being the art to provide inspiring spaces, enhancing the lives of people with a decorated and invigorating environment.

Based on thoughts by Pallasma on experiencing architecture through one’s senses which ties well with the concept of user-centric design, Norberg Schulz’s concept of architecture becoming a place with special meaning leading to the concept of genius loci, and Rapoport’s concept of meanings of the built environment and the man-environment studies, it can be inferred that architecture has evolved into a deep, multifold experience incorporating sensorial elements. It has become an intense multi-sensorial experience, in which people can experience the different aspects of the space. This experience of the space through their senses, through the character of the built environment based on a multitude of factors, and through the meaning inhabited by the built environment is what this study is focused on.

Research suggests that most people spend 95% of their time indoors, which makes sensual and responsive architecture even more influential. Most architecture as we know it is built only for the viewer's eye and generally prefers to neglect the non-visual senses of listening, smelling, touching, and feeling, let alone deciphering the meanings and character of the built environment. However, considering the depth of concepts outlined above and the impact that built environments can have on individuals experiencing them, it becomes important to understand the effect of the different senses on the occupants of a building, the significant interactions that happen between the sensory atmosphere, and the built environment, and the multitude of factors contributing to those experiences. "Senses cross formal cognitive boundaries — a space does not need to be called “architecture” to experience it."172

CHAPTER 3:

PROJECT SITE AND PROGRAM

3.1 Site Characteristics and Accessibility

The Qatar campus is located in the Southwest part of Doha City, between the main Salwa road (on the south) and a road connecting Salwa road to the Rayan road (on the west). The site measures 6,430,800 square meters or 643.08 hectares. Located about 15 kilometers or 9.3 miles North, the University is easy to access via the corniche as shown in Figure 33 & 35 below, North of Doha. Two major roads connect the area making it easily accessible. Above sea level, the site rises to an altitude of 18 to 24 meters or 59 to 78 feet as shown in Figure 34 and Figure 35.

![Figure 33. Location of Qatar University campus.](image-url)
Figure 34 & Figure 35. Show the elevated site of the Qatar University campus in comparison to the city of Doha where the modern skyscrapers in the background define the skyline.

Figure 35. Showing the elevated campus site.
Figure 36. Shows Qatar University master plan, boundaries, and access.
Figure 37. Shows Qatar University entrances and layout of the campus.
Figure 38. Kafrawi’s original Qatar University Master plan showing the initial concept.
3.2 The Founding of Qatar University

In the year 1968, the government of Great Britain declared that it would withdraw from the Gulf at the end of 1971. The British government also encouraged the nine small sheikhdom jurisdictions that were yet to establish independent states to deliberate uniting to become one entity. Saudi Arabia and Kuwait had converted their sheikhdoms into states already and by mid-1971; it was clear that Qatar and Bahrain would also develop their own states. The seven adjacent Gulf sheikhdoms, meanwhile, were establishing the federation of the United Arab Emirates. Within the region of the Arab Gulf, the Kuwait and Bahrain commercial centers were leading by example in the development of contemporary education with the primary purpose of dissemination of non-religious knowledge and development of practical skills. As the early private, fee-based educational institutions fell into financial difficulties, responsibility for education was assumed by the leading rulers. As the graduates of the school systems emerged, so did the need for higher education institutions.

With the advent of oil wealth in the 1950s, the Ministry of Education was developed by Emir Ali bin Abdullah Al Thani in 1956 in Qatar. The accumulation of the petro-dollar also transformed the society from rural-based traditional Bedouin clans to an urban-based car owner society, thus leading towards the concepts of universal education and societal transformation. In 1966, the Ministry of Education of Qatar asked the United Nations Educational, Science, and Cultural Organization (UNESCO) to evaluate the state of education in Qatar and give recommendations for its improvement. Director-General of the Ministry, Dr. Kamal Nagi, was entrusted with the task of translating the UNESCO recommendations into design solutions. For that, he chaired a joint meeting with UNESCO and the planning committee. Nagi said that “the

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The concept of a University arose from the deliberations of this committee in 1968. The idea at first was to create a University of the Gulf located in Qatar that would serve the nine sheikhdoms which were to be politically united. By 1973 under a formal decree from the Emir of Qatar, the College of Education was established.

Planning for the new University continued with the participation of the Ministry of Education, UNESCO, and the Faculties of Education. The unexpected development that prompted the establishment of the University of Qatar was the conference decision of the Ministry of Education for the Arab Gulf States, which declared that a regional University must be created. In 1973, Qatar University was instigated with two colleges, one for men and the other for women. The Egyptian architect, Kamal El Kafrawi was commissioned by UNESCO for the preliminary studies and proposals based on the needs for the design of just the two colleges. During the year, the architectural brief was prepared with work in Qatar and Paris and the report was submitted. El Kafrawi prepared a detailed report on what a prestigious institution that represented the state of Qatar, as well as one that would project Qatar’s pride of educational image to the world at the same time incorporating the values and traditions laid out by Islam should incorporate. In the long list of requirements, he did propose the choice of a responsible architect to be based on the following two criteria:

1. *The architect should have experience and specialized architectural knowledge in the field of higher educational buildings.*

2. *As Qatar has no native architect, the foreign architect chosen should have an understanding of the country’s socio-cultural characteristics.*

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175 El Kafrawi, “Higher Teaching Training Colleges at Doha”, 87.
Interestingly, in March 1974, following the report, the state of Qatar commissioned Dr. El Kafrawi moved to Doha to commence the detailed planning of the brief and the buildings and execute the work. Dr. El Kafrawi was appointed as the architect by the Office of His Highness the Emir. However, the College of Education at this time reported and recommended to the office of the Emir building of a much larger facility - a University complex. The proposal was accepted by Emir and a freshly detailed master plan enlarging space requirements and increasing the ancillary central functions was prepared. In 1975, the design and layout of a full- fledged campus were finalized and approved by the Emir. The construction plan included housing for 600 faculty members and 4500 students. In May 1976, the site of the University was displaced 4 km/2.5 miles to an equally sandy site situated 10 km/6.2 miles from Doha since 500 square hectares of area was required keeping in mind the future extension of a "scientific and cultural institution constituting the center of attraction for the city of Doha." Thus, a new master plan was prepared, presented, and accepted in October 1976.

The detailed design for Phase 1 included the male and female colleges of education, colleges of science and civil aviation, central facilities, as well as the infrastructure of roads, services, and landscaping. The completion of initial site contracts and construction of an on-site factory for the production of necessary building materials followed in 1977. After a review of the academic requirements by a team from UNESCO and the University, there was submission of a new brief, area requirements, and master plan in 1978. While the construction contracts and contract for the pre-cast production plant were being tendered in the following years, the original completion date was extended to October 1983 with the replanning of both Phase 1A and 1B.

The initial campus facilities were ready in 1985 while the work on the rest of the campus continued through the early 1990s. As per the governance by the State of Qatar Government for this project, the master plan for the campus of Qatar must be aligned with and should affirm the fundamental commitments made by the State of Qatar Government. Quality should be the objective of its norms in all respects. The purpose of its design should be elegance, as well as quality. The first phase of the campus was officially inaugurated on February 23, 1985. H.H. the Emir of Qatar held celebrations for the event.

Initially, a single campus was proposed for both women and men even though their educational and recreational facilities were to be strictly segregated. The male and female facilities were scaled differently and the library was planned for joint use (with gender-separate spaces). However, this process faced opposition from some of the female student's parents, who argued that the new building would encourage the mixing of male and female students. They made their grievances known to the University's Emir, the Supreme President of the University, eventually leading to the construction of separate libraries along with segregated activity buildings and sports facilities. The colleges for men and women were thus designed on the opposite ends, one on the south, the other on the north. Even the circulation pathways for the various campus facilities were programmatically separated. When established, Article 1 of the decree described the University as “an Arabic Islamic University and a beacon for human mind.” Article 2 stated its mission: “It specializes in all matters related to higher education.…while maintaining its profound Arabic origin, cultural and Islamic inveterate heritage...”


Figure 39. Shows the site of the Qatar University campus.\textsuperscript{179}

3.3 Architect Kamal El Kafrawi

Architect Kamal El Kafrawi, born in Egypt in 1931 came to be known for creating structures that embodied Islamic presence and history. As a young man, he trained in the Department of Architecture at the Egyptian Faculty of Fine Arts in Cairo and obtained his first Architectural degree. He was appointed as a teaching assistant at the same college in 1958 and worked on a project to reconstruct the historic city of Rasso for the People’s Republic of Poland which had already been completely destroyed during the Second World War. After working on the restoration and various other projects in Egypt, El Kafrawi moved to Paris in 1960 to do

postgraduate studies where he obtained a Louvre diploma in Islamic arts and a city planning diploma, as well as a doctorate in architecture from the *Beaux-Arts* architecture. The research topic was the development and planning of archaeological and historical cities and sites in the Nile Valley - Developing and planning the sites of Abu Simbel temples in their new location in Nubia, given that this area was a center of Nuba civilization and the center of Egypt's contact with African countries. After getting his diploma, Kafrawi taught from 1969 to 1975 at Ecole des Beaux-Arts in Paris. In 1973, he became a specialist in cultural and educational facilities with UNESCO and a consultant for the government of the Middle East for cultural and educational planning.

In Paris as well as in the Gulf, El Kafrawi lived a life that was a mixture of both the traditional as well as modern aspects. He participated with the French engineer Louis Arch in the planning and design of a number of major projects in Karnasa, the most important of which is the planning of the universities of Rouen and Rennes in the Brittny region as shown in Figure 40 below, as well as the general planning of the central neighborhood of the city of Rennes and the new city of Orien-La Source. He implemented tourism projects in France and Spain. After his experience in the design of the Qatar University campus, he won the competition for the Dar Al Fikr Schools project for males and females in Jeddah, Saudi Arabia, built-in 1987.\(^{181}\)

\(^{180}\) Brain Brace Taylor, “University, Qatar,” *Mimar*, no. 16 (1984), 18.

El Kafrawi’s architectural design inspirations were rooted in artistic form and the local vernacular. Once formally appointed as the architect for Qatar University in 1973, he started out by making a lengthy, carefully preserved study of the traditional ways of life in Qatar, and its older buildings (such as the mosque), uncovering a palpable influence of Bedouin traditions (refer to chapter BEDOUIN TENT for details on Bedouins).\(^\text{183}\) (Unfortunately, Kafrawi only mentions this study in the document that he prepared for UNESCO but for this research, I couldn’t locate the actual study). Kafrawi’s statement on the design of the Qatar campus after his study and research as stated below clearly elaborate on all his design concepts, concerns, and deep cultural, traditional, and built environment considerations:

"I do not claim to have produced the perfect design for the University, but would rather suggest that this work be seen as the first stage of a continuing Architectural Study, directed towards a modern expression of Islamic Architecture. The material for this

\(^{182}\) "Dr. Kamal El Kafrawi in Brief". (Arabic translation by the author).

\(^{183}\) Note: refer to page 131, Chapter: BEDOUIN TENT - ORGANIZATIONAL BASIS OF QATAR UNIVERSITY
study is the environment and the people within it, the entire
University; which is unique in that its basis is local, not imported,
and its objectives are far from those of commercial projects. These
aspects set it apart from many buildings In the Gulf and Arab
Countries.

Architecture is a tangible expression of civilization, the product of
the intellectual, social, economic, and political activity of a whole
people; construction technology is simply the tool with which to
give form to this expression. One has to closely analyze the
environment and character of villages, towns, and cities in the
Arab world to determine the effects of contemporary Western
Architecture. Since the technology has been applied without the
philosophy which underlines it, the modern buildings are foreign to
the area, which shows how far Arab architecture has lost direction,
and the profound effect this has on the individual and his
environment. "184

El Kafrawi did not want to use Western infrastructure forms as he thought they would be
disruptive to the establishment of the traditional community of Qatar.

He believed that the original traditional mission for higher education institutions was to
develop the need for knowledge, skills, and new skills foundations. He said, “There was a need
for a change from the attitudes, customs, and social structures developed several centuries ago,
and little changed since. At the same time, there was a determination that in achieving these
changes, the Arab Gulf States should not lose the moral and human values embedded in their

Although the process of planning the college seemed to simmer in disorganization early on, one element that was universal amongst the various stakeholders was the need to develop a place that exuded cultural identity. The tradition entailed upholding of Islamic values as well as advancing Arabian culture and that’s what El Kafrawi sought to achieve in the design of the campus of Qatar.

This idea of tradition has been well explained by T.S. Eliot where he refers to tradition as a completed whole, a continuum, that comprises of all the preceding creative endeavors out of which the new creativity is born. Referring specifically to the creativity of poets, Eliot asserts that a poet cannot write and create unless they have developed a historical sense, a sense not of the pastness of the past, but of its presence. Unlike those who conceptualize tradition as something fixed, Eliot elucidates it as that part of living culture that is functioning in the formation of the present, but is inherited from the past. Eliot maintains that tradition is closely connected with historical sense, which may be defined as the perception that the past is not something that has been forgotten and is no longer relevant or invalid. Living practitioners of any discipline, according to Eliot, add to, shape, alter, and transform into new the accumulated wealth of their predecessor’s efforts, making the tradition a reproduction that gives the poet a sense of place in history, a history that matters because it is both present and past to the writer.

“The work of past poets informs a reader’s sense of meaning today. When a new work of art comes into the world, “the existing order” adjusts to its presence. He writes, “the past should be altered by the present as much as the present is directed by the past.”

The poet must be conscious of the ideas that have carried through history. The mind of a

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country, as with an individual, constantly changes but it “abandons nothing en route.””

3.4 Campus Design Influence (Hassan Fathy)

One of the profound aspects of architecture is its influence on human well-being through the environment because nearly three-quarters of the urban population around the globe spend about 95 percent of their time inside buildings. However, most architectural designs have neglected the non-visual senses in their designs. Richard Williams (1914-2016), architect and educator from the University of Illinois School of Architecture, specializing in “Mid-Continent Modern” design aesthetic which sought “harmonics of humanity and nature” noted some 40 years ago: “Aside from meeting common standards of performance, architects do little creatively with acoustical, thermal, olfactory, and tactile sensory responses.”

Hassan Fathy, (1900 - 1989), an Egyptian artist and architect, born in a wealthy family in Alexandria, explored this neglect in his 'Natural energy and vernacular architecture' work by offering careful articulation and use of senses to evaluate building spaces supported by scientific facts.

Fathy is known as one of the notable Egyptian architects who founded a better approach to the correct use of building technologies in Egypt. Throughout his career, Fathy aimed to create architecture serving as a model environment for people inhabiting it, especially one that would also reflect Egypt’s local context. He believed in involving more and more people to create spaces for where they lived, worked, and played, in creating their environment, both physically and psychologically, and not leaving them as passive consumers. He also believed in combating

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environmental issues of particular regions through the answers in the form of methods of construction found true to the region itself. He valued and propagated architecture which was rooted not in the imported internationalism in the name of modernism, rather in the culture and location of the region itself, rooted in the common humanism rather than common technology. rooted in common technology rather than common humanism.

After graduating in 1926, when Fathy started teaching at the College of Fine Arts in 1930, he built his first adobe structure. The climatically efficient houses of Mamluk and Ottoman Cairo highly influenced him with their astute shading and ventilation through Masharbiya, internal courtyards and the remarkable native mud brick construction. The simple rural architecture inspired him to become the architect of the poor. The onset of his career started with examination of the cultured characteristics of the pre-industrial building systems of Egypt, to devise groundbreaking approaches for social, economic, and aesthetic issues, and environment control and strategies that could be adapted for contemporary use - all that typically impacts the building of low-cost housing. Thus, he disregarded structural steel as a choice for a poor country, even materials such as timber, glass, and cement, adhering to the local and natural mud brick construction. Addressing the social concerns, he attempted to consult directly with every user family for who the construction was being done, highly advocating the involvement of social ethnographers in the planning process. With regard to aesthetic concerns, Fathy emphasized regional traditional elements and architectural designs with the use of rich traditional building techniques that he described led to “spacious, lovely, clean, and harmonious houses.”

Fathy’s responsibility towards architecture is seen in his work in New Gourna of 1948 which became the well recognized exemplary aspiration of architecture ingrained in local

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heritage continuing into the future. His simple compositions, techniques, and his ability to recreate the essence of tradition epitomized the strength and endurance of the vernacular. His focus remained on community architecture and he is “best known for bringing architects, craftsmen, and the community together in the creation of a shelter for the poor.”

For example, while designing the Market Complex of the new Baris (also spelled as Bariz) Village, as shown in Figure 41 below, Fathy faced an extra parameter along with the location of the new agricultural village subjected to high temperatures, being located in the middle of the desert: storing crops in a place having no possibility of any cooling or refrigeration system. Fathy carefully designed appropriate interior climate regulation for grains, vegetables, and perishable fruits through the use of clay, the thermal mass of which permits the much needed crucial temperature contrast between the interior and the exterior. The Market Complex design included an extensive application of ventilation claustra-work to optimize the movement of air, and wind while regulating temperature. In the design, Fathy used various natural tower techniques to produce refrigeration and cooling. He funneled the desert winds through the use of various Malkaf, an earthen windcatcher, using them in conjunction with secondary towers to speed up air circulation. With this system of techniques, he was very successful in reducing the internal temperature by 15 degrees. Crops were stored underground taking advantage of the thermal inertia provided by the dynamic cooling of thick clay that let the warmth of the day penetrate the warehouse only after nightfall and would dissipate before morning. The marketplace of the new Baris village became symbolic. For the villagers, it became symbolic socially and economically, but for them and rest of the world, it became symbolic for its

architectural success, and for the implemented natural ventilation and cooling systems built at such a large scale. Thus, Hassan Fathy constructed a community in the middle of the desert by establishing, via architecture, a connection between its people and the spaces that make up the many components of this microsociety.193 As per Fathy: "Baris was an interesting problem in which I was able to create all the parts of a community, to bring together in the best manner possible people whom I did not know. All that I had at my disposal were demographic, geographic, and climatic surveys. I had to provide the aesthetics, the sense of man in a space constructed by man."194 Fathy focused on a detailed analysis of the region's traditional architecture as well as its environment design. By using the most economical, locally available clay, and taking advantage of its natural properties, Fathy was able to use vernacular architecture to build buildings with natural ventilation and a community that can work in the middle of the desert. He was able to do all of this at a low cost.195

Figure 41. The images above show the structure at New Baris Village with Islamic architectural elements - cooling thick masonry arcade and traditional arch forms.

193 Hassan Fathy, Vernacular architecture: principles and examples with reference to hot arid climates (Chicago: University of Chicago press, 1986), 64.


Through his architecture, Fathy primarily aimed to establish scaled spaces that were well-connected and intimately compact where private and public functions could occur without hindrance. According to Fathy, the circulation corridors' location served both functions of air distribution and movement in the Baris village. Additionally, he suggested and used convective loops in order to ensure that streets and courtyards have appropriate cooling. The village is planned along the “north-south axis” which gives an advantage of the shadows of the buildings on the streets all day long. For the dwellings, people closed their houses to the outside while opening them inwardly onto the interior open to the sky courtyards called Sahn. Integrated with different architectural systems such as the Taktaboosh (also spelled as Takhtabush or Tahtabshu - meaning a type of loggia, Arabic word for Roman tablinum, an open seating area at the lower level usually enclosed between shaded courtyard and backyard) as shown in the plan and sections in Figure 42, Figure 43, Figure 44, Figure 45, Figure 47, Figure 46 and Figure 48 below,”196 the arrangement dropped the air temperature by 18-36°F by night.197

Figure 42. Shows the plan of the Suhaymi House with QA’A, Courtyard, and Takhtabush.

Figure 43. Showing the ventilation system in part of the ground floor of the Qā’ of Muhib Ad-Din Ash-Shafi’i AlMuwaqqi at Darb Al-Usta, Cairo in two courtyards with a Takhtabush in between them.
Figure 44. Shows sections and facade for the new Baris village showing the wind tower and ventilation system and use of traditional forms or arches and masharbiya (screens).

Figure 45. Shows the air movement for the new Baris village through wind towers and internal courtyards.
Fathy utilized traditional Egyptian forms, such as domes, vaults, and arches in much of his architecture as a form of natural passive ventilation systems as a part of a global strategy of ventilation and humidification. Fathy firmly believed in using natural and locally available materials and traditional building methods with adaptations as required to

“deal with the demands and conditions of modern life and the use of climate-oriented design. Building techniques, methods, and material costs are to be tailored to the economy and capabilities of the people for whom the structure is intended rather than matching the tenants to the technique, method, and costs of the intended structure. Thus, citizens must participate in the design of buildings, thereby leading to a triangular relationship between the citizen, the architect, and the builder.”

He preached and practiced building pertaining to local conditions instead of settling with general or international solutions for buildings acting as generic for other countries and climates. According to Fathy, roofs and walls should be made of thick mud bricks considering the harsh

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climatic conditions of the Arab world. Fathy added light color finishes on ceilings and walls, as well as a shaded arcaded entry, using a Malkaf to harness winds and funnel cool air.\textsuperscript{199}

"...a very cool internal temperature could be obtained by shading the insolated surface, obstructing direct penetration of solar radiation, enhancing a flow of cool air, using thick light-colored walls made of a low thermal conductivity material, using high ceilings provided with roof ventilation, and providing sources of evaporation including possibly a roof pond and an internal fountain."\textsuperscript{200}

![Figure 48. A section of Al-suwaymi house, Cairo showing air flowing from the shaded courtyard through the Takhtbush into the backyard (unshaded courtyard).](image)

Fathy designed several types and scales of various buildings in New Baris Village. He grouped around courtyards to adjoin open spaces to ensure constant airflow by a joint convective system.\textsuperscript{201} Masterfully, Fathy provided residential units for multifamily designs with ample spaces, minimal floor areas and extensively changing interior definitions and configurations using ingenious and artful space configurations. He tactfully used different repetitive principles for every house's design. He set the building orientation in the North-South direction for maximum shading at daytime, close clustering of buildings for minimum surfaces exposed to

\textsuperscript{199} Fathy, Shearer, and Sultan, \textit{Natural Energy and Vernacular Architecture}, 25.  
\textsuperscript{200} Fathy, Shearer, and Sultan, \textit{Natural Energy and Vernacular Architecture}, 25.  
\textsuperscript{201} Fathy, Shearer, and Sultan, \textit{Natural Energy and Vernacular Architecture}, 31.
heat gain during the daytime, and also configured segments of the building for partial protection including openings on exterior walls for minimum western exposure.  

Fathy took charge as the head of the Architectural Section of Fine Arts in 1954 while Kamal El Kafrawi was a student there completing his degree. In the article about Arab Architecture and talking of the the architects of Egypt, the authors analyze the works of various Egyptian architects in context of works that provide identity and for the new developments of appropriate architectures including Kamal El Kafrawi for his work in design and building of Qatar University campus. The common denominator for their analysis is the influence of works of Hassan Fathy.

Fathy’s work portrays how essential it is for design professionals to uphold conscious and sincere inquisitive and critical cultural evaluation in architectural design contexts. His works make it clear that these practices should incorporate the appropriate application of both man-made and naturally existing fabrics to accomplish building designs that harmonize with natural energy. Fathy, through his designs, was not only able to encompass vernacular practices, cultural heritage, and traditions, but he was able to utilize natural and environmental factors to the advantage of inhabitants to provide the inhabitants optimum light quality, air movement, and thermal comfort conducive to sensory architecture. His practices incorporated sensory modality inputs to transform and enhance humans' well-being, health, and the environment clearly evident from Fathy’s design implementations of thermal and light comfort for the users not only in the interior spaces, but in overall planning as well. Fathy carefully sized and placed design elements like the interstices and masharbiyas to adjust to the amount of direct solar radiation keeping the thermal comfort of the occupants in mind. He used rounded balusters, which disbursed the light.

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that reached their surfaces, alleviating the harsh contrast between the dark and opaque balusters and the brilliant bright light entering through the interstices\textsuperscript{204} as described in the Figure 49. below. He believed in providing a richer architectural design experience by integrating sensory inputs.

Figure 49. The traditional Mashrabiya in Jamal Ad-Din Adh-Dhababi house in Cairo shows the increase of the inner spacing at the high levels, filling the interior space with ample glare-free filtered light.

Figure 50. Shows the working of masharbiya in regulating the quality of light. 51(a) lattice layouts of masharbiyas; and 51(b) the scientific working of effect of light falling on a cylinder.

\textsuperscript{204} Fathy, Shearer, and Sultan, \textit{Natural Energy and Vernacular Architecture}, 47.
The cylinder's progressive light and shade minimize the blinding effect of dark-light contrast that happens when viewing from the interior toward the light outside. This technique of increased spacing at high levels in the masharbiyas as well as the effect of light and air for the width of the columns has been discussed by Vitruvius as well in regards to the Greek columns. “...because the width of the intercolumniations is such that the air seems to eat away and diminish the thickness of shafts...the columns at the corners should be made thicker ...because they are sharply outlined by the unobstructed air around them, and seem to the beholder more slender than they are. Hence, the adjust the proportions is needed to mitigate the ocular deception.”

3.5 Hassan Fathy, Kamal El Kafrawi, Amos Rapoport - timelines and links

Hassan Fathy and Kamal El Kafrawi were linked through the same institution. Fathy served as the head of the Architectural section of the faculty of fine arts from 1953 - 1957. At that time, Kafrawi was undergoing his graduate degree in the same department. Kafrawi graduated from the department in 1958. From 1957 - 1962, Hassan Fathy worked as a consultant for Doxiades Associates in Athens and taught “Climate and Architecture” at the Athens Technical Institute. For his work and research in West Africa and the Middle East, he was given the Gold Medal and Encouragement Prize for Fine Arts in 1959. However, the bureaucracy frustrated him. He firmly believed in traditional methods as the most suitable for buildings that tackled the climate of the area well, speaking louder than words. That led him to move to Athens where, under the directive of Constantinos Doxiadis, he collaborated with international planners on different projects. While Fathy was working in Athens, Kafrawi was in Paris for his diploma and

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206 Vitruvius, *Vitruvius, the Ten Books on*, 84.
Ph.D. in Islamic Architecture. After returning to Cairo in 1963, Fathy undertook research on the "Cities of the Future" program in Africa. Working on major community projects for Pakistan and Iraq, he functioned as the proponent of traditional natural-energy solutions. Fathy acted as a director of pilot projects for housing at the Cairo Ministry of Research, worked on the design and construction supervision of the village of Baris for the Egyptian Desert Development Organization, also acting as a consultant to the Minister of Tourism in Cairo. While Fathy became a UN consultant for a rural development project in Saudi Arabia in 1966, Kafrawi became a specialist in cultural and educational facilities with UNESCO and a consultant for the government of the Middle East for cultural and educational planning a few years later in 1973. Around the same time, Amos Rapoport came up with his first book, ‘House Form and Culture' on environmental behavior research published in 1969, and another one - 'Human Aspects of Urban Form' in 1977, which is around the time when Kafrawi was in the process of designing the Qatar Campus.

While there is no direct evidence that Hassan Fathy or Kamal El Kafrawi were aware of Amos Rapoport's work, there are several indications that they may have been familiar with his ideas. First, Rapoport's work on the relationship between culture and architecture was widely read and discussed among architects and scholars in the mid-20th century, particularly in the field of Environment-Behavior Studies (EBS) that he founded. It is possible that Fathy and El Kafrawi, who were both practicing architects during this period, would have been exposed to his ideas through their professional networks and publications.

Second, while it is not clear whether Rapoport's books were translated into Arabic, it is possible that they were translated into French, which was a commonly used language in academic circles in Egypt and the Middle East at the time. This would have made his work more
accessible to Fathy and El Kafrawi, who were both educated in France and had a strong connection to French culture and language.

Finally, there is evidence that Rapoport's work was reviewed and discussed in architecture journals that Fathy and El Kafrawi would have likely read. For example, the Journal of Architectural Education, which was widely read in the United States and Europe, published several articles on Rapoport's work in the 1960s and 1970s. It is possible that similar articles or reviews of his work appeared in Egyptian or Middle Eastern architecture journals during this period.

Overall, while there is no direct evidence that Fathy and El Kafrawi were aware of Rapoport's work, it is likely that they were at least indirectly exposed to his ideas through their professional networks and publications, and through the wider discourse in architecture and EBS during the mid-20th century. Therefore, it is reasonable to suggest that they may have been aware of Rapoport and his work on the relationship between culture and architecture.

3.6 El Kafrawi’s design philosophy for Qatar campus

Kamal El Kafrawi’s design philosophy in the Qatar campus is one that is deeply rooted in local culture and history, much like Fathy. His belief was that “one has to reconcile the immediate need for the import of modern technology with the need to adapt it for use in the local environment. This implies a considerable study of the needs and aspirations of the inhabitant. As a philosophical principle in the design of the university, I posed this problem of the conflict between local culture and imported technology to experts in various disciplines. I would suggest that education in the effects of the conflict should be the principal aim of the new University of the State of Qatar.”

Kafrawi’s statement clearly showed his awareness about the impact of Western influences manifesting into building types of Qatar, otherwise unknown to the traditional Islamic architecture. He further clarifies it by saying, “…it would likewise be mistaken to import directly the building forms of Europe and America Into the Islamic State of Qatar, since these foreign forms could disorient the Arab and disturb the Islamic values In his relationship to society.”

El Kafrawi brought to attention the extent of Arab Architecture losing direction due to Western technology being implemented without consideration of the philosophy which underlies it and modern buildings springing up totally foreign to the area. He called upon the design community to closely scrutinize and probe the environment and character of the Arab world depicted in its villages, towns, and cities ” to determine the effects of Western contemporary Architecture.”

This dominance of western forms during the time of the design of the campus was also vividly expressed by one of the revolutionary innovators of Western technology, Fazlur Khan, in the paper that he presented at the first seminar of the Aga Khan Award for Architecture in 1978. Lending his voice on "The Islamic Environment: Can Future Learn from the Past?", he described: "the force of modern technology, whose base is primarily Europe and America, is so overwhelming, so deceptively attractive to these countries and so responsive to their desire for fast construction of unprecedented scale and volume that it is almost impossible to resist the temptation to copy, by-and-large, their methods, forms, and technology." Thus, El Kafrawi wanted to create a design that was trustworthy and true to Qatar's culture, and one that concurrently embraced its identity. The underlying philosophy was to design buildings that considered the country’s weather; taking the reliance off of modern methods of cooling, such as air conditioning. However, El Kafrawi believed that given the scale of the campus and hence the

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amount of energy required to combat harsh weather, modern methods like air conditioning would work better in conjunction with the traditional methods which work to reduce the heat effects by half.

The cultural, academic, and philosophical planning of El Kaфrawi’s work reflects various considerations, including viewing the University as a unique and distinguished institution of learning in Doha. When the commercial centers of Bahrain and Kuwait led the way for modern education after the Britisher’s withdrawal from the Gulf, the University in Qatar was also developed as a modern institution for modern education - “an education whose primary purpose was the dissemination of non-religious knowledge and development of practical skills,” that encourages specific social, intellectual, and educational aspects, as reflected on all students. The university’s principal aim was the creation of an environment conducive to learning.

The Middle of the city of Doha made it difficult to accommodate for the land area required for the University and its future expansion of about 500 square hectares. Thus, a site about 2 kilometers/1.2 miles from the Gulf shore and 7 kilometers/4.3 miles from Doha was chosen.

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211 Qatar University, “Reaching Higher: Qatar University”, 13.
Sitting on an elevated, gently sloping site, higher than the city of Doha, in El Kafrawi’s words, “the site is a particular influence on the internal and external planning. It has affected the main vehicular and pedestrian entrances on the South and East sides of the University, and its entire relationship with the community's cultural and social activities. It is linked to the city of Doha with a network of roads, facilitating the movement of traffic to and from it. It is under its size and functional nature a scientific and cultural institution that constitutes a center of attraction for the growth of the city of Doha.”

Furthering on the concept of development of the Qatar campus, El Kafrawi elaborates that “University is an educational, cultural, and social institution that is a small city or an academic village. Therefore, the planning and construction should take its own identity. It is in the form of a green oasis that includes educational buildings, sports facilities, and a future residential city for its employees and international students.”

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212 El Kafrawi, “Higher Teacher Training Colleges at Doha”, 81.
El Kafrawi made a careful evaluation of existing school buildings in Qatar, their planning, design, and cost. He visited about 12 schools in Doha and in other cities and villages throughout the country with the Ministry of Education for a thorough understanding of planning concepts, a careful and detailed study of the requirements, and to understand the relationship of those buildings to the local environment. “At the same time, I undertook a personal study of the major features of Qatar, exploring the nation’s environmental characteristics and their effect on architecture and urban planning, local methods of building, construction both traditional and modern, building materials, design, and cost together with Qatar’s social and economic activities.”214 (Note: No documented research or records found on El Kafrawi’s studies done for the design of the Qatar campus)

3.7 Campus design approach

In Kafrwai’s own words describing the concept of development of the project, “Design consultants have developed three identifiable design approaches.”215

The first approach that he describes is the synthesis of the cultural and Islamic heritage of the Gulf States on one hand with modern construction technology on the other. Giving further explanation, he describes this approach as, “This concept makes use of the traditional forms of spaces; local urban patterns, and environmental control devices including traditional inward concepts with courtyards in the pattern of planning.”216

Kafrawi describes the second approach as involving functional organization “ubiquitous in the Western Universities, using modern technology for construction and environmental control.”217

The third approach he describes as similar to the second in terms of space organization, “but uses traditional Islamic architectural elements as symbols - such as the arch, dome and curving structural elements used in the imitation of traditional features.”

The University was constructed for multidisciplinary uses ranging from educational, sports, and social, to residential facilities. The majority of inhabitants were locals (82%) from the State of Qatar, foreigners from Islamic regions (13%), as well as other countries of the world (5%).

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CHAPTER 4

DESIGN ELEMENTS OF QATAR UniversityCAMPUS - THE ORGANIZATION, LINKS, MEANING, AND COMMUNICATION

For evaluating and studying built environments, Rapoport poses one major corollary question - if there is mutual interaction between people and the environments, there must be some processes, some mechanisms that act as a connection between them. He describes some of these processes and mechanisms as “a form of nonverbal communication, i.e., a code decoded by users; as a symbol system; perception (via the various senses); and cognition (giving meaning to the environment through naming, classification, and ordering).”\(^{219}\) However, throughout the case of most of these, the environment is very strongly linked to culture for it is the culture, in any form, made up of certain values, certain behavior patterns, and certain beliefs that define and form the blueprint and foundation of that society.

A variety of aspects of man-environment communication and design can be seen in aspects of congruence, in which people attempt to tone and compliment their attributes, values, presumptions, norms, habits, ways, and doings to physical environments through design. This study is an effort to recognize these mechanisms, namely the variables of culture to understand and analyze the meanings of the Qatar campus environment.

Qatar University campus boasts of very distinctly designed spaces that make up its built environment. These fixed elements or components under study are -

1. Specifically designed geometrical classrooms accompanied by specially designed wind and light towers

\(^{219}\)Rapoport, The Mutual Interaction of People, 11.
2. Courtyards
3. Corridors and Transitional Spaces

4.1 BUILT SPACE ORGANIZATION AND ASSOCIATIONS:

When commissioned for the design of the University campus, El Kafrawi began with a study of many aspects of the traditional ways of life in Qatar. It was a massive scheme that, in El Kafrawi’s own words, “combined traditional elements with contemporary needs.” El Kafrawi used old Arab traditions in various parts of the design of the campus, explaining his goal - "I aim to extend the way in which traditional values and lines are expressed architecturally, so as to strengthen the psychological link with the Qatari character, and ensure a sense of continuity in the modern environment."

Aiming to achieve a harmonious integration and to give the distinct character to the environment, El Kafrawi said, “it is important to do traditional and modern technology at the same time: to engage with a region's history and to make it an integrated component and harmony in the design aligned with contemporary requisites. Past traditional values and modern technology necessities are not conflicting, but rather harmoniously connected elements. The University will blend academic, cultural, and recreational facilities to form a comprehensive educational institution in the essence of contemporary Islam. This statement itself aligns wholly with the scope of this study. A diagram for the campus made by El Kafrawi as shown in Figure 52 below visually explains the relationship and organizational structure of spaces as planned by El Kafrawi. The diagram clearly shows Islamic principles as the basis of organization with segregated spaces.

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222 Kultermann, “Contemporary Arab Architecture”, 42.
To analyze, we can ask the question - why did El Kafrawi intend to blend historical and traditional components in the campus design even though the demand was for a modern institute with technological needs? He himself clearly stated the answer to this as - “...to strengthen the psychological link, and to engage with a region's history...”223 because he conceptualized the built environment as perceptual and expressive, one in which individuals experience the world in the domain of cultural values that lends it a strong meaningful character linking people strongly with their environment. “Designs need to respond to ‘culture’, i.e., be culture-specific.”224

224 Rapoport, Culture, Architecture, and Design, 1.
Like Hassan Fathy, El Kafrawi also firmly believed in the influence of cultures in an environment. “In defending cultural authenticity, Hassan Fathy emphasized that there is an essential non-interchangeability of cultures. By that, he meant that basic cultural elements were developed in response to indigenous, environmental, and psychological needs and that alien elements cannot be implanted or transplanted from other cultures or other environments if they are culturally inappropriate.” To get a thorough understanding of these basic cultural elements, El Kafrawi talked to a wide range of people in Qatar and found intense interest in any development which would affect them or the society in which they live. To better understand and comprehend the traditional, cultural, and societal influences of Qatar, El Kafrawi undertook a study of the construction of older buildings in Doha, Al-Wakrah, Al-Khor, and the North City. In each town, El Kafrawi found extensive evidence of influence from the traditional Bedouin way of life in the built environments. Rapoport also highly recommended that designers do all that they can to understand the environment before they start building. “The actors must have cultural knowledge upon which to draw in order to embed messages in social contexts.” He further stresses on this point, “...an understanding of behavior patterns, including desires, motivations, and feelings, is essential to the understanding of built form since the built form is the physical embodiment of these patterns...”

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226 Rapoport, The Meaning of the Built, 75.
227 Rapoport, House Form and Culture, 16.
In designing the campus, El Kafrawi defined and used following design principles:

**4.1.1 Undeviated reproductio**

“*Maintaining the traditional means of construction in the Islamic world, without modification or improvement would be a mistake, as it would hamper Arabs from benefiting from contemporary technology.*” 228

**4.1.2 Western structure**

Based on the first principle, it would also be a failure to directly import the building forms from Europe and America to the Islamic State of Qatar, as these foreign forms may befuddle the Arab and disturb his relationship with Islamic beliefs and society.229

**4.1.3 Advancement of traditional forms**

Western technology, on the other hand, can be used to improve and enhance Arab culture's current building forms, as well as getting the material benefits of progress while keeping the individual's origins in their society intact. El Kafrawi said that "*The latter principle formed the basis of my thinking, and the academic field has been the subject of my further studies.*”230

These principles outlined clearly by El Kafrawi show that El Kafrawi’s design intentions for the Qatar campus very much rested on the foundation of culture and traditions.

Rapoport stresses the importance of rhythm and organization of space as a factor that gives “*character*”, and identity to a space. Norberg Schulz affirms, “*Centralization, direction,“*
and rhythm are important properties of concrete space...in architecture as in literature, many appealing buildings are surprisingly simple, even repetitive in their designs. "Undoubtedly, a very distinct rhythm of tower forms is clearly visible in the first glimpse of the campus as shown in Figure 53 below.

![Figure 53. Shows the repetitive design element, rhythm, and strong directionality of the campus.]

A strong axially, modular repetitiveness, and rhythm are also audibly seen in the plan and organization of campus buildings as shown below in Figure 54 and Figure 55 showing the arrangement of the campus, giving it centralization, direction, and rhythm.

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Figure 54. Shows repetition and rhythm as implemented in the men’s college building.

Figure 55. Shows the strong axial arrangement for circulation in the campus organization.

As per the design intentions of El Kafrawi, the master planning of the University has been aligned with the objective of providing quality spaces with a visible synthesis of Arab cultural and Islamic heritage combined with modern technology.
4.1.4 Falcon as the meaningful historical link?

If we take a close look at the main academic building block of the campus, interestingly, the overall arrangement is shaped like a bird - specifically a falcon. The College of Engineering occupies the bird's body, while the other colleges and academic institutions are found on the bird's wings as shown in Figure 56 below.

![Figure 56. Shows the significant bird shape of the Qatar University campus engineering block.](image)

When it comes to legacy and culture, falconry has been an integral part of Arabs. Falconers share a strong bond with their birds. It's a very significant element of Qatari history, culture, and tradition. Bedouin hunters used falcons for hundreds of years, making it one of the preeminent animals in the country. Falcons helped Bedouin's by hunting animals native to the region in the scarce desert environment. One can question this link to the shape and the significance - why specifically falcon and not any other bird? Falcons could be trained to deliver their prey without killing it first, which is considered vital in Islam. In Islam, in order to ensure that the meat is halal, the animals that are going to be used for food must still be alive when their

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throats are cut and blood is drawn. They are seen as symbols of courage and force. This technique and form of traditional hunting represented a big symbol of the Qatari culture.233

When Rapoport details on finding the meanings of built environments based on the symbolism present in that built environment, he suggests the symbolism as a separate system or as a part of the overall space organization that lends meaning to the built environment. "If space organization includes communicative and symbolic features, meaning is typically represented by signs, materials, colors, forms, landscaping, etc. Thus meaning can be a part of space organization or a separate symbolic system. "234

The organization of the main academic building in the form of a falcon communicates a clear connection and an expressive meaning to the Arab cultural roots and traditions. According to UNESCO, such is the importance of Falcon in the Qatari and Arab tradition that today falconry is identified with camaraderie, and relayed as a cultural tradition. This is done through various means and different avenues - through mentoring, formal training clubs, and learning within the families as a traditional sport, even though originally it was a way of obtaining food.235 The implementation and conscious use of Falcon in the design of the Qatar campus shows El Kafrawi’s focus on giving meaning to the campus through symbolism.

Norberg Schulz also states that both architecture and the symbolism associated with the architecture, along with representations of society’s cultural perceptions of place are significant in the notion of genius loci. This genius is determined by what is visualized, complemented, symbolized, or gathered.236 In the case of the layout of the Qatar campus, a falcon is visualized,
complemented with the functions of force and power of education projected in the world for everyone to take notice, very symbolic of the tradition and culture of Qatar, and gathered as a place holding meaning in every detail.

For the organization in a built environment, Rapoport talks about the forms and details that express meaning being very important.”*Hence the built environment gets much more intimately linked to beliefs, values, and social relations, all of which form the definition of culture. This leads to an easy finding of the system and the links with the built environment.*”

“*Even the space organization of such buildings and their relations to the larger environment has meaning and operates in the associational as well as, or more than, in the perceptual realm.*”

We have discussed the link to the built environment in the Qatar campus associated with the organization of form related to a falcon. Further strong links are found as we start the exploration of designed spaces. Taking the case of circulation corridors, based on the Bedouin tradition and Islamic values, men and women have segregated hallways and separately designated areas. In his original design of the Qatar University campus, El Kafrawi says about segregation of gender as an important consideration in the design “*Qatar being an Islamic nation that conserves its socio-cultural traditions, customs require that the education of the sexes be separate. Although it has been permitted that the two colleges exist side by side, certain physical barriers must remain between them, which necessitates special architectural planning.*”

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Figure 58A & Figure 57 B. The images above and below show the segregation gates pointed by arrows and the segregation wall between differentiated spaces for men and women.²⁴⁰


4.1.5 Bedouin Tent - Organizational Basis of Qatar University?

Studying and researching the Bedouin (nomadic Arabs) way of life, El Kafrawi realized that the life of Badu provided the most pervasive influence in the life of the majority of people living in Qatar. The life of Badu revolved around the most essential element - family and their tent. The Badu man confronted, adapted, and lived with nature. Despite the harshness of the desert life, Badu man lived life with dignity and richness. This richness, El Kafrawi found, was not the material richness but the richness of culture, a wholly non-material richness. The richness of Badu culture was essentially inward expressed through various art forms, including built forms, along with other forms like weaving, and poetry. Their artifacts were an expression of the aspirations of the human spirit with their work having aesthetic as well as practical value. Rarely in any other society, El Kafrawi saw art forms, especially poetry reaching the heights of expression and as well integrated with the lives of people as in the poetry of the desert.

Figure 59. Shows the typical bedouin tent.
Figure 60. Illustrates the detailed structure of a Bedouin tent's interior with segregated spaces.

Is it safe to assume that El Kafrawi incorporated the same richness of form and expression of spirit that he learned from the bedouins in the Qatar campus? Did Kafrawi design the campus keeping in mind the harshness of the desert climate like Bedouins did? Let’s look at the details to find out.

The traditional Bedouin dwelling called “the tent, or bayt al-shaer, or house of hair" was a protected dwelling that a nomad family transported to different places during their movements. The tent was the Bedouins’ largest weaving structure: it was totally wrapped with hand-made cloth, or al-Sadu fabric, which worked as a barrier, protecting them from the harsh summer sun and winter cold and rain. In Bedouin society, the tent represented not just social links and family
structure, but also gender norms. Can it be presumed that Kafrawi based the organization and layout of the Qatar campus following the same Badu concepts?

Very similar to the Bedouin space and way of life, the social organizational links in the Qatar campus were designed to take place in the courtyards and transition areas mimicking the courtyards of the Badu tent community as shown in Figure 63 above. The early Arab villages on land were also formed of tents encircling a shared center core or space to achieve security and durability against desert climatic conditions as shown in Figure 61 below.

![Figure 61. Shows a plan of tents from 1-5 of Muhammed bin Jabar’s Al-Murrah camp at al-Wugbah in south Qatar laid out in a semi-circular pattern with a central communal space.](image)

Figure 61. Shows a plan of tents from 1-5 of Muhammed bin Jabar’s Al-Murrah camp at al-Wugbah in south Qatar laid out in a semi-circular pattern with a central communal space.

Following the same concepts as the Badu tent, El Kafrawi divided the campus interior space into several zones, each with its own purpose. Men and women had separate places inside the tent. Similarly, the circulation pathways and activity areas for men and women have been

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segregated in the University Campus. The tent had a space designated for female weavers, very similar to a studio in campus, and an especially designed textile laboratory and communal space for arts and crafts on campus, where they did their crafts and developed their skills. El Kafrawi was very well familiar with the culture and traditions which is vivid from the fact that he incorporated a designated arts and crafts center as a part of the College of Education. “The activities of the textile laboratory will include cloth weaving and tapestry, these being the traditional arts of Qatar.”

In the traditional Bedouin community, their tents depicted family status, social relationships, kinships, an internally built network, but also the rules of gender, which is very clearly the case in the design of the Qatar campus as well. Similarly, the expressions of unity and security are also incorporated in the campus design through unity of form, clustering of units, through small exterior windows, through each classroom cluster opening only into the interior courtyard not only at each cluster level, but in the overall design scheme as shown in Figure 63, the whole tightly knit composition held together by the mosque.

Figure 63. The images above show different zones in the Qatar campus corresponding to bedouin tent zones.

**Left**: Qatar campus buildings site plan.

**Right**: Bedouin tent zones showing the segregation areas.

While the traditional tent demarcated the Bedouin space, the organization of the internal space and the way it was constructed was what determined how the tribe or family was discerned by the society or the outside world. It held a critical role in defining, forming, and delineating the spaces: the exterior with non-patterned textiles designated as a public space, while the interior patterned textiles represented private areas. Very similar to the concept, Kafrawi organized campus spaces with the classrooms on the very interior as private, shielded, and quiet spaces where knowledge could be shared without external interruptions. Courtyards, engulfed by these private classrooms, act as the gathering and transitional spaces integrating social cultures, expressing a shared identity and a relationship with the culture that exists in the outside world, at the same time remaining secluded and shielded from the outside world. The activity spaces are
segregated in both, and gender norms are similarly followed in well-designated areas of the campus, as explained in detail in the following passages and illustrated in Figure 63 above.
Figure 64. The images above show a detailed comparison between Qatar campus planning and Bedouin tent in terms of inward planning - central courtyards.

**Right**: Details plan for Qatar University campus. **Left**: Details plan for Bedouin tent.
The Bedouin tribes used symbols to identify themselves, their belongings, and their spaces. This traditional utilization of a symbol or a marker to give identity to a group, an idea, a brand, or kinship is widespread in the modern world since identification is not always associated with corresponding to a specific location. Such was the strength of the Bedouins tribes’ identity and symbolism that even when they migrated to a new location not their own, their identity could be effortlessly recognized.

The central plaza in an Arabic urban development, the central courtyard in a traditional Arab house and a mosque, and a courtyard centered in each module in the Qatar campus layout - all act as symbolic centers. Similarly, the circulation corridors of Qatar and route structures have the same kind of use and hierarchy related to them as in a traditional urban organization. There is the same kind of extreme cognitive consistency with the complex system of rules that are found in a traditional Arab house, a Bedouin tent, a traditional urban town, Hassan Fathy’s new Baris village, or the campus of Qatar as shown in Figure 65 below. The segregated areas and channeled flow of spaces are all reinforced by religion, its beliefs, and its values.
Figure 65. Plans showing the similarities in the organization of Bedouin tent, New Baris village, Arab Traditional house, and Qatar University campus.
For the concept of genius loci, Norberg-Schulz signifies the important role of symbols in an environment. “Symbolism (that is, meaning) is central to all environments.” Buildings and the symbolic meaning of a settlement are both significant for the genius loci concept since they are representations of society's cultural perception of location. Norberg-Schulz explains the concept of symbolization that helps “gather” a number of meanings in the environment and refers to it as the most important concept which relates to the symbolism of place and also the place to identity. Schulz also argues that “man cannot gain a foothold through scientific understanding alone. He needs symbols, that is, works of art which "represent life-situations.” Rapoport says that the effects of values, images, schemata, and human behavior all work together to shape the urban form. Thus, behavior and symbols both form an essential link to culture, hence linking it all to the environment. Based on these concepts, we question - did Kafrawi embed symbols- as the identification markers in the design of the campus? The following paragraphs will help us analyze further as we unfold the links related to each thoughtfully designed element of the campus.

The first visual of the campus becomes highly recognizable as an unmistakable rhythmic pattern. It aligns clearly with the Bedouin tent methodology of having a bold, distinct identity. Not only does it serve as a focus for internal identification, just like the Bedouin tents, it serves to communicate a strong and distinct identity of Qatar to the world.

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244 Rapoport, *The Meaning of the Built*, 44.
The same kind of relationship of structure and built forms to the environment are seen as well in the campus design as in the Bedouin tents - discreet segregation of areas, a unified concept, and other symbolic representations of the culture, tradition, history, religion, norms, and society in the built environment like a traditional Arab house modified to fit the scale of a learning institution which will be discussed in the following passages. Rapoport says, “Without trying to define culture, one can say that it is about a group of people who share a set of values, beliefs, a world view and symbol system which is reflected in the lifestyle, guiding behavior, roles, manners, and the built form.”247 This is very precisely projected in the campus spaces and their organization - there is a certain norm that is being followed everywhere. Females have to be in certain areas, while males have their own specified spaces to use. The organization of the spaces must follow the standards of the philosophy of certain values.248

Mosque as the head of the falcon acts as the authority outlying the behavioral ‘script’ for the campus spaces and its users, as shown in FFigure 68 below. “Settings and their rules are

247 Rapoport, Human Aspects of Urban Form, 119.
248 Rapoport, Culture, Architecture, and Design, 39.
usually communicated by cues which are the physical elements of the setting." The fact that
the users of the campus are aware of the socio-cultural setting of the campus spaces, behave
‘appropriately’ according to the cultural schemata, and mold their conduct and behaviors as they
move along the settings clearly depicts an environment designed on a known cultural schemata.

Figure 67. Central mosque in Qatar University campus.

Figure 68. The master plan of the Qatar University camp showing the location of the mosque at the head of the falcon.

Rapoport, Culture, Architecture, and Design, 28.
Note that even in the organization and placement of the mosque in the whole composition, Kaftawi separated the floors for men and women, in his words, “for religious, cultural, and social” reasons. Also to note is the fact that the angle of the mosque is specifically for the Kebla to be oriented towards the direction of Mecca.

As per Rapoport, “It is implicitly accepted that there is a link between behavior and form in two senses: first, in the sense that an understanding of behavior patterns, including desire, motivations, and feelings, is essential to the understanding of built form since the built form is the physical embodiment of these patterns; and second, in the sense that forms, once built, affect behavior and the way of life.”

In the case of the Qatar campus, behavior patterns are clearly defined by Islamic fundamentals and Arab traditions. Built form fully accepts and encompasses these fundamentals and traditions; otherwise, the clustering of units around courtyards as an organization of the space and segregating circulation corridors was not a requirement if the design were solely based on ‘modern institution.’ It was an expectation and a requirement of the built form to withhold the traditions, values, and culture, and the use of the built form and spaces also clearly expresses this expected behavior.

Another mechanism that Rapoport lays out for the study of a built environment is the cues. “Environmental meaning involves looking directly at various environments and settings and observing the cues present in them, identifying how they are interpreted by users - that is, the particular meanings these cues have for human behavior, affect, and so on.” He gives a strong visual example, “People's images about urban areas, characteristics of neighborhoods, and entire urban sectors (and of people living in them) have major effects on how people search for

250 Rapoport, House Form and Culture, 16.
housing vacancies, whom they ask and trust, the newspapers they read and the visual cues on which they rely when they search in the real city are all also affected by images.”

Furthering his assertion on visual cues, Rapoport explains that “images are the point of contact between people and environment, thus linking them to behavior.”

Looking at the Qatar campus from that viewpoint, the first visuals of the Qatar campus in the form of a sharp skyline generated by the wind and light towers definitely give it a very strong visual cue. The strong and enigmatic visual identity sparks a strong interest in attracting users and visitors alike, inviting the on-looker to come and explore what’s hidden behind the strong image. Rapoport says of these images as the visuals representing a form of “attitude to space,” acting as links to feelings, prejudices or biases, preconceived notions, and ideas. Eventually, when they are drawn to experience the spaces, the organizational meanings become clear, and the links get established. Rapoport explains that the active scanning of the eye movement leads to the building up of a percept, selection of cues, and their organization, and the ones that get selected by the eye are the ones that are important because of cultural link, personal experience, attention, and motivation.

“Vision is active and searching, involving peripheral vision and an awareness of behind and above.”

The visual perceptual modality has been well-supported by science. In the article describing visual as the most researched modality, the author Fabian Hutmacher states various types of research in support. “Kandel et al. (2000) claim that “most of our impressions about the world and our memories of it are based on sight.”

“Visual dominance” is explained by the author taking the famous example of the “Colavita effect”, in which the participants were

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252 Rapoport, Human Aspects of Urban Form, 41.
253 Rapoport, Human Aspects of Urban Form, 41.
254 Rapoport, Human Aspects of Urban Form, 186.
presented simultaneously with visual and auditory stimuli. Whereas the participants showed a strong response to the visual stimulus, the auditory was reported to be not perceived at all. The core scientific explanation of this lies in the fact that the primate-neocortex is responsible for processing visual information, which is the largest part of the human brain making up 80% of the brain mass and containing 16 billion neurons. Information from other modalities is processed in the rest of the 20% smaller brain regions, 3% exclusively dedicated to auditory, and 11% to somatosensory processing. “Thus, one may argue that the greater “brain power” available for processing visual information allows for a more fine-grained analysis of the incoming visual stimulation compared to the stimulation from other modalities.”256

Clearly, the strong visual of the campus builds up a percept in the first glance invigorating the senses and inspiring always-searching eyes to look for more. After the visual information is percepted, Rapoport explains that it gets correlated with sound, smell, touch, kinesthetics, air movement, history, and others which either reinforces or weakens the visual cues, thus helping or hindering the processing of information.257 Peter Zumthor, on the same lines, says that it is important that architecture invokes feelings that happen through visuals first, vision being the dominant sense and appeals to human senses because then it’s sensory design architecture. For that, structures require a certain character for them to be appealing to the human senses.258

“The organization of the environment is, therefore, the result of the application of a set of rules which reflect differing concepts of environmental quality.”259 “...environment symbols are increasingly important...if one cannot communicate, one cannot relate, and when symbols no

257 Rapoport, Human Aspects of Urban Form, 191.
258 Zumthor, Thinking Architecture, 18.
259 Rapoport, Human Aspects of Urban Form, 14.
longer have a common meaning, people search for new symbols; generally, the absence of 
symbols and symbolic integration may lead to breakdown and social pathology."\textsuperscript{260} Rapoport 
stresses on a design and organization that expresses clear communication of rules 
through its symbols. "Design can hence be seen as an attempt to give a form of expression to 
some image of an ideal environment."\textsuperscript{261}

Based on our discussion, concepts, and analysis of symbolism, identity, culture, character, 
and architecture for the senses, let’s look at the individually designed components of the Qatar 
campus that make up its environment and lend it its specific character.

\textsuperscript{260} Rapoport, Human Aspects of Urban Form, 325. 
\textsuperscript{261} Rapoport, Human Aspects of Urban Form, 15.
CHAPTER 5

THE OCTAGONAL-SHAPED CLASSROOM UNIT: MEANINGS AND LINKS

For many purposes, El Kafrawi deployed the octagonal design plan for the classrooms. As described by Kafrawi, “The octagonal module formed the basis for design composition and organization of the whole campus with Kafrawi designating it under the name of “Space-form unit”\textsuperscript{262}. He further describes the shape - “The octagon shape provided a handy type of reinforcement for the specially designed square wind towers and light towers. The specifically designed octagonal shape also helped to reduce heat absorption by reducing the time span the sun shone on either side. It allowed for any combination of groupings of desks to accommodate the needs of the instructor. The designed octagonal units stay surmounted using wind-tower structures to provide cool air and reduce humidity. The modular form also takes a fresh view of an ancient geometric Islamic shape (chapter 5: paragraph titled The originality of the octagonal plan in Islam, page 152). It adopts the concepts of thermodynamics and construction and offers flexibility in teaching methods. Its creativity is to meet environmental standards and academic objectives of excellence.”\textsuperscript{263}

The standard lecture room has an octagonal layout that is 8.4 m or 27.5 feet broad and is linked to at least two hallways that are 3.5 m square or 37 square feet. The first hallway serves as an entrance, a small library for the lecture room, and a transition zone between the interior and exterior, allowing for a smooth transition from the air-conditioned enclosure to the outside

\textsuperscript{262} El Kafrawi, “Campus Plan for the University”, 126.
\textsuperscript{263} El Kafrawi, “Campus Plan for the University”, 125.
environment. The second hallway provides natural light and an area for small groups of students to socialize or study.

This brief design description of the design of the octagonal classroom modules provided by Kafrawi definitely shows Kafrawi’s thoughts and considerations - that he thought of the flexibility of seating arrangement and the flexibility of use of the room and its adjoining spaces. It also reveals his deep consideration of combating the harsh Qatar climate by providing transitional spaces for the body to adjust and by having these rooms ventilated by wind towers as well as considerations for natural light - a vital aspect of the classrooms (details in the following paragraphs).

The structures' form expresses the geometry of the lecture rooms, accurately representing the educational and physical components of the buildings' usage. This concept of repetitive units put in a geometric pattern has been characterized as an approach understood no better than an Islamic designer. In the book, ‘Islamic geometric patterns’, the author Jay Bonner talks of the inspired use of geometry by Muslim artists that led way to the evolution of multiple assortments of very detailed patterns, organizations, and schemes. He talks of repetitive schema having a distinctive significance for every Muslim culture and dynasty.

In the article by Ahmed Abdulwahid published in the Journal of Islamic Architecture titled ‘Repetitive elements and their objectives in ancient and contemporary mosques’, the author calls repetition one of the most important design principles in mosque architecture, starting with the first mosque construction. He quotes the researchers who have studied repetition in art and architecture, elaborating on different objectives of repetition. The objective could be for ‘unity and order’ through balance, harmony, and proportionality between the elements. The repetitive
octagonal units of the campus do showcase all of these. As per the author, achieving this objective "mimics the experience of hearing a melody." 264

Repetition, especially repetitive modules, also help achieve functional aspects, such as the structural objective, achieved in Qatar campus design through the repetitive wind and light towers fulfilling the multitude of purposes of structural supports, ventilation shafts, and decorative distinct features. Thus the octagonal modules, in conjunction with the wind and light towers, also become repetitive environmental elements that fulfill the objective of letting air and glare-free light in, reducing energy consumption, and enhancing the interior atmosphere. Rhythm and movement are also achieved through repetitive blocks or through repetition of spaces, as per the research cited by the author. If the repetitive elements are emphasized, either perfectly or imperfectly, they help achieve the objective of element visibility as well, achieved through the masharbiyas (perforated screens) incorporated in these modules. This leads to achieving a symbolic or semantic objective since the culture and identity of the local culture are expressed through the repetitive traditional element, thus leading to the achievement of overall unity, continuity, and harmony.

As I dug deeper into the design elements and their descriptions by Kafrawi, I realized that even each sub-component of the octagonal module held many links to history and symbols in various aspects. Let’s take a look in detail.

Figure 69. Shows the detailed plan of the typical octagon shape unit.

Figure 70. Shows the typical octagon shape unit in an axonometric section as designed by Kafrawi.
Figure 71. Shows the rhythm, repetition, and unity of intertwined octagonal-shaped units in plan and section.
5.1 Octagon: meaning, link, history, symbolism, and Islam?

5.1.1 The originality of the octagonal plan in Islam

From prehistoric times, numbers and shapes have been seen as symbols that transfer meanings from the superior worlds to the material world. Principles of geometry have been adapted in diverse ways in numerous architectural traditions. Egyptians considered the triangle the most stable structure, so they built their pyramids in the triangle form, the height of the triangle form taking them closer to God. Early Christians associated sphere or circle with the heavens and square with the earth. Even Buddhists and Hindus in southeast Asia had symbolic associations with various geometric forms they used in their built structures.

Geometry is said to hold an intrinsic importance in Islamic architecture and art, in which its development is held in Islamic philosophy and the Islamic way of life. It is regarded as the manifestation of divine and rational thoughts. Islamic geometric patterns have historically been considered a reflection of cultural tendency. The architecture of Muslims, derived from the text of the Holy Quran is based on human being’s spiritual pursuit towards the creator, the divine, present in all dimensions and behaviors, man’s spiritual activism towards the origin of creation present in all measures and actions. The belief of Islamic architecture lies in art directing and leading one to God, encompassing the forms of divine manifestations, and keeping the self aside. Thus, traditional Islamic architecture sees flexible adaptations of the rules of geometry in establishing general guidelines rather than specified principles of design.

In the article, Spiritual Search of Art in Islamic Architecture, by Sayed Ahmed, the author quotes, “Islamic art is the art which adheres to Muslim aesthetics, regardless of the various geographical and national influences that have a bearing on it.”

geometric shapes and patterns in Islam, the author details that the geometric patterns followed in Islam embody the idea of negative and positive space, where the sense of cosmic harmony is inspired by the fact that for every negative, there is a corresponding positive. The importance of repetition and rhythm in Islam is attributed to Allah’s infiniteness. “The pattern...without a beginning or an end, portrays this sense of infinity and is the best means to describe in art the doctrine of Tawhid (Divine Unity)”\textsuperscript{266}

“The most common regular polygon in Islamic art design is the octagon. ... The regular octagon, which is a fundamentally important element of the Islamic art design, has been widely used as arithmetic objects in algebra along with other regular polygons in Mesopotamia.”\textsuperscript{267} The octagonal star shape is an adaptation of the Islamic symbol of overlapping squares. The octagon is a Qur'anic symbol of Paradise in Islamic architecture, such as in the Taj Mahal. Once that symbol serves as a foundation for reflection, there is no limitation to the spiritual insights that can be gained. The shape, unity, and centrality of Islam based on the Qur’an encompasses the entire reality and philosophy of Islam.\textsuperscript{268}

In Islam, numbers are considered spiritual images formed as a result of the recurrence of unity embodied in the human mind. The connotation of certain numbers and certain geometric shapes in Islam have been related to the Pythagorean system in which numbers are not solely defined through mathematical formulas; instead, they are qualitative in addition to being quantitative. Each number in Islam has an inner symbolism that distinguishes it from other numbers and links it continuously to its source, as per some beliefs.\textsuperscript{269}

\textsuperscript{266} Ahmed, “The Spiritual Search of Art”, 4.
\textsuperscript{268} Yahya Monastra, Theology: The Kabah as an Islamic symbol, \url{http://www.mwcoalition.org/id55.html} (accessed December 15, 2021).
\textsuperscript{269} Nazli Ganizadeh Hesar, Nasim Najaf Kalantari, and Mortaza Ahmadi, “Study of Sacred Geometry in Islamic Architecture” 36, no. 3 (2015), 3811.
5.1.2 Symbolism of geometric shapes, octagon, and the importance of the number 8

Talking of symbolism, in the research titled “Study of Sacred Geometry in Islamic Architecture,” authors start the discussion with “symbolic and esoteric ontology being as old as human thinking.” Historically, we have seen symbolism in the built environments starting with prehistoric caves of the cro-magnons. Timeless faith in animal spirit has been seen magnificently as paintings in the caves of primal hunters for whom the wild beasts meant existence as food and life force. Ideas of symbolism have been shared by scientists at two levels. Where the first level focuses on the symbolism of existence based on logic or reality and reasoning, the second dwells on symbolism as a means of relaying the expression from one region to another.

Goethe describes the function and duty of symbols to portray something special. It is the symbols that guide humans toward the perception of the artwork as per Goethe. In Islam and Islamic thought, symbolism is not considered confined to any specific area or action; instead, it is a manifestation in each moment, each activity, each action, and all aspects of life, taking into account the definitions it provides for each component, existence, world, and human action.

The roots of Islamic urbanization are considered sacred architectural spaces. Architecture as an art in Islam is considered to satisfy the pure, spiritual aspects augmenting and enhancing the material, and superficial aspects and needs of humans. Nasr describes the Islamic spiritual dimension as the source and authority of Islamic art and advises seeking this connection from within the Quran itself. Architectural spaces should be designed with the rich Islamic concepts extracted from the Holy Quran and expressed through architectural form. In Iran's Islamic

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270 Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3811.
271 Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3800.
architecture and the geometry that comes from it, every shape and pattern has a spiritual meaning, no art form is meaningless shapes or patterns.\textsuperscript{272}

\section*{5.1.3 KA’BAH AND OCTAGON?}

In Islam, Ka’bah represents a symbol of Islam as a whole. The whole reality and doctrine of Islam are summed up in its shape, its unity, and its centrality. The Ka’bah is considered a meta-cosmic symbol. Its crystalline shape recalls the symbolism of crystals transmitting light, retaining the purity of the transcendent.\textsuperscript{273}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{kabah.jpg}
\caption{The Ka’bah.}
\end{figure}

Islam considers space formed by the holy Ka’bah’s presence as a qualitative space, encircling altitude and azimuth, latitude and longitude, ordinate and abscissa, right ascension and declension - all dimensions of the world. All forms of the associated spaces (triangle, square, and circle) and realization of the ideal world.\textsuperscript{274} The basic geometric shapes of a circle and a square are used for the formation of Ka’bah. The four corners of the Ka’bah are regarded to model an

\textsuperscript{272} Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3801.
\textsuperscript{273} Monastra, Theology: The Kabah as an Islamic”. (accessed December 15, 2021).
ideal mosque with a square construction, consisting of triangles, an octagon, and a dome. This heavenly model is believed to have been derived from Prophet Mohammad’s vision. Where the geometric shapes represent and depict the presence and beauty of Almighty God, the symbolic language is considered to represent the geometric structure of the universe and the relationship of its elements.275

Among the various expansions of the Ka’bah complex, the first Saudi extension was sponsored by King Abdul Aziz (1932-1953) between 1955 and 1973. Under this expansion, each of the four minarets erected had two octagonal balconies decorated with colonettes.276 As a part of the expansion project at the holy Kabba undertaken by the Saudi government in 2015, the Great Mosque or ‘masjid al-haram in Makkah had a ceremonial octagonal-shaped dome roof added. This became the world’s largest sliding roof that could be moved over the roof deck for natural ventilation.277 The expansion of the Mataaf (the circumambulation areas around the Ka’bah), as a part of the final phase of expansion of the Mecca complex is also in octagonal shape as shown in Figure 73, Figure 74, Figure 75, and Figure 76 below.

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Figure 73. Shows the largest sliding octagonal dome roof in the grand mosque expansion.

Figure 74. Shows the view of Masjid Al Haram expansion.
Figure 75. Shows the octagonal shape in the Ground floor plan for Masjid Al Haram expansion.

Figure 76. Shows the first, second, and third phases of Masjid Al Haram expansion.

Islamic architecture developed due to the growing introduction of Islamic principles into the area of architecture. Seyyed Hossein Nasr emphasizes that “by increasing the culture level of
people and perspective of Muslims and increasing the progress and understanding of Muslims, Islamic architecture has been developed toward the meaning-oriented course.”

Tavani Golani details that according to the symbolism, geometrical shapes, and proportion in Islamic architecture, “the hierarchy of the universe begins with God and ends with creatures including elements that have eight characters.”

Not fully convinced of the importance of the octagonal shape, I dwelled further into the research looking for more significance related to this particular geometrical shape and number 8, and found very significant information on the importance of the number 8 in Islam. Let’s look at the significance of the number 8 associated with the octagon in Islam in two examples - the Dome of the Rock and the Soltaneih Mosque, both of which are considered key monuments in Islam.

5.1.4 Dome of the Rock - number 8 and Octagon

Dome of the Rock, also referred to as Qubbat al-Sakhra is an octagonal structure, revered and esteemed by Muslims as much more than a mere structure, for they consider it as the spot from which the Prophet Muhammad ascended to Heaven. The octagonal structure is constructed on an elevated platform in the center of Jerusalem's Temple Mount.

The uniqueness and revere of the Dome of the Rock as one of the earliest existing structures has been well documented in many Islamic pieces of research. Some consider its octagonal shape as a transitional form of geometry between a circle, which traditionally has been considered to represent heaven, and the square considered as representing earth. For many

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Muslims, it represents Muhammad's ascent to Heaven. It has served as a spiritual center for Muslims since it was built. The octagonal shape of the Dome of the Rock symbolizes the wholeness and balance essential to the Muslim faith.

Figure 77. Shows octagonal plan and section showing various geometries of the dome of the rock.

The Dome of the rock has been cherished by Muslims for its symbolic meanings. The inscriptions and location of the Dome also refer to the earliest records of coming to light of
Islam, how Muslims initially modeled their religious identity, within themselves as well as in comparison to the Jews, and Christians.\(^{280}\)

In the book “Symbolism of numbers and shapes in geometry and proportions of Islamic architecture”, Genon dwells on the secrets of the octagon and deems it as a bond between spiritual and temporal, serving to transform square to a circle.\(^{281}\) In Gnostic cosmology, the octagon is considered to correspond to the middle ages and the constellations of stars. The number eight is considered as the one that has passed through seven heavens, hence considered as the number of paradise. Muslims believe in the throne that surrounds the world being held by eight angels. These eight angels correlate to the eight spatial regions and alphabetical groups of the Arabic alphabet.\(^{282}\)

It is also believed that the symbolic value of number eight in Christianity is what influenced the octagonal elements in the Islamic designs.\(^{283}\) “The eighth day is the eternal day, sanctified by the Resurrection of Jesus. Octagonal monuments are thus inherently an interpretation of the Resurrection.”

The octagonal form of the Dome of the Rock has been said to be based on geometry’s philosophical dimension and understanding rather instead of just as a form fulfilling the functional requirement or based on precedents. Yet, some of the previous studies on the topic suggest that the design of the monument is a continuation of the Roman and Byzantine architecture of the area. Yet, the general impression given by the previous studies on the subject


\(^{282}\) Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3809.

is that the monument's design shows a continuation of the preceding Roman/Byzantine architecture in the region.  

Octagons became a symbol of perfection, symmetry, unity, and harmony in Islamic art and architecture because of the perfection of their symmetry around numerous axes. This perfection and symmetry have been related to the heavens as per the researches based on Islam. Al-Hamad describes, “Several verses of the Qur’an mention ‘heaven’, ‘paradise’ or ‘garden’ as the place of eternal life hereafter for ‘those who believe and do deeds of righteousness’ (4:57) suggests that the general theme for the design of the Dome of the Rock was to portray the symbol of paradise.” Many of the elements included in the Qur’anic description of paradise like trees, fruit baskets, precious jewels, pairs of wings suggesting angels, and the octagonal plan has been used in different forms in the Dome of the Rock. 

Numbers have been used by most of the world’s civilizations, whether Sumerians, Persians, Egyptians, south-east Asian cultures, and various other ancient nations and religions, as a symbol that defines and transfers the concepts of the great world, a realm unknown to the realistic, man-made world. The mythologist JanShuvalieh in an extensive discussion on the meaning of symbols, thinks that a symbol is more than a simple meaning, interpretation, or sign. Numbers have been associated with varied symbolic meanings in different nations and communities, and he considers this symbolism full of effectiveness and dynamism. Nonetheless, they all contain mysterious, mental, abstract, and metaphysical concepts. Each number corresponds to a symbol found in the architecture of historic buildings in relation to the community's culture and religion.

287 Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3802.
The outer octagon's eight different corner points aligned with the eight construction axes and extremely high central portion capped with a dome produce an arrangement that exactly shows an image given in Surah Al-Haqqaverses 15 to 18 of the Qur'an.

5.1.5 SOLTANIEH MOSQUE: Number 8 and Octagon

Soltanieh Mosque and dome with the octagonal plan and eight pillars is another representation showing the importance of the octagonal shape and number eight in Islam. It is considered as a symbol of recreation depicting "the eternal swing of the heavens." It has been considered equivalent to temperaments and the secret of the octagon has been discussed as between spiritual and temporal, something which has been the medium of converting square to circle.

The geometry of eight is embedded vividly in the plans and sections of the Soltaniyeh Monument. There are eight minarets, eight arches with eight high vaults in the interior, traditional geometric courtyards, and an assortment of geometric patterns seen in inlays, screens, floors, dome, and even in bricklaying.

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288 Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3809.
The eight paramount minarets support the roof providing it the static stability, giving symmetry to the structure, and tackling the thrust forces. The octagonal dome space flanked by eight piers and eight high vaults provides support to the dome finished as an octagonal ceiling in the interior.\textsuperscript{290}

Figure 79. Shows the 3D model for Soltaniyeh building marking the octagon shape, the red color shows the octagonal form and the arrow points to the eight vaults.

5.1.6 Functional and semantic requirements of the octagonal form in Islam

In Iranian architecture, geometry, and structure play a crucial part in achieving the spiritual characteristics and functions of the architectural form. Islam regards unity, forgiveness, and justice, as the primary attributes of beauty, which are embodied in the art forms of unity, harmony, and perfection. That's because, in Iranian architecture, the way structural elements are put together shows the idea of unity through balance and pure geometric form.

The expression of the concept can be seen in the way traditional dome houses put together their structural elements. The same is the case in the Soltaniyeh building, where the eight high vaults under the dome atop an octagonal form create a monolithic dome house. The surrounding traditional elements, like the minarets in the perimeter, contribute to the overall

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unity and help achieve balance in the overall composition which is what El Kafrawi has tried to achieve as well by surmounting wind towers along with the octagonal classrooms.

Figure 80. **Left:** The above plan shows the octagonal module surrounded by wind towers (marked by blue square), the red color lines showing the octagonal form, and the repetition of components.

Figure 81. **Right:** The above plan shows the plan of simple geometric shapes in the Soltaniyeh building marking the octagon shape, the red color shows the octagonal form and repetition of components surrounded by minarets (Marked by a green circle). The arrow points to the eight vaults.

Rapoport stresses that religion forms an essential part of any cultural setting. Thus he considers it to be the most powerful force leading to the symbolic nature of buildings. If we compare the octagonal forms of the Dome of the Rock and Soltanieh mosque to the octagonal classrooms and supporting minarets and peripheral areas to the wind and light towers of the Qatar campus, a very clear and precise picture is seen with the same unifying factors, balancing
elements, and defining forces even though the elements have been manifested in different built environments.

Do we still think of the octagonal design of the classroom module in the Qatar campus as a design coincidence on El Kafrawi’s part? The connection and association to the historical representation of the symbolism of Islam in this geometry are vividly clear. Undoubtedly, it can be inferred that the form of these classrooms holds special meaning, association, and a robust link to history, identity, and religion and expresses clear symbolism holding multiple layers of meanings in just the form. “...Higher levels of meaning are more culturally determined since appropriate associations need to be elicited and the object needs to be read”293 “The function of symbols is thus communication….and symbol systems give concrete expression to concepts of values, meanings and the like.”294 This identification, and association, as per Schulz, is what gives a special character to the environment.

Rapoport has stressed symbolism, identity, and historical association as aspects of culture giving meaning to the environment. “The critical point to think about is that .....they all communicate identity, status, and the like, and through this, they establish a context and define a situation.” Norberg-Schulz describes this “symbolization”, and “visualization” as the processes that translate these meanings of the man-made place to become a microcosmos, the way man “builds” his world.

5.2 Octagon as space form unit: advantages and flexibility

As per Kafrawi, the octagonal classroom is a modular unit that can be used in any number and kinds of combinations. The octagonal shape of the lecture rooms enables a variety of teaching approaches to be used. The lecturer may position himself in the center of the room,

293 Rapoport, Human Aspects of Urban Form, 57.
294 Rapoport, Human Aspects of Urban Form, 319.
establishing a close relationship by limiting the distance between himself and any student in the
class. The lecturer may stand on one side of the room, facing the students, as is a typical way of
arrangement.\textsuperscript{295} The clustered octagonal module is very reminiscent of the organization of
Bedouin tents (see Figure 82 A & B. below), organized around a central communal area. The
idea of a communal kitchen, everyone gathered together and eating from a family platter sitting
on the floor (as shown in Figure 82C. below showing the Shammar tribe, Nafud Desert, Saudi
Arabia), who still eat the main meal of the day communally, is also implemented by El Kafrawi
in the community kitchen on campus. Segregated areas for men and women allow even the
professors gather in the communal dining

\textsuperscript{295} El Kafrawi, “Gulf University: State of Qatar”, 2.
Figure 82. the similarity of organization around central space, bedouin tents, classroom modules, and eating tradition.

Under the concept of EBS, Rapoport introduces the concept of open-ended design - a design that determines certain parts of the system, at the same time allowing other parts, even unforeseen ones, to happen simultaneously. As per Rapoport, the open-ended design creates
environments that allow more degrees of freedom. The octagonal-shaped classrooms provide ample possibilities for the way instruction and events can happen and also how many events can take place simultaneously, definitely fitting the open-ended design description.

“Open-endedness also corresponds with the idea of "functional" flexibility. This is a potential advantage...”296 Elaborating on this concept, Rapoport stresses that the environment can also be evaluated in terms of the extent to which they do or do not permit freedom of action, involvement, creative adaptation, and modification. The flexibility that is allowed by the various settings of the octagonal classrooms comes across the users of the campus as an active and positive modification, definitely forming an example of a creative adaptation of the traditional form. This further reinforces a point made by Rapoport that for a built environment to have flexibility does not mean that they have to lose their meaning. “... designers-even when they stressed physical flexibility-seemed strongly to resist giving up meaning.”297

Even though Kafrawi thought of the classroom plan keeping in mind the constraints of natural ventilation and indirect lighting, he kept the future flexibility of use and variations in focus when he said, “The octagonal plan is extremely flexible in massing, and permits extension to the existing buildings in any direction without external constraint on ventilation or light sources.”298 Rapoport uses the terms loose fit, flexibility, adaptability, and responsiveness to describe these open-ended designs that can be molded with ease with time which is clearly seen in the design of campus modules by El Kufrawi. The flexibility of the octagonal classrooms is shown in the Figure 83, Figure 84 and Figure 85 below.

296 Rapoport, Human Aspects of Urban Form, 357.
Figure 83. Octagonal classrooms in Qatar University campus.

The lecturer could be teaching in a traditional position from the side of the room, facing the class, still not too far from any class member.
The room could be divided in the middle into two or four quadrants as per the need. Different activities could be held in the divided spaces by the same or different instructors extending the use and variety of uses of the octagonal-shaped classroom.
Figure 85. Different arrangement of octagonal classroom spaces in Qatar University campus.

Figure 86. Plan shows one of the seating arrangements in the classrooms in Qatar University campus.

The octagonal-shaped educational module could be combined with the rectangular lobby to extend the scope of use of spaces even further to hold events, exhibitions, and presentations.

“*The ability to understand and synthesize complex, diverse inputs across many disciplines into*
one compelling, immersive experience is the magic and meaning of design.” The same immersive experience has been provided by El Kafrawi in these thoughtfully designed classrooms, which takes into account all aspects of users’ comfort, and a strong link to the space they are in.

Figure 87. Shows the arrangement of the octagonal classroom extended into the lobby.

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5.2.2 Climatic advantage of the Octagon and dome-form roof:

The distinct geometric shape of the classrooms, in conjunction with the colors of light desert shades, distinct wind and ventilation towers that have been specifically and indigenously designed to encourage air circulation and decrease humidity lead to careful consideration by the architect of the local weather pattern and environmental factors. In Kafrawi’s words, “the classrooms also accommodate and blend thermodynamic and construction principles, while providing versatility in teaching methods making these classrooms fulfill not only environmental needs but academic goals of excellence.” The thermodynamics of these classrooms is attained through the specially designed wind towers, as shown in Figure 88 below. Each of the Octagonal modules is topped with a four-sided wind-catcher in the form of a rotated square (more details on these wind towers or wind catchers are in (chapter 5: paragraph titled Wind towers, page186 above). These wind catchers seize the high winds through the openings at the top, and the vertical panels direct them through the rooms exiting through the internal courtyards after providing ample cross ventilation through the living spaces.

Figure 88. Shows the ventilation of classroom spaces through the wind tower in Qatar University Campus.
The geometrical layout of the octagonal shape allowed for easy addition of square structures, which Kafrawi designed into lobbies as light sources, thereby indirectly lighting the classrooms. The planar dome in the roof allows for the addition of cubic structures on top that act as light sources, providing diffused overhead light, and avoiding the direct harsh sunlight in the classroom spaces as shown in Figure 89 below.

![Figure 89](image)

Figure 89. Shows light coming from the wind towers through the classroom.

### 5.2.3 Why Dome form in the campus- links to history?

Domes and dome forms have historically been used extensively in built spaces of various eras and periods. As a structural element, it changed shape, functions, and materials with the advancement of the human race. Variations of dome structures as mounds were used in prehistoric times for sheltering and as tomb markers. In the ancient Middle East and the area around it, it was modified to be used for granaries, mastabas, and tent structures. In the early Imperial period, domes formed the structure for hot baths to maintain the heat in the space.\(^{300}\)

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\(^{300}\) Souktik Bhattacherjee, “Evolution of Domes in Architecture - RTF: Rethinking the Future,” (RTF | Rethinking The Future, December 13, 2021),
The dome form became a well-known Islamic architectural element starting with the tomb of Muhammed B. Musa and the Great Mosque of Qom of the early Islamic period. To have a dome on squinches covering a regular octagonal base became a regular practice of dome building in Islamic architecture, starting with the Samanid Mausoleum in Transoxiana.\textsuperscript{301} The dome architecture influenced different regions of the world, and the form continued to evolve based on the requirements and developments.

Many parts of the Iranian plateau faced a scarcity of wood as the building material due to which, domes and dome forms became a meaningful part of the area’s vernacular fabric. Dome was associated with royalty not only in mosques but in churches as well. “The invention of the squinch enabled the transition from the walls of a square chamber to an octagonal base for a dome moving the form to the forefront of Islamic architecture.”\textsuperscript{302} The first building built with the octagonal base squinch was the Samanid Mausoleum in Transoxiana which led to dome building as a standard practice. Because of the transcendental symbolism of the dome, it became one of the most essential elements of the Islamic Architecture.

In a research article titled “Computational Analysis of Natural Ventilation Flows in Geodesic Dome Building in Hot Climates,” the authors list the results of various research on the thermal advantages provided by dome roof forms. The structure of the dome with a self-supporting arch and vault benefits the overall built form by easing the loads. It’s considered easy to build and also provides thermal advantages as well as the use of local materials. Thus, multiple advantages provided by the dome forms have made them an integral part of traditional architecture, especially in the hot and arid regions of the Middle East, where they have been

\begin{itemize}
\item KRE8 Dome Housing, \textit{No Place like Dome}, (2017), 20.
\end{itemize}
prevalent forms for centuries. Thus, where domes were used as an element to span and cover
uninterrupted religious spaces, they were very commonly used for their energy-efficiency
advantages. They could maintain heat; they could easily cool the interiors as well along with
providing well-ventilated and well-lit areas, they were strong, durable, weatherproof, and easy to
maintain. They also provided glare-free, brilliantly lit spaces and lightened loads of otherwise
massive structures.

Domes became a popular choice for large built forms needing large distances of travel of
sound for the volume of space they engulfed. The volume allowed air to circulate efficiently,
especially in hot regions while the volume they enclosed, especially over prayer halls of the
mosques, allowed the required amplification of one’s voice especially considering the times
when microphones were not prevalent, as shown in the Figure below. “Spherical shapes cover
the greatest amount of space with the least amount of materials, giving domes the most favorable
ratio of surface area to volume of any structure. Because there is less surface area, not as much
heat escapes in the winter or seeps in during the summer.” There is typically a minimum of
30% less surface area in a dome than in other comparable structural shapes. This reduced
surface area can increase the energy efficiency of domes, as they can require 30% less energy for
heating and cooling.”

Advantages of dome roof for hot, arid regions in traditional houses to combat harsh weather.

In the same article researching the natural ventilation of dome structures in hot climates, the author lists several studies that have looked into the thermal capabilities of dome roofs to keep the spaces cool in summer. The investigation of those studies cites various reasons for this, such as thermal lag due to the application of stone and adobe as thermal mass, resulting in a significant day and night temperature difference. Another reason for this cooling performance of a domed roof is the reduction of directly exposed surface area to solar radiation and hence heat gain by one-third compared to a flat roof.\textsuperscript{307} In conjunction with the roof vents, the piled-up ventilation worked to let the rising hot air escape through, which is what is seen in traditional wind catchers. The hot air got replaced with fresh cool air channeled into the interior spaces with the help of peripheral openings at lower levels, as seen in the Qatar campus as well. Another reason for the cooling performance of domed roofs has been cited by the study as the process of exhausted, hot air being trapped at a level higher as opposed to a flat roof due to higher interior height, hence leaving the lower zone cooler. The wind-induced ventilation, its performance, and the pressure of airflow around the domes and domed roofs became a topic of research in recent

\textsuperscript{307} Hughes, Calautit, and Abdul Ghani, “The Development of Commercial Wind”, 617.
years. Faghih and Bahadori applied analytics to study if the domed roofs provided thermal satisfaction in warm weather. Various parameters were taken into account like the amount of solar radiation, amount of heat exchange between the ground and the sky, the flow of air around the domed roofs, as well as structural openings. Domes finished in ordinary material as well as glazed tiles were into consideration. The study found better thermal conditions provided by domed roofs, even more so by the ones covered with glazed tiles. The study also found domed roofs in conjunction with the vents and openings, caused passive airflow inside the building, hence meeting the thermal comfort levels.

Another research study took into account airflow and interior temperature to analyze and compare the performance of the flat versus the domed roof form. The study was done in the arid and semi-arid climate of Tehran using mathematical and CFD analysis as tools. The results showed the interior area of the domed roof at a temperature 8 kelvin lower than the temperature of interior spaces with a flat roof. In addition, compared to the flat-roofed region, the pressure differential between the windward and leeward sides of the domed roof was greater, resulting in improved airflow patterns. Both heat gain and loss numbers came out lower with the domed roof than with the flat one.

Not only for thermal comfort but the dome roof form atop these octagonal classroom modules also provides an advantage in the overall sound quality in the space. The multiple reflections of the lecturer’s voice off many surfaces dampen the echoes, thus providing good acoustics without the expense of sound insulation. Regardless of the combination of seating in the classrooms, the sound quality remains the same, which is a big advantage in these rooms and one that is an extremely important factor for classroom design. Rapoport describes sound as a

308 Soleimani, Calautit, and Hughes, “Computational Analysis of Natural Ventilation”, 3.
309 Soleimani, Calautit, and Hughes, “Computational Analysis of Natural Ventilation”, 4.
sense which is unfocused and fluid and which emphasizes space rather than objects as compared to vision. “Without sound, visual perception is less contrastful and less informative.”

In a study done to analyze the impact of dome shapes on acoustic performance, four typical architectural and traditional dome shapes were taken into consideration - Saucer, Drum, Onion, and Pointed domes. The study used the ODEON Room Acoustics Program considering the source of sound (in this case the Imam or prayer leader of the mosque). The evaluation of the acoustic characteristics established the shape of dome as vital, having a positive or negative effect on the sound quality. In the evaluations, both saucer and pointed dome shape numbers showed the optimum acoustic performance meeting the theoretical standards of acoustical comfort. The parameters taken into consideration were Reverberation Time (T30), Early Decay Time (EDT), Clarity (C80), Center time Ts), Sound Pressure Level (SPL), and Speech Transmission Index (STI). The findings conveyed saucer and pointed domes achieving optimal and homogenous T30 values, better BR values, and short EDT values keeping the sound strong and clear. Small reverberated spaces and best choral and speech Ts were also obtained by these dome shapes. Even the STI index showed better performance by saucer and pointed domes, hence concluding that these dome forms provided optimum acoustical performance along with achieving better distributions of all acoustical parameters.

Even though research needs to be done specifically to gauge the acoustic quality of these classroom modules covered by flat dome forms, in personal experience, having attended sessions in these classrooms, it won’t be unjustified to say that the excellent sound quality in any of the seating settings in the classrooms makes these classroom spaces into an enriching experience. If sound quality and good acoustics were absent, the experience of being there won’t be immersive

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for an individual, the body will not respond with comfortable participation, the mind would lose its focus, and the fluid vision will wander off on objects, and textures instead of the space itself depriving the body of other sensory experiences as well. “Sounds provide an important link to reality, are enriching and protective.”

In addition to the structural advantages, domes, and tent canopies have been associated with different symbolic ideas in different cultures. In Ancient Persia and the Hellenistic-Roman period, they were associated with the heavens. The geometric significance of a dome on a square base was represented in the structure's design. The circle was symbolic of perfection, eternity, and the heavens. The square symbolized the earth. Dome in the mosque signified the representation of the vault of heaven as the direction of prayer symbolized Allah's universe. It acted as a symbolic representation of the vault of heaven in the mosque, reinforcing the notion of a centralized and singular power system. The dome became one of the most important architectural elements in the architecture of mosques in particular, and Islamic architecture in general, starting with the Umayyad period in Jerusalem in 691 AD.

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311 Todor Stojanovski, “Typo-Morphology and Environmental Perception of Urban Space” (Russia, Krasnoyarsk: KTH Royal Institute of Technology, 2018), 1.
Figure 91. Qatar University campus image showing clusters of flat domed roof modules providing magnificent roof outline.

Figure 91A Images A above and below B show the distinctive rhythm of planar dome form used within the octagonal module in Qatar campus.
The polygonal shape of the octagonal classroom and its multi-pitched roof provides the advantage of reducing exposure to direct sunlight, as explained above, on any one surface because the structure shades itself. This limits heat absorption as a result by each surface and hence limits the heat transfer to the interior spaces making the whole design scheme work to channel the harsh climate in favor of users of space.

Taking the example of the mosque of Isphahan, Rapoport describes the purpose of a structure that incorporates sensory modalities - color, materials, scale, light, shade, sound, temperature, etc., as achieving a meaning, an associational goal. In the case of the mosque of Isphahan, he describes the goal to “give a vision or foretaste of paradise, both in terms of the characteristics imputed to that place and in terms of the characteristics of the surrounding urban fabric.” “Sensory variations are very much a fundamental part of human existence that holds the responsibility of providing a great, good, or bad experience.” The blend of thermodynamic and construction principles in the classrooms, while providing versatility in teaching methods makes

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these classroom modules as structures full of life and ‘soul’, invoking all the senses, fulfilling environmental needs as well as academic goals of excellence. “Zumthor explains that unless the structure has a certain ‘character’ if it does not make people feel inspired or fascinated, it will be a building with no “soul”. The octagonal classroom modules thoughtfully incorporate modalities as discussed above, giving them a ‘soul’, but the multitude of meanings through associations, history, and tradition, as discussed below give these unique structural modules an opulent character.

The use of dome form to top the octagonal classroom module by El Kafrawi definitely gives it a strong meaning, explicit symbolism, and a lucid non-verbal cue as defined by Rapoport that projects the compelling meaning of this design element. It also provides a visual cue that users can identify with in conjunction with Islam and mosques, are used to it in their environment, and can very well relate to its meaning and symbolism.

“A work of art is any artifact in the presence of which we play a particular social role, a culturally transmitted combination of patterns of behavior.”

The creation of a successful structure can be experienced depending on the reality of its environment (the materials) as well as imagination. When designing a building, the terms place and purpose are significant. These aspects determine the sensory architectural nature of the building and what feelings exactly the architect intends to evoke when a person looks or lives, or even works in the structure. Clearly, the octagonal form of the classrooms and the number eight hold a magnitude of historical meanings and linkages carrying a load of symbolic meaning in the built environment at the Qatar campus.

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5.3 WIND TOWERS

The wind towers have been a conventional system of ventilation in the Gulf region. In traditional architecture, this cooling system known as the wind catcher or wind scooper which did not rely on conventional energy was considered to be the most important since it cooled spaces in an innovative way in the hot desert regions. People in the Middle East have been using this system to combat harsh weather conditions for over three thousand years. It came to be known by different names like Badgir, Malqaf (also spelled as Malghaf), depending on the area or district. Traditionally, the design of the windcatcher, including its height, number, and position of its openings, the cross-section of the air channels, and even the position of the tower, was a result of the landlord’s wealth, social standing, and the experience of the builder or architect.319 According to academics and scholars, the design of this device in a range of shapes and technological aspects dependent on environmental conditions demonstrated the breadth of architectural vision and innovation.320

Windcatchers were designed as tall structures with a height between 3 and 33m (9.84 feet and 108.26 feet) placed either on the roof of the building or as a separate structure adjoining the main building. They were often shaped as quadrilateral or polygonal turrets higher than the rest of the house according to the size of the household. More number of people in the household meant a larger wind catcher to let more volume of air into the house. The ventilation system relied primarily on airflow via pressure difference and secondarily on airflow by convection.321

321 Pirhayati et al., “Ancient Iran, the Origin Land of”, 435.
Windcatcher, as an architectural feature was designed to force the movement of high-pressure winds into the interior spaces of the structures. It was known in Bahrain as "cashteel", and in Imarets as "Barjeel", in Qatar as "badkeer" or “badgir” (spelled different ways), and in eastern province of Saudi Arabia, in Alhasa as "badjeen". Fomed by two Persian words; “Bad” meant air, and “keer” meant to catch or take, the basic composition of these towers included a group of vertical ducts with usually two interior diagonal walls, sometimes varying in shape, the whole scheme surrounded by four walls, forming a polygon. The basic tower form was made up of three parts - a solid bottom part, known as the “tower base,” middle, “tower body,” and the top known as “Alttaj,” meaning the crown (see Figure 92 below). Whereas sometimes windows were inserted in the tower base, the middle part, containing three or more rectangular units showed off the traditional arches and ornamentation, while the top was usually simple ornamentation. The tower base constituted the biggest area to allow for more wind into the base through the openings, at the same time obstrucing the penetration of sand and dust. The internal surfaces were treated with appropriate material depending on the region either to absorb the excessive humidity and allow for replaced drier air or to add moisture into the dry air for cooling.

Figure 92. The image above shows the main components of the wind tower.

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The wind catchers were traditionally designed as unidirectional or multidirectional (two, three, or four-sided with square, hexahedral, or octagonal plans as shown in Figure 93 below), depending on the prevailing wind. Regions in the Middle East with a permanent prevailing wind fully utilized the unidirectional wind catchers, but in areas with unfavorable wind directions, one-sided windcatchers did not function well.

Figure 93. “Sectional plans of five typical Yazdi wind tower types.

A. Unidirectional
B. Two directional
C. Four directional
D. Octagonal with two vents on each side
E. Four directional with two “false” vents on two opposite sides”
5.4 Working of Badgir to combat wind factor in air movement

The scientific explanation behind the working of this traditional ventilation system has been well researched and documented. Vents or slots in the windcatcher admit the wind, deflecting it down a shaft and reaching the lower floors where there is an opening, and the wind can directly reach the level of a sitting or an asleep person, as shown in Figure 94 below.

![Figure 94](image)

Figure 94. The images above explain an illustration from Dubai, United Arab Emirates, for the Badgir.

The inlet openings of the windcatcher are at a higher level to take advantage of the stack effect (buoyancy effect), similar to the functioning of a solar chimney. The difference in air pressure on the windward and leeward sides of the building guarantees air circulation. Even if the air entering the interiors is at a higher temperature than the existing warm air, the constant flow of air, moving and replacing the existing stale air still results in a cooling effect. Thus, traditionally, water vessels or damp straw mats inside the shaft were also in parallel to increase
and enhance this effect. Thus, the windcatcher fulfilled two vital functions related to effective ventilation - bringing fresh air inside the building and removing hot and polluted air. The simple scientific fact of air moving from a positive pressure area to a negative pressure area also explains the ventilation provided by the windcatchers. Thus, the opening facing the direction of wind absorbs the air into the inside of the building, and the existing interior air under negative pressure departs from the exit of the windcatcher, as shown in Figure 95.323

![Wind effect on Wind-catcher.](image)

Figure 95. Wind effect on Wind-catcher.

![Image showing airflow and pressure changes for the wind.](image)

Figure 96. The image above shows the airflow and pressure changes for the wind.

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In another research study done to analyze the efficiency of windcatchers, the measured readings showed that when the outside temperature was at 31°C, the interior temperature of the office spaces was a more comfortable 25°C, especially on the ground floor. Not only for thermal comfort, windcatcher has also been proven effective in studies for improved air quality due to a decrease in the level of CO2 concentration. In one of the studies exploring indoor air quality and temperature in a room with a square windcatcher versus another room with a conventional window in the UK, it was found that the room with the windcatcher had a 3°C lower temperature in summer than the external temperature. CO2 levels also had lower values in the room ventilated by the windcatcher measured during different summer months of the year.\textsuperscript{324}

The windcatcher thus is very useful in preventing sand and dust from entering the interior areas, enhancing the interior air quality, which is common in the winds of hot dry climates. The bottom of the shaft helps to discharge much of the sand that does manage to enter through the

\textsuperscript{324} Nejat et al., “Windcatcher as Sustainable Passive Cooling”, 3.
inlet openings. Its significance is especially apparent in congested cities with warm, and humid conditions, where air circulation is needed most for thermal comfort.\textsuperscript{325} The windcatchers were often built with wooden sticks protruding from their sides, which were utilized not only for maintenance purposes but also to mount cloth for a more effective channel of airflow.\textsuperscript{326}

Figure 98. The image above shows how the Malqaf and Tower Escape make the air flow inside the building.


Figure 99. Show an illustration of traditional malqaf from Dubai, United Arab Emirates.

<table>
<thead>
<tr>
<th>Figure 100. One-sided windcatcher.</th>
<th>Figure 101. Two-sided windcatcher.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shows the structure and working of a one-sided windcatcher - the incoming wind is grasped through the single opening. It gets channeled into the living spaces, exiting through internally located windows, doors, and vents.</td>
<td>Shows the structure and working of a bi-directional windcatcher—both the openings, in conjunction, suction, and channel the airflow. Compared to the one-sided windcatcher, the incident angle gives the bi-directional windcatcher a principal advantage over the unidirectional windcatcher.</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Figure 102. Three-sided windcatcher.</th>
<th>Figure 103. Four-sided windcatcher.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illustrates the working and structure of a three-sided windcatcher. More openings and the larger windward side of this kind of windcatcher helped capture the predominant wind from three sides. Due to the curved forms of inlet openings, air entering the wind catchers increased in velocity.</td>
<td>Used in areas without a specific wind direction. The design of this kind of windcatcher captured and let the air in from all four directions maximizing interior ventilation.</td>
</tr>
</tbody>
</table>
Figure 104. Hexahedral and Octahedral Windcatchers.

The image shows the tallest traditional windcatcher in the world in the famous garden of Dolat Abaad in Iran, approximately 40 m (131.2 feet) high, octagonal in plan, capturing winds from all directions. Being higher than the other windcatchers, hexahedral and octahedral windcatchers are considered more stable against wind pressures. Their form also helps regulate the airflow with lower pressure.

Figure 105. The image above shows how badgirs were employed as pairs of different configurations to cool underground water tanks.

Hassan Fathy also explained the working of this ventilation system, as shown in the diagram below. The design of the building ensures the circulation of air in the building as well as the necessary loss of heat to give the inhabitants a cooling effect. The design is simple yet precise, taking into account the heat gain through radiation as well as the heat loss through ventilation and how these aspects make the building suitable for its inhabitants.  

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327 Fathy, Vernacular architecture: principles and examples, 24.
Figure 106. The schematic Figure above shows the various modes of heat gain and loss in a structure.

Figure 107. Section showing the working of wind catcher by Hassan Fathy in New Baris.

For the Qatar campus, El Kafrawi also conducted a study of these traditional forms of natural ventilation throughout the Gulf area before starting the campus project. Finding those traditional methods working the best in providing optimum ventilation, he decided to adopt the same methodology integrating it with a modern method of control. In designing these wind and light towers, El Kafrawi focused on natural ventilation and links with the traditional architectural elements for the design. Across the campus, the use of Arabic traditional wind towers was one of
his goals when he said, “I aim to extend the way in which traditional values and lines are expressed architecturally, so as to strengthen the psychological link with the Qatari character and ensure a sense of continuity in the modern environment.”

One of the case studies done by El Kafrawi to understand the cultural concepts, traditions, elements, organization, and spaces was the Mohammed Said Naserallah House of Doha, built in 1920. The house was built during the first quarter of the fourteenth century of Hijra. The very traditional house with rooms organized around the central courtyard represented the prototype of traditional Islamic architecture. The malqaf located on the southwest corner also acted as the main decorative feature of the house.

![Wind tower or malqaf](image)

Figure 108. Shows an aerial perspective of the traditional Mohammed Said Naserallah house with a courtyard and malqaf (Doha, 1920).

While designing the campus, El Kafrawi specifically put the sectional detail of the wind tower that he designed for the Qatar Campus along with the section of the Mohammed Said Naserallah House, showing the similarity of wind towers as shown below.

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328 Udo Kultermann, “Education and Arab Identity: Kamal El Kafrawi, the University of Qatar”, Doha, (1996), 86.
Figure 109. Shows a comparison between the Qatar University wind tower and traditional house wind tower in Qatar.\textsuperscript{329} \textbf{Left}: Qatar University campus wind tower designed by Kamal El Kafrawi.

\textbf{Right}: Traditional wind tower of Mohammed Said Naserallah House.

\textsuperscript{329} Kamal El Kafrawi, “Campus Plan for the University of Qatar,” no. 184 (1986), 125.
In Qatar Campus, these towers form one of the most distinguishing characteristics of the Qatar University campus. The tower's measurement is three meters (9’- 8”') from the side. It expands into space from the ceiling and projects approximately six meters (19’-7”’) above the roof. The towers are constructed with two walls within the tower made of textile that are perpendicular to two wooden beams. These walls divide the tower into four hollow parts. On the outside, each of the four sections opens onto one of the four directions, producing a system of ventilation that captures winds coming from all directions with as much volume as possible. The top of the tower is closed, and each of the four sections can be shut by means of a movable wooden covering generally used in the winter. During my visit to campus in the months of May and June, the cool breeze in the courtyards provided by the convection currents of the wind towers made it a perfect place to catch up with an old friend who confirmed the thermal comfort of the courtyards throughout the year. As per her experience, “There’s always a cool breeze in
the courtyards, making it a perfect place to sit and enjoy a cup of tea while working or socializing with friends or working in groups.”

Figure 112. Shows the section drawings of the wind tower.

Figure 113. The section drawing above shows the detailed section of the wind tower.
Figure 114. Shows Section/ Elevation of Humanities faculty modules in Qatar University.

Figure 115. The images above show the details of the wind tower from the exterior and interior view acting simultaneously as a form of clerestory window providing glare-free light.

El Kafrawi describes the thought behind the design of these wind towers, “the use of traditional textiles should be integrated with contemporary architectural design.” Further detailing the working of the designed wind tower, Kafrawi explains the function of openings in the adjoining walls all around the room to provide free circulation throughout the space. As explained in the diagram above, these openings, being located at one meter (3.3 feet) above the

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floor, provide ventilation for a seated or sleeping person. Further details reveal Kafrawi’s depth of concern for the visual comfort and the created environment, “such openings are small so that the visual barrier between inside and outside remains and that the private, intimate nature of the internal environment is not disturbed.”

The Towers of Wind came into the design with the additional ability of them being remotely controlled to open and close the openings as per weather variations (Figure 114 below shows the remote switch). The remote allows shutting, opening, or adjusting the direction of vertical panels as per the weather to adjust the amount of wind to be let in. These traditionally based modern innovations were designed to serve as perfect substitutes for mechanical ventilation and air conditioning in case of power failure. These very effective Wind Towers also became the basis of ventilation in both lecture rooms and residences on campus, eliminating the need for use of mechanical systems.

In addition to ventilation, openings often serve to allow light to reach the room and to prevent glare and, reduce the brightness of the sun. Another study done specifically on the functionality of these towers in terms of ventilation and particularly illumination levels showed a reduction of light levels by 45% at the higher vertical surface of these wind towers, reducing the glare and intensity from direct sunlight, which in turn indicated tower’s efficiency in reducing the accompanying temperature. The results also indicated an extreme reduction of light levels by 88% at around 2.4 meters (7.87 feet) in the lower portion of the towers, greatly helping in avoiding direct sunlight and high temperatures in the interior spaces. The same study also concluded these wind towers as a modern and clearest representation of functional traditional

331 El Kafrawi, “Higher Teaching Training Colleges at”, 92.
Arab elements which allow for ventilation and contribute to the light performance in the interior spaces.\textsuperscript{333}

\textbf{Wind tower opening covered with glass letting natural light inside}

![Wind tower opening covered with glass letting natural light inside](image1)

\textbf{Artificial lighting}

![Artificial lighting](image2)

Figure 116. Show the interior views of the dual purpose Wind towers that, with the coverings, let the natural glare-free light in the classrooms in addition to providing ventilation.

Figure 117. shows the wind tower remote-controlled to open and close the wind tower according to different seasons and interior views of the dual-purpose wind towers that let the natural glare-free light in the classrooms in addition to providing ventilation.
Figure 118. Showing wind tower in the octagonal module lobby providing ventilation and an even disbursement of light in the area below even without artificial lighting on.

Figure 119. showing the detail of the working of the Qatar wind tower.
In explaining the design thoughts behind these wind towers, Kafrawi stressed on the identification of the airflow pattern all around the building using aerodynamic principles and orienting the entrance effectively for the airflow. A building placed in the wind will generally create a zone of compression on the windward side and a low-pressure zone on the leeward side. Depending on the wind velocity, this low-pressure zone extends a given distance beyond the building, as seen in the image below. Because of eddies formed on the lower surface that interrupt the smooth airflow pattern, the higher the wind velocity, the shorter the low-pressure zone. For average wind speeds, the length of the low-pressure zone is five times the height of the structure.334

Kafrawi’s statements and explanation of the design of campus wind towers do show his depth of understanding, not only of the mechanics of such a system but the understanding of the richness of culture and tradition that was displayed by the Bedouins.

It cannot be argued that these wind towers are very reminiscent of the traditional minarets, symbolic of the ancient Arab forms. I looked at how these tower forms have been used over the years as a part of the traditional building in the Middle East. In trying to analyze the historical aspect, I came across an intriguing link to history.

5.5 Badgir and Arab tents?

Earlier, we looked at the Badu tent as the organizational basis of spaces in the Qatar campus (refer to Chapter 3 under Bedouin Tent- Organizational Basis Of Qatar University). Interestingly, the inception of the idea of developing a mechanism to combat harsh climatic factors in the hot arid regions was also thought of by the Badu men (nomadic Arabs).

A kind of Arab tent called a tepee was also developed by the Badu with wind control flaps as shown in Figure 121 below. This Arab tent used a back strip, which could be moved as needed to either block or encourage the flow of wind. (refer to Figure 121 below)

![Tepee, showing wind control flaps.](image)

Figure 121. Tepee, showing wind control flaps.

Bedouins’ made use of textiles made from sheep and goats’ wool for their tents, which prevailed for thousands of years as part of their nomadic way of life. This "textile architecture"
has traditionally been well adapted to the needs of a Bedouin society. The unique properties of these fabrics helped prevent water, solar radiation, and sandstorms from entering the area.

Figure 122. Showing traditional textile architecture of Bedouins’ tent.

Figure 123. Textiles used to protect the interior from the sun and to direct the force of the wind.

Figure 124. Cane for protection from the sun while allowing the entrance of air.
El Kafrawi also made use of this traditional textile architecture inside the wind towers to capture the wind currents and to regulate and channel their quality and direction. Understanding the practicality, suitability, as well as local production and utilization skills of traditional textile architecture from the study of nomadic Arabs, Kafrawi incorporated these textiles “to protect the enclosed area from water, solar radiation, and sandstorms.” He further covered the openings with perforated gypsum to allow for natural ventilation. In the precast concrete framing, he used a diagonal partition incorporating textile material in conjunction with fixed glazed and aluminum vent panels on the sides.

335 El Kafrawi, “Higher Teaching Training Colleges at”, 91.
Explaining the role of wind in measuring comfort, Rapoport elaborates that wind speed, humidity, and temperature all fall under the concept of ‘effective temperature,’ which is a measure of comfort. When it is cold or dry, wind becomes undesirable, while when it is hot and humid, it becomes essential; thus, comfort leads to either encouraging or discouraging wind, and the most primitive and effective device for controlling the wind is the windbreak or badgir.

Similarly, comfort depends on the right humidity because “temperature and humidity operate together as regards comfort.” Hence where there’s high humidity, ventilation is required to help the body lose heat, and when the humidity is low, humidifying devices and vegetation can help increase it for comfort. The Tower of Winds has been designed by El Kafrawi for enhanced air circulation providing the best natural method of tackling high humidity, which is much needed in the harsh climate of Qatar. The wind towers in conjunction with the adjacent sloping roof, replace the incoming dust-laden hot air current with a cool draft of the clean courtyard channeled back into the classrooms. Explaining the experience and pleasure of how we encounter architecture through our senses, Lupton & Lipps elaborate, “As we pass through a doorway, space hugs us tight and then lets us go. Air mutters through the HVAC system and ripples over our skin…”

Rapoport says that…”the constancy of need, the territorial instinct, and the relation of house to settlement - helps our understanding of the built form.” Elaborating on the instance of constancy, he stresses the value of past solutions since the solutions proposed as novel are often identical to those used in traditional cultures. Considering the invention of the wind tower by the nomadic Arabs and extensive deployment and use of the mechanics and form in various built forms, the wind towers designed by El Kafrawi in the campus not only represent a very creative

338 Rapoport, House Form and Culture, 81.
339 Rapoport, House Form and Culture, 81.
adaptation of the traditional form, but it also represents a very innovative solution, representing the traditional constancy and giving a superior meaning to the built form of Qatar campus. What generally works is what we might call *creative adaptation* - the rejection of some innovations, the adoption of others, and their integration into the cultural system.340

Comparing the octagonal classroom module to the Badu tent, the specifically designed wind towers with the technology that can further regulate the comfort of interior space provide a modern, prolific, and novel reshaping fitting perfectly in the cultural system of the Qatar campus. This adaptation of cultural constancy with the design of these towers projects the value of past solutions. It provides the identity that Rapoport forms as the basis for deducing meanings of the built form. It is another example of the socio-cultural factor seen in the built form on the Qatar campus, which Rapoport has classified as a primary force of the meaning of the built form.

In the research paper “The Measures of Light Performance of Wind Catchers in Hot Climatic Zones by Egal Kkalaf Aljofi,” the study concluded that where the light levels in the wind towers were reduced at the vertical surface on the higher part of the tower as related to the outside by 45%, reducing the glare due to the penetration of direct sunlight, the towers were very efficient in the reduction of the outside temperature as well, thus helping in cooling the interiors considerably. Rapoport says, “the point made is that the meaning of many environments is generated through personalization - through taking possession, completing it, changing it.”341

In addition to the functional aspect of these towers, one cannot ignore the visuals provided by these towers. The very first, very rhythmic and symmetrical view of the campus is projected by the distinctive shape and rhythm of these wind towers, lending it a very unique and

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distinct character, as seen in the images below Figure 127, Figure 128, Figure 129, and Figure 130.

Figure 127. **Left:** Shows the exterior views of the Wind tower.

Figure 128. **Right:** Shows the rhythmic exterior view for the wind towers of the Qatar campus.

Figure 129. Shows the details of the very rhythmic exterior pattern of the Wind towers.
In the article “Study of Sacred Geometry in Islamic Architecture”, authors Nazli Ganizadeh Hesar, Nasim Najaf Kalantari, and Mortaza Ahmadi describe repetition as a spiritual representation of unity manifested in the human mind.\(^{342}\) The distinctive repetitive character induces an element of curiosity with the very first look at the perspective. The eye is a visual touch as it serves as a substitute for the skin. The vision can recognize the feeling of the materials or objects before touching them.\(^{343}\)

In ‘Architecture of Happiness,’ Button credits order in architecture as the fundamental quality contributing to the appeal of most substantial works. “...documents of beauty in which every cable and door frame has been measured and in which, we may nonetheless sense, and delight in, the overwhelming presence of precision and intent.”\(^{344}\)

Norberg Schulz talks about the “cultural landscape” of a built environment where he stresses on the importance of a relationship that “serves as foci where the environmental

\(^{342}\) Hesar, Kalantari, and Ahmadi, “Study of Sacred Geometry in Islamic”, 3811.

\(^{343}\) Lupton and Lipps, The Senses: Design beyond Vision, 42.

character is condensed and explained.”^345 The uniquely designed wind towers clearly lend a
unique character to the Qatar campus, fit and follow the concept of the cultural landscape,
provide identity and structural identification, and symbolize an integrated solution to a cultural
need. “the specific solution to certain needs which, while they depend on interpretation, tend to
be fairly widespread: the expression of one’s faith and philosophy of life, communication with
one’s fellows, and protection from climate and enemies.”^346

5.6 Towers of light

The towers of light were designed by Kafrawi to regulate the powerful sunlight of the
region and reduce electrical consumption. The overhead light features are meant to mimic the
sun's rays and produce natural and not harsh indoor lighting. Some skylights and wind towers are
combined to facilitate a complex combination of air and light. These "Sun Light Towers,”
especially on top of the library, keep temperatures constant to prevent damage to documents and
the microfilm and allow natural light to go through the space.^347

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^345 Schulz, Genius Loci: Towards a Phenomenology of, 10.
^346 Rapoport, House Form and Culture, 61.
^347 Inauguration of the New Campus of the University of Qatar, Doha: Qatar university, Department of Cultural
Affairs, (1985), 76.
Figure 131. Shows the lighting through the light towers in the library building.

Figure 132. Shows the Mezzanine Plan for the library with the light towers.
Figure 133. Shows the sectional view of the towers of light in the library.

Figure 134: **Left**.

.Figure 135: **Right**, Left & Right Shows the exterior of the library light tower, Mashrabiya from the outside, and stained glass from the inside.
For the design of the library building, Kafrawi laid out very careful design considerations. It is a well-known fact that proper lighting is of utmost importance for the overall success of a designed space like a library. Natural light or daylight has been regarded as desirable and a hallmark of good design. "Memorable library spaces for centuries have been characterized by volumes and surfaces illuminated with natural light, providing glare-free light in reading spaces." \(^{348}\) Kafrawi’s notes detail his design considerations - “It is recommended that the glass surface of the library be kept at a minimum to avoid glare. It is preferable to have natural light emanating from the ceiling rather than from wall areas in order to reduce the powerful effects of the sun’s radiation and to have more wall space available for library use.” \(^{349}\)

In the book Experiencing Architecture, Rasmussen says, “light is of decisive importance in experiencing architecture. The same room can be made to give a very different spatial impression

\(^{349}\) El Kafrawi, “Higher Teaching Training Colleges at”, 50.
by simply changing the size and location of its openings.”350 Needless to argue that occupants’ comfort and experience of the space were on Kafrawi’s mind in designing the campus spaces.

He furthered the details of his library design based on lighting as the tool that provided the most spatial implications due to its pronounced psychological effects as well as effects on other architectural elements, such as material, space, and structure. Thus, he proposed the total surface of windows to be 20% of the total area if walls were the light source. Considering the harsh weather and to avoid thermal gain, he went with ceiling lighting, reducing the window area to 15% of the total area instead. “When skillfully introduced, daylight creates an ambiance of quiet contemplation and visual comfort and links the modern library user psychologically with the pre-technological past.”351 Kafrawi did skillfully handle the overall environment in the library, as we’ll analyze in the following passages. His skillful and thoughtful handling ensured proper levels of illumination in the stack and reading areas, and uniform intensity, keeping in mind the open-ended concept of flexibility in the library’s arrangement.

![Figure 137. Shows the rhythm of the light towers of Qatar University.](image)

The unequivocal rhythmic pattern as seen with the wind towers, is also evident with the towers of light in the Qatar campus, as shown in the images above.

Alberto Perez-Gomez, in his book “Built upon Love,” talks of rhythm as the root of life and culture, inseparable from the human condition, calling it “the simplest, most permanent, and most ancient manifestation that causes us to be men...”. “The experience of architecture is rooted in rhythm.” Such is the importance given to rhythmic experience in architecture by the author that he describes it as an incantation that transforms ideal geometries into living spaces. Let’s analyze more components related to these specially designed towers.

**5.6.1 Towers of Light and Minarets?**

Author Laurajane Smith in the book ‘Uses of Heritage’ describes ”Islamic heritage as a system of classification that is regularly integrated into the built environment and circulated throughout the Islamic world as a distinctly identifiable concept.”

Turnbridge & Ashworth provides the best-comprehended definition of “heritage” as “a contemporary item molded from history due to its tendency to center the present era during its development.”

Undoubtedly, this “heritage” is apparent in the specifically designed towers of light for the Qatar University campus by El Kafrawi. Whereas tower forms used in the Octagonal classroom modules are reminiscent of the traditional badgirs and malqaf, as discussed earlier, the towers of light link in history to the traditional minarets in Islamic architecture.

Tower forms have been seen as a part of the architecture from ancient times, starting with the tower of Babel, whether in the form of pyramids, ziggurats, fortresses, obelisks, watch towers, towers along the city walls as guard towers, towers signifying gated city entrances, campaniles, bell towers, exhibition towers, Gothic church towers, and steeples, stupas in

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Buddhist architecture, pavilions in Chinese architecture, Hindu temple towers in Indian architecture, or the minarets in Islamic architecture.

In Islamic architecture, the minaret has been considered to be one of the most distinctive features, for it is from here that the 'muezzin' makes the call to Muslims for prayers. In trying to understand how the tower got its special meaning in Islamic societies, scholars have attempted—with mixed success—to trace minarets back to various traditions of tower building in the pre-Islamic cultures of Eurasia. Over a century ago, for example, A. J. Butler, the British historian of Roman Egypt, speculated that the multistoried form of the typical Cairene minaret of the Mamluk period might have been derived from the Pharos (lighthouse) of Alexandria, one of the wonders of the ancient world.

The traditional minarets originally served as illuminated watchtowers (hence the derivation of the word from the Arabic nur, meaning “light.” A minaret is a “lighthouse or beacon.”\(^{354}\) Associating the modern adaptation of these traditional elements to the traditionally illuminated watchtowers or minarets, thus, can be reasonably justified.

Not only for illumination but these minarets have also been suggested to be the architectural representation of Islamic pride as well, for they became the “landmarks of Islam” - to be visible from afar and to stamp an area with Islamic character.\(^{355}\) The identical representation is seen in the University through these light and wind towers on the campus of Qatar. These uniquely designed light and wind towers do become the landmark characteristic of this University campus based on Islamic thoughts and concepts.

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A. The minaret of Ouled Djallel mosque (Algerian Ministry of Culture and Information, 1970).


Figure 139. **Left:** Shows a contemporary landmark minaret tower form.

Figure 140. **Right:** Shows Qatar campus landmark clustered light towers.
The association of these light towers with the traditional towers gets reinforced by El Kafrawi’s use of stained glass for lights. A question comes to mind - why stained glass adapted in a modern institution instead of clear or tinted glass?

We are used to seeing stained glass windows in churches and cathedrals. It is widely known that Abbot Suger of Saint-Denis considered the colored light as the manifestation of God himself. Thus the trend of rose windows with stained glass in circular form came into being at the beginning of the Renaissance, the circle being related to the heavens.

The origins of stained glass are not certain, but ancient Egyptians are considered the first people to discover glass while making their vessels; the oldest examples of man-made glass are Egyptian-colored glass beads from around 2700 BC.\textsuperscript{356} Stained glass windows were first used by the Romans in their homes in the first century AD. Early examples of stained glass windows can also be found in some of the palaces and mosques in the Middle East.

It is said that the Romans, Egyptians, and Persians used the technique of colored glass, and it was transmitted to the Arabs and carried to Spain. The idea of using colored glass to create geometric and floral designs also has multiple origins. In 1937, in Syria, archeologists named Jean LaFond and David Schlumberger discovered an 8th-century Islamic city in the desert near Palmyra. They found 115 colored glass fragments in colors like “greenish white, bluish-white, moss green ... tobacco yellows ... burnt sienna, smokey, three purples (one near wine, one more brown), a garnet [red] of great beauty and two violet purples ...” Schlumberger found evidence that they had been mounted in a framework of stucco in arabesque designs so that light would show through the glass. This technique has also been found in Yemen, where instead of glass, thin pieces of alabaster let a golden light through the design into the room between the stucco. Early stained-glass windows from the 8th century are found in Umayyad City.

Experts believe that Arabian “filigree” windows moved into Europe when the Muslims entered Spain and that these windows were cemented into marble, plaster, or stone, with iron ribs used to make the windows stronger. These early stained-glass window designs may have appeared there as early as the 10th century or as late as the 13th century. German art historian Otto von Simson explained the origin of the rose window by comparing the idea to the six-sided rosettes and octagon window on the outside wall of the Umayyad palace Khirbat al-Mafjar, built in the Holy Land in about 750 CE.

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5.6.2 Colored lights: Islamic architecture and traditional Orsis (also spelled as Orosi)

The purpose of stained glass windows has traditionally been to beautify buildings, control light, and oftentimes to tell a story that has been seen in churches and cathedrals. By the 8th century, colored glass was used extensively to adorn mosques, palaces, and other staples of Islamic architecture, with windows rich in color and complex in pattern. In a book written by Persian chemist Jābir ibn Ḥayyān, Kitab al-Durra al-Maknuna “The Book of the Hidden Pearl”, he talks about the magic behind the colored glass and offers dozens of “recipes” for colored glass and artificial gemstones which became a distinct ornamental part of the Islamic architecture. Historians believe that Jābir ibn Ḥayyān's creative approach illustrates the Islamic approach to the stained glass practice.358

In most of the religious architecture around the world, light holds a special meaning. In Islam also, it is considered a significant feature, a welcoming message from the Divine source. This is mentioned in a chapter in Quran: "Allah is the light of the heavens and the earth."359 It is also symbolic of heavenly wisdom and a manifestation of the Supreme Being’s presence. In traditional Iranian architecture, natural light has been used to create an immersive environment that induces various emotional responses in the occupants.360 Stained glass, for the same purpose, plays a major role in this heritage in the form of wooden framed windows with Girih designs called Orsi (also spelled as Orosi). Orsi, a latticed window formed with colorful pieces of glass

usually in a symmetrical Iranian-Islamic pattern, is considered one of the main traditional architectural elements of the Iranian building. The aesthetic and psychological effects of Orsis have been emphasized by various precedent researches. They have been considered a colorful manifestation of daylight rays acting as passive components for controlling light in the traditional architecture of Iran.361

In the article, “The psychological effects of stained glass in Traditional Iranian Architecture: the case of Orsi,” the author further explains the working of Orsis. “Daylight passes through these Orsis, and depending on the time of the day –which dictates the angle and corner through which lighting takes place- it projects different colors into the interior, creating different psychological stimulations in the viewer.”362

Various studies have investigated Orosi and colored glass in many ways, some applying qualitative methods and some doing case study analysis. One study analyzing the World Heritage site of Safavid palaces in Tehran inferred decoration as the function of warm colors of Orsis, while colored grids attributed to balancing light and heat. Another research based on literature and descriptive-analytical method demonstrated psychological and physical aspects of colors, inferring blue, turquoise, and golden as the traditional colors.363 The additional study particularly aimed at the reason for applying colorful glass attributed it to Iranian religious beliefs of “unity to plurality and plurality to unity.”364

Further studies have dwelled on the selection of appropriate colors enhancing the environmental characteristics resulting in appealing vital spaces. One of the researches exploring

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363 Hosseini et al., “Quantitative Investigation through Climate-Based”, 21.
364 Hosseini et al., “Quantitative Investigation through Climate-Based”, 23.
the appropriate colors to control direct sunlight for meeting visual comfort criteria based on climatic-luminance metrics demonstrated that blue color had the most significant effects. Most of the studies concluded that colored or stained glass not only helped create a sustainable, friendly, and relaxing environment, but when integrated with the quality and various angles of natural light, colors created different spatial identities in the space throughout the day. The effects made by the color of the space, depending on the factors and qualities of that color, implement a phenomenon called the Color Effect - a term implying the psychological effect of color. This effect is widely utilized through Orsis in traditional Iranian architecture.\textsuperscript{365} Even though individually, the colors get characterized as cold, warm, light, dark, or saturated, when used in combination, the properties of one affect and influence the other, resulting in varying environmental experiences.

In the same research paper, the authors list the following table of characteristics corresponding to each of the primary colors as shown in Figure 142 below:

<table>
<thead>
<tr>
<th>Color</th>
<th>Color properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Represents peace, truth, trust, surrender and sacrifice; and a symbol of eternity and symptoms of lasting tradition and values.</td>
</tr>
<tr>
<td>Green</td>
<td>Represents willpower, perseverance, stability of mind and consciousness. This color is soothing and resembles nature; often used to overcome psychological crisis.</td>
</tr>
<tr>
<td>Red</td>
<td>Represents the life force and all forms of desire and passion. It means to obtain the desired results and success.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Represents a fleeting happiness, expansion, and expansion easy to imagine, exhilaration. It can have anomalous effects on the mind in long-term and cause disturbances and mental confusion unless accompanied by its complementary color; violet.</td>
</tr>
</tbody>
</table>

Figure 142. Shows the characteristics of the primary colors.

Considering the various measurable effects of colors on human minds and the nervous system, the research study concludes that the colorful rays have a considerable impact on the psychological and physical health of occupants, resulting in a reduction of stresses and anxieties

\textsuperscript{365} Ostadzamani, Shafiei, and Ghomeishi, “The Psychological Effects of Stained”, 42.
since the colorfully illuminated interiors manipulate emotions and percepts. Not only for the impact on interior spaces, but the study also elaborates how in traditional architecture, large frames were divided into smaller lattice work grids of stained glass to avoid unwanted heat gains through bigger pieces, thus providing a favorable environment for the users. The choice of colors for the Orsis wasn’t random, either. It was a careful selection based on the desired emotional response from the space and its users, depending on the quality of the color.

In the Qatar campus light towers, El Kafrawi used shades of blue, green, red, and yellow colored glass in the octagonal star-shaped patterned windows, as shown in Figure 144 below. The research study mentioned above cites the selection of colors for the Orsi based on logical evaluation and professional consideration. The harmony created by these colors integrated with the light that has not been split stands as a symbol of God’s wisdom and presence. The light is supposed to create a connection with the human spirit. The study mentions that the colors have to be chosen considering climate, skylight, room temperature, spatial function, and the psychological need, relation with nature also being an integral factor. With natural colors at any hour of the day, with the sunlight beaming through the desired color, the intended mood is created. Blue reflection induces peace in the morning hours. Red reflection induces appetite and energy during noon hours, violet rays in the afternoon set the mood for seclusion, and yellow color promises the spirits of a shiny and uplifting day. A research study investigating the effects of colored transmitted light on thermal and visual comfort was conducted by authors Mohammad Haghshenas, Mohammad Reza Bemanian, and Zahra Ghiabklou, who have been conducting various such studies on the subject. This study aimed to find the extent of the effect on occupants’ sensation of illumination and thermal comfort by the colored transmitted light. Using the descriptive-analytical method, the results were compared with the outputs of simulation
analysis. The results showed more visual satisfaction and a cooling effect by blue light. No wonder modern science is venturing into these psychological effects of colors on human environments to treat patients in complementary and alternative medicine, as used in traditional Oriental medicine.

Figure 143. Left: Shows an area naturally and mechanically lit by the tower of light.

Figure 144. Right: Showing an interior view of light towers in the library with color stained glass.
Figure 145. The images above show the interior views of the light tower, also showing the magnificent yellow light from the Orsi and its dramatic reflection on the opposite wall at different levels.

The quality of magnificent light seen in the images above is what Tadao Ando calls a miraculous attribute of regulating sunlight that enters the space and the desirable trait of the architect. As Louis Kahn states, "The sun did not know how beautiful its light was until it was reflected off this building." Just like the wind towers were designed to entrap and filter the dust-laden hot, humid air of the region, filter it and run the circulated cool and soothing air in the classrooms, the tower of light was also specifically designed to entrap the bright sunlight and glare of the region. The specially designed overhead lighting system of the tower reflects the beam of glary sunlight to generate natural, glare-free, filtered interior lighting. To add to the effect of unfiltered quality light, stained glass window coverings have been provided in the interior of these library light towers, while the exterior is covered with masharbiyas (perforated screens - (refer to the subchapter titled Masharbiyas, page 231 below).
The ultimate effect of the light provided by these light towers is such that at the first experience of the space, one is led to think as if quite a few light fixtures have been deployed to provide that amount of light, as shown in Figure 147 below. In essence, as shown in the pictures below taken on a walk-through in person, a magnificent light quality is provided by these light towers in conjunction with the artificial light sources.
On the importance of lighting and colors, Zumthor states that “Good lighting and sensuous colors go a long way in making an ordinary architecture look beautiful.” Beauty in itself is very contradictory since it is not known whether beauty is a state of mind or a human sensation. What is deemed beautiful is purely a reflection of individual experiences, cultural norms, or a unanimous response.

Is it just a sheer coincidence that El Kafrawi used stained glass in the light towers of the University instead of clear or tinted glass? Rapoport talks of meaning in the built environment through historical associations. Alain de Botton mentions John Ruskin’s proposal of seeking two things from the buildings - one, that they shelter us, and the other, that they speak to us - “to speak to us of whatever we find important and need to be reminded of.” The language in the Qatar Campus exists, and each designed element tells a different tale of the same book with the same characters. The associations are apparent at every step, in every element, and every detail of every dismantled component. Another point to be noted, as Rapoport says in the Qatar campus, is El Kafrawi’s focus on taking possession, understanding the blueprint, changing/modifying as per the demand of the environment, and completing it through personalization. This personalization is seen in each of the designed elements of the Qatar campus, starting from what constitutes a microcosmos to the whole. “...the meaning of many environments is generated through personalization - through taking possession, completing it, changing it. From that point of view, the meaning gets designed into an environment....”

367 Zumthor, *Thinking Architecture*, 76.
“Sensory design considers materiality across multiple dimensions, from the visible to beyond.”370 “An implementation of elements contributing to the enhancement of the activities will contribute to making the space more livable.”371 Clearly, the specifically designed elements of the Qatar campus enhance the experience of spaces and senses.

5.7 MASHARBIYAS (also spelled as Mosharbiya or Mashrabiya)

To deal with the Gulf region's brilliant, but harsh and strong sunlight, El Kafrawi deployed structural modifications to enhance psychological and visual comfort. This was done through the use of a traditional building element called masharbiya.

Masharbiya is the Arabic term given to a type of lattice screen traditionally carved out of timber used for different purposes in the middle east. “Masharbiyas, as shown in Figure 148 and Figure 149 below, have been considered one of the most traditional elements of Islamic architecture.”372 These unique decorative elements represent cultural heritage and harmony between the artistic and architectural philosophy of Arab culture. Also called ‘Shanashil (or shanshul or rushan), ’ their association with Arab culture stretches back to the history of Islamic architecture. “Al-Shanashil” has its roots in a non-Arabic word borrowed from the Persian language. The word consists of two parts, Shah meaning king and Shen meaning throne, a distinctive feature of Baghdad’s earliest houses.373

At the height of the Baghdadi civilization, especially in the Al-Abbasi era, masharbiyas were restricted to palaces and public buildings; however, it was used extensively in the Ottoman era, where they embroidered harmony between functionality and beauty. It provided a comfortable internal environment in harsh climatic conditions. As the efficiency and use of Masharbiyas spread, various forms appeared depending on the material and the construction techniques.

Masharbiyas also act to fulfill traditional functions, such as circulation of air, light infiltration, and providing privacy to the occupants while maintaining contact with the outside world. Designers and craftsmen traditionally carved wood and inscriptions to produce
magnificent patterns of the mashrabiyas. Stained glass was also inserted in some designs to add to the further aesthetics of old Baghdadi houses.\textsuperscript{374}

The design of the mashrabiya was compelled by various constraints and forces (i.e., Islamic laws, architectural/urban, user/occupant needs, and environmental conditions). The impact of these screens was twofold: First, it led to the practice of covering a building opening with pierced woodwork, either in a mashrabiya as a unit that projects from the facade or in windows set into the facade; second, it led to the emergence of a rule that prohibited the placement of pierced woodwork directly across from an opening or door in the neighbor’s residence.

Due to the dry desert heat and high outside temperatures, designers had to consider the orientation and location of Mashrabiyas in relation to the sun's path. It was important to consider how the mashrabiyas manipulated the interior climate and hence the comfort of occupants. It helped maintain the much-required airflow in the spaces as well as in adjusting the interior temperatures. The small openings of the mashrabiyas provided a continuous stream of air flowing through the rooms. In the past, residents of the homes would put earthenware pottery filled with water in front of the mashrabiyas so that when hot air entered through it, the water would evaporate, causing the air to cool down, thus leading to cooler air circulation in the rooms, thus explaining its Egyptian name which comes from the Arabic root ‘sharab’ meaning “the place to store the drinking water pots.”\textsuperscript{375} The humidity of air passing into the house through the mashrabiya also increased due to the nature of the material used to manufacture these traditional

\textsuperscript{374} Fareq, “Mashrabiya”. (accessed December 20, 2021).
\textsuperscript{375} Fathy, Shearer, and Sultan, \textit{Natural Energy and Vernacular Architecture}, 46.
elements. They were made out of porous material of organic fiber, which absorbed water, thus helping replace the dry desert wind and maintaining the environment.

Mashrabiyas also provided the advantage of controlling the light in the interior spaces. For this, the distance between perforations and the size of the bars or perforations was considered while designing them. The space between the bars was supposed to be narrower to increase the refraction of light and reduce the intensity of the sunlight passing through, whereas in the lower part, the distances between the bars were increased to compensate for the lack of lighting.376 Thus, privacy got added as a benefit through the mashrabiya design as well, for the dense lower section ensured privacy while the decorative and open upper part allowed the air to flow.

These carved screens are found throughout the Qatar campus, showcasing Islamic architectural style and are used for aesthetic and functional aspects. They act as light filters enriching the visual character of spaces in the University.

Figure 150. The image above shows the Mashrabiya acting as a shaded pathway between the octagon units in the Qatar campus.

Figure 151. Showing mashrabiyas in section, plan and elevation.
Figure 152. Showing mashrabiya in the exterior facade of the Qatar University campus on the first floor.

Figure 153. Showing mashrabiya along the shaded corridor in the BCR building.

Figure 154. Shows the mashrabiyas by the classrooms in transitional lobbies/spaces in Qatar campus to provide some privacy for the classroom.
Figure 155. Showing mashrabiya around a shaded courtyard.

Figure 156. Showing mashrabiya to provide a shaded walkway by the courtyards.

Figure 157. Shows round and big walls of mashrabiya in the administration building.
Figure 158. Shows the details of the pattern of Mashrabiya in Qatar University campus.

Figure 159. Shows the screen of Mashrabiya in Qatar University campus outdoor space.
Figure 160. Showing round mashrabiya in the light of towers at the library building.

Figure 161. Showing mashrabiya between the corridors in the BCR building to give more shading across the corridors.
Figure 162. Showing mashrabiya in one of the lobby spaces in Qatar campus for natural lighting.

Figure 163. Showing mashrabiya in the classroom /office spaces in Qatar University campus building.
Figure 164. showing mashrabiya around a shaded courtyard overlooking the classroom space.

Figure 165. Showing mashrabiya along the shaded corridor in the BCR building.
5.7.1 The science behind the working of mashrabiya

Hassan Fathy in his book, “Natural Energy and Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates,” explains how the different patterns of mashrabiya were developed to satisfy a variety of conditions or functions. These functions, as he puts them in order, are (1) controlling the passage of light, (2) controlling the airflow, (3) reducing the temperature of the air current, (4) increasing the humidity of the air current, and (5) ensuring privacy, with each masharbiya pattern traditionally designed to fulfill all or as required above functions.\(^\text{377}\) The desired functionality is achieved through the size of the interstices or spaces between adjacent balusters, as well as the diameter of the balusters that are specifically adjusted to serve these functions.\(^\text{378}\)

Detailing the functions and conceptual, using Egyptian climate as a model, Fathy pointed out that users of a room with a south-facing opening had two significant components to combat - the direct high-intensity sunlight and the lower-intensity reflected glare. A lattice with small interstices and round balusters, in this case, will graduate the light reaching their surfaces, thus softening the contrast between the dark, opaque balusters and the brightness of light entering through the interstices of the masharbiya. The characteristic shape of the lattice, with its lines interrupted by the protruding sections of the balusters, produces a silhouette that carries the eye from one baluster to the next across the interstices, vertically and horizontally. This design corrects the slashing effect caused by the flat slats of the brise soleil.\(^\text{379}\)

\(^{377}\) Fathy, Shearer, and Sultan, *Natural Energy and Vernacular Architecture*, 47.
\(^{378}\) Fathy, Shearer, and Sultan, *Natural Energy and Vernacular Architecture*, 47.
Hassan Fathy also explains masharbiyas as elements of conditioning the rooms/built spaces by providing shade, light, and visual comfort. He explains how the shape of the balusters and the size of the interstices can help in controlling and achieving the desired amount of airflow, humidity, shade, and privacy. For example, to accommodate for a reduction in light, Fathy suggests and explains that the interstices be made larger in the upper part of the screen compared to the lower part. This will allow more reflected light to enter and brighten the upper part of the space while preventing direct sunlight and glare from entering and warming the rest of the room. On the other hand, if the window is on the north face, where the direct sunlight and heat are not as big of an issue, then the interstices of the mashrabiya screen on its lower part could be made relatively bigger, keeping privacy into consideration which of course will provide a room full of natural light.

Explaining in detail the structure of masharbiya, he states: “A typical mashrabiya is composed of two parts: a lower section with fine balusters in close mesh, and an upper section filled with a wide mesh grill of turned wood... Suppose this solution still does not provide sufficient air movement due to the small interstices required to reduce the glare. In that case, the dimensions of the mashrabiya can be increased to cover any size opening, even to the point of filling up the entire facade of a room.”\textsuperscript{380} For increasing humidity, Fathy refers to the characteristic of organic building material, such as wood, that works well in retaining and releasing water as a part of the mechanism, thus regulating skin temperature and comfort in the space around these materials. The “\textit{evapotranspiration}” process, as he explains when applied to the technique and style of creating mashrabiya, works as follows: Wind passing through the

interstices of the porous-wooden mashrabiya will give up some of its humidity to the wooden balusters if they are cool, as at night. When the mashrabiya is directly heated by sunlight, this humidity is released to any air that may be flowing through the interstices…The balusters and interstices of the mashrabiya have optimal absolute and relative sizes that are based on the area of the surfaces exposed to the air and the rate at which the air passes through. Thus, if the surface area is increased by increasing the baluster size, the cooling, and humidification are increased. Furthermore, a larger baluster has not only more surface area to absorb water vapor and serve as a surface for evaporation, but also more volume, which means that it has more capacity and will therefore release the water for evaporation over a longer period of time. Consequently, the design of the turnery pieces relies on a technique that firmly focuses on the function of conditioning the hot arid air of the desert climate.

Figure 166. Showing the work of mashrabiyas to cool the space.

The profound effect of Islamic principles is seen in the construction designs, building components, and even ornamentation. This effect is seen in the Islamic urban communities in their winding, spontaneous roads because of which, even though land plots are arranged in a
similar fashion, the houses are typically organized as squares and rectangles. This organization and arrangement, as a result, lead to dead corners and unconventional living spaces. The projecting components of the masharbiya and masharbiya’s pliable nature allow for generous compensation of these unpredictably shaped spaces. Not only masharbiyas allowed the expansion of usable space on the upper floor, but they also helped large urban buildings feel close to human scale by creating a visually walled-in area of the road.

Islam defines the fundamental human needs as religion, life, property, mind, and descendants and further classifies them into the following requirements for the built environment and user needs:

**Physical**: Space conducive to users in terms of design, scale, form, etc.

**Psychological**: Space that gives comfort and provides relaxation in terms of aesthetics, colors, and so on, providing a link between interior spaces and an indoor-outdoor connection as well. The experience of the space provided by masharbiya enhances the feelings of confidence, bliss, and quiet relaxation experienced by the occupants, and it rouses and inspires creative energy.

**Social**: Space that puts users in a comfortable environment to be able to associate with family, relatives, and neighbors confidently.

**Spiritual needs**: Space that promotes and permits Islamic practices, love, and worship.

The mashrabiya serves a critical role in fulfilling these needs: it guarantees the occupants are sheltered from the outside while enabling occupants to remain connected to the outside through the screen as well.\(^{381}\)

**Environmental conditions**: The mashrabiya has four capacities related to the environment, including controlling the entry of light, regulating airflow, and reducing

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\(^{381}\) Ashour, “Islamic Architectural Heritage: Mashrabiya”, 248.
temperatures. The design is selected based on the need to satisfy these capacities. The sizes of the interstices (i.e., spaces between neighboring balusters) and the width of the balusters are balanced in the design.

Masharbiyas work in the same way as plants; how they control their cell temperatures through transpiration and dissipation (called evapotranspiration). “Water collected by the plant moves through its filaments to its surfaces, where the water dissipates, thus cooling the plant. Wood retains this capacity, even after it is cut from the tree and incorporated into built structures, so long as its pores are not plugged by an impenetrable paint or finish.”

The inscription and geometry of the masharbiyas have traditionally been laden with meanings as well. Depending on the location of the masharbiyas, their position, and the gaze of the visitors, the perception of the space and the spatial experience provided by masharbiya changed as well. When someone looked inside the building from the outside, towards the direction of Mecca, they could read the inscription of "Allah" in the masharbiya. The inscription was made into a three-dimensional puzzle of lace pieces that were based on Kufic calligraphy. Moving inside and looking outside, cross-stitch-like motifs could be seen, which is a clear sign of the culture in the area.

Figure 167. The Mashrabiyas of Mohammed Said Naserallah house.

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Mashrabiyas in the Qatar campus, thus, act as an architectural element revealing the cultural, historical, and political dimensions not only as incorporated in the Qatar campus, but also in light of cultural globalization, foregrounding thereby the notion of identity as a process of constant flux and cultural exchange. El Kafrawi used mashrabiyas in discreet places, which act as symbols of constancy, and identity, and offer vivid cultural cues, thus providing a multitude of meanings in the campus that users do relate to even from their homes. "Mashrabiyas act as a spiritual, decorative, and functional architectural element that merges the form and function of the Islamic window screen with a conventional jalousie, taking on the materiality of local culture." 384

In its distinct cultural symbolism, formal references, and historical meanings and associations, the Qatar campus stands out as a cultural signifier connecting histories, geographies, traditions, and symbols into a dynamic spatial experience. El Kafrawi says that we may evaluate the decorations perceptually if we wish to be more "scientific". In the Qatar campus, the mashrabiyas definitely provide a reprieve from the harsh glare and brightness of sky and ground and hot, dry wind, thus providing thermal comfort to the users making a complex and rich environment. "Yet these decorations are significant and meaningful - their primary purpose is associational." 385

Rapoport explains, "The primacy of the meaning of this element, its latent rather than manifest function is clear: The purpose is to establish front and communicate self-worth in the culturally appropriate way." 386 Not only do the mashrabiyas in the Qatar campus regulate the quality of light, providing continuous movement of much-needed filtered air, but they also act as

elements representing tradition, encoded with meaning in a way that is easily decoded by the campus users. The patterned and textured surface provided by the masharbiyas adds to the experience in the campus as explained by Lipps and Lupton, “Visible textures can add warmth to any work of design—even when the texture isn’t physically touched. A rough concrete wall seen from a distance or a grainy scrim applied to a digital photograph changes our mental response to what we are looking at.”

5.8 Campus courtyards

The Qatar University campus has been designed very thoughtfully, keeping in mind the vernacular, traditional, and harsh climate of Qatar. Contrary to the circulation of typical Western University trends where circulation within the campus happens in corridors and enclosed stairways, the circulation in the Qatar campus is served by a system of internal and partly covered courtyards, appropriate to the hot climate and the Arab cultural tradition. These courtyards act as an oasis within the University and form a distinct component of the campus design as shown in Figures 164-170. These open and partially covered courtyards integrate gardens and fountains, enhancing the overall character of the built environment and cooling the air. These courtyards are a significant element in the design of the campus, as they provide opportunities for informal activities and social collaborations, and conviviality as clear from Figure 169. They offer ventilation for central wind towers that collect warm air in the same way that the chimney extracts smoke from the fire as shown in Figure 176 below. In these areas between the linking corridors and staircases (refer to Figure 168), the

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courtyards create the feeling of a traditional atmosphere. The following plan shows the planning of the campus around courtyards.

Figure 168. Plan showing a modular repetitive unit of courtyards across Qatar University campus, stairways, and corridors.

388 El Kafrawi, “Campus Plan for the University of Qatar”, 126.
Figure 169. Showing informal activities and social collaboration in the courtyard.

Courtyards have been an integral part of Arab design and built environments for centuries. See the image below for the courtyard design of Mohammed Said Naserallah’s house, El Kafrawi’s case study.

Figure 170. Shows the ground-floor and first-floor plan for Mohammed Said Naserallah house facing the internal courtyard.
As Arab’s oldest form of dwelling, the courtyard house pattern has its origins in the Graeco-Roman period. We have seen and analyzed how Arabs adopted the courtyard plan as an architectural pattern which fit in with the concepts and traditions of rich Arab culture, just like the Badu tents.

Courtyards in the Qatar campus have been designed and incorporated into the campus plan to express the same richness of culture and tradition as represented by Bedouins.

Figure 171. Shows the partially covered courtyard (inner courtyard) with seating for informal interactions and social gatherings with masharbiyas as the backdrop providing the intricate, rich, traditional environment.
Figure 172. Showing a planted inner covered courtyard with a fountain along a passageway with stairs as access to the first floor.

Figure 173. Shows the internal courtyard in the main academic building.
In addition to linking various spaces together, courtyards provide a protected space for gathering and group study sessions. Integrating it with the green areas and water fountains, these courtyards provide shade from the sun, making them into pleasing lounging and gathering areas.
A scientific explanation behind the design of the courtyard house concept was given by Hassan Fathy. As per Fathy, in hot, dry zones, the air temperature drops considerably after sunset from re-radiation to the night sky. The air is relatively free of water vapor that would reflect the heat or infrared radiation back toward the ground, which occurs in warm, humid regions. Thus, the courtyard becomes the static cooling system that generates air movement by convection. That’s why the courtyard concept has been employed as a design phenomenon to enhance thermal comfort in Arab houses and buildings. To combat the hostility of nature in these desert areas, people traditionally learned to close their houses to the outside and open them inwardly onto internal courtyards. These were traditionally called SAHN, which meant spaces open to the sky. This arrangement of the convectional cooling provided drops in air temperature of 10-20 degrees C (18-36 F) at night.389

Furthering the explanation for the definitive use of the courtyard concept even today, Fathy explained that as the evening advances, the warm air of the courtyard, which was heated directly by the sun and indirectly by the warm buildings, rises and is gradually replaced by the already cooled night air from above. This cool air accumulates in the courtyard in laminar layers.

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It seeps into the surrounding rooms, cooling them, which is what is seen in the classroom module surrounding the Qatar courtyards.

"In the morning, the courtyard air is shaded by its four walls, and the surrounding rooms heat slowly and remain cool until late in the day when the sun shines directly into the courtyard. The warm wind passing above the built structure during the day does not enter the courtyard, but merely creates eddies inside unless baffles are installed to deflect the airflow. Hence the courtyard becomes and serves as a reservoir of coolness."^390

Thus, the universal application of courtyard is traditionally seen in the architecture of hot arid regions stretching from Iran in the East to the shores of the Atlantic Ocean in the West, in both rural and urban built forms, as well as in the campus of Qatar.

The air around water and plants has been established to be cooler than the arid air in the desert. Thus, gardens and foliage were traditionally cultivated to make the weather cooler near houses.

Traditionally, the concept of a courtyard was implemented and modified into different formats integrated with other traditional elements like the masharbiyas for the benefits provided by design. It took the form of a loggia, called the takhtabush, as discussed before. Loggias are also seen as part of traditional Italian architecture, where there is a covered seating area at the ground level, located between the courtyard and the back garden. Since the back garden was usually larger and less shaded than the courtyard, air heated up readily in the loggia than in the courtyard. The heated air rising in the back garden draws cool air from the courtyard through the takhtbaush, creating a cool draft. This concept and arrangement are found in the tablinum of the Roman villas of Pompeii and many town plans since the arrangement provides a cool and

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agreeable meeting place for the inhabitants. El Kafrawi has used a very similar concept in the design of the Qatar campus. The courtyards have been integrated with the mashrabiyas in the overall scheme to provide cool convection air into the parts of inhabited spaces, especially the courtyards and the adjoining classrooms, which are further cooled by the wind towers. The wind towers further extract the warm air through the interior courtyards in the Qatar campus, providing natural circulation and ventilation to the adjoining areas.\(^{391}\)

In the design considerations listed by El Kafrawi, he talked of these courtyards, calling them verandas. “Each classroom will be surrounded by a veranda. They are to be employed as teaching spaces. They will also serve to protect the interior environment from the sun rays by acting as an intermediate space between the main building and the outside.”\(^{392}\) His idea of these shaded and semi-shaded spaces was to “create a micro-climate using gardens, patios, patios, and landscaping for the inhabitants to assure comfortable physical conditions.”\(^{393}\) As discussed in (chapter 2, the subchapter titled courtyard house page 37 above) on the concept of courtyards as gardens in traditional houses, walls were used as enclosures. In the campus at Qatar, El Kafrawi specifically mentioned, “In accordance with this tradition, the colleges will be bordered with a wall, but in preference to a solid one, a wall of vegetation.”\(^{394}\) So much was his emphasis on tradition, environment, and comfort of the inhabitants. Not only that, he proposed the use of terraces at varying artificial contours that will serve the dual functions of contributing to the green environment as well as providing visual barriers.

Qatar University campus spaces, along with other same-scale, heavy-use buildings, were examined as a part of MIMAR 16 for their incorporation of outdoor(or outdoor-like) spaces as a

\(^{391}\) El Kafrawi, “Campus Plan for the University”, 127.
\(^{392}\) El Kafrawi, “Higher Teaching Training Colleges at”, 74.
\(^{393}\) El Kafrawi, “Higher Teaching Training Colleges at”, 78.
\(^{394}\) El Kafrawi, “Higher Teaching Training Colleges at”, 78.
response to climate and traditional and cultural patterns. In addition to the shared factors of climate, symbolic dimension was intrinsic to the design of all the buildings chosen. Following comments and experiences were recorded by the author Brian Brace Taylor:

“On visiting the campus of Qatar University, conceived by Egyptian architect, Kamal El Kafrawi, one of the most outstanding features to strike the observer is the inclusion of a series of tightly-enclosed, interlinked courtyards between the classrooms, laboratories, and auditorium spaces. They seem to be rooms without roofs, landscaped in various ways, providing ample seating for quiet study or social encounters. In a vast complex of repetitive, modular units woven into a dense architectural fabric, these open patios have an interior counterpart as well: covered, planted courts with fountains situated along passageways connecting different academic facilities. By breaking down the rigid distinctions between indoor and outdoor space within an enclosed volume - typical of traditional patio houses - the architect provides something of a domestic scale at points throughout an urban-scale campus. Environmental control, specifically the filtering of light for interior spaces, but also for courtyards and galleries is remarkably well-handled at Qatar University. The wooden screens, or mashrabiya, which were mass-produced by machine (12,000 square feet in eight weeks) by Korean contractors for Qatar University, are both a functional and decorative feature in keeping with traditions in the region.”395

395 Taylor, “University, Qatar”, 18.
Figure 177. Shows different views of the shaded courtyard & loggias in the Qatar University campus.

The climatic, social, and psychological implications of a courtyard are explained by Rapoport in the diagram below. In addition to providing protection from the sandstorms of the desert region, when provided with greenery, water, and shade, the courtyard acts as a cooling well. “It modifies the micro-climate by lowering ground temperatures and radiation and by evaporation.”\textsuperscript{396} Greenery and water add to the soothing and cooling psychological effects, especially in hot arid areas like Qatar, also providing an outdoor living area.

\textsuperscript{396} Rapoport, \textit{House Form and Culture}, 90.
The intention behind open and public spaces in the form of partially covered courtyards and fully covered courtyards displaying fountains and gardens at the Qatar campus was also to create a scheme that reflected tradition and cultural symbolism just like other designed elements while working ingeniously to counter the effects of harsh weather. While explaining the concept of designing based on senses, Lupton and Lipps elaborate that the building which has a space for social and gathering activities should be easily identified from outside and inside of the building.\(^\text{397}\) The structures should be planned in a way people can find their direction.\(^\text{398}\) Therefore, to provide visual communication and connectivity in the campus hub, the architects design an open layout staircase to have an ideal community space for social gathering, to

\(^{397}\) Lupton and Lipps, *The Senses: Design beyond Vision*, 143.

\(^{398}\) Lupton and Lipps, *The Senses: Design beyond Vision*, 140.
encourage discussion and communication, and to provide a spatial connection with the surrounding environment. 399

Such is the cultural association and meaning of these courtyards in traditional Islamic architecture that Rapoport calls them one of the perpetually perceptual variables which lend quality, success, and meaning to the design of the built environment. “The full appreciation and evaluation of the quality and success of the design depend on an understanding of its meaning and the way in which perceptual variables are used to achieve and communicate it.”400 These courtyards act as promoters of a sense of community being shared open spaces enriched by shaded walkways, green foliage, and running water from the fountain, also facilitating an enhanced experience of intellectual discussions, casual encounters, and conversation at any given time.

Figure 179. Shows Qatar University campus buildings integrated with green areas.

Pallasma also emphasizes the importance of these interconnecting and fluid spaces as spacious passageways that encourage gathering, interaction, and conversation in addition to enhancing sensory reach, allowing people to perceive others approaching them. According to

399 Lupton and Lipps, The Senses: Design beyond Vision, 147.
400 Rapoport, The Meaning of the Built, 27.
El-Shorbagy, “the courtyard is the most essential element, which represents the core of all Islamic-Arab houses. It may acquire all the qualities and characteristics of a garden while fulfilling its function as an important architectural component of a house.

Arabic word 'Maskan’ used for a house is derived from the root ‘sakana’ which means to settle. From the same root, the word ‘sakinah’ is derived, which means tranquility. Hossam Mahdy, in the article ‘Meaning and Significance of the gardens and courtyard in Arab Muslim traditions’ calls sakinah as a crucial concept for understanding the Arab-Muslim courtyard house at a spiritual level, fir it is the goal that Muslims strive to achieve - tranquility. “It is who sent down tranquility into the hearts of the believers” (Qur’an, Chapter 48, verse 4)...“He sent tranquility upon them” (Qur’an, Chapter 48, verse 18). Thus the inner focused Muslim house is considered as one that offers tranquility to its inhabitants on the materialistic level. Courtyard houses, especially in densely populated settlements are see as the medium to achieving this quality. Rapoport calls these houses as “inside-out city.” It is the courtyard that helps achieve the delicate balances as explained below between public and private interests following the crucial Shari’a principal whether in a house or an Islamic institution like Qatar campus.

Courtyards enable the students and faculty a connection with nature. When the weather gets too harsh, these courtyards still enable the occupants a shelter and reprieve through the vegetation and shaded areas.

Courtyards function as gardens sharing similar aesthetics. The evaporative cooling of the embedded water feature provides enhanced thermal comfort in conjunction with the green cover and masharbiyas. The sound of the running water provides additional tranquility and peace as

described by the author above. “Similar to a garden, the aesthetic of a courtyard address the five senses.”

Whereas the courtyards in the Qatar campus act as semi-private spaces for each of the adjoining octagonal classroom modules, they also form important links to other campus spaces encouraging community bonds and interactions. The achievement of privacy when and where required leads to a willingness to interact with the community without transgressing on private territories or aspects of life.

Hassan Fathy, on the same lines, explains how an interior courtyard enhanced with vegetation and water flow in a hot arid climate can be beneficial in attaining a much more comfortable space. “...a very cool internal temperature could be obtained by shading the isolated surface, obstructing direct penetration of solar radiation, enhancing the flow of cool air, using thick light colored walls, using high ceilings with roof ventilation, and providing sources of evaporation including an internal fountain” - all of which have been ingeniously incorporated by El Kafrawi in the Qatar University campus.

5.9 Windows and other details

Not only in the overall organization, design elements, traditional concepts, user comfort and tradition, and culture have also been incorporated thoughtfully into the openings provided in the campus buildings. El Kafrawi very thoughtfully chose materials for walls, floors, and even furniture that would help control the issue of reflection of light and for sound absorption, especially in the library building.

“The following materials are recommended

404 Fathy, Shearer, and Sultan, Natural Energy and Vernacular Architecture, 25.
- Mahogany, with a light reflection of 8%
- Dark oak, of 13%
- Light oak, of 32\%"^{405}

For the prevention of severe and direct solar radiation is prevented, deployment of small recessed windows designed in modern ways was done to enrich the interiors with soft, comfortable lighting. This was additionally supported by thick insulated walls, measuring 0.6m - 1.5m (23.6” - 59”) through precast panels, the heavy mass of which delayed heat absorption and radiation, durable for the region— another clear example of the use of modern technology set into the local environment, giving the place a comfortable character (unfortunately, a section of the wall construction could not be found to be included in this research). El Kafrawi went even further in designing the concrete mix for the precast panels - “The design of the concrete mix required to achieve the color and smooth texture that would not catch the sand involved considerable experimentation and research.” The details of the campus elements - from design organization, elements, and structural details, to the material - all show Kafrawi’s prime focus as the comfort of the occupants and their experience of the spaces incorporating modern technology, all being tied together in a traditional setting.

Even the small size of windows provided in the external walls showcase the implementation of another vernacular concept - privacy and shield from harsh weather forces. This was traditionally implemented in the tented settlements and traditional Arab houses through the use of inward planning and small external openings, if any. “The minimum windows and openings within these clustered houses and buildings within any Islamic Arabic city contribute to preserving privacy.”^{406}

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^{405} El Kafrawi, “Higher Teaching Training Colleges at Doha”, 50.

^{406} Rajan, Al Nuaimi, and Furlan, “Qatar University campus: Built Form”, 102.
Figure 180. **Left:** The image above shows the small windows through the classroom in the Qatar University campus.

Figure 181. **Right:** The image above shows the men's Majlis (Men’s formal room) that has been decorated with arches in Mohammed Said Naserallah house. Notice the small exterior windows on the exterior wall and the big windows opening into the interior courtyard.

El Kafrawi also took into account the orientation of buildings considering Islamic practice principles as well as the wind direction. Whereas all the modules open up to the interior courtyards, the broad site location is exposed to the north direction to give a desirable position and a natural response to the intense heat and natural winds of the city. In the UNESCO report on the campus by El Kafrawi, he explains the importance of the north orientation of windows for uniform natural lighting and for the prevention of harsh sun penetrating the interiors. Since the

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wind currents originate from the north and northwest, the smooth finish of the windowless exterior helps in shunning sand accumulation while the captured drafts are channeled through the vertical openings of the wind towers to filter, and circulate through the rooms and the interior courtyards. “The large dimension of the site exposed to the North gives it a favorable location in relation to air currents.”

Rapoport elaborates, “Any environment is experienced in all modalities, and it can be understood in terms of the individual’s total perception of, and response to, the external physical, social milieu, and the concurrent monitoring of his internal environment….The body is immersed in the environment and responds to its meaning, sound, feel, texture, temperature, and so on, as well as vision.”

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408 El Kafrawi, “Higher Teaching Training Colleges at Doha”, 81.
409 Rapoport, Human Aspects of Urban Form, 186.
CHAPTER 6

CONCLUSION

“Successful modern reinterpretations of traditional architectural styles move us not only at an aesthetic level; they show us how we, too, might straddle eras and countries, holding on to our own precedents and regions while drawing on the modern and the universal... Without patronizing the history they profess to love, they show us how we, too, might carry the valuable parts of the past and the local into a restless global future... succeeding in succumbing neither to nostalgia nor to amnesia.”

These words by Alain de Botton hold up the message high in the design of the Qatar campus as we walk through architect Kamal El Kafrawi’s vision of building a bond between the past and the future based on the preservation of society’s ethnic and traditional values as an Arab and Islamic nation, the reflection and focus being on core values and norms acting as the spinal cord of the organization.

As Rapoport said, what is significant about a culture is the specific solution to certain needs, which it depends on, which is an expression of one’s faith and philosophy, and provides protection from climate and external forces. The implementation of this concept is evident in the designed elements of the Qatar campus.

If tradition, culture, image, symbolism, and comfort of the users didn’t hold important meaning for El Kafrawi, he would not have incorporated any traditional elements in the design of Qatar campus buildings. Not only the traditional elements in just the educational buildings, or the mosque on campus, or the overall organization, El Kafrawi also incorporated a separate

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dedicated structure as the ‘home economics center’ to serve the students and the residential community on campus. This home economics center included a food lab, a textile lab, and a laundry which would serve as a “practice” house for home management as per the Arab culture.\textsuperscript{411} The crystal clear incorporation of traditional and cultural was further seen when he built this “practice” house on the model of Mohamed Said Nasr-al-Alah house, one of his case studies for this project as a typical traditional house.\textsuperscript{412} In his words, “the presence of such a house would serve the broader function of making all the students aware of the traditional environment and the traditional way of life in Qatar.”\textsuperscript{413}

If reducing glare and filtering light was the sole objective of El Kafrawi in the design of the campus, without considering tradition and culture, he could have achieved that with the use of adjustable louvers or blinds or by incorporating technology the way he did for remotely operated adjustable louvers for the wind towers.

Cultural geographers have asserted, based on their research, that in the same location, there could be a significant variation in forms. Built forms have been known to vary greatly in any given region despite facing the same climatic and cultural concepts. For instance, despite being made of different materials and having different forms, the Eskimo summer and winter houses such as the tent and the igloo share many characteristics common to both. Question then arises, what exactly then determines the forms and their elements? Rapoport provides the answer to this question, saying that “\textit{this involves ideas of environmental quality...very much dependent on the factors and variables related to the culture of a place.}”\textsuperscript{414} The language of Islam, its culture, its history, and its traditions is very apparent everywhere in the campus, even the

\begin{footnotesize}
\textsuperscript{411} El Kafrawi, “Higher Teaching Training Colleges at Doha”, 43.
\textsuperscript{412} El Kafrawi, “Higher Teaching Training Colleges at Doha”, 43.
\textsuperscript{413} El Kafrawi, “Higher Teaching Training Colleges at Doha”, 43.
\textsuperscript{414} Rapoport, \textit{Human Aspects of Urban Form}, 15.
\end{footnotesize}
communal facilities. It serves as a hub for student meetings, relaxation, prayers, study sessions, dining and a multi-use building. This building is also ventilated using traditional towers in conjunction with the technical means, surrounded by traditional verandahs and green courtyard spaces. Not only that, the dining area is divided into two separate areas as well with separate entrances for men and women. What Kafrawi learned, understood, designed and implemented at the macrocosmic level, he scaled the same to fit at the microcosmic level as well.

His consideration, understanding, and implementation of traditional and cultural is further reflected in the detailed organization of this space as he explains it: “in accordance with the social customs of Qatar, by which everyone, no matter what his rank may be, eats together, the professors will eat with the students. Thus there will be no special eating place reserved for professors’ use.” Schulz says, “If the settlements are organically related to their environment, it implies that they serve as foci where the environmental character is condensed and “explained”.”

In the ‘Architecture of Happiness’, Alain de Botton designates “culture” as the force that identifies our visual and emotional faculties to the elements of the built environment constantly guiding us and supporting our many sensations that we tend to focus on and apportion value to.

“Despite the fact that the campus has grown exponentially over the past so many years with several expansions in addition to the construction of numerous new buildings, which differ in style and architectural treatment, the campus of Qatar University is still known for its iconic buildings with traditional “Mashrabiyas” and “badgirs” as their major design features.”

416 Schulz, Genius Loci: Towards a Phenomenology of, 10.
417 Rajan, Al Nuaimi, and Furlan, “Qatar University Campus: Built Form”, 100.
As per the definition provided by Susanne Langer, “Architecture comes into being when a total environment is made visible.” In general, as per Schulz, this means to concretize the genius loci. We have seen that this is done by means of buildings that gather the properties of the place and bring them close to man. The basic act of architecture is, therefore, to understand the “vocation” of the place.”

At this point, can we infer that Qatar campus has a ‘distinct character’?

Based on all the meanings and associations in each element of the specifically designed campus, can we deduce that this unique design is a success? Talking about the success of a built environment, Rapoport says, “the success of areas generally depends on the meaning they have for residents; meaning is the result of the action, use, and movement, i.e., of involvement.” He further asserts that these actions and involvement depend on shared cultural knowledge and behavior. Thus, for an environment to work perfectly for its users, people have to know how to behave, what the restrictions are, what the settings are; they are able to identify them, relate with them, draw upon the applicable rules, and act appropriately, which is dependent on common cultural knowledge and behavior. Users and visitors of the Qatar campus know the segregation of areas, limitations of space usage, invisible and visible boundaries, and behavioral expectations that have been clearly laid out on the basis of culture. The deeply rooted concept of segregation in the Arabic and Islamic traditions is an ideal held by both the students attending Qatar University and also by their families visiting the campus. This requirement contributes to the formation of a safe environment where families feel comfortable and safe where their kids and siblings spend years of their life to pursue an education. Also, students themselves belonging to an Islamic culture feel more comfortable when a cultural principle such as privacy and

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418 Schulz, Genius Loci: Towards a Phenomenology of, 23.
419 Schulz, Genius Loci: Towards a Phenomenology of, 5.
420 Rapoport, Human Aspects of Urban Form, 380.
segregation is maintained within the physical environment. A physical environment where such cultural principle is maintained is preferred to environments where this principle is neglected. Therefore, the physical embedment of segregation is appraised by the student community.

“The evidence is all around us that settings work - people know how to behave and are able to co-act effectively in shops, classrooms, and so on. In effect, people enter settings many times a day, identify them and the relevant information, draw upon the applicable rules, and act appropriately.”

In addition and significantly, the strategy for implementation of the outdoor areas and/or for enhancing livability within the campus, respecting the traditional culture, has also been maintained.

The compact buildings and dense housing of traditional Arab cities yielded closely spaced structures that helped minimize the surface areas of the facades exposed to direct sunlight. This helped to temper the micro-climate with the cool breeze, naturally ventilating the small alleyways in between. The same concept is seen in the campus at Qatar, with tightly knit modules all along the circulation corridors, which provide not only a cool breeze but also critical spaces necessary in a campus that foster outdoor interactions and activities. Where El Kafrawi used shaded walkways and partly covered courtyards for horizontal circulation, he incorporated vertical circulation through the open stairs, in his words, “to improve the atmosphere of the buildings. The role of architecture in such a harsh environment is to lessen the physical discomforts and to help create a favorable milieu for human activities.”

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422 El Kafrawi, “Higher Teaching Training Colleges at Doha”, 83.
Where the respect of cultural values is clearly seen as the way of life and culture in the Qatar campus, the livability of the physical setting and, namely the enhancement of the users’ feeling of comfort has not been neglected in any place.423

Rapoport clarifies that even the quality and experience of an environment are dependent on culture. Talking of people’s sensory capacities, the ways in which they, as active users of the environment, perceive it through the senses give it meaning. In the case of campus spaces designed by El Kafrawi, users do enjoy the magnificently filtered glare-free lighting in the classrooms and corridors through the light towers, stained glass windows, and masharbiyas. They enjoy the thermal comfort provided by the wind towers in the classroom areas, shaded gathering areas aired by cool courtyard air, plants, and fountains. “Since the ways in which environments are used, the ways in which they are understood and interpreted, and even in which sensory modalities are stressed, are all affected by membership in particular groups, people must inevitably be considered as members of such groups with particular values, beliefs, and ways of understanding the world.”424

Specifically talking about the meanings in classrooms, Rapoport questions, “What is the meaning of these rooms in terms of what they communicate about the various actors in the design process, the University as a client, and so on?”425 We have seen the meanings and thoughts that El Kafrawi put in the design of classrooms at Qatar, with the associations and multitude connections of the octagonal shape, specially designed wind towers and light towers based on the traditional badgirs and minarets, as well as the meaning of the stained glass windows for optimal light quality in conjunction with discreetly placed masharbiyas in the Qatar

424 Rapoport, Human Aspects of Urban Form, 2.

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campus. In addition, El Kafrawi integrated the historical associations, meanings, and traditions with modern technology and the concept of futuristic open-ended, flexible design not only in these classrooms, but also in the library and the connecting pathways. Rapoport says that it is these global and affective responses that give meaning to the environment. “..these global, affective responses are based on the meaning that environments, and particular aspects of them, have for people.”

Pallasma mentions “life-enhancing” architecture, which should simultaneously address and engage all the senses fusing the image of self with the experience of the world. Zumthor states that architectural space is experienced as a fully integrated package of senses, not as a series of isolated retina pictures. Therefore, the architect should engage the human body in the space, and it should be felt by the occupants as a crucial sensorial element of the space.

Whether it's in the classrooms, the courtyards, shaded walkways, linking staircases, transitional spaces, the library, or the circulation corridors, lit and aired by masharbiyas, the eyes relate to the visual familiarity first giving a sense of comfort, and then the experience of all the senses get integrated, and the body is in a complete immersion of the built environment being led into different spaces - whether its the shaded courtyards, octagonal rooms, reading spaces lit with colorful diffused light, or the sound of muezzin for prayers from the mosque. “The essential mental task of architecture is accommodation and integration.” Kent states that culture is a theoretical context that hasn’t and can’t be seen by anyone. Only its effects, impacts, and its implications in the environment are what are visible. “Culture exists by definition: it is a
conceptual summary for particular conjugations of a great variety of human phenomenon.**

This concept is vividly laid out by Kafrawi in the design of the Qatar campus.

Rapoport also says that built environments have to be considered in the context of the activities, for they are a reflection of behavior patterns that are socio-cultural. Human behavior is derived from culture and activities; in turn, culture emerges from that behavior. Thus, the built environment must be created to support these activities. If we consider the physical activity patterns on the campus scale, they can be categorized as regular activities of life like walking to and from classrooms and other built spaces, studying, listening, group activities, eating, and socializing. As per Kent and Rapoport, “Built environments are created to support users’ desired behavior, and if the architecture encloses behavior tightly, then activities will tend to shape architecture.” It can well be concluded from this statement that if activities determine the architecture of spaces and the built form, then the spaces are best utilized if the architecture supports those activities providing an enhanced relationship with the built environment. These activities that shape the spaces, which we have already seen through Rapoport’s concepts, are a factor of culture and its variables. In the case of Qatar University campus, these activities are held in corridors, pathways, transitional spaces, courtyards, and green spaces, lecture halls, and cafeterias. These might be the everyday activities that are held in everyday space, considered as key elements that shape the space, may it be a house, institution, or workplace. In Qatar campus, these activities take shape through privacy, identity, and internal planning, concepts of traditional Arab planning and Islam. As Rapoport and Kent emphasize, the concept of culture, as a way of life, leads to a system of activity: activities are direct expressions of a way of life and, ultimately of culture. Rapport says that the purpose of design is to create environments and their constituent

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parts that suit users, i.e., the settings are supportive for their users, their activities, and their requirements, which means that such designs and built environments must be based on an understanding of human characteristics and must fit and be supportive of those. This only happens” if the design responds to ‘culture’”.

In a study done by Shiney Rachel Rajan, Abdulla Al Nuaimi, and Raffaello Furlan on Qatar University Campus: Built Form, Culture, and Livability, oral data was collected from the students through an oral survey divided into three parts. The first part aimed at identifying whether students preferred outdoor to indoor spaces and the location of such spaces. Among 40 students who participated in the initial part of the survey, 26 students preferred the thoughtfully designed outside spaces and courtyards. Four main activities were identified by these students - Walking, Socializing, Eating, and Studying. Walking was selected by 21 students, and this is identified as a casual walk among friends and preferably in a shaded location like one of the courtyards at a slow pace. Socializing was selected by 15 students, and this is defined as talking or watching media with friends on mobile phones or laptops. Some students would be seated and others would be standing. Eating was selected by 11 students. Studying was selected by 5 students. Usually, this task would be done seated. Additionally, 3 students selected other activities in the below Figure 182.

430 Rapoport, Culture, Architecture, and Design, 1.
431 Rajan, Al Nuaimi, and Furlan, “Qatar University Campus: Built Form”, 103.
During my visit to the campus, talking to students, I did observe shaded areas of courtyards extensively used and preferred by students as spaces to conduct most of the activities listed above. “An implementation of elements contributing to the enhancement of the activities will contribute to making the space more livable.”

Norberg Schulz describes architecture “as a means to visualize the genius loci, and the task of the architect as to create meaningful places, whereby the helps man to dwell” Based on this definition, can we infer that El Kafrawi created a meaningful place in Qatar campus where the distinct character and spirit has been visualized splendidly?

The Qatar University campus is definitely enriched with meanings present in all its uniquely designed elements that stimulate not only visual but a multisensory experience, making a user very aware of his/her own presence in that environment. The falcon organization, the octagonal forms, the rhythmic pattern of badgirs, the presence of a central mosque as the guide, magnificently filtered light from stained glass windows, a play of light, shadow, and filtered cool air through the masharbiyas in the corridors, courtyards full of foliage and running water - all of

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432 Rajan, Al Nuaimi, and Furlan, “Qatar UniversityCampus: Built Form”, 102.
433 Schulz, Genius Loci: Towards a Phenomenology of, 5.
these elements start as strong visual cues and then are reinforced with the experiences of the quality of sound, light, and thermal comfort in the classrooms, in the passageways, in the cool and shaded courtyards, in the transitional areas, in the library, through the sound of mosque prayer calls, reinforce the visual cues eventually leading to a greater richness of the experienced environment.

In explaining the links between senses, Pallasmaa says, “Every sense experience produces expectation in the other senses.” Thus an immersive experience is a multisensory experience. The vibrant manifestation of light and air in these classrooms, seating arrangements that allow users to communicate and express with their eyes, and interact closely with their professor and fellow students make the classrooms not only appealing to the visual sense, but the psychic sense as well. Lupton supports the thought by detailing, “Light and color clarify gesture and movement...spacious passageways encourage gathering and conversation....Circular seating arrangements allow people to talk together with their hands, eyes, and faces.” Bauman supports, “Air and light connect people...” One finds all of the above-mentioned activities, responses, and experiences in the classroom modules, library, courtyard gathering places, open stairways, and connecting pathways.

Holl says that the most effective architectural designs should be capable of reducing discomfort while optimizing various comforts such as noise levels, light, temperature, etc. The materials and methods employed to come up with unique designs should be capable of allowing the occupant to experience a conducive environment where different aspects such as noise reduction are guaranteed, glares are reduced, and temperature controlled. This consideration

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436 Lupton and Lipps, The Senses: Design beyond Vision, 125.
437 Holl, Pallasmaa, Alberto, Questions of Perception Phenomenology of, 30.
boosts the occupant's comfort, a factor that results in improved quality of life. Such consideration is also effective in allowing the occupant to interact with the surroundings, a factor that results in appropriate architectural designs and constructions. Architecture should always be looking forward to the development of efficient architectural designs that can provide the required experience to the occupant. Such a consideration can allow the architecture to boost the aspect of sensory interaction between architectural designs and the occupants. After looking at and analyzing each of the designed elements of the Qatar campus, these words by Holl seem particularly applicable to El Kafrawi’s design of the campus.

The pathways or the shaded corridors that link the campus buildings form a hierarchy of spaces - they serve as a meaningful path that leads a user to a more meaningful place which might equate to “home.” These pathways are considered as a traditional way of movement across the University campus. The path in context of life has been described as one that provides “movement,” and as such, possesses “direction” and “rhythm”. The path is therefore, a fundamental extremital symbol that concretizes the dimension of time. Sometimes the path leads to a meaningful goal, where the movement is arrested, and time becomes permanent.

From the analysis that we have done on each part of the campus, it can be clearly inferred that there is a certain coherence, an underlying, binding thought that is running through the built scheme. Alain de Botton talks of buildings as choirs, not as soloists, the performance of which leads to beautiful consonance provided the buildings agree on their mission, what they project, “persuading their disparate elements to pull together to make a logical contribution to the whole.”

Based on the discussion, as per Norberg Schulz, is the "total environment made visible?" Rapoport talks of such an environment that displays clear and consistent choices and fits a particular image or schema seen at all scales - from landscape to the room as the one built on congruence of culture, behavior, and communication. The campus does project a soul, which is very visible through its carefully designed elements; thus, the total environment is given a distinct character. Each of the specially designed elements of the campus is a symbolic representation of a part of history, of the rich culture and the rich traditions. Norberg Schulz clarifies that it is the symbolization that plays a crucial role in concretizing the meanings since it is symbolization that “gathers” the meanings to realize the genius loci of the built environment. “In general, this means to concretize the genius loci. We have seen that this is done by means of buildings which gather the properties of the place and bring them close to man.”

The mosque on campus denotes the sacred center that Norberg-Schulz identifies as a gathering space, holding the users and composition together; “they serve as objects of man’s orientation and identification and constitute a spatial structure.”

Rapoport lays out objectives for a built environment to be considered successful.

1. “It needs to be socially and culturally valid (traditional possibly works the best).” Our analysis above shows this objective as very well accomplished in the case of the Qatar campus.

2. “It should ensure the health of occupants (In relation to climate, traditional housing succeeds...).” Again, our analysis of all the accommodations made by El Kafrawi

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442 Rapoport, *House Form and Culture*, 129.
443 Rapoport, *House Form and Culture*, 129.
dealing with the harsh weather conditions of Qatar clearly reveals that a lot of effort and thought has been made by the architect to ensure the health, comfort, and experience of the campus users.

The harmonious blend of the Qatar campus gives the site a valuable meaning and a unique character, converting it into a rich place that cultivates an exclusive historical context that inspires students, teachers, administrators, and visitors alike. The character lent by the design elements provides a strong psychological link to the Qatari character in the modern environment while being deeply rooted in Islamic values and Arab culture.

Norberg-Schulz says that designers should cultivate an understanding of the “spirit of the place” or the “genius loci,” which he explains could be recognizing the essence of each being, each element, each component that forms the whole for it is what gives a place its life. Integral to this essence are local materials, native vegetation, local building elements, and local communal practices. “The resulting place evolves by embracing the unique qualities without trying to change or control it. In this sense, humans and places help define each other, and at this point, humans can truly be connected with their surroundings.”

Historically, traditional Islamic architects are said to consider not just the form of the building but the mental and spiritual dimension of it since it is the belief of Islam that beauty depicted through appearances does not last long. It is the inner beauty, the spiritual beauty, and the spirit of the space that, when paid attention to, leads to great architecture. Even after over five decades since El Kafrawi thoughtfully designed the campus, the richness of tradition, culture, and character is distinctly clear and visible. In Experiencing Architecture, Rasmussen says the task of the architect is not to make the architecture visible; but to experience the special purpose

it was designed for, “how it was attuned it is to the entire concept and rhythm...how you are naturally led from one space to the other,” how the choices were made for the orientation, textural effects, colors used, how you dwell in the spaces, and how “order and relation are tied into the human surroundings.”

Alain de Botton describes the feeling of beauty in a built environment as more than mere aesthetics, “it implies an attraction to a particular way of life...” - the meanings that the structures are promoting “through its roof, door handles, window frames, staircase, and furnishings.” Based on this definition and the detailed designs analyzed in the Qatar campus, El Kafrawi’s built environment justifies being called beautiful.

Undoubtedly there is a language that the built environment of the Qatar campus projects as we have been analyzing. Rasmussen asks the question of speaking architecture. “Can architecture be heard? Most people would probably say that as architecture does not produce sound, it cannot be heard. But neither does it radiate light, and yet it can be seen.” From the in-depth look at all the specially designed elements of the Qatar campus, we can clearly infer the language and hear the sound that each part of the campus is radiating. "It is not enough to see architecture; you must experience it. You must observe how it was designed for a special purpose and how it was attuned to the entire concept and rhythm of a specific era.” Rasmussen’s words perfectly resonate with the design of the Qatar campus. Can it thus be inferred that El Kafrawi was able to create a meaningful place for the users of the Qatar campus?

445 Rasmussen and Wendt, Experiencing Architecture, 33.
447 Rasmussen and Wendt, Experiencing Architecture, 224.
448 Rasmussen and Wendt, Experiencing Architecture, 33.
“It is clear that the architect is neither a mystical creator (operating outside of language) nor a productive engineer (operating through mathematical language). He or she must necessarily engage the linguistic dimension of a culture. The main concern...is ethical, seeking to find appropriate language that may frame a project in view of the common good, a language always specific to each task at hand. The presence of a well-grounded praxis, the trajectory of architect’s words and deeds over time that embodies a responsible, practical philosophy, is far more crucial than the aesthetic or functional qualities of a particular work.”

It is very apparent from the analysis that El Kafrawi succeeded in understanding clearly what the needs of the campus design were. He clearly understood, outlined, and through his ingenious design, attained goals and objectives laid out for the design of an institution in Qatar, but he didn’t just succeed in doing that. He was successful in creating an environment that fits perfectly well with the traditions and local culture, an environment that had an identity and history behind each form and space created, an environment that kept the comfort and behavior of users at every step, an iconic environment that gave a visual expression of vernacular and traditional, an environment that embedded contemporary and modern techniques, a unique environment that through clear and consistent choices fit the cultural schema as well as an environment that does what its design claims to do and is supposed to do - “The existential purpose of architecture is, therefore, to make a site become a place, that is, to uncover the meanings potentially present in the given environment” for that represents genius loci - “what a thing is, or what it wants to be.”

Author Brain Brace Taylor for MIMAR 16 says for El Kafrawi’s design of the campus, “However one feels about the success of the end result, El


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Kafrawi has sought metaphorical expressions from within the local building heritage.452 As Le Corbusier puts it - “Architecture is a thing of art, a phenomenon of the emotions. The purpose of construction is to make things hold together, of architecture to move us. Architectural emotion exists when the work rings within us in tune with a universe whose laws we obey, recognize, and respect. When certain harmonies have been attained, the work captures us. Architecture is a matter of “harmonies,” it is a “pure creation of the spirit.”453 In the campus design of Qatar University, El Kafrawi does introduce originality in the design. that produces a unique, fresh, and harmonic space in the country's history without shrouding connections and relationships with the past.

Keeping in line with the scope of this research in context of meanings that Kafrawi established in the design of the campus, we have analyzed that the design is a success with all its historical meanings. The success of the Qatar University campus project can be seen further in its influence on one of the recent projects that I came across - the conceptual design of classrooms for the Los Angeles Unified School District, designed by the Conceptual Design Group, an association of Architects and Industrial Designers based in Califronia. The intent of this project was also to integrate technology to provide a modern learning experience much like El Kafrawi's approach in Qatar. Even the form of the classrooms can be seen as a direct influence of El Kafrawi’s approach as shown in Figure 183 below. In their notes on their choice of the octagonal shape for the concept, they elaborate- “The “Octagon” is designed for interchangeable use as a Classroom, “Learning Theater” or Group Activity Room suitable for all grades.”454

452 Taylor, “University, Qatar, 19.
This demonstrates how successful designs can be inspiring and influential in future projects, even in different contexts.

Figure 183. Shows four and six classroom modules around a learning theater.

Incorporating emerging technologies into the Octagonal classrooms, they describe this setting and form as “the best environment for excellence.”

While the Qatar University campus project by Kamal El Kafrawi has been widely praised for its successful integration of modern technology with traditional architectural forms, it has also been a subject of some criticism. One major issue that has been noted is the difficulty in wayfinding due to the modularity of the university’s iconic classroom buildings.

According to a 2018 article titled "Complexity in the Built Environment: Wayfinding Difficulties in the Modular Design of Qatar University’s Most Iconic Building,” the identical classroom modules have been held responsible for the lack of intuitive wayfinding for students and visitors. The multiple identical modules make it difficult to distinguish between different sections and find specific rooms or offices. Whereas the campus's octagonal and square plan
form makes it visually attractive and interesting, it also creates a complex and confusing layout that is difficult to navigate. As a result, the University has had to rely on signage, markers, and wayfinding maps to direct people to the proper locations within the campus. Although many modern buildings with complex designs and layouts face similar challenges and signage has been regarded as a standard solution, it has been noted that it can detract from the aesthetic, immersive, and cultural value of the space, which holds especially true in the case of Qatar campus. In particular, the reliance on English-language signage has been criticized as a failure to fully integrate the building into the cultural and linguistic context of Qatar. It also highlights the importance of considering both functionality and aesthetics in architectural design and the need for ongoing evaluation and improvement of built environments to ensure they meet or exceed the needs and expectations of their users.

In addition, according to the University officials, even though El Kafrawi’s richly designed Qatar campus has been contemplated as a design success, it has also been deemed inadequate for the dramatic growth experienced by the University and has been unable to suffice for the modern demands. As per the Assistant VP for Facilities and Information Technology for the University, Dr. Khaled Naji, the campus is being challenged to accommodate a phenomenal 12% increase in students and related facilities per year. This has led to the implementation of 17 new major construction projects for the campus, including 100,000 square meters (~1,100,000 square feet) of multi-story parking, 76,000 square meters (~ 820,000 square feet) of Engineering Building, 23,000 square meters (~250,000 square feet) of Pharmacy Building, an early childhood center, a 60,000 sq. feet maintenance center, a 135,000 square meter (~1,460,000 square feet) student housing complex, along with academic offices, multipurpose hall, administrative
buildings, college buildings for various other disciplines. The University community is witnessing exponential growth in the form of a sweeping urban movement, rendering El Kafrawi’s spatial and tectonic development unusable for extension projects to keep up with its extensive demands. Therefore, the University decided to preserve the buildings designed by El Kafrawi as part of the cultural and historical heritage of the country and use them for other purposes while providing modern facilities for students and staff in the new development.

In an effort to get more into the detail regarding the expansion of the Qatar University Complex ignoring El Kafrawi’s initial development and not being able to get any response from the University officials on this matter, I got in touch with Dr. Mark David, an assistant professor at Qatar University in the Department of Architecture. He has been researching the spatial layouts and structures of nine Doha neighborhoods, including the QU campus, since 2017. In his opinion, based on his research, abandoning of El Kafrawi’s original planning of the QU campus is attributed to a couple of factors. First is the lack of availability of space for the rapidly increasing demand. This held true not only for the buildings designed by El Kafrawi, but even for the campus extension development that followed. As per some of the information provided by other long-time professors of the department, it is said that the College of Engineering, although initiated in 1973, took around 10 years for completion, thus becoming effectively obsolete even before the construction was finished due to organizational growth. Secondly, it is also speculated that the new modernized development of QU is a competitive reaction to the high-profile buildings for the Qatar Foundation in the Education City of Qatar by renowned architects like Arata Isozaki. In his research using syntax modeling, Dr. Mark David

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did uncover the fact that El Kafrawi’s master plan for the QU provided a solid foundation for the
design and expansion of the QU campus.

Although no other design projects based on El Kafrawi’s design ideas and philosophy
could be located, an exuberant ode to the well-known buildings of the city has been given by
artist Shezad Dawood. He has created a playful version of iconic buildings built in the 1980s,
one of them being the Qatar University campus by El Kafrawi. Working closely with the
architect and historian Fatma Al Sahlawi, Dawood created a miniature city with these buildings
in the form of a playground, defining them as “a key group of modernist buildings that really
represented the shift to an independent nation”. The four buildings that he chose for the
playground are – the Sheraton Hotel by William Pereira, the National Theatre and Ministry of
Information by Triad CICO, Qatar University by Kamal El Kafrawi, and the Qatar Post Office by
Twist & Whitley.456

Figure 184. Shows the miniature design of Qatar University includes a climbing wall and illuminated mashrabiyas.

(accessed April 15, 2023).
Future research plan:

Amos Rapoport's analytical framework could also be utilized to identify the shortcomings in the design of Qatar Campus and to develop/suggest effective solutions. Not only that, further qualitative and quantitative research is needed to further analyze the sub-elements and details of the designed campus and its areas. Hence, a further research plan is suggested, which will incorporate the following process:

1. Develop a research methodology: Develop a research methodology that outlines how each designed element and subelement of the Qatar University campus will be studied and analyzed. This methodology could include both qualitative and quantitative research methods, such as site observations, interviews, surveys, focus groups, and document analysis.

2. Gather data: Collect data on each element of the Qatar University campus. This may involve taking photographs, conducting surveys, interviewing students and faculty, and examining relevant documents and records.

3. Analyze the data: Analyze the data gathered on each element of the Qatar University campus. This analysis should focus on identifying the meanings, interpretations, and significance of each element and how they relate to the overall design of the campus. Not only the data gathered will be analyzed, but this data will also be compared and analyzed in the context of other researches ongoing and already done on different parts of the campus, whether they are from a climatic aspect, traditional aspect, functional aspect, or even from aspect of phenomenology of each of the spaces.

4. Synthesize the findings: Synthesize the findings from the analysis of each element of the Qatar University campus. This synthesis should aim to provide a comprehensive
understanding of how the various elements of the campus contribute to its overall meaning and character.

Figure 185. The beautiful Qatar University campus showing hierarchy of spaces - secluded and shaded green courtyard spaces in between the rhythm of wind and light towers, with the modern skyline of Doha city.


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