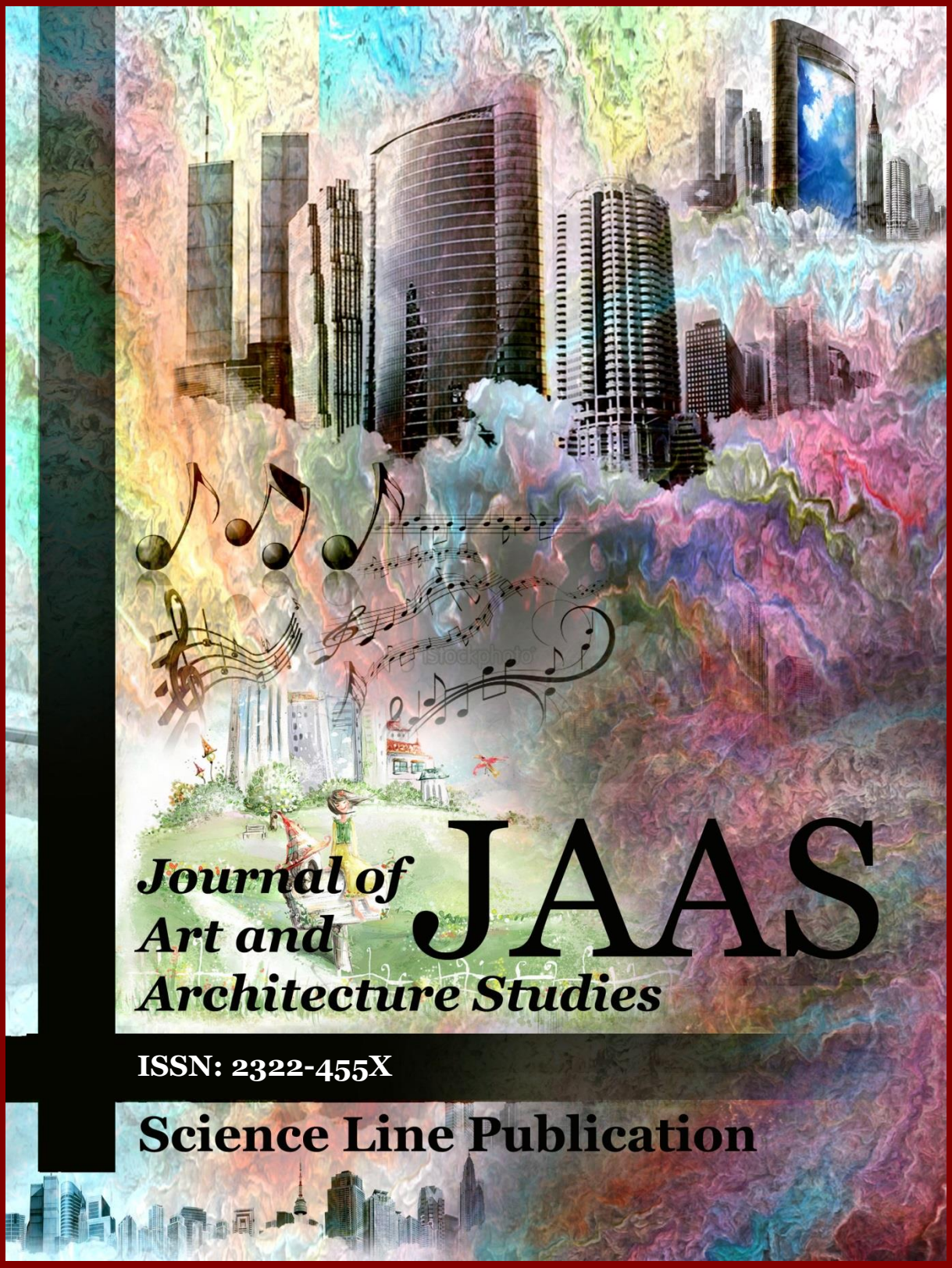
In the Name of God



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Architecture and the politics of nationalism in the era of globalization

Hussaini IU, Wakawa BU, Umar A and Elnafaty AS.

J. Art Arch. Stud., 12(2): 11-18, 2023; pii:S238315532300002-12
DOI: https://dx.doi.org/10.54203/jaas.2023.2

ABSTRACT

Architecture is a physical force and a communication medium that speaks to power of value and ideals of a society through effective communication of socio-political messages embedded in its physical configurations. It helps to create the physical as well as the political institutions of establishments in the society that embodies the civilization codes of "law and order." However, the power of architecture as a political propaganda tool is reminiscent of nationalism in many facets and circumstances. In the past imperial establishments, the ruler used architecture as a control tool to influence the people's perception of the state and the achievements of the civilization. Whereas, the later civilization of globalization in the 21st century helps to create the institutional establishments of democratic architecture with a renewed strategy to wield power to entertain and gain political and socio-economic supports for the governments and corporate organizations. This review therefore demonstrates the role of architecture in the politics of power and influence vividly evident in the emergent democracies and some current establishments of globalization, a case reference of Dubai.

Keywords: Architecture, Politics, Nationalism, Civilization, Globalization.

[Full text-PDF] [Crossref Metadata] [Export from ePrints]

Research Paper

The architectural features of nursing homes affect the residents' sense of home

Aliyari M.

J. Art Arch. Stud., 12(2): 19-26, 2023; pii:S238315532300003-12
DOI: https://dx.doi.org/10.54203/jaas.2023.3

ABSTRACT

Following the increase in the elderly population in Europe and other parts of the world, taking proper care of elderly people has recently become a significant concern in Iran as well. The architecture and design of nursing homes can have a profound impact on the sense of home and well-being of the elderly residing in these facilities. Therefore, the aim of this study is to determine the relationship between influential architectural factors in the nursing homes of District 10 of Tehran and the sense of home among the elderly. The research method used in this study was descriptive correlational, and data collection was carried out in two stages: library and documentary research, as well as field survey. A purposive sample of 45 elderly residents of nursing homes in District 10 of Tehran were studied using two questionnaires on design and architectural factors of nursing homes and the motivation for living. The results showed that the correlation coefficients of the design and architectural factors and their components concerning lighting, public private and spaces, accessibility, and green spaces with the sense of home among the elderly were 0.521, 0.224, 0.621, 0.413, 0.281, and 0.403, respectively. Based on the findings of this research, it can be concluded that the design aspect has a direct impact on the formation of the sense of home in the elderly, and it is not possible to separate the physical and environmental aspects from the psychological dimension of the elderly.

Keywords: Elderly, Sense Of Home, Architecture, Care

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Review

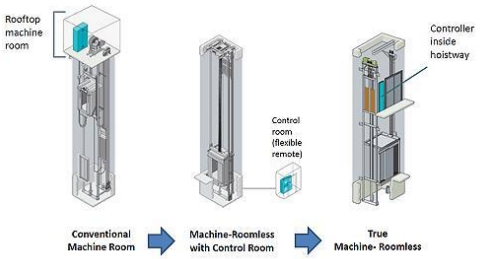
A review of limitations and future challenges in optimization of energy in sustainable high-rise buildings

Kadaei S.

J. Art Arch. Stud., 12(2): 27-34, 2023; pii:S238315532300004-12
DOI: https://dx.doi.org/10.54203/jaas.2023.4

ABSTRACT

Sustainability has been one of architecture's most significant trends over the last twenty years. Environmental consciousness of professionals has put sustainability at the heart of the architectural profession and has contributed to adopting and implementing sustainable designs on the scale of urban landscapes. Buildings consume 40% of global energy, in which high-rise buildings account for a significant proportion of the total energy used. Hence, present study reviews limitations and future challenges in optimization of energy in sustainable high-rise buildings. Results of this study show that budget limitations, managerial and organizational policies, legal issues, technical and scientific infrastructure, and cultural and geographical aspects are all affecting the widespread use from energy optimization in current high-rise buildings and need to be considered in future studies.



Keywords: Energy, Sustainable Architecture, High-Rise Building.

[Full text-PDF] [Crossref Metadata] [Export from ePrints]

Research Paper

The form and content in the architecture of the Yemeni temple gate: the gate of the Baran temple in Ma'rib as a model

Al-Nehmi AA.

J. Art Arch. Stud., 12(2): 35-43, 2023; pii:S238315532300005-12

DOI: https://dx.doi.org/10.54203/jaas.2023.5

ABSTRACT

Architecture has been considered one of the most expressive means for humans since the beginning of settlement. It carries two aspects, one of which is physical, which is the visible and tangible form. The other is non-physical, which is the intellectual content that the form reveals. Yemeni architecture in general and the architecture of temple gates in particular were shaped by the local environment and social culture. The Yemeni person tried to express his visions, beliefs, and perceptions in a unique architectural form that is distinct from others in an embodied and abstract form. The current research attempts to investigate the content that the architectural form of the Yemeni temple gates carried in form and details. The research focuses on tracing the relationship between the idea and the symbol of portal architecture from the stage of embodiment to the stage of abstraction. The research relies on descriptive and analytical approaches and comparative approaches to compare the gates with their counterparts in the kingdoms of ancient Yemen to determine the similarities and differences the extent of influence between the kingdoms. It aims to analyze the architectural form of the gate in a comprehensive and detailed manner to identify intellectual sources. The study reached an understanding of the architectural form of the temple gates and their contents. Yemeni thought was characterized by integration in embodiment and abstraction. The Yemeni architect turned to signs and symbols in order to give the form the character of embodiment through abstraction, while preserving the main features of the inspired form.

Figure 10. An offering table embodies the shape of Yemeni temple [7]

Keywords: Architectural Form, Temples, Yemeni Architecture, Gates, Sheba, Ancient Yemen.

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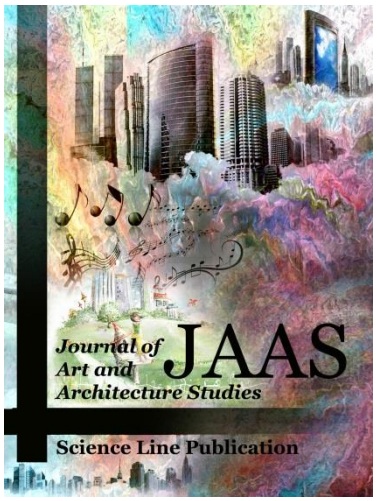

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ARCHITECTURE AND THE POLITICS OF NATIONALISM IN THE ERA OF GLOBALIZATION

Ibrahim Udale HUSSAINI, Bukar Usman WAKAWA, Aminu UMAR and Abbas Said ELNAFATY

Department of Architecture, Abubakar Tafawa Balewa University Bauchi, Nigeria

Review Article

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Corresponding author:
E-mail: hudalib@yahoo.co.uk

ABSTRACT: Architecture is a physical force and a communication medium that speaks to power of value and ideals of a society through effective communication of socio-political messages embedded in its physical configurations. It helps to create the physical as well as the political institutions of establishments in the society that embodies the civilization codes of "law and order." However, the power of architecture as a political propaganda tool is reminiscent of nationalism in many facets and circumstances. In the past imperial establishments, the ruler used architecture as a control tool to influence the people's perception of the state and the achievements of the civilization. Whereas, the later civilization of globalization in the 21st century helps to create the institutional establishments of democratic architecture with a renewed strategy to wield power to entertain and gain political and socio-economic supports for the governments and corporate organizations. This review therefore demonstrates the role of architecture in the politics of power and influence vividly evident in the emergent democracies and some current establishments of globalization, a case reference of Dubai.

KEYWORDS: Architecture, Politics, Nationalism, Civilization, Globalization.

INTRODUCTION

The subject of study centres generally on architecture and its role in national politics of development focusing on the present age of globalization. For ages, architecture as a discipline has been deployed as a propaganda tool for political and social objectives, demonstrating on the existing socio-physical variables in the built environment. However, it has been argued that architecture is a self-contained sign system that can be read in its own language with potency for delivering messages in its physical form to serve public interests [1]. Hence, it provides the space for the principal institutions of the society in which social and political activities take place [2].

In fact, all nations of the world in the past as well as the present attempt to build their reputations through a process of nation building or 'nation brand' which is synonymous with the term nationalism. This involves the build-up of symbolic values of social, political and economic products that can project distinctive characteristics of the nation to the foreign public. According to Yari et al. [1], buildings offer the most appropriate medium to help attain these goals in many powerful ways. This is because, the aesthetic value of architecture and the physical imposing power of buildings do motivate human emotions and help to engage consumers to its content using their physical senses to recognize the function. By this phenomenon, architecture portrays its values of utility and aesthetics. Consequently, architecture is being deployed by many countries of the world to propagate their foreign and domestic politics, and also to glorify their economies. Literature records present ideological and aesthetic motifs in fascist Italy, Japan and the former USSR as typical examples of the early scenarios; followed by the reformed kind of architecture established by the Art-Nouveau representatives and early functionalism, and influenced official, administrative edifices used for the state purposes [1]. On this note, Dr. Alice Sabrina Ismail in Yari et al. [1] asserts that architecture "arouses nationalistic emotions in the people and sensitizes them to maintain status and position in the society."

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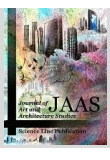

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Architecture and politics have successfully combined together to shape the human society on the local and international levels. While architecture helps to conceive the physical structures in which we dwell, the political art helps to conceive institutional structures that allow humans to live together harmoniously in their respective societies [3]. Thus, this review is aimed at projecting the value of architecture as a physical entity in nation building particularly in the politics of nationalism.

ARCHITECTURE AND ITS ROLE IN NATIONAL POLITICS

There is the potency in the physical components of architecture to denote and symbolize societal and national values in diverse ways. In fact, the glass as a physical entity of a structure has been used to signify transparency which in political language denotes democratic accountability. In the same manner, the element of height has also been used to symbolize freedom of the society from oppression, intimidation and the likes. Though, it is argued that these symbolic representations in the view of the common observers, which may not equally be comprehensible, are susceptible to further explanations that do actually influence the political experiences of buildings [1].

Roussinos [4] asserts that architecture is a political act that serves as a permanent marker of a civilization that demonstrates dramatic expression of a society's relationship to power providing most reliable guides to the "life" of past civilizations through the readings of historic buildings [2]. Thus, the public character of architecture is evident in its account of world architecture characterized by the value of its historic monumentality and state order, exclusively evident in the architectural works on capitols, courts, palaces, tombs, temples, and churches of the past days. These architectural values elucidate on the state's order, the creed of its civilization, the ruling institutions and its political economy. In consequence, it enshrines the society's civilization codes of "law and order" to ensure a conservative alliance between it and the state power [2]. On this note, Norris Kelly Smith in Milne [2] refers to the uniqueness of architecture as an "establishment art" responsible for institutional establishments not common with other forms of art.

Architecture comprises of all establishments of structures, public spaces, and buildings including their interiors and landscapes created by man as contributions towards human social constructions; while the politics is bound with the task of developing and improving on the social structure of the society. This is essentially important in order to create a good living environment and a sustainable society with high quality of life [5].

Architecture actually speaks to power of political, social and economic hegemony. It is used to conceptualize a social model of structural-thought based on the understanding of social and political relationships. These relationships of power are embodied in monumental architecture created by political powers and they do actually demonstrate the nature and strength of the power created in them [6].

Political leaders have wittingly used architecture as a symbolic medium to project on how they wished to be seen and perceived by the citizens and the foreign public. In addition, it serves as a tool of change capable of instilling mental control and intimidation; and subsequently impacting political ideals on the public. This forecast provides the control mechanism which runs on the emotions of people with the ability to create desired effects of the political power in place.

In the words of Lebbeus Woods in Yari et al. [1], 'buildings change the society that builds them, creating social and political transformations in the society.' These transformations are mostly achieved through the practice of monumental architecture which embodies the nature of their rule in the building plans and the city setting. These well-orchestrated plans and schemes serve as the visual statements of their ideology of power which astutely justifies the need for architecture as a potent tool for the development of the public realm. In fact, the shape and size of architectural feats in conjunction with the visual and relational properties are capable of evincing political authority of the state [1].

ARCHITECTURE AND THE DEVELOPMENT OF THE PUBLIC REALM

The built environment which is a product of architecture and planning is considered a political setting. This is because the space created by architecture, in the words of Daniel Libeskind in Yari et al. [1] is recognized by the citizens as their polity and themselves as subscribing to democratic values. Architecture thrives in providing the space for democratic performance in the public realm of human existence; which in consequence acts as the medium by which the ruling class exercises authority. Thus, the ruling class creates the public order with political characteristics, and architecture connects with the public order by creating the

building institutions for political activities, such as the parliament buildings, the courts and the executive office complexes for the ministries and government agencies. It is architecture that interfaces with town planning to create the urban domain, which is the city platform. The city platform is further being shaped by political decisions in terms of policy formulation to determine the type and nature of development which includes physical planning, construction, infrastructure, recreation and the general organization of the social spaces [3].

It is with this understanding of architecture and politics that Lindvall [3] further relates that buildings and the city setting (architecture) are metaphors for the state or the political system; which he summarily affirms that;

"...a building's purpose is to be useful to those who live, work, and convene within it, even if those people are very different from each other....."

"....similarly, the purpose of a well-ordered political system is to make life easier and better for those who live in it, while recognizing that people differ from each other and have different goals and ideals in life."

Accordingly, the classified metaphors tend to suggest that a sustainable political system should address the needs of the citizens and as well reflect their values and desired aspirations. To meet this requirement, the Roman architect, Vitruvius in Milne [2] argued that a good building or city setting (architecture) should be characterized by three values of strength, utility and beauty as a demand of the state constitution.

Architecture is the concurrence platform for the visual manifestation of the state power and ideology in the establishment of the public realms. However, the adopted plan configurations in the city setting are either axial or non-axial used to portray desired effects. The axial plans are intrinsically used to direct people to certain goals meant to represent the seat or symbol of power; while the non-axial plans reflect on the quality of the community setting and the associated freedom through choices rather than the supremacy of a single goal, thereby redirecting political power to the mandates of the people [6].

On the other hand, Yari et al. [1] elucidate widely on the attributes of scale and form of buildings on the political authority of the state. He stressed that the scale of a building in terms of height, length, width and depth when juxtaposed with its visibility and dramatic sculptural effects do in fact symbolize authority; and can be used as connotations to the following needs;

i. Emphasis of dominancy and control,
ii. Evocation of feelings of impressiveness in order to be remembered,
iii. Assertion of identity in the world,
iv. Visual prestige and dignity of the patron,
v. Projection of influence in the society.

Yari et al. [1] further affirm that the form of a building has the capacity to arouse perceptual interest in people; a strategy the ruling class deploys to express authority in many diverse ways from historic past to the era of globalization.

ARCHITECTURE AND POLITICS IN THE ERA OF GLOBALIZATION

Though, architecture had staged a global influence on national politics of all times, there is a great divergence in its public character of the state and religious edifices of the historic past, and the modern corporate and opulent structures of the globalization era [2]. Be that as it may, the epoch of globalization is characterized by keen advancement in technology that has greatly influenced the rate and nature of developments evident in the eulogies of politics and architectural practice of the 21st century.

Beyond the depiction of the power of the state and its influence on the emotions of the citizens, architecture has endured a more sustainable approach in creating enduring values in our daily experiences in recent times by deploying the advanced technologies. Accordingly, globalization demands a change in our ways of life and our urban development scheme in order to create a sustainable society [5]. This is explicitly evident in the ongoing socio-political and physical developments in both the western and eastern blocks of the globe. As such, the developmental trend in the new city setting is considered key to sustainability with a concern for the reduction in the greenhouse gas emissions and effective as well as efficient resources management.

Strunke & Carenholm [5] advocate globalization to intently accommodate good communication facilities for nearness, convenience and security in order to attain salutary living conditions. This is occasioned by good transportation systems that ensure good traffic flow through a well-coordinated system of settlements and transport infrastructure planning intended to minimize resources. Therefore, a sustainable urban future demands an architecture that provides the needed social and physical integration liable to peaceful coexistence. This is attainable through a

formidable design process and value initiatives that give birth to the evolution of a city 'whole' of harmonious life devoid of social tensions and conflicts.

Globalization is reminiscent of sustainable architecture that is responsible for the creation of sustainable built environment undoubtedly dependent on energy-efficient technologies based on considerations of ecological, social and economic sustainability. In addition to the needed conservation measures to tackle issues of resources depletion, the preservation of our heritage achievable through effective and efficient programmes of upgrading and modernization of old facilities, amenable to changing needs and functions is heavily desired [5].

Typical examples of architecture as symbolic medium of political power can be found in past civilizations of the Egyptian, Greek, Roman empires, etc. in the monumental display of the pyramids, temples, and cathedrals. But a more recent example of monumental architecture can be found in the Gulf States and in some western and eastern parts of the world. A case study is the city of Dubai, which is almost non-existent in the '1980s' but has now become a global attraction through the Dubai strategy of the ruling class via architecture. Dubai as an outcome of globalization is able to wield power to entertain, gain support for the government's campaigns and encourage a formidable unity of the new-built city. This is a successful story of a situation where great political transformations are attained through immense architectural practice to gain the loyalty of the people and to promote their image [1].

Unlike the period of imperialism, the current dispensation of secular and democratic society has no place for ambitious militarists and would-be dictators who might desire to perpetually cling on to power on feudal or autocratic jurisdiction. Nevertheless, architecture remains a powerful tool in the hands of political leaders in addition to technology and other important contemporary media for the propagation of ideals of globalization [7].

Similar to the historic past, the architecture of the globalization era is characterized by the presence of super structures of monumental heights and grandeur. The emergence of the supertall buildings as widely recognizable icon of the cities is an impetus for future building growth and economic development [8]. In a grandiose show of eminence and propaganda of strength in socio-cultural, political and economic development, the skylines across the major cities of the world have been rising considerably over the past decades. A typical example of this development is the current trends of supertall building developments in the Gulf States of the Arab world. The current architectural feat of this region has helped to shape the image of the emerging cities and the national leadership with strong influences on the perception of the inhabitants and the outside world, and traction towards a more sustainable tomorrow. The politics of prominence through physical/economic development and social integration is massively on the display. The buildings' imagery (shown in table 1) represents a cultural iconic symbol that depicts societal identities; a reflection of the cultural aspects through historical analysis of the cities [9, 10].

Nonetheless, the motivating factor in these developments has been to push the boundaries of technology and accomplish feats of sustainable political power and socioeconomic strength never before imagined as exemplified by the Burj Khalifah superstructure [11].

Most of the emerging edifices of the globalization era are constructed using sustainable principles to achieve greater sustainability with a consideration for reduced greenhouse gas emissions and energy (cooling) loads in specifically hot climatic regions. Principal among others is the desirability of the supper structures; and the intent of public awareness to raise super buildings to a state of the art environmental agenda in which technology innovation in the adoption of natural energy systems is integrated with innovative structures [9].

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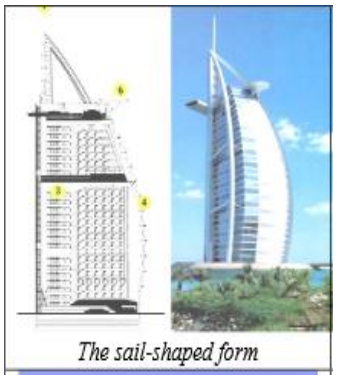
Table 1. Examples of high-rise buildings with responsive cultural patterns

	Description	**The building design**	**Inspirative model**
Burji Al-Arab Hotel, UAE	The form resembles a sail that reflects the navigation activity, one of the major activities in Dubai, as a dramatic tribute to the region's seafaring heritage (El-Kordy et al., 2007) [9].	 *The sail-shaped form*	 *Traditional boat*
Twin Towers, Doha, Qatar	The tea pot symbolism at the Twin Towers and Teapot Sculpture at Eastern End of the Corniche (http://www.allposters.com/) [9].	 *Twin Towers and Teapot Sculpture.*	 *Qatari tea pot statue and modern tea pot statue*

The Burj Dubai Tower, UAE	The tower is inspired from the geometrics of the indigenous desert flower and the patterning systems employed in Islamic architecture. The tower's base and the geometry reflect the six petal desert flower of the region. Its harmonious structure is one of the organizing principles for the design (El-Kordy et al., 2007) [9].	 *The tower's base and geometry*	 *Native desert flower*
Hilal (Half Moon) Headquarters for the Organization of Islamic States, Saudi Arabia	The building is designed as an abstract reading of Islamic Culture. The building is shaped in the form of the Islamic symbol of the Hilal coupled with the Nejme or Star (Azad-Hye Newsletter, 2006) [9].	 *The hilal-shaped form*	 Hilal

Source: (Abdel-Hafeez et al., 2009) [9]

CONCLUSION

Studies have indicated that the metaphors of politics and architecture have collectively repositioned the issues of nationalism in all settings; and particularly in the era of globalization. While architecture is needed to accommodate and provide the shelter space for all human activities, it is the practice of politics that defines the manner and essence of such activities in the social, economic and environmental spheres of human existence. Architecture has played a significant role not only in shaping the physical environment of man, but also in defining human perceptions and the location of the civic functions; as well as showcasing the image and power of the society.

Public spaces meant for civic functions are the creation of architecture which invariably is responsible for potent political activities necessary for sound political performance which inevitably gives room to the ruling class to exercise authority. Hitherto, the remarkable building attributes provide the symbolic medium to project on how the rulers wished to be seen and perceived by the citizens and the foreign public.

The era of globalization has the fortune of technology to advance the potency of architecture to create sustainable built environment which enables good communication facilities for nearness, convenience and security in order to attain salutary living conditions.

The Gulf Arab States and particularly Dubai is a typical example of how architecture has served as a successful tool of propaganda in the politics of nationalism in the era of globalization. This is occasioned by the creation of super structures to boost the image of the leadership and the emerging city with strong influences on the perception of the inhabitants and the outside world, and a shift towards a more sustainable tomorrow.

DECLARATIONS

Corresponding author

Correspondence and requests for materials should be addressed to Ibrahim Udale HUSSAINI; E-mail: hudalib@yahoo.co.uk

Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Authors' contribution

All authors contributed equally to this work.

Competing interests

The author declares that there is no competing interest.

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THE ARCHITECTURAL FEATURES OF NURSING HOMES AFFECT THE RESIDENTS' SENSE OF HOME

Mahdi ALIYARI

Department of Architecture, Islamic Azad University, Shabestar Branch, Shabestar, Iran

Research Article

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Corresponding author:
E-mail:
mehdi_je2000@yahoo.com

ABSTRACT: Following the increase in the elderly population in Europe and other parts of the world, taking proper care of elderly people has recently become a significant concern in Iran as well. The architecture and design of nursing homes can have a profound impact on the sense of home and well-being of the elderly residing in these facilities. Therefore, the aim of this study is to determine the relationship between influential architectural factors in the nursing homes of District 10 of Tehran and the sense of home among the elderly. The research method used in this study was descriptive correlational, and data collection was carried out in two stages: library and documentary research, as well as field survey. A purposive sample of 45 elderly residents of nursing homes in District 10 of Tehran was studied using two questionnaires on design and architectural factors of nursing homes and the motivation for living. The results showed that the correlation coefficients of the design and architectural factors and their components concerning lighting, public private and spaces, accessibility, and green spaces with the sense of home among the elderly were 0.521, 0.224, 0.621, 0.413, 0.281, and 0.403, respectively. Based on the findings of this research, it can be concluded that the design aspect has a direct impact on the formation of the sense of home in the elderly, and it is not possible to separate the physical and environmental aspects from the psychological dimension of the elderly.

KEYWORDS: Elderly, Sense Of Home, Architecture, Care

INTRODUCTION

The global increase in life expectancy is associated with a significant rise in the number of highly elderly individuals who are profoundly affected by disabilities, dependencies, and multiple chronic illnesses, including neurocognitive disorders. Predictions indicate that by the year 2020, the global elderly population will reach one billion individuals. In 2006, the United Nations estimated the world's elderly population to be 687 million and 923 thousand, and it is projected to reach 1 billion and 968 million and 153 thousand by 2050. This represents approximately 21.4% of the population at that time. Iran is not exempt from the phenomenon of population aging, as the average life expectancy of Iranians increased by about 10 years from 1365 to 1375. According to the 2011 census in Iran, there were 6.2 million elderly individuals aged 60 and above in the country, accounting for 8.2% of the total population [1]. These figures indicate that if the country's planners and policymakers do not have a specific and effective plan from now on, the country will face a significant crisis and fundamental challenges in addressing the economic, health, and social issues faced by this group in the next 20 years.

A considerable portion of the elderly population lives in nursing homes. These nursing homes face a significant challenge: how to provide care services that meet the increasing needs of their residents while creating a pleasant living environment that fosters well-being and allows residents to engage in new projects. In this regard, many publications regularly highlight the physical environment as a crucial factor in determining the quality of life (QoL), well-being, and health [2].

Elderly individuals should be able to continue their lifestyle before entering nursing homes [3]. Therefore, several healthcare organizations strive to create arrangements that focus on "good living" rather than being centered solely on healthcare, and aim to create an environment that resembles a home for its residents [2]. Providing good clinical care and a homely environment poses challenges. Emphasizing safety and hygiene requirements can create risk-prone environments that compromise the quality of life in nursing homes.

One of the challenges of caring for elderly people at home in modern times is creating a sense

of home and motivation for the residents. The sense of home is a multi-factorial phenomenon heavily influenced by social and individual characteristics, as well as the built environment and architectural facilities. The sense of home is related to personal experiences and emotions. It does not happen overnight; rather, it develops gradually in individuals who require independence, security, a source of identity, choices, controls, and memories [4]. Creating a sense of home is closely connected to the theory of place attachment [5]. Place attachment is a multi-dimensional phenomenon that describes the emotional bond between individuals and a place, which is influenced by personal experiences.

Rijnaard et al. [4] systematically examined the factors influencing the sense of home in elderly residents of nursing homes. Their study revealed that the sense of home in nursing home residents is influenced by 15 factors, which can be divided into three themes. The first theme includes psychological factors such as a sense of belonging, maintaining personal habits and values, autonomy and control, and coping. The second theme encompasses social factors, including interactions and relationships with staff, residents, family, friends, and pets, as well as activities. The third theme is the built environment, which includes private and (semi-)public spaces, personal belongings, technology, aesthetics and ambiance, and outdoor spaces. Van Hoof et al. [6] studied the factors influencing the sense of home in elderly residents living in nursing homes from the perspectives of residents, relatives, and care professionals through a photo elicitation study. The findings indicated that building design and interior design are the main factors in creating a sense of home.

Architecture and urban planning are among the most important elements related to the lives of the elderly. The presence of the elderly in their homes and communities requires an initial response to their needs. This response should consider the physical limitations and mental conditions of these individuals. In order to maximize the elderly's access to services and the community, the lives and psyches of the elderly must be carefully analyzed. Physical and mental conditions, needs, and characteristics of the elderly are factors that contribute to achieving this goal. Paying attention to human needs in each stage of an individual's health leads to a healthier society. The elderly are one of the vulnerable populations in society. In architecture, not only should specific principles and standards be defined, established, and observed for this group, but also a dedicated spatial pattern should be defined for these individuals.

Despite the existing evidence, creating a sense of home in elderly care homes is challenging in daily practice. The care environment often does not align with therapeutic goals that person-centered care approaches seek to achieve [2]. Therefore, the present study aims to explore the relationship between architectural factors and the sense of home in elderly care homes.

METHODOLOGY

The present study is a descriptive correlational research. The statistical population consisted of all elderly residents of the nursing home in District 10 of Tehran in December 2022. Using purposive sampling, a sample of 45 individuals from this nursing home was selected for the study.

The selected site is located in District 10. District 10 is situated in the western part of Tehran and is bordered by Districts 17, 11, 9, and 2. On the right side of this site is Jeyhoon Street, which runs north to south. Hashemi Street is located above the site, intersecting with Jeyhoon Street. The hierarchy of the access network surrounding the site is indicated on the map, including main streets and secondary streets. The site's functions include healthcare, educational, and commercial purposes.

(A) Questionnaire on the Factors of Design and Architecture of the Elderly Care Centers:

This questionnaire was developed by the researcher and consists of 46 items and 5 factor components: lighting (7 items), public space (8 items), personal space (10 items), accessibility (10 items), and green space (11 items). The questionnaire is designed on a five-point Likert scale ranging from "completely disagree" to "completely agree," with a scoring range from 1 (completely disagree) to 5 (completely agree). The minimum and maximum scores in this questionnaire are 46 and 230, respectively. The closer the elderly person's score is to 230, the higher their satisfaction with the factors of design and architecture of the nursing home, and vice versa.

In this study, the content validity of the questionnaire was determined using the method of content validity. In this regard, the questionnaire was approved by 9 professors from the departments of fine arts, architecture, educational sciences, and psychology at Sistan and Baluchestan University, ensuring that the questionnaires measure the intended characteristic of the researcher and possess

the necessary validity. To determine the reliability of the tool, the questionnaires were first administered to 30 randomly selected elderly individuals, and then the Cronbach's alpha test was used. The coefficient value for the questionnaire on the factors of design and architecture of the nursing home is 0.903, and for the sub-scales, the values are: lighting 0.833, public space 0.968, personal space 0.975, accessibility 0.797, and green space 0.863.

(B) Sense of Home in Elderly Care Centers:

This questionnaire is adapted from the Life Motivation Questionnaire and consists of 32 items and 5 main scales: learnability and encouragement of spaces, comfort and environmental attractiveness, personal calmness and silence, perception of a sense of ownership, and similarity to home environment. The learnability and encouragement of spaces scale includes 8 items, the comfort and environmental attractiveness scale includes 7 items, the personal calmness and silence scale includes 7 items, the perception of a sense of ownership scale includes 5 items, and finally, the similarity to home environment scale includes 5 items. Each question is scored on a five-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). Zarqami and Olfat [7] demonstrated that this tool has a good fit and the five factor indicators have good reliability. The combined reliability mean of the entire scale is 0.782. The convergent validity between the indicators of the sense of home in the elderly was confirmed with correlation coefficients ranging from 0.42 to 0.88.

The procedure for conducting the study involved obtaining research approval from the University of Art, Tehran, and coordinating with the officials of the nursing homes. The researcher personally visited these centers and selected the elderly participants. The criterion for inclusion in the study was a minimum residency period of three months in the nursing homes. Therefore, elderly individuals who had resided in the nursing homes for less than three months were excluded from the study. This is because those who have recently entered the nursing homes have not yet adapted to their current living conditions, and their life motivation is likely to be more concerning compared to those who have spent longer periods in the nursing homes. The elderly answered the questionnaires individually. In cases where elderly individuals were illiterate or had disabilities, the researcher asked the questions orally and recorded their responses. The maximum time allowed for completing the questionnaires was 30 minutes. Before distributing the questionnaires, the research objective was explained to the elderly participants, and they were assured that the collected information would be completely confidential and used only for research purposes. They were also assured that none of the demographic questions could identify them. They were given the choice to participate voluntarily in the study and could withdraw their participation at any time. In this study, all questionnaires were completed in a complete and reliable manner, and no missing or incomplete responses were observed.

Pearson correlation coefficient was used to analyze the data using SPSS software version 21.

RESULTS

To evaluate the research variables (architectural factors of the nursing homes and their life motivation), a one-sample t-test was used, and the findings are presented in Table 1. Based on the results in Table 1, the average scores for the factors of brightness, personal space, and green space are higher than the theoretical average. Considering that the calculated t-values are significant at a level less than 0.05, it can be accepted that the elderly are moderately to highly satisfied with these factors. However, the average scores for public space and accessibility are lower than the theoretical average. Since the calculated t-values are significant at a level less than 0.05, it can be inferred that the elderly are not highly satisfied with public spaces and their accessibility.

Also, in the investigation of the variable of sense of place attachment in the nursing homes, the average scores for learnability, spatial stimulation, comfort and environmental desirability, personal tranquillity and silence, and perception of ownership are higher than the theoretical average. Since the calculated t-values are significant at a level greater than 0.05, it can be concluded that the elderly have a sense of life motivation or home attachment below the average level.

Next, the correlation between the design and architectural factors of the nursing homes and their life motivation was assessed using the Pearson correlation coefficient, and the results are reported in Table 2. According to the findings in Table 2, there is a positive and significant relationship between the architectural factors of the nursing homes (light and brightness factor, public space, personal space, accessibility, and green space) and the life motivation of the elderly.

Table 1. Participants' Response to Research Variables

Variable	Mean	Standard Deviation	t	Theoretical Mean	P
Lighting Factor	23.31	4.31	60.51	21	0.03
Public Space	25.34	5.27	30	68.91	0.002
Private Space	26.21	6.34	24	42.43	0.001
Accessible Space	29.64	5.23	30	96.23	0.002
Green Space	37.71	6.35	33	72.81	0.04
Learnability	3.54	0.094	3	51.32	0.001
Environmental Stimulus	3.84	0.61	2.96	69.21	0.002
Comfort and Environmental Pleasantness	4.18	0.88	3	51.99	0.005
Personal Serenity and Silence	4.153	0.77	3.25	61.33	0.002
Sense of Ownership	4.22	0.84	3.34	52.32	0.001
Resemblance to Home	3.48	0.651	3.12	60.71	0.001

Table 2. Correlation Coefficients between Design and Architectural Factors of Elderly Care Centers and Sense of Home in the Elderly

Variable	Learnability	Environmental Stimulus	Comfort and Environmental Pleasantness	Personal Serenity and Silence	Sense of Ownership	Resemblance to Home
Lighting Factor	0.56**	0.268**	0.347**	0.512**	0.71**	0.419**
Public Space	0.27**	0.136**	0.224**	0.136**	0.412 ns	0.126**
Private Space	0.314*	0.352 ns	0.526**	0.622**	0.515**	0.321**
Accessible Space	0.188**	0.284**	0.194**	0.312**	0.197**	0.367*
Green Space	0.361*	0.229**	0.417**	0.127**	0.651**	0.427*
Total Factors	0.521**	0.224**	0.621**	0.413*	0.281**	0.403**

ns: Not significant; *: Significant at $p < 0.05$; **: Significant at $p < 0.01$.

DISCUSSION

Throughout all stages of life, from childhood to old age, humans need a suitable environment for growth and well-being. In this context, architecture is not merely a material and functional issue; it is about space and thought. Architecture can create a suitable foundation for meeting human needs, growth, and flourishing. In such an environment and space, individuals can find their creativity and self-confidence optimally. Therefore, a nursing home is not just a place for the elderly to reside and survive; it should also provide a dignified and vibrant environment. To achieve this, the design and adherence to architectural principles, as well as maximizing the interaction of the elderly with nature, are among the factors that have a direct impact on their mental and physical health.

Based on the research results, five factors including learnability, spatial stimulation, comfort and environmental desirability, personal tranquillity and silence, and perception of ownership and similarity to the home environment, are identified in relation to the sense of home or life motivation in the elderly residing in nursing homes. In Western countries, where planners' attention to the elderly and their needs is much higher than in Iran, innovative methods have been adopted to determine housing for the elderly. In Denmark, constructing one-story small-scale residences as part of the country's housing complex is a prevalent approach. In England, a new approach approved by the government involves building small houses equipped with all necessary facilities and amenities [8]. In contrast, in Iran, the term "nursing home" is recognized only as the sole residential center for the elderly, and the environmental quality and type of elderly housing have not been adequately addressed from their perspective and the perspective of experts. The consequence of this neglect is a decrease in life motivation and the sense of home in the elderly.

This study was conducted with the aim of examining the relationship between architectural

factors influencing the sense of home in nursing homes. According to the findings, there is a positive but meaningful relationship between the satisfaction of the elderly with the design and architecture factors of the nursing home and the sense of home or life motivation in nursing homes. In other words, the higher the satisfaction of the elderly with the quality of design and architecture of the nursing home, the stronger their feeling that the nursing home is like a real home.

The findings also indicate a significant relationship between public, personal spaces, and accessibility with the sense of home. According to Ahmadi et al. [9], the creation of various sports spaces as motivational factors can improve physical and mental conditions, fill leisure time effectively, and create interactive spaces to reduce social relationship problems during leisure time. Creating spaces such as individual gardens, greenhouses, or art and educational workshops where the elderly can engage as a daily occupation and practically benefit from life experiences during leisure time can help reduce problems and enhance their sense of self-worth. Andersson [10] demonstrated that architectural aesthetics, appropriateness of spaces, and the social fabric of the environment significantly contribute to prolonging life in a place. The results of Nasiri et al. [11] indicate that improving the compatibility between elderly residents of nursing homes and their living environment through comprehensive design has a meaningful impact on their capabilities and adaptability to the elderly environment.

The sense of home is associated with having a private room in nursing homes. A shared bedroom is often unacceptable for most residents. The desire for a private room may be based on having opportunities for solitude, a preference for maintaining privacy and personal belongings, and a sense of ownership. Residents, value spending time in their own room or apartment and engaging in household tasks. They have a need for solitude, retreat to their own space, and create their environment. These feelings are shared by their family members as well.

The perception factor of ownership sense is related to having a sense of ownership over their own bedroom or having a personal space, the quality of the bedroom, the manageability and controllability of the space for the elderly, and the presence of recreational spaces such as a chess room, card games, and entertainment, as well as the size of the kitchen. It seems that the need for privacy is the main motivator for having a private room. Self-closing doors in private rooms are one of the actions that hinder the preservation of privacy. Residents want to maintain control over their room and its appearance [12].

The similarity factor to home is related to fine-grained factors such as the quality of the living room and reception area, the size of adjacent spaces (bathroom, toilet), the quality of adjacent spaces (bathroom, toilet), the ability to rearrange furniture within and proximity and closeness to other elderly residents.

Rijnaard et al. [4] systematically examined the factors influencing the sense of home among elderly residents in nursing homes. Their study showed that the sense of home among nursing home residents is influenced by 15 factors, which can be divided into three themes. The first theme includes psychological factors, such as a sense of belonging, maintaining personal habits and values, autonomy and control, as well as coping. The second theme includes social factors, encompassing interactions and relationships with staff, residents, family, friends, and pets, as well as activities. The third theme is the built environment, which includes private and (semi) public spaces, personal belongings, technology, aesthetics and ambiance, and outdoor spaces. Van Hoof et al. [6] investigated the factors influencing the sense of home among elderly residents in nursing homes from the perspectives of residents, family members, and care professionals through a photovoice study. The findings indicated that the building and interior design are the primary factors in creating a sense of home. The main challenge for architects, facility managers, and interior designers is translating these aspects into an integrated and feasible design. The elements constituting the sense of home need to be described and aligned with healthcare organizations in every planning and design phase.

According to Eijkelenboom et al. [12], in order for nursing homes to provide a sense of home to the elderly, residents need to step out of their private rooms and interact with others. A shared living space can sometimes reflect ambiguous and conflicting expectations. Occasionally, communal spaces can also lead to distraction and confusion. Interior symbols in the living room, such as family photos, carpets, and tables, should be clear and consistent to create a living room atmosphere instead of an waiting room ambiance. The boundaries between public and private domains are often blurred, and as a result, a distinctive home is

defined by relatively sharp boundaries. In general, less residential density, including family-style dining, enhances the sense of belonging. In many facilities, residents may have their designated spot around the table (e.g., dining table). Having a personal chair can help residents feel like they are in their own home. Familiarity-wise, relatives prefer to talk about chairs, dedicated dishes, and having a individual seat at a preferred spot.

Proper closets, display spaces, and storage areas should be provided for personal belongings and professional equipment. The building should be designed in a way that care professionals cannot isolate themselves from the residents as they need to be easily accessible. Other important aspects of public spaces include the need for walking areas (e.g., oval shape so that people don't reach a dead end). Residents should be able to access all points of a space with a wheelchair. Wide hallways and wide doors are considered vital for easy access by individuals using wheelchairs [12].

Suitable space for personal belongings and professional equipment, such as a closet, display space, and storage space, should be provided. The building should be designed in a way that caregivers cannot lock themselves away from the residents because they need to have easy access. Other aspects of public space are also important, such as the need for a walkway (for example, an oval shape so that people don't reach a dead end). Residents should be able to access all areas of a space with a wheelchair. Wide hallways and wide doors were considered vital for easy access for wheelchair users [12].

Findings have shown a meaningful correlation between green spaces and the feeling of home. Nature and its beauties have always inspired humans to create unique works and soothe their minds and souls, helping them escape from the noise of the external and internal world. This study has shown a positive relationship between green spaces and the motivation to live. Mohammadian [13] demonstrated that green spaces provide the possibility of creating peace and also resting throughout the day, just like being comfortable at home, for elderly individuals.

Furthermore, the results of the present study demonstrated a positive correlation between personal tranquility and attachment to a place. It can be stated that reducing noise pollution, the presence of shade-providing trees outside the building, the presence of outdoor furniture such as benches and waste bins, an interior space with personal solitude and appropriate and cheerful views, the presence of fountains, waterfalls, and ponds, and the presence of rest areas in outdoor spaces contribute to this tranquillity in the elderly. Eijkelenboom et al. [12] stated that some residents need an environment that is free from excessive noise or visual stimuli. The physical environment that enables activities enhances enjoyment and stimulation, supports all senses from light, acoustics, fresh scents, and tactile qualities, especially for individuals with limited mobility.

The findings of Mazbieh Baf et al. [14] show that the most important characteristics for creating a sense of belonging to a place for users are the physical elements of that place. The research results indicate that the sense of belonging to a place is a fundamental factor in creating ideal spaces that lead to the establishment of a meaningful and identity-based living environment for the elderly, resulting in the prevention of isolation and an increase in participation, interaction, and life satisfaction.

Some residents mentioned that access to daylight, fresh colors and appearance without unpleasant odors is crucial. Lighting has an impact on improving various forms of depression, sleep disorders, as well as many physical and mental disorders. Bright lighting can utilize natural light from outside the house or special lamps and other artificial light sources for individuals.

One limitation of this research is that the study was limited to the elderly residents of care facilities, therefore, it may not be universally applicable to all cases. Another limitation of the research is the difficulty of filling out questionnaires and establishing relationships with them for elderly individuals, which was addressed by researchers and the executive staff who had emotional connections with them. The collaboration with some nursing homes also posed significant interruptions to the research process.

CONCLUSION

The factors that contribute to the "appearance and feeling" are related to architecture, interior design, and public maintenance. A facility should both look and feel like a home or have a sense of homeliness to be considered as a home. The building should be homely, organized, and welcoming to its family members. Based on the research findings, it can be stated that increasing the sense of home in the elderly is related to the design and architecture of the environment. The results showed a positive and meaningful relationship between the architectural factors of elder care facilities and their components (lighting factor, public space, personal space,

accessibility space, and green space) with the motivation for elderly people's lives. Generally, this article focuses on the sense of home in the environment of elderly care facilities and how these aspects integrate into a physical design. Apart from these design features, architects and staff of elder care facilities also consider other aspects of the environment that affect health, performance, and safety. These features support independence, self-care, and functionality among the residents of elder care facilities.

DECLARATIONS

Corresponding author

Correspondence and requests for materials should be addressed to Mahdi Aliyari; E-mail: mehdi_je2000@yahoo.com

Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The author declares that there is no competing interest.

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A REVIEW OF LIMITATIONS AND FUTURE CHALLENGES IN OPTIMIZATION OF ENERGY IN SUSTAINABLE HIGH-RISE BUILDINGS

Samireh KADAEI

Department of Architecture, Central Tehran Branch, Islamic Azad University, Tehran, Iran

Review Article

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Corresponding author:
E-mail: samira.kadaei@gmail.com

ABSTRACT: Sustainability has been one of architecture's most significant trends over the last twenty years. Environmental consciousness of professionals has put sustainability at the heart of the architectural profession and has contributed to adopting and implementing sustainable designs on the scale of urban landscapes. Buildings consume 40% of global energy, in which high-rise buildings account for a significant proportion of the total energy used. Hence, present study reviews limitations and future challenges in optimization of energy in sustainable high-rise buildings. Results of this study show that budget limitations, managerial and organizational policies, legal issues, technical and scientific infrastructure, and cultural and geographical aspects are all affecting the widespread use from energy optimization in current high-rise buildings and need to be considered in future studies.

KEYWORDS: Energy, Sustainable Architecture, High-Rise Building.

INTRODUCTION

Nowadays, energy crisis is among the most widespread discussions and numberless studies are being conducted throughout the world [1]. In the modern era, energy plays a key role in the socio-economic development of different countries. Therefore, management and optimization of energy consumption as one of the ways to ensure energy security is significantly considered by energy policymakers [2], The building sector has a considerable impact on the environment, since it accounts for one third of greenhouse gas emissions and 40% of the energy consumption worldwide [3], In a high-rise high-density city such as Hong Kong, buildings can even account for 60% of the carbon emissions and 90% of total electricity consumption [4]. As the residential building sector consumes approximately 30% of the total energy used worldwide, buildings account for approximately 36% of carbon dioxide (CO2) emissions the main causative pollutant for global warming [5-6] Futuristically, this percentage is expected to increase owing to the exponential growth in population and urban development. Consequently, cities expand vertically given the limited land space for accommodating the increasing population [7]. Moreover, the urban expansion will result in changes in energy use pattern, where further high demand in the building construction industry is a primary concern of governments, especially in developing countries, the availability of more modern housing in urban areas has helped significantly to meet the growing demand for housing from the huge number of people who move to fast-growing cities. Moreover, the urban expansion will result in changes in energy use pattern, which is further exacerbated by varying climate conditions [8-9]; thereby, evoking the need for urban sustainability. During the past decades, several studies are directed towards developing measures to promote building energy management, conservation and sustainability [10-11].

In general, five measures are identified to be impactful in reducing the ecological footprint of buildings: building insulation [12], equipment system [13], renewable resources [6], conserving behaviours [10] and control and management systems. Designing and implementing these measures based on climate data and characteristic features of the building will further augment the building performance [12]. Cao et al. [14] studied the effect of current climate trends on building heating and cooling loads and showed that the current trend has a more intense impact during winter than in summer. Heating loads were observed to decrease by 1%–4% while cooling loads increased by 0%–3% depending on location [14]. This result can offer insights into the design requirements for energy

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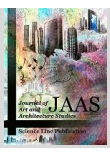

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conserving measures Energy Conserving Measures. The proposed optimization approach provides insights regarding the critical parameters relevant to the ultimate energy performance of high-rise buildings, and serves as a decision support tool for minimizing the high-rise building energy consumption, contributing to a sustainable built environment.

Literature review

To find the best energy-efficient floor plan design for high-rise residential structures, Gan et al., [15], created an energy performance-based optimization approach. To comprehensively investigate the ideal layout for optimizing the building's energy efficiency, an evolutionary genetic algorithm (GA)-based simulation-based optimization method was devised in their study.

Their proposed optimization approach was used as an example to create the layout design for a 40-story public housing building in Hong Kong. The findings showed that GA makes an effort to employ natural energy sources as much as possible (such as sunlight and wind-driven natural ventilation) in order to reduce the total energy consumption for lighting and air conditioning by 30 to 40%. As they argued, a significant amount of energy can be saved in high-rise residential buildings by using the optimization strategy, which also contributes to a built environment that is sustainable.

Hong et al. [10], examined the performance-based impact of high-rise office building architectural and engineering components in various climatic settings. Using the evaluation findings acquired by utilizing the benefits of the climate features, the most sustainable construction model was then created. The findings showed that, in various climates, a building's performance varies depending on factors including its plan ratio, core position, and atrium effect. While a square building plan (with a split core and no atrium) displayed the best performance in the hot-summer-mild-winter (HSMW) climate zone, a rectangular building plan (1:1.44 plan ratio, split-core position, and central atrium) presented the best performance in the warm-summer-cold-winter (WSCW) climate zone. Additionally, a combination of passive techniques was developed to be acceptable for achieving sustainability and comfort goals in the WSCW zone by utilizing the benefits of the building and climate characteristics. In contrast, structures in the HSMW zone need active strategies.

MATERIALS AND METHODS

There have been more than 104,000 scholarly research studies on High-Rise Buildings since before the 20th century. In this section, international research articles from different sources, i.e., scientific studies, books, case studies, and reports, are reviewed. First, the indexes of journals were searched to identify some related journals, such as Science Direct, Scimagojr, and Scopus. Then, we searched for the desired keyword (High-rise Building) on the sites of each journal to determine the number of articles in each journal separately. Table 1 reports the results of this search. Next, article search platforms such as Scopus, Web of Science, Google Scholar, and Science Direct were searched for a list of relevant keywords which are tabulated in Table 1. Several articles are stored in the library. Similar or non-accessible articles were then removed from the library. Figure 1 shows the percentage of studies for different high-rise buildings-related keywords. Statistics from the Science Direct website show that the amount of research studies in the field of High rise building is increasing. Also, reports the number of research studies on high-rise buildings years starting this study from 2012-2022. This chart indicates a steady increase in the total number of publications in this field.

Table 1: Keywords of some research used in the current research in the field of High rise building

	Keywords	N
1	High rise building structures	5
2	Technological advances modern high rise buildings	6
3	Energy consumption in high-rise buildings	9

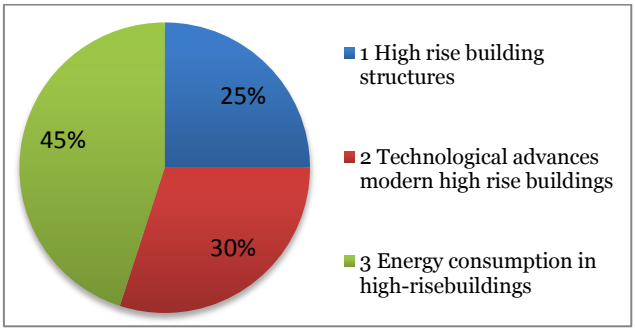

Figure 1. Keywords of some research were used in the current research in high-rise buildings.

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1. Types of High-rise Buildings structural systems

The followings are the conventional high-rise buildings addressed in relevant literature:

a. Braced frame structural system: Braced frames are cantilevered vertical trusses that resist lateral stresses, especially diagonal elements. The girders and columns serve as the "chords" and collectively they create the "web" of the vertical truss. Bracing components prevent beams and columns from bending. Braced frames have the excellent benefit of being repeatable up the height of the building with evident design and fabrication economy. It might, however, make it difficult to plan internally or choose where to put doors and windows. It must be integrated inside along with the walls and barriers, for this reason [16].

b. Rigid frame structural system: In a rigid frame construction, columns and beams are built as a single unit to endure moments brought on by loads. The bending stiffness of the columns, girders, and connectors in-plane determines the rigid frame's lateral stiffness. Buildings made with reinforced concrete can use it. It might also be employed in steel building, but the connections will be expensive. The chance of planning and installing windows due to the open rectangular arrangement is one of the benefits of rigid frames [17].

c. Wall-frame system (dual system): It is made up of a wall and a frame that work together horizontally to create a stronger and more rigid system. The walls can be found surrounding stairwells, elevator shafts, and/or at the outside of the structure. They are typically solid (not pierced by apertures). The walls may improve the frames' performance by, for example, preventing a soft story collapse. Wall-frame systems, which are superior to shear or rigid frame alone, are suited for buildings with a story count of between 40 and 60 stories. Steel rigid frames and braced frames both offer similar benefits of horizontal interaction [18].

d. Shear wall system: It is a continuous vertical wall made of masonry or reinforced concrete. Shear walls function as a thin, deep cantilever beam and can sustain both gravity and lateral stresses. It is ideally suited for bracing steel or reinforced concrete tall structures. This is due to the considerable in plane stiffness and strength of shear walls. Hotel and residential structures that have repeating floor-by-floor layout that enables the walls to be vertically continuous are good candidates for shear wall systems [19].

e. Core and outrigger structural system: By connecting the spine or core to the closely spaced outside columns, outriggers are rigid horizontal structures intended to increase the stiffness and strength of buildings during overturning. Shear walls or braced frames can be found at the core's center. By connecting two structural systems (a perimeter system and a core system), outrigger systems enable a structure to act almost like a composite cantilever. In reinforced concrete buildings, the outriggers take the shape of walls, whereas trusses are used in steel buildings. Up to five times as much moment resistance as a single outrigger system may be produced by multilevel outrigger systems [20].

2. Technological advances modern high rise buildings

Much of the “green” agenda focuses on reducing energy consumption. Buildings consume about 40% of the world’s energy, and elevators account for 2%–10% of a building’s energy consumption. During peak usage hours, elevators may utilize up to 40% of the building’s energy [21-22]. Glen Pederick, 2014, explains that everyday there are more than 7 billion elevator journeys taken in buildings all over the world; and as such, energy-saving elevators will reduce energy consumption significantly [23]. Fortunately, new technologies and best practices involving motors, regeneration converters, control software, optimization of counterweights and cabin lighting can yield significant savings [24]. Researcher Patrick Bass writes of recent examples of ThyssenKrupp technologies that provide energy savings of about 27% and space saving of about 30% [25].

Introduced in the mid-1990s, machine-room-less (MRL) technology was one of the biggest advances in elevator design since they went electric a century before. Manufacturers redesigned the motors and all other equipment normally housed in a machine room to fit into the hoistway, eliminating the need to build a machine room. Earlier, elevator equipment was so massive that a dedicated machine room (about 8 feet tall or greater) was required, usually placed above the hoistway atop a building’s roof. The machine room was costly because it needed to support heavy Today, MRL elevators are increasingly common [26]. The MRL system becomes even more energy efficient when it is combined with regenerative drives [27].

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century before. Manufacturers redesigned the motors and all other equipment normally housed in a machine room to fit into the hoistway, eliminating the need to build a machine room. Earlier, elevator equipment was so massive that a dedicated machine room (about 8 feet tall or greater) was required, usually placed above the hoistway atop a building's roof. The machine room was costly because it needed to support heavy machinery (Figure 2). Today, MRL elevators are increasingly common [26]. The MRL system becomes even more energy efficient when it is combined with regenerative drives [27].

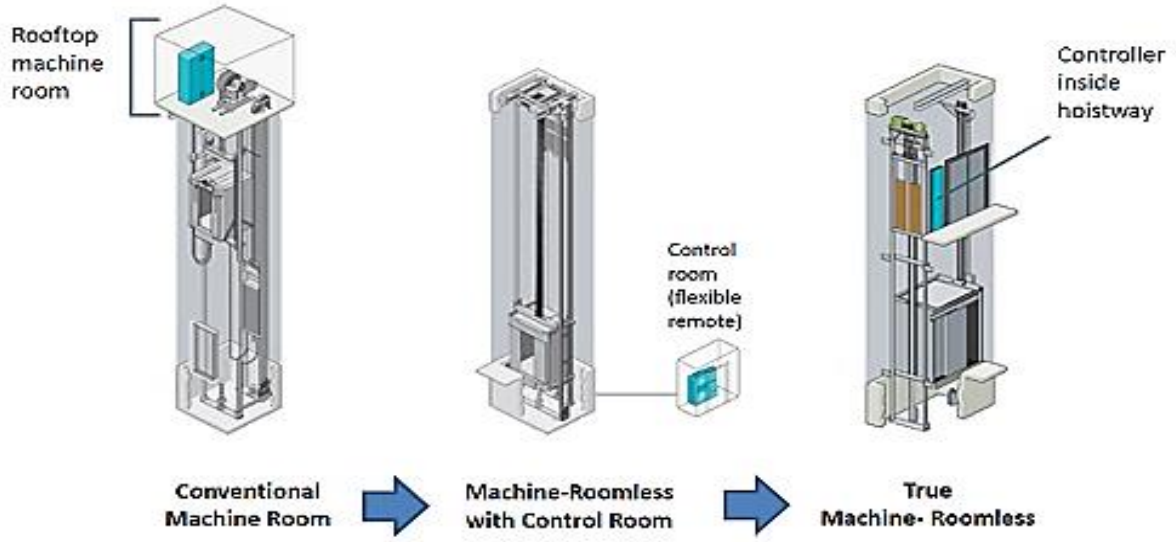

Figure 2. Gearless Machine-Roomless Revolution. Note space saving factor as technology advances. This increases usable spaces, which is crucially important in skyscrapers (Source: http://www.otisworldwide.com).

a. Energy consumption in high-rise buildings

Whilst the majority of tall buildings constructed today continue to demonstrate 'fourth generation' characteristics, meeting regulatory energy performance criteria, but not bettering these by any substantial amount, there is a growing number of high-rise designs and completed buildings that aim to go above and beyond the norm in terms of reducing primary energy consumption. In an age where climate change is arguably the greatest challenge to the modern world and bodies such as the IPCC are predicting a temperature increase of between 1.8ºC and 4ºC by the end of the century, this change cannot occur quickly enough. Arguably the first significant tall building reflecting these new environmentally conscious principles was the Commerzbank in Frankfurt (by Foster and Partners, 1997), although one could look to the bio-climatic skyscrapers of Dr Ken Yeang SOM's National Commercial Bank in Jeddah(1984), or even Frank Lloyd Wright's Price Tower in Oklahoma (1956) as earlier examples of 'sustainable' high-rise design. The Commerzbank, incorporates a high degree of primary energy-reducing design strategies and technologies that include:

- A full building height central atrium, providing natural lighting and ventilation to internal office spaces.
- The use of large, open sky gardens further to increase daylight penetration to office areas.
- A facade design that allows for natural ventilation for over half the year through operable windows (known as the Klimafacade). A water-based cooling system of chilled ceilings

in fact many qualities of the Commerzbank are typical of fifth-generation skyscrapers. In terms of form and shape, tall buildings of this category have high surface area to volume ratios — typically between 0.10 m2/m3 and 0.22 m2/m3— compared to around 0.09 m2/m3 for the more bulky fourth-generation buildings. This is achieved by utilising shallow floor plans (eg,. GSW Headquarters, Berlin, 1999) or by using large atria effectively to reduce the depth of deeper floorplates (eg, Deutsche Post Tower, Bonn, 2002); 'Swiss Re' Tower, London, 2004), allowing air and natural light to penetrate deep into office spaces. Although this increase in

surface area to volume ratio would reduce artificial lighting loads and make natural ventilation a possibility, winter heating loads in these buildings would also rise as previously discussed. Artificial lighting requirements in these towers are further reduced by the use of photo- and motion-sensors that adjust over headlights, turning them down or off when natural lighting levels are sufficient, or when rooms are empty. For example, in the Bank of America Tower(New York, 2008) this technology will help to reduce the demand for electric lighting by 25%.

Energy consumption of the changes in tall-building characteristics across these five generations. Tall building envelope design in particular would benefit from such studies: determining whether future tall buildings may benefit from 'first and second generation' characteristics — such as increased opacity and thermal mass within the facade — in order to reduce their primary energy needs and assist in meeting the modern-day challenge of climate change.

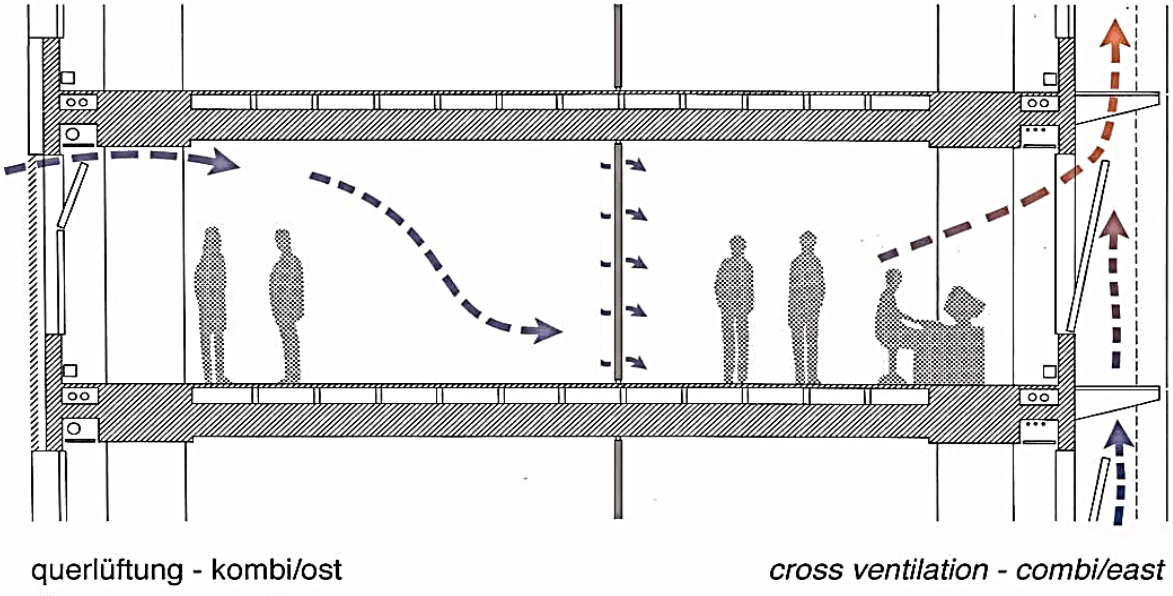

Figure 3: GSW Headquarters, Berlin, 1999. Part-section showing the natural ventilation strategy and double skin facade (to the right) [28].

CONCLUSION

Limitations

Lack of data: The lack of data on energy consumption and performance in high-rise buildings makes it difficult to optimize energy use.

Complex design: High-rise buildings have complex designs, making it challenging to optimize energy use.

High cost: The implementation of energy-efficient technologies and systems in high-rise buildings can be expensive, making it difficult for developers to invest in them.

Limited space: High-rise buildings have limited space for energy-efficient systems, making it challenging to implement them effectively.

Technical expertise: The optimization of energy in high-rise buildings requires technical expertise, which may not be readily available.

Future challenges

Rapid urbanization: As more people move to cities, there will be an increased demand for high-rise buildings, which will require sustainable energy solutions.

Climate change: Climate change is a significant challenge that requires the optimization of energy in high-rise buildings to mitigate its effects.

Advancements in technology: As technology advances, there will be a need to incorporate new and emerging technologies into high-rise buildings to optimize energy use.

Government policies: Government policies and regulations play a significant role in promoting sustainable energy use in high-rise buildings. However, there is a need for more stringent policies to encourage developers to invest in sustainable energy solutions.

Changing user behavior: Changing user behavior is crucial in optimizing energy use in high-rise buildings. There is a need for education and awareness campaigns to promote sustainable energy use among building occupants.

Aging infrastructure: Many high-rise buildings are aging and require upgrades to their energy systems to improve efficiency.

Integration of renewable energy: The integration of renewable energy sources, such as solar and wind power, into high-rise buildings can be challenging due to limited space and complex designs.

Resilience to natural disasters: High-rise buildings need to be designed and built to withstand natural disasters such as earthquakes, hurricanes, and floods while maintaining energy efficiency.

Equity and affordability: Sustainable energy solutions in high-rise buildings should be accessible and affordable for all, including low-income residents, to promote social equity and reduce energy poverty.

Smart building technology: The integration of smart building technology, such as automated energy management systems and sensors, can help optimize energy use in high-rise buildings but requires significant investment and expertise.

Energy storage: High-rise buildings can benefit from energy storage systems to store excess energy generated from renewable sources or during off-peak hours for later use.

Energy consumption monitoring: To optimize energy use in high-rise buildings, it is essential to monitor energy consumption regularly to identify areas for improvement and track progress towards energy efficiency goals.

Building codes and regulations: Governments need to implement building codes and regulations that promote sustainable energy solutions in high-rise buildings and encourage developers to adopt green building practices.

Public awareness and education: Public awareness and education campaigns can help increase awareness of the benefits of sustainable energy solutions in high-rise buildings and encourage individuals to adopt energy-efficient behaviors.

Renewable energy sources: High-rise buildings can harness renewable energy sources such as solar, wind, or geothermal energy to reduce reliance on traditional fossil fuels.

Energy-efficient lighting: The use of energy-efficient lighting technologies such as LED lights can significantly reduce energy consumption in high-rise buildings.

Water conservation: High-rise buildings can implement water conservation measures such as low-flow fixtures, rainwater harvesting, and greywater recycling to reduce water consumption and wastewater.

Life cycle analysis: A life cycle analysis of high-rise buildings can help identify areas for improvement in terms of energy use, materials, and waste management throughout the building's lifespan.

Results of this study show that budget limitations, managerial and organizational policies, legal issues, technical and scientific infrastructure, and cultural and geographical aspects are all affecting the widespread use from energy optimization in current high-rise buildings and need to be considered in future studies.

DECLARATIONS

Corresponding author

Correspondence and requests for materials should be addressed to Samireh KADAEI; E-mail: samira.kadaei@gmail.com

Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Authors' contribution

Kadaei Samireh performed the research, data analysis, and manuscript writing.

Competing interests

The author declares that there is no competing interest.

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THE FORM AND CONTENT IN THE ARCHITECTURE OF THE YEMENI TEMPLE GATE: THE GATE OF THE BARAN TEMPLE IN MA'RIB AS A MODEL

Ahmed Abdurabu AL-NEHMI

Associate Prof. Dr., Department of Architecture, College of Engineering, Thamar University, Yemen

Research Article

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Corresponding author:
E-mail:
ahmedabdurabu7@gmail.com

ABSTRACT: Architecture has been considered one of the most expressive means for humans since the beginning of settlement. It carries two aspects, one of which is physical, which is the visible and tangible form. The other is non- physical, which is the intellectual content that the form reveals. Yemeni architecture in general and the architecture of temple gates in particular were shaped by the local environment and social culture. The Yemeni person tried to express his visions, beliefs, and perceptions in a unique architectural form that is distinct from others in an embodied and abstract form. The current research attempts to investigate the content that the architectural form of the Yemeni temple gates carried in form and details. The research focuses on tracing the relationship between the idea and the symbol of portal architecture from the stage of embodiment to the stage of abstraction. The research relies on descriptive and analytical approaches and comparative approaches to compare the gates with their counterparts in the kingdoms of ancient Yemen to determine the similarities and differences the extent of influence between the kingdoms. It aims to analyze the architectural form of the gate in a comprehensive and detailed manner to identify intellectual sources. The study reached an understanding of the architectural form of the temple gates and their contents. Yemeni thought was characterized by integration in embodiment and abstraction. The Yemeni architect turned to signs and symbols in order to give the form the character of embodiment through abstraction, while preserving the main features of the inspired form.

KEYWORDS: Architectural Form, Temples, Yemeni Architecture, Gates, Sheba, Ancient Yemen.

INTRODUCTION

The old Yemeni architecture as the spinal column represents the architecture of the Arabian Peninsula, with rich experiences, large capabilities, and its local environment. The six columns of the temple gate were represented in Marib, the so-called most important architecture of Yemen. It is an icon telling Yemen's history, such as the pyramids' history of Egypt and the portal of Babel's history of Iraq. The architectural gate, which is formed from several columns, had only four, six, and eight. It has become a symbol of the Yemeni kingdoms, which flourished in the second and first millennia B.C.

The columns of Yemeni temples are the largest witness to a building that has technical and highest-grown characteristics. They are more exercised and maintained because they are cut from alone stones and weigh several tons. Anyone cannot uproot the columns from archaeological sites and use them in new buildings. The truth is that the ancient Yemeni are linked to columns and monuments, where the beginning of the columns is rooted in the prehistoric period [1]. The columns called "Qaif" were set up as a domain for the protection of land and property limits [2].

The study addresses the architectural icon of gate columns in terms of the form, the fabrics, and the contents. They are not interested in the architects, ethnic and historical only, but are interested in all Yemeni categories and persons. Hence, previous studies related to the subject of research must be exposed to identify aspects that the present research must continue.

One historian believes that ancient Yemeni thought was characterized by its verticality. It is always oriented vertically in both material and non-material cultural products. In the Musnad script, vertical lines separate the words. One of the ancient linguists likened the letters of the southern writing to columns and pointed out that the ancient Yemeni mentality tended towards columns in the architecture, and it was reflected in the writing. Another one of the ancient linguists pointed out the

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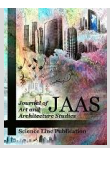

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impact of ancient Yemeni architecture and the columns on the form of the geometry of Musnad letters [3].

Munir Al-Ariqi believes that the design of the ancient Yemeni temple, especially the external form of the architecture, is what the ancient Yemeni artists drew from, as they inspired the form and embodied it in all types of decorations that they used in other arts. The artists inspired most types of shapes of incense burners, most types of column capitals, especially conical ones, and various types of offering tables that were identical to the design of the temple in the facades and details of the decoration [4].

Christian Darl argues that the offering tables that were used in ancient Yemeni temples are only a miniature model of the form of ancient Yemeni temples. The ornamentation and decorations found on their facades are similar to the decorations used in ancient Yemeni temples [5]. On the other hand, Ali Tueaiman's study of the stone columns of the Kingdom of Sheba and the temple of Yaha in northern Ethiopia noted that the columns of the temple gates carried religious and cultural symbols and connotations that were prevalent in the civilization of the Kingdom of Sheba) [6].

The research problem

Architecture and its development represent a measure of the extent of the prosperity of civilizations. It was the truest means of human expression of ideas and beliefs. It has two dimensions, one of which is material, which is the apparent form, and the other is non-material, which is the essence or intellectual content. Yemeni architecture in general and the architecture of temple gates in particular were shaped by the local environment and societal culture. In which the Yemeni people tried to express their beliefs in unique architectural forms.

The studies that discussed the subject of temple architecture and the architecture of temple gates were descriptive archaeological studies. They did not pay attention to the artistic and intellectual aspects of the architectural form of temples, nor to the gates and their columns. They did not attempt to delve deeply into the motives and reasons that made the ancient Yemenis sanctify this form and repeat its construction in a unified style in all temples on the lands of Yemen. This clearly indicates that it represented a sacred thing that could not be changed or altered. Accordingly, the research problem is the presence of ambiguity in knowing what the architectural form of the ancient Yemeni temple gate and its columns holds and contents, which have become a Yemeni symbol for the state, society, and history of Yemen.

Research objectives

Perhaps the lack of in-depth knowledge of this architecture led to ignoring and omitting its reality and searching for its entity out of place. This research goes beyond the concepts and formal characteristics of architecture by identifying its content and meaning. It aims to trace the gate design of ancient Yemeni temples to know their formation, functional, and structural architectural characteristics. It targets determining the sources of the architectural form and knowing the significance of the origins of the artistic forms influenced. In addition, it attempts to know the content, which is the architectural form of the gates carried. It focuses on tracing the relationship between the idea and the symbol of the form from the stage of embodiment to abstraction.

METHODOLOGY

- The study relies on a qualitative method to collect the information required for the study. It depends on collecting information from previous historical, archaeological, and architectural sources, as well as going to the research field for taking pictures and draws the plans. Field visits were also made to some Yemeni museums to obtain artistic pieces for analysis and comparison. In addition, the research relies on the following approaches: The comparative approach should be used to compare the temple architecture and gates with their counterparts in the Yemeni kingdoms to identify similarities, differences and to find out the extent of influence between the kingdoms.
- The analytical and descriptive approach should be used to analyze and draw a clear picture of the architectural characteristics of temple architecture and gates, as well as to analyze and compare the types of artistic production.
- An analysis of the architectural form of the cubic-shaped temple gate, from which the front of the gate protrudes from one of its sides. A comprehensive and detailed structural analysis of the gate and its columns to know intellectual sources in the embodiment and abstract forms.

Temples in ancient Yemen

Temples in ancient Yemen were considered houses of the gods. They were mentioned in Musnad inscriptions with the word "house," which means the house of the god. The temple is a building that contains the activities and rituals of worship. It represents the residence of the god and the ideal

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place for manifestation. The temple consists of a main part (the sacred) which is considered similar in all the kingdoms of ancient Yemen. The sacred is designed in the shape of a rectangle with a gate protruding from one of its sides. Several columns support the roof. In special cases, these columns were not found, and they were only shrines. The courtyard differed from one temple to another and from one kingdom to another. It was of two types: either an open courtyard with corridors or a roofed one with several columns supporting the roof [4]. The plan of the temple is a rectangle from one side of which the gate protrudes axially with the holy of holies, which usually consists of three rooms and a central courtyard surrounded by porticos (Figure 1), or an offering table located at the top of the central courtyard surrounded by porticos (Figure 2). This model was generally used in planning temples. The temple's structural system relied mainly on columns, which were carved from a single stone to support the roof beams. The beams were fixed to the columns in an interlocking manner, and a protrusion emerged from the top of the column, carving out a place for it in the roof beams.

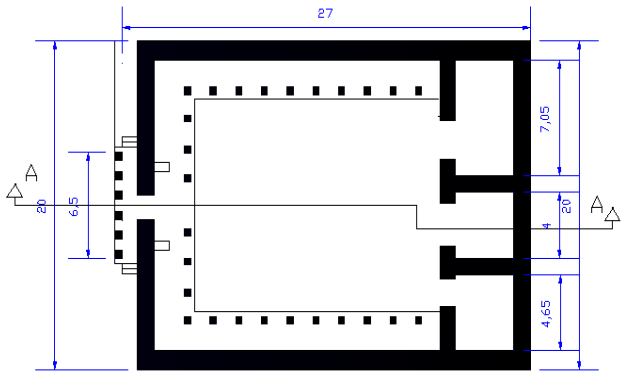

Figure 1. The temple of Wad Dho Masmam [7]

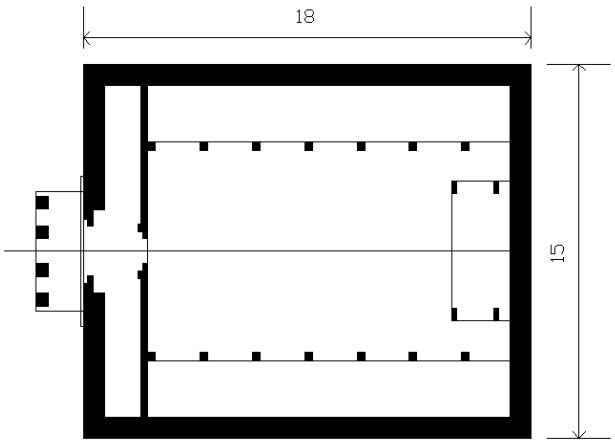

Figure 2. The temple of Athtar in Ma'in [7]

The temple generally consists of the following main elements:

The holy of holies: It represents the main architectural space in the composition of the temple. Its design differed according to the type of rituals that were being held and according to the type and number of gods to whom the temple was dedicated. It varied and developed over time. It consisted of an altar located in the center of the holy place. Then it consisted of three rooms located at the end of the axis of the temple, and then it combined the previous two types.

The courtyard: It is an architectural space located between the gate and the holy of holies, which is surrounded by porticoes whose roof is supported by columns. The courtyard is considered one of the main components of temples. The courtyard plays another functional role as part of the space for worship and the performance of rites and rituals [4]. The gate: The design of the gate in the temples took a unified pattern, as there is a main entrance to each temple, which is the only entrance. Sometimes the temple has more than one secondary entrance. It should be differentiated between two types of gates: the sacred temple gate and the sanctuary gate. The sacred temple has one gate fronted by a row of columns, on which the current research focuses.

Temple gates

The gate has a rectangular shape protruding from one of the temple sides. The gate is preceded by a row of columns that differ in number from one kingdom to another. In the Kingdom of Sheba, there are six columns except for the gate of the Awam temple, which consists of eight columns. In the Kingdom of Hadhramaut and the Kingdom of Ma'in, there are four columns. The gate is roofed with stone lintels extending over the tops of the columns that precede the gate. Then beams are placed perpendicularly over the lintels of the columns and the wall of the temple. This causes the shape to appear with a gradual slope backwards, resulting from the height of the columns from the wall. Therefore, the gate appears tilted backwards in the facade and section (Figure 3).

The design of the column row that precedes the temple has developed in terms of the dimensions and the formation of the components and structural elements. The column with a square or rectangular cross-section, which is without a capital, is the oldest type of column (Figure 4). It later changed and developed to include the crowns and bases [8]. In

general, the column consists of three parts: the base, which supports the column. It was made up of finger-like stones in which several centimeters were drilled according to the cross-section of the column. The body was transformed from a single stone column with a square or rectangular section. Then it developed because of the presence of ribs on the body. The capitals were developed without a capital, and then capitals began to appear as part of the column body, such as the columns of the temple of Baran.

Figure 3. The gate columns of temple of Ma'in [7]

Figure 4. The gate columns of the temple of Awam (Author)

Form and content in art formations

The study focuses on the Yemeni temple gate with a view to tracking the assets of architectural elements and fabrics that stand behind the form. The seeds of art formations and primary models are required to understand the form and content. There is no doubt that the environment is one of the sources of the configuration world through which they can go deep in detecting facts. The environment and its elements have affected the validity of Yemeni human beings. They looked impressed by their characteristics of superiority over humans and related them to the metaphysical world.

The Yemenis have used animal symbols and sometimes members of them as horns since the beginning of the 3000 B.C. in more than one scene showing the ibex horns or bull horns. The ibex received the greatest share of attention from Yemenis because they saw in its body and members holiness. In the era of kingdoms, it became the most commonly used icon in art formations and architectural elements. It has emerged as an art language in the three-dimensional formations and abstraction at the beginning of the 1000 B.C. in Al-Jawf and Marib [9]. The wide spread is due to its use as a symbol of the god in all Yemeni kingdoms, which represents the Venus planet [10]. The Yemenis have been careful and skilled in all situations. It was embodied in its role in protection, where it sits on rectangular bases (Figures 5- 6). In fact, what ancient man built was a reversion to represent the original works. Each building was a pattern of a universe, which became the optimal model, and all its constructive building was only repeated [11]. The assets telling the beginnings of things as agriculture, writing, buildings, and most of what man is doing and practicing simulate what the gods did. Every action is done by man, who is equivalent to primitive models for most activities in the life of society [12]. The ritual tools and offering tables used in Yemeni temples as a means of performance and worship represent a kind of physical and thought product. They were used for religious goals and were closely related to visions and beliefs. The offering tables were presented to the god as a witness to the presenter. They are placed after being submitted to a temple. The symbolic function lies in its form and design, so that all of them are produced in specific patterns [7].

The ritual tools are designed with different types and shapes, including a table used for fluid water and blood. Its design is in a cube, which has two types as its prominent front: the first type is either a bullhead or two bullheads on one of its sides (Figure 7). The second type is a form that has a prominent introduction on one of its sides from the ibex's rows and on its upper surface basin. There is no bank to remove fluid, indicating that they were not used for liquids. Its actual function was a symbolic function (Figure 8). Another type of table simulates the form of the temple (Figure 9) and features the last type of table as rich in decorations covering their four aspects, including decorations of Yemeni temples, doors, and windows [4].

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Figure 5. Votive panels with Ibexes Row formations (Author)

Figure 6. Panels with Ibex embodiment (Author)

Figure 7. The offering table with bulls and two heads (Author)

Figure 8. The offering table with a Row of Ibexes (Author)

Figure 9. The offering table model of temple (Author)

RESULTS AND DISCUSSION

The gate of the Baran temple in Ma'rib as a model

Baran temple is one of the ancient Sabaean temples, located on the southern side of the ancient city of Ma'rib, about 2.7 kilometers away between agricultural fields. The oldest mention of the temple dates back to the tenth century B.C. The temple includes several architectural facilities that were used as workshops for artistic works and rooms for worship. The temple was used from the beginning of the first millennium B.C. until the centuries A.D. [6].

The sacred temple was designed in a cubic shape, with the gate protruding from the western side. It was built on a gradually raised terrace that reached the level of the gate, which was formed by six columns by means of a staircase. The temple has a large courtyard with a corridor of stone columns on three sides. The courtyard is entered through three entrances on the western, northern, and southern sides.

The six columns that front the gate of the Baran temple are considered the highest stone columns in ancient Yemen. Each column was cut from a single stone, and its height reaches 8.2 meters. The cross-sectional area of the column changes with height, and it tilts slightly backwards with increasing height [6].

A) Architectural Form from Embodiment to Abstraction

Architecture has a symbolic communicative function between man and his surroundings. On the other hand, humans use architecture to express their culture and beliefs through architectural elements. Form has been the primary means of communication between humans throughout history. Expression in form represents the reality of communication, and the meaning of form, if abstract, lies in the act of communication and similarity. It is clear by comparison that the form of the Yemeni temple is very similar and identical to the shapes of the offering tables (Figures 10-11). There is no doubt that they are models of the temple's design. The shape of the temple is a cube with the gate prominent in its front, embodying a row of ibexes in the three-dimensional model.

Figure 10. An offering table embodies the shape of Yemeni temple [7]

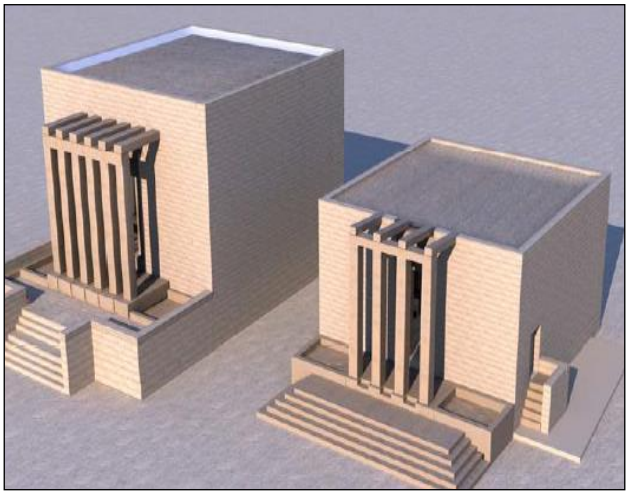

Figure 11. The models of the Nekrah temple resemble the offering table [13].

Therefore, the shape came to meet the visions and beliefs. This shape represented the typical model that the Yemeni architect adopted, repeated, and copied in all regions and at all times. It is proposed that the ancient Yemeni architect stuck with the form and did not try to change it because this form carries philosophical concepts and visions. It was a rectangular shape, from which emerged a rectangular front that was symbolically employed by a row of ibexes to symbolize divine protection, as the ibex is a symbol of the god who protects buildings.

B) Form and Content of the Baran Temple Gate

In fact, there is no function of the columns in the gates of Yemeni temples for improving and facilitating the process of entry and exit. If the aim was purely functional, two columns carrying the roof of the gate in order to protect it from the sun and rain would have formed the entrance. The distance between the columns would have been relatively large to allow passage through them, or the distance between the two central columns of the six columns would have been large in order to make movement easy and allow a person to enter and exit comfortably and easily.

The distance between the columns is approximately equal for all temple gates, which reflects the symbolic and expressive function. When comparing the offering table (the model of the temple) and the gate of the Baran temple (Figures 12-13). It becomes clear that the columns in front of the gate are only an abstraction of the row of ibexes, especially the legs of the ibexes. The rest of the ibex body was embodied abstractly. The horizontal beams were placed on the columns, and the frieze embodied the faces of the ibex. The beams graduated

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backward embody the curvature and knots of the horns (Figures 16-17). Therefore, every two columns in the gate are two legs of a single ibex. The gate preceded by eight columns is an embodiment of four ibexes the gate preceded by six columns is an embodiment of three ibexes and the gate preceded by four columns is an embodiment of two ibexes.

Figure 12. Front Façade for Offering Table Explains the Legs of Ibexes Row (Author)

Figure 13. The Gate Columns of Baran Temple – Five and the Sixth Broken (Author)

It is noticeable in the offering tables, or what can be considered models of temples, that rows of ibexes usually stand on a high-tiered platform (Figure 14). It can be seen in an abstract form in the tiered platform on which the gate and columns of the Baran temple were erected. In addition, the sections of the columns of the temple gate gradually decrease in thickness from top to bottom, and the straightness of the columns at the top tends backwards (Figure 15). This is to mimic the legs of the ibex's row in that they bend backwards and change the thickness of the cross-section of the legs and this is evident in the three-dimensional representation on the offering tables.

Figure 14. Embedding and Decline to the Platform under the Ibexes Row (Author)

Figure 15. Decreased Column and Bending Back the Gate of Baran Temple [7]

It is logical for the ancient Yemeni architect to try to embody the ibex's horns on the gates, but construction laws and structural forces were an obstacle to achieving that. In addition, the building material itself, represented by stones, had the most important role. The architect resorted to abstracting some architectural elements of form to achieve the

idea and content to express the visions and beliefs. He erected the ceilings of the gate to decrease in height gradually as they moved backwards. Therefore, the rear thresholds became lower in height than the front thresholds to achieve the curved and arched shape of the ibex horns, which tilts and decreases to the back in an abstract way to serve the idea (Figures 16-17).

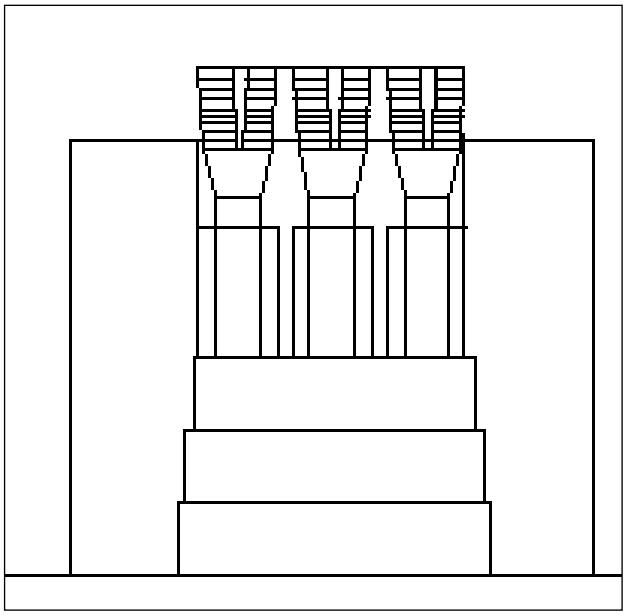

Figure 16. Façade of the offering table (Author)

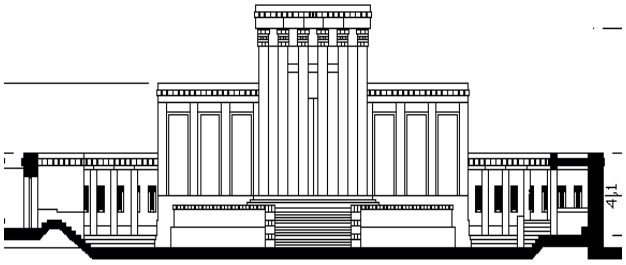

Figure 17. Imagine façade and section from courtyard of the Baran Temple (Author)

CONCLUSION AND RECOMMENDATIONS

The study dealt with an important topic related to Yemeni history and heritage. It focused on studying the architectural form as a vessel containing intellectual contents in the gates and columns of Yemeni temples, which have become a national symbol of Yemen par excellence.

The gate of the Baran temple in the ancient city of Ma'rib was adopted as a model. The study concluded with a set of results as follows:

- The study concluded that the formal structure of the ritual materials was in specific stereotypical shapes, which confirms that they are the embodiment of intellectual visions and perceptions. They were used for symbolic purposes and were presented by the worshiper to the worshiped as embodied symbolic gifts.
- It was concluded that every two columns in the gates of Yemeni temples represent two legs of a single ibex in an abstract form. The gate with six columns consists of three ibexes, the gate with eight columns consists of four ibexes and the gate with four columns consists of two ibexes.
- The ancient Yemeni were distinguished by adopting intellectual integration in the structure of form and content through embodiment and abstraction in an attempt to clarify visions and perceptions. The architect turned to symbolic and abstract suggestions in order to remove the characteristic of frank, superficial expression through abstraction while preserving the main features of the form that was inspired.
- The ancient Yemeni architecture was characterized by harmony and compatibility between form and content in the process of embodiment and abstraction. The characteristics of form embodied in the architectural masses and the structural and formal characteristics of the symbol were consistent with the essential characteristics of the content and thought values.
- The artistic characteristics of ancient Yemeni architecture were characterized by the use of horizontal lines for architectural formation in ceilings and horizontal decorative formations, while the use of strict and strong vertical lines in columns and walls.
- The study recommends preserving ancient Yemeni architecture because it represents a cultural heritage. It gives society belonging and connection with cultural history and generates a sense of familiarity, and aesthetic emotion and strengthens national identity.
- The study emphasizes on architects the importance of inspiration from the urban heritage of Yemen, deducing the intellectual foundations produced by architectural styles and adapting them to the spirit of the times to produce modern architecture that expresses the spatial and cultural specificity.

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DECLARATIONS

Corresponding author

Correspondence and requests for materials should be addressed to Ahmed Abdurabu AL-Nehmi; E-mail: ahmedabdurabu7@gmail.com

Competing interest

The author declares that there is no competing interest.

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For In press manuscripts (maximum 2):
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For Conference:
Hira A. and Mendis P. (1995). Wind Design of Tall Buildings. Conference on High-rise Buildings in Vietnam. Hanoi, Vietnam. http://archnet.org/library/files/one_file.jsp?file_id=108. Site accessed 3 March 2009.
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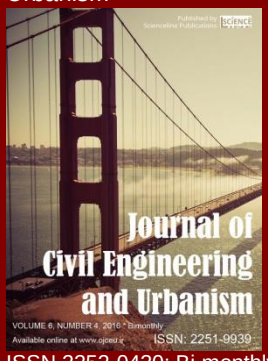

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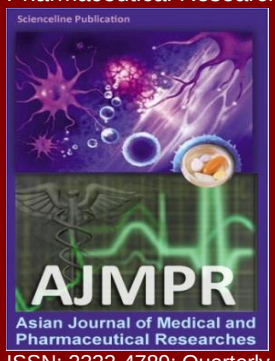

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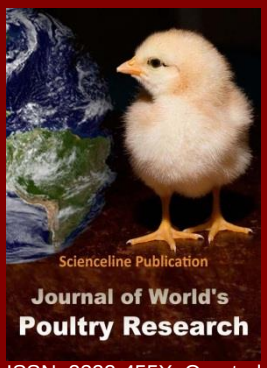

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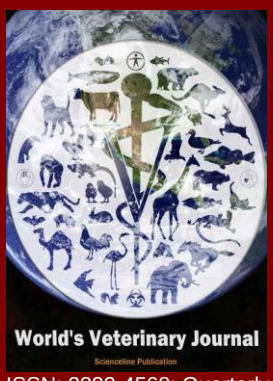

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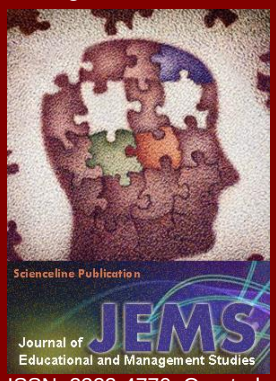

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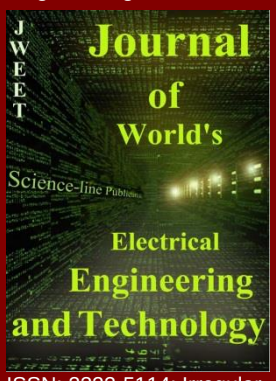

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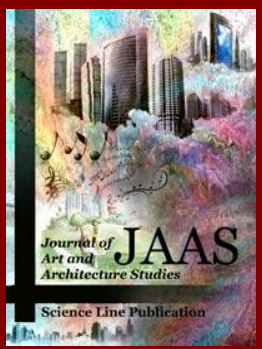

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