# Form and Content in Yemeni Architecture: Exploring Continuity Mechanisms of Heritage - A Case Study of Sana'a City

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**ABSTRACT**

The architectural landscape of Sana'a's old city is a manifestation of its receptiveness to societal needs and its intricate interplay with religious, social, and economic influences, utilizing local building materials. At present, it stands as a creative embodiment of beauty and simplicity, with profound meanings that mirror the values, experiences, and beliefs of society. However, the rapid urban development in recent years has ushered in intellectual and cultural shifts, marked by subjective tendencies that have, at the compositional and semantic levels, abandoned traditional architectural forms. This departure from tradition has given rise to a set of challenges, as the new designs lack the symbols and values inherited from traditions, adopting abstract forms detached from societal traditions. This shift has resulted in chaos and disharmony in the urban landscape, threatening the local identity. This inconsistency jeopardizes the identity of Yemeni architecture in both form and content, impaired by a lack of understanding of its objectives amid rapid local development. This study holds significance as the first comprehensive architectural exploration, delving into the philosophical aspects of Yemeni architecture, addressing both form and content and examining the continuity mechanisms of heritage. The study identifies a cognitive deficiency and a lack of intellectual orientation concerning the clear design mechanisms that bridge heritage architecture and modern developments, striving to achieve harmony between the two. The research aims to develop cognitive perception to formulate a future continuity language, integrating heritage architecture and leveraging modern developments. Focusing on the design and aesthetics of architectural content and traditional insights, the study seeks to produce local architecture with symbolic architectural meanings with societal needs and preserve originality and historic identity. To accomplish these objectives, the research adopts a comprehensive analytical approach, incorporating descriptive, comparative, inductive, and deductive methods. By analysing the form and content in heritage architecture and continuity, the study aims to provide insights into fostering a harmonious coexistence between traditional and modern architectural forms.

## 1. INTRODUCTION

Throughout human history, every civilization and cultural entity has shaped the built environment in harmony with its beliefs, customs, and way of life. Yemeni architecture, with its rich and ancient history, reflects the profound interaction between humans and their environment, as well as the societal and civilizational framework. This interaction is manifested through the creation of architectural forms that serve as a craft for the conscience and spirit inherent in society's values, burdened with symbolic and semantic content.

Yemeni architectural development, extending through successive generations, embodies a progressive continuum [1]. Each epoch introduces distinctive characteristics that shape and enrich the human environment, thus contributing to

an ongoing and dynamic architectural legacy. This progression yields a harmonious and interconnected heritage, flowing seamlessly over time. The form, as a variable expression, undergoes development through design techniques such as symbol, legend, abstraction, and manipulation of elements, all contributing to the creation of a unique identity for a place. In contrast, the content embodies the enduring manifestation of a society's civilizational values, demonstrating resilience against alteration across both time and geographical contexts [2]. Therefore, preserving heritage goes beyond mere imitation or explicit replication of past architecture; it involves a holistic approach that accommodates continuous changes to align with modern developments. This process entails a simultaneous and sequential transition, preserving the essence of the past while harmonizing old forms with contemporary needs. The goal is

to give a renewed essence and meaning to architecture, producing a local architectural model that keeps pace with modernization. In doing so, it revives the spirit, essence, and identity of local Yemeni architecture, safeguarding its originality and cultural identity [3].

## 2. LITERATURE REVIEW

This section of the study presents and discusses the current state of knowledge on the subject of this study "Form and Content in Yemeni Architecture". Moreover, providing a review of published literature concerning the architectural form evolution throughout history, However, the rapid urban development in recent years has ushered in intellectual and cultural shifts, marked by subjective tendencies that have, at the compositional and semantic levels, abandoned traditional architectural forms.

### 2.1 Form and content in architecture

The content is the substance and the human context between the sender and the recipient, expressed through painting, music, or architecture using linguistic, acoustic, formal, or formative symbols, organized based on the individual (sender) personality, and their social characteristics [1].
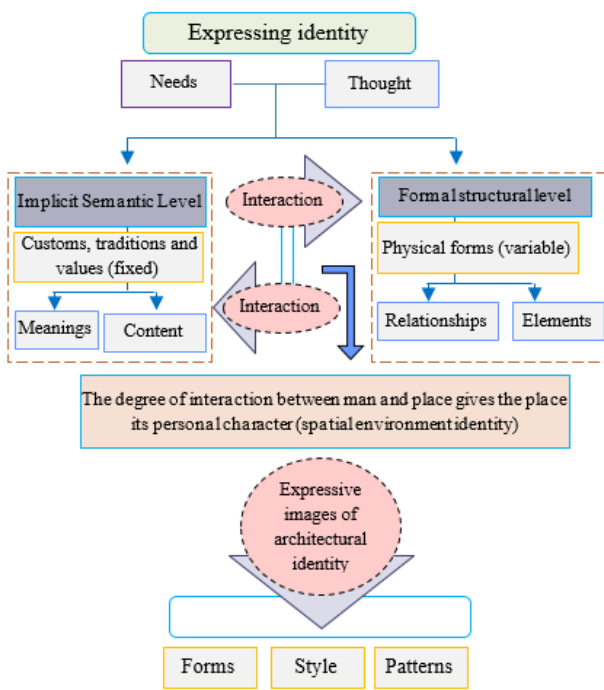


**Figure 1.** Mechanism for expressing architectural identity in urban space
Source: [1]

The external form is shaped by societal values, whereas the internal form is influenced by the values of the society's members [4]. The semantic form, on the other hand, constitutes abstract physical formations designed to convey content and embody spiritual meanings. It serves as a tangible means of expressing local values, and its interpretation is linked to the familiar aspects of form meanings, which can vary across different societies. Symbolic representations through abstract local formations are utilized to express

identity [5]. Architectural identity is expressed through two interrelated factors. The first factor involves the elements of form, associated with the physical or compositional aspect, encompassing all forms used by the designer, whether abstract, borrowed, stereotyped, or derived from structural materials that express identity. The second factor comprises the components of content, representing the moral or semantic aspect, encompassing the ideas and concepts intended to be expressed [5]. Figure 1 illustrates the mechanism of expressing identity. Jenkins provides insight into the architectural interaction of form and content, where the signifier encompasses shapes, spaces, surfaces, and sizes, characterized by elements such as rhythm, color, and texture. Simultaneously, the meaning or content encapsulates ideas that reference a purpose or function within the architectural context. The convergence of architectural form (expression) and content (meaning) gives rise to a dual entity termed an architectural sign [6].

### 2.2 Architectural form evolution throughout history

The evolution of human thought, as reflected in the contents and forms of expression, has undergone significant transformations throughout history. The study dells and explores the historical journey of the "form and content" that have evolved and the dynamic relationship between the religious, social, and economic variables that accompany them. This section will show briefly the development of civilizations, tracing their forms and content from prehistoric times to the realms of postmodern architecture.

Architecture throughout history has attempted to give form and content a related meaning in terms of symbols and social significance. The meaning of form and content is relevant to all human projects, and all arts and crafts; therefore it is important to understand how architecture in general deals with meaning. Jurgen Habermas, explains how form and content have religious roots in ancient Greek culture. In ancient Greek, the word for "idea" was the Latin word for "form". Thus, the idea is the origin and content of form. There is no form without an idea. The form is the result of the relation between an idea, to an object; and the idea is the generative force of form and its content. Thus there can be no form without an idea [7]. Therefore, it is found that the essence of Roman and Byzantine architecture is rooted in the fertile soil of the Greek style [8]. These architectural styles are imbued with a profound connection to nature, belief in spirits, and a rich tapestry of mythology [9]. The architectural landscape is a testament to the explicit and monumental nature of their variety of buildings (administrative cultural buildings, entertainment palaces, theatres, gladiatorial arenas) [9], and the harmonious blend of form and function can be seen from the diversity of elements such as arches, domes, and columns [10]. Form finds its place in the discussion of the content that is foremost as an architectural design component, operating too many other design-creating elements, and in the conception of the initial idea of the architectural project to convey the message to be achieved in a building. It also gains significance in discussing the symbolic associations that can manifest by articulating form in architectural terms [9]. Figure 2 illustrates the grandeur of temples that exemplify the distinctive characteristics of Byzantine and Roman architecture [10]. Also in Islamic architecture, the Islamic style was based on religious and cultural foundations rational and grounded in the oneness of God, is mirrored in architecture that is both

ideologically and socially cohesive. This architectural tradition embraces environmental, heritage, and technological diversity in places of worship, governance, and housing [11]. Islamic style, characterized by its interest in diverse content and adaptive form changes, evolves through different architectural styles across historical eras. These styles include the era of the Prophet, Umayyad, Abbasid, Fatimid, Seljuk, Andalusian Moroccan, Safavid, Mongols, and Ottoman periods [12]. Figure 3 illustrates selected buildings of Islamic architectural style.



**Figure 2.** Temples and some buildings of Byzantine and Roman architecture
Source: [9]



**Figure 3.** Some buildings of Islamic architecture
Source: [12]

The Renaissance witnessed a broad movement in several fields such as arts, literature, sculpture, and architecture, in which architecture and art attempted to reuse Roman and Greek ideals without the architects of this era copying Roman architectural elements. However, the amount of change and transformation was enormous and effective. As noted, a noticeable separation occurred between secular and religious styles in Europe. Rational materialist thinking gained prominence, seeking causality for all phenomena, and distancing itself from sacred and divine associations. This is significantly clear in the thought of Rococo architecture, which relied on the separation of church from state and the multiplicity of religions, and its buildings drew inspiration from Roman forms, influenced architecture, with Renaissance buildings drawing inspiration from Roman forms, including palaces, churches, and villas [13]. Figure 4 illustrates a selection of Renaissance palaces, churches, and villas. Figure 5 illustrates some of the buildings of the Rocoque architecture.



**Figure 4.** Palazzo Rochelle, Florence, palaces, church and villa in Renaissance Italy
Source: [14]



**Figure 5.** Rococo building
Source: [15]



**Figure 6.** Cathedrals, palaces and buildings of nineteenth-century architecture
Source: [16]



**Figure 7.** Some buildings of modernity architecture
Source: [17]

Early 19th-century architecture and building designs were characterized by the Romantic style, which focused on reviving past structures, emphasizing a harmonious balance between form and content [16]. Figure 6 illustrates a curated selection of cathedrals, palaces, and buildings representing nineteenth-century architecture.

Architecture, the craft of building, has become an alliance between taste and capital, art and profit, and style and power. We argue that contemporary architectural practice has become dissociated: it is increasingly divorced from form and content; aesthetics has been negated, reduced to appearance, and dressed up as art [17]. Therefore, in modern architecture, there is a prevalent emphasis on utilitarian function, leading to the creation of uniform and simplified forms that can be perceived as lacking in diversity and detached from heritage, human, and societal contexts. This approach signifies a departure from historical associations, opting for a philosophy where form strictly adheres to function, embodying a mechanical and iterative conceptualization [18]. The outcome of modern architecture tends to be monolithic, shaped by a reduction in function and value. This approach results in forms and contents that lack the symbolic richness inherited from tradition, favoring an abstract concept of form with meanings not inherently understood or rooted in societal customs. The dominance and Westernization of modern architecture, even in its native context, contribute to a sense of isolation and alienation. While responding to material, social, and economic needs, this architectural shift has introduced chaos and disharmony to the urban landscape, highlighting a stark contrast with ancient and traditional architectural values [19]. Figure 7 illustrates selected buildings of modern architecture.

Postmodern architecture emerged as a reaction against the perceived monotony and homogeneity of modernist architecture, which often prioritized functionalism and rejected historical references. Postmodern architecture also broke away from the strict rules of modernism and embraced a more eclectic, playful, and symbolic approach to design. This approach aimed to create buildings with familiar cultural images, carrying multiple symbolic architectural meanings that engage with the public and innate human needs [20]. In adopting the narrative, messaging, and symbolic aspects, postmodern architectural productions sought to mitigate the dominance of Westernization. The movement aimed to reconnect with the past, navigate cultural identities, and counter alienation towards older structures by fostering a more eclectic and inclusive architectural language. Postmodern architecture expressed a keen interest in heritage architecture for its symbolic images and meanings but sometimes fell short

in addressing environmental and social needs [21]. Charles Jencks, an American cultural theorist and landscape designer, in 1991 pointed out "In both art and architecture, the postmodern tradition is beginning to mature, and we can see limited progress and development like that of the Renaissance, that the impresarios of beauty are at it again: the pedlars of harmony, balance, and proportion - those worn-out precepts - are dusting off the classics. The counterfeiters, by manipulating taste, are freeing architecture from the effort to change the world". The aesthetic form is being emptied of social content. Post-Modem maturity is upon us. Figure 8 illustrates selected buildings of postmodern architectural style.



**Figure 8.** Postmodern architecture buildings
Source: [20]

The evolution of style regarding form and content in successive civilizations reveals three distinct positions:

i. Dominance of Form: In certain historical periods, such as the Renaissance, Baroque, and Rococo, there was a clear precedence of form over content, evident in architectural expressions.

ii. Dominance of Function: In contrast, the modern era emphasized the dominance of function over formal composition, epitomized by the principle "form follows function." This extreme perspective often resulted in architecture lacking spiritual essence and vitality, focused solely on material functions.

iii. Balance between Form and Function: Some civilizations achieved a balance between form and function, creating a harmonious blend where the internal design factors adapt logically to the environment and function. This approach is exemplified in Mesopotamian architecture, Islamic architecture, and postmodern architecture. Figure 9 shows the relationship between form and content for successive civilizations throughout history.
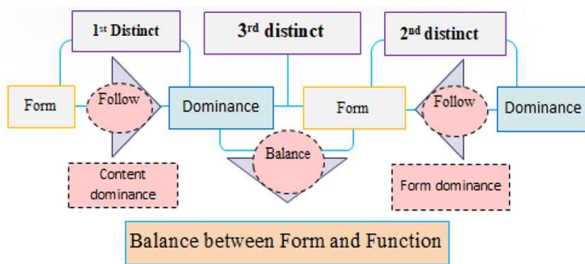


**Figure 9.** The relationship of form to content in successive eras of civilizations

## 3. MATERIAL AND METHOD

The architecture of the old city of Sana'a, in its forms and contents, was distinguished by values rich in meaning that reflect the values, principles, and beliefs of Yemeni society, and it remains a creative model of beauty and simplicity. However, rapid urban development in recent years has led to intellectual and cultural transformations, characterized by subjective tendencies that have abandoned traditional architectural forms on both the structural and semantic levels [22]. This transformation has led to chaos and disharmony in the urban landscape, threatening local identity [23]. To fully understand this chaos and disharmony, it is necessary to study the intellectual and cultural transformations accompanying this rapid urban development, which were characterized by subjective tendencies that abandoned traditional architectural forms, on both the structural and semantic levels.

### 3.1 Study area

Sana'a is considered one of the most civilized old cities in the Arab world. It is, unlike many Islamic cities such as Baghdad or Fustat, is distinguished by its gradual, spontaneous, and natural emergence. Sana'a is located on a mountain plateau 2,500 meters above sea level. And is one of the fastest-growing cities in Yemen. It has been transformed from a small town enclosed by walls into a metropolitan area in only about four decades [24]. In this study, Sana'a City has been chosen as it provides a fine illustration that represents the status of the local architecture by meeting the needs of society and its interaction with social and economic influences and available local building materials. Sana'a is rapidly urbanizing due to many techniques and technologies that have affected contemporary life with a range of variables and intellectual and cultural trends. Contemporary circumstances did not allow it to interact with the spirit of local identity and accelerate changes [25]. Furthermore, many of these contemporary designs are environmentally, socially, and culturally conflicting with the values of Yemeni society. This inconsistency jeopardizes the identity of ancient Yemeni architecture in both form and content, impaired by a lack of understanding of its objectives amid rapid local development [26] (Figures 10 and 11).
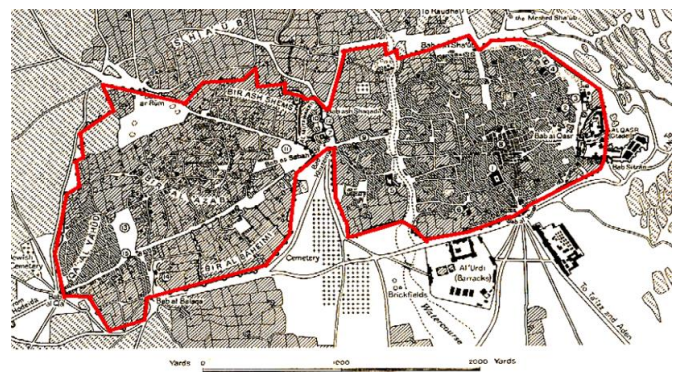


**Figure 10.** Sana'a map in the 1940s
Source: [22]

3.1.1 Sana'a City architecture, origin and development
Sana'a, recognized as one of the oldest Arab cities, finds its historical roots back to the Sabaean and Himyarite periods, back to the second half of the first century AD, following the establishment of major Sabaean cities like Marib and Sirwah. Many ancient historians, including Al-Hamdani, Nashwan bin Saeed Al-Himyar, and Ibn Al-Kalbi, credit him with the construction of the city [27]. The enduring recognition of the name Azal persists to this day. Moreover, historians confirm that the same name, Azal, is mentioned in the Torah, further solidifying its historical significance [24]. Figure 12 shows selected buildings in the old city of Sana'a. Figure 13 shows the structure of Dar al-Hajar Palace in Sana'a.
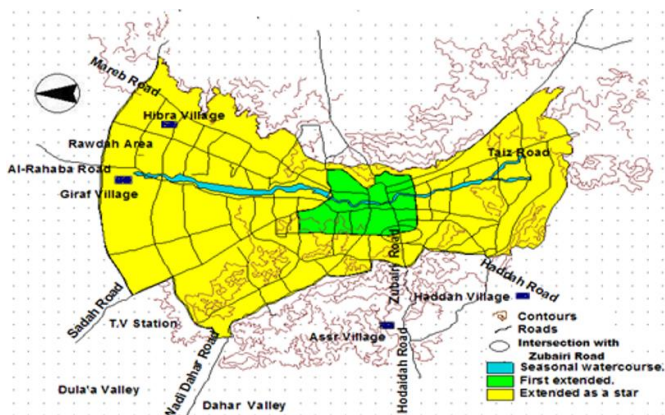
**Figure 11.** The circular expansion of Sana'a
Source: [28]



**Figure 12.** Residential buildings in Old Sanaa
Source: [22]



**Figure 13.** Dar Al-Hajar Palace - Sanaa
Source: [1]

## 3.2 Research methodology

The study focuses on two aspects, namely the theoretical and practical aspects. Thus, the secondary data was derived from the theoretical aspect of studying, the theoretical background of research works from the desktop literature review from multiple sources such as published and unpublished materials in books, journals, magazines, research works, conferences/seminars, and working papers which deals with the form and content in architecture, and architectural form evolution throughout history. While the practical aspect involves field studies the case study was selected (Sana'a City). This section discusses the procedures and explains the practical field research methodology adopted for the data collection, processing, and analysis as well as the presentation and interpretations of field results and findings. Hence, the study will address the issue of the form and content of Yemeni architecture and the mechanisms of communication with heritage. Furthermore, the study examines the intellectual and cultural transformations accompanying this rapid urban development, which were characterized by subjective tendencies that abandoned traditional architectural forms, on both the structural and semantic levels. Drawing from the

literature review concerning the study strategies used in similar studies, the research methods adopted for this study were quantitative and qualitative surveys [29]. The study's primary data were gathered through three principal survey techniques: site observation, photographs, and in-depth interviews. The target group for the survey included a sample of residents in different parts of the case study, local authorities, those responsible for concepts and issues of heritage conservation, several academic researchers, and architects.

## 4. DISCUSSION, RESULTS AND FINDINGS

This section presents and discusses the result of the analysis of the data derived from the literature review, based on historical methods, case studies, and ethnography. It begins with the presentation and discussion of the result of the analysis of form and content in architecture, and architectural form evolution throughout history, which have dramatically altered the symbolic architectural meanings that interact with society and contemporary human needs to preserve authenticity and cultural identity. Secondly, this section deals with studying the results related to the subject of the study, "form and content," in the architecture of the city of Sana'a, in its old and modern parts, through the descriptive, analytical, and comparative approach to heritage architecture and communication with heritage. Moreover, this part provides the reader with an understanding of the research's primary topic, the departure from tradition has given rise to a set of challenges, as the new designs lack the symbols and values inherited from traditions, adopting abstract forms detached from societal traditions. This shift has resulted in chaos and disharmony in the urban landscape, posing a threat to the local identity.

## 4.1 Form and content in the architecture of old city of Sana'a

(1) Case study: Old city of Sana'a (observation & photo tracking)

From the observation and the site visit to Old Sana'a City (case study), it becomes clear that the architectural style prevalent in the old city of Sana'a serves as a definite embodiment of various elements, both formal and semantic. These architectural characteristics convey the physical structure and encapsulate the essence of the community's thoughts and identity [30]. This distinctive style is a testament to the dynamic interplay of human, social, religious, climatic, economic, and political influences. The architectural style of the old city of Sana'a, encompassing its elements, forms, relationships, compositions, and various components, resonates strongly even in the present time. Rooted in Yemeni architectural traditions, it is built upon geometric principles and imbued with aesthetic, spiritual, and human values. This synthesis results in an architectural assembly transcending mere construction, transforming into a visually rich artistic masterpiece characterized by intricate lines, vibrant colors, and ornate elements [31]. The old city's architecture harmonizes like silent music, weaving a symphony of elements that delight and dance in tune with its surroundings. Figures 14 and 15 illustrate the facades of the ancient buildings in Sana'a, showcasing their enduring vitality through distinctive elements, architectural features, and aesthetic

values that persist to the present era [32].



**Figure 14.** Arcade and details of the facade of one of the buildings in the old city of Sana'a
Source: [1]
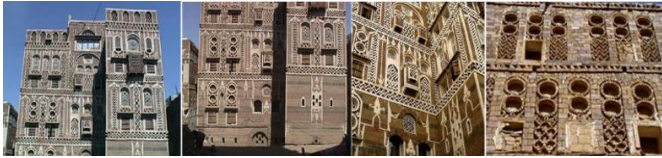


**Figure 15.** Facades of buildings in the old city of Sana'a express their harmony and integration
Source: [1]

(2) Case study: Old city of Sana'a (interview)

This part presents and discusses the results of the analysis of the data derived from the interviews with the local authorities, those responsible for concepts and issues of heritage conservation, several academic researchers, and architects. The questions asked were about the old city of Sana'a's history, urban and architectural formation, and the philosophy behind its creation. Participants cited that the case study is unique with a combination of architectural and cultural. The participants pointed out that the old city of Sana'a stands out not only for its historical significance but also for its distinctive urban and architectural formation, guided by aesthetic values. The philosophy behind its creation demonstrates compatibility with natural, social, and economic environments, showcasing a thoughtful approach to urban planning. The organization of spatial and functional interactions within the city's layout and architecture plays a crucial role in integrating the various components of the city and its buildings. This careful organization serves to fulfill the diverse requirements of human living, reflecting a harmonious blend of cultural, social, and practical considerations in the formation of the cityscape [33]. The Old City of Sana'a has preserved its character and architectural coherence throughout thousands of years. It has safeguarded its arches, distinctive architecture, winding alleys, fortified walls, and urban gardens, along with its wells, maintaining its cultural and historical integrity well into the present century. The city stands as a living testament to the enduring legacy of its past, showcasing a remarkable continuity in its architectural features and urban layout [34]. Moreover, the orchards and green spaces (Maqashem) in the city of Sana'a were notable for their lush greenery, characterized by a variety of trees and plantings that maintained their verdant appearance throughout the year [24]. This deliberate landscaping was a response to environmental, social, aesthetic, and economic considerations and requirements. These green spaces served as the lungs of the city, facilitating the movement of air, and purifying it from dusty particles. They also played a role in raising humidity, moderating atmospheric temperatures, and absorbing direct sunlight, contributing to a more comfortable environment. Additionally, the strategic placement of these green areas helped reduce noise, and the use of ablution water from mosques and springs in various neighborhoods added a sustainable element to this ecological harmony [24]. Figure 16 provides a glimpse of the residential units surrounding the orchards (Maqashem), forming a cohesive environment that promotes environmental sustainability and enhances thermal and psychological comfort for the residents [24].



**Figure 16.** Old Sana'a buildings overlooking the orchards and gardens that represent the lungs of the city
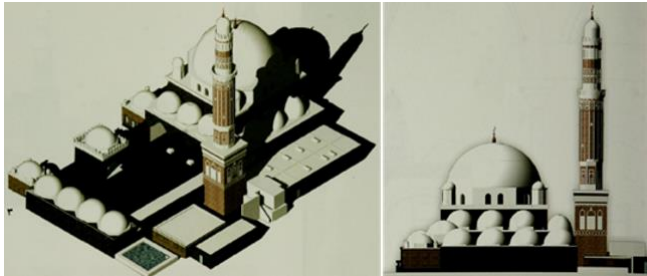Source: [24]

At the urban level, some participants indicated that the urban fabric incorporated into the architecture of Old Sana'a was designed to accommodate the gathering of buildings closely situated on both sides of the streets. The prevalent style of tower construction, emphasizing vertical extension, and the use of cubic forms contributed to a diverse array of sizes, overlaps, and adhesions among residential units. This architectural approach aimed to meet environmental requirements, adjusting to the local context. The arrangement of buildings reduced the exposure of external surfaces to intense sunlight, leading to streets and corridors narrower than the height of buildings. This intentional design choice created shadows for pedestrians, offering relief from the sun's intensity while hindering the penetration of hot, dusty air from outside the city. This design also contributed to temperature retention during the night [22]. In addition to environmental considerations, these architectural principles responded to aesthetic and social requirements, resulting in a harmonious, diverse, and aesthetically pleasing urban landscape within each block and the overall composition of the city. Furthermore, careful planning optimizes land use by avoiding construction on arable land. The mosque served as the central and spiritual axis for social gatherings within the community, fostering human connections among its inhabitants. It stood as a symbolic and functionally significant structure, embodying various styles that, despite their differences, shared consistency in form, integration, simplicity, homogeneity, and contrast in shape among elements such as the body, minarets, writing patterns, and diverse ornate. This unity in composition and the careful arrangement of elements contributed to the aesthetic value of the mosques, providing a sense of cohesion and beauty within their architectural designs [35]. Figure 17 shows some silos (minarets) of the old city of Sana'a. Figure 18 shows Al-Bukayriyah Dome Mosque.

By asking questions to the architects, and several academic researchers the participants pointed out that the adept Yemeni architect masterfully crafted the architecture of Sana'a, achieving remarkable harmony and artistic coherence. This achievement stems from the diverse use of building materials, giving rise to magnificent palaces and tower-style buildings that showcase the city's most beautiful styles [32]. These structures feature both vertical and horizontal inscriptions that were employed in different places on the facades of the buildings. Which developed in various phases and times, and their direct impact on the visual shaping properties of the building facades composed of various local materials known for formability, resilience to climate changes, thermal insulation properties, and adaptability to the surrounding environment [36] (see Figure 19).
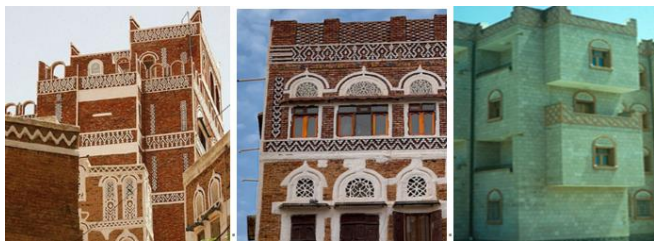
**Figure 17.** Some of the minarets of the old city of Sana'a, showing traditional architectural pattern
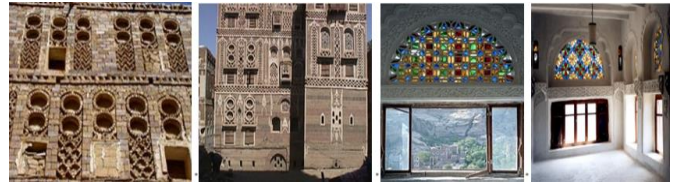Source: [35]



**Figure 18.** Al-Bukayriyah Mosque
Source: [1]



**Figure 19.** Developed inscriptions employed in different Places on the facades of newly constructed building

Moreover, the durability, endurance, recyclability, and aesthetic appeal of materials such as different kinds of stone, mud-brick, clay, cementum, grout, wood, and lunar (locally known as Qamariyah) which came to be called the Qamariya from the moon as a symbol and indication of a deity in ancient Yemeni religion. It is a circular opening made of polished and transparent marble that rises above the window openings at night and through the internal lighting appears to the outside like the moon on a full moon night. The Qamariya evolved in different stages and times until it took the Semi-Circular form of Gypsum and inlaid with colored glass played a crucial role in shaping Sana'a's architectural landscape, see Figure 20. Yemeni architects preserved building blocks as canvas, creating visual pleasure through diversity, horizontal lines, varied vertical holes, and the cladding of facades with prominent white grout stones [32]. The addition of peacock colors for Qamariyah, coupled with a range of decorations, fosters a sense of harmony between these architectural elements [22]. The result is a facade resembling a painting that energizes viewers, offering enjoyment, breaking monotony, and engaging with the natural, environmental, and social traditions. This meticulous approach extends beyond buildings to influence the clothing styles of residents of Sana'a both men and women. The aesthetic values embedded in the city's architecture serve as an expression of the material and intellectual content, forming a harmonious interplay between form and content in the urban and architectural heritage. This enduring and renewable system reflects a commitment to sustaining the cultural and architectural legacy of Sana'a into the present time, see Figure 21.



**Figure 20.** The Qamariya evolved in different stages and times until it took the Semi-Circular form



**Figure 21.** Colours of Qamariya and the decoration of the buildings reflected the beauty of the appearance of the Sana'a woman
Source: [1]

The architecture and urbanization in the old city of Sana'a are intricately connected to residents' social life, lifestyle, and daily relations. The design of residences, places of worship, and markets reflects the community's culture and traditions. Attention to texture, colour, and smell creates a meaningful environment, creating a strong sense of place. The balance between privacy for families and societal cohesion is emphasized in the planning, fostering both individual well-being and community interactions. This relationship between the environment and social dynamics shaped the identity of the old city over time [32]. Figure 22 shows the connecting bridges between opposing housing units to promote communication and interaction among family members residing in separate units.



**Figure 22.** Bridges linking neighbouring residential units in the old city of Sana'a to enhance social interaction and bonding
Source: [1]

## 4.2 Form and content in the architecture of Modern Sana'a

The contemporary urban housing formation in Sana'a diverges significantly from its traditional antecedent. In contrast to the traditional urban fabric characterized by the stacking and contiguity of architectural blocks, the modern cityscape features perpendicular streets and dispersed buildings, as depicted in Figure 23 [37].

The traditional city had a winding street network, designed to impede cold winds and mitigate their impact. While the modern city has variable street widths which lack the desired correlation between street width and building height, resulting in a dearth of shaded surfaces. The city and its neighborhoods are deficient in orchards and green spaces, which previously constituted a landscape conducive to the local climate. This absence hinders the elevation of relative humidity rates, sunlight absorption, and air purification. Consequently, the fabric of the modern city manifests a rigid structure, departing from the spontaneity inherent in the traditional urban fabric [28]. The contemporary urban planning evident in Sana'a

reflects a departure from traditional principles, as seen in the standardized repetition of street shapes and directional determinations within the spatial configuration. This approach has compromised the sequential and spatial progression of the city, contributing to continuous traffic exposure on the streets. Consequently, the residential groups experience diminished tranquillity, acoustic and visual privacy, and a weakened sense of belonging, as illustrated in Figure 24 [33]. In terms of architectural evolution, modern Sana'a incorporates novel construction methods and materials. Examples include the use of glass facades and cement-coloured concrete structures on building exteriors [37] (Figure 24).



**Figure 23.** Some of the streets of the modern city of Sana'a. The streets are arranged perpendicular to each other and straight developing a grid-iron pattern
Source: [1]



**Figure 24.** Al-Saidi Tower, modern Sana'a City, with large glass areas

The prevalence of standardized flat windows, consistent in size and shape across all floors, with extensive use of glass in external facades, has altered the morphological characteristics of buildings. The introduction of balconies further influences facade aesthetics but contributes to an increased absorption of sun rays, raising solar radiation and the thermal load on the buildings. Notably, the transformation extends to the roofs, which have transitioned to a flat, single-level design, deviating from the graduated skyline and distinctive surfaces characteristic of ancient architecture. Unfortunately, these alterations in architectural elements and building materials do not adequately consider the local climate conditions, reflecting a manifestation of Westernization [37]. This oversight adversely impacts the thermal comfort of inhabitants and constitutes a significant departure from traditional architectural practices that were inherently adapted to the environmental context. The evolution of customs and traditions in the modern city of Sana'a, defined by increased social openness and change, has significantly influenced family dynamics and, in turn, reshaped the architectural landscape. Significantly, the transition to modern architecture signifies a departure from traditional family structures, thereby influencing the identity of historic architecture. Modern architectural trends prioritize independent housing for each family, a reflection of the societal shift that has occurred. This societal shift has transformed society from a model where families resided in tower residential buildings with both vertical and horizontal extensions, organized in family blocs and groups, to a society where individuals tend towards isolation, forming separate households. This social evolution represents a departure from the communal living arrangements characteristic of traditional environments. As a result, many old social values have been compromised, leading to weak social and family ties, diminished privacy among society members and within families, and a decline in the spirit of neighbourliness. The breakdown of traditional social values is exemplified by the diminishing interest in neighbourly relations, communal participation, and acquaintance among neighbours. Consequently, the consideration of a neighbour's rights, including the right to privacy, has become neglected, as illustrated in Figure 25. In the city of Sana'a, the fading presence of traditional architecture is marked by the emergence of modern structures characterized by concrete elements. However, the transition to modern architecture in Sana'a has been accompanied by challenges, notably evident in the mundane repetition of balconies and holes that lack consideration for environmental, social, and aesthetic values.



**Figure 25.** The boring repetition of balconies and openings in modern Sana'a architecture

Modern Sana'a architecture has grappled with a crisis resulting in the loss of aesthetic and creative values. This contrasts with the old architecture, which adeptly balanced form and content, as well as functional and aesthetic considerations. The traditional architecture achieved a seamless integration of creative aesthetic performance with the functional and beneficial aspects of the buildings. Despite the rich heritage offering diverse forms, values, and contents, many of these have not been incorporated into modern architectural practices. Furthermore, modern buildings in Sana'a often exhibit an overlapping and multifunctional nature, where the form fails to adequately express function. This departure from the principle that form should harmonize with content and be in unity with style has contributed to a discrepancy in the aesthetic values of the modern architecture of Sana'a. The prevailing tendency towards monotony and boredom in form, content, and colours diverges from the harmonious coexistence with ancient architecture, as illustrated in Figure 26.



**Figure 26.** Some buildings in the modern city of Sana'a have lost their identity and character

The modern architecture of Sana'a has deviated from its inherent character and local identity, manifesting a lack of coherence in design, diversity in materials, and an absence of clear determinants that guide their formation. This departure

stems from the incorporation of elements, compositions, and concepts borrowed from various sources and whims, resulting in what can be described as an architectural ordeal. The disconnect between architecture and its intended purposes is evident, marked by poor spatial design, a disregard for social needs, the omission of essential functional spaces, a detachment between design and use, a separation from societal context, and disharmony with the surrounding environment. Consequently, the comfort within these buildings is compromised, contributing to the loss of the distinctive character of Old Sana'a architecture. The only common thread lies in the use of local materials to some extent, with each building adopting an independent identity in terms of formation. This approach has led to indifference and chaos in architectural formations, ultimately resulting in the erosion of the city's overall character.

The analysis above underscores the dominance of physical values over spiritual and human considerations in modern architecture. This is evident in the prioritization of material aspects at the expense of form, intellectual, and expressive content. The imposition of the label "modern architecture" further exacerbates the issue by disconnecting Sana'a's contemporary architectural identity from its intrinsic spirit. This separation results in a lack of acknowledgment of its objective, a consequence of architects neglecting to employ communicative design mechanisms that could foster harmony between heritage architecture and modern developments. Architects' tendency toward refined designs reflecting personal preferences perpetuates the detachment from the cultural, intellectual, and semantic essence of Sana'a. The failure to balance environmental and social demands further contributes to the estrangement of the city's historical architecture. Modern designs often fall short of emulating the distinctive form and content of Old Sana'a architecture.

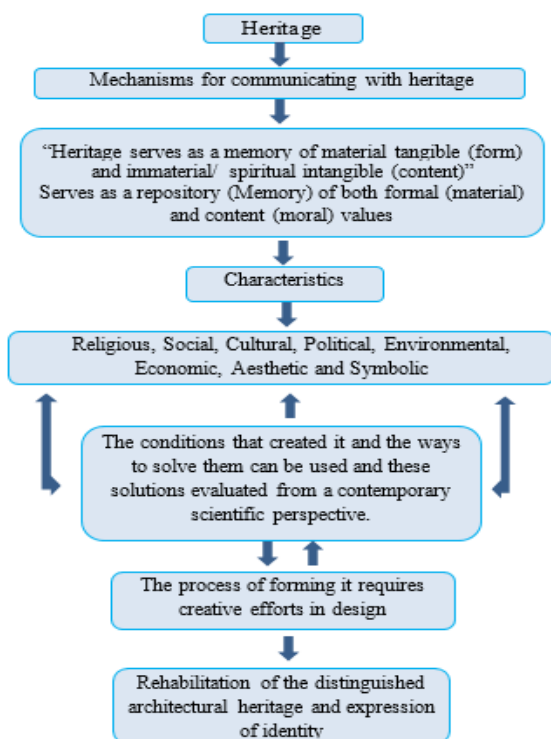## 4.3 The proposed vision for continuity mechanisms of heritage



**Figure 27.** Mechanism for communicating with heritage

Heritage serves as a repository of both formal (material) and content (moral) values spanning religious, social, cultural, political, environmental, economic, aesthetic, and symbolic dimensions. There is potential to derive contemporary solutions through a scientific perspective. The formative process necessitates creative design efforts, facilitating adaptation to the current environment for the rehabilitation of distinguished architectural heritage and the expression of identity. Design, as an organized mental process, integrates diverse information into a coherent vision, playing a crucial role in the architectural design process and contributing to the attainment of novel and remarkable outcomes. A proposed mechanism for communicating with heritage is shown in Figure 27.

### 4.3.1 Vision

Drawing inspiration from heritage architecture involves incorporating both its form and content into a communicative design approach. This entails renewing and creating architectural forms that not only align with modern developments but also meet the requirements of contemporary society.

### 4.3.2 Requirements for vision implementation

The design process, which imbues meanings, contents, and connotations based on the proposed vision, mandates a deep understanding of both heritage and the contemporary needs of society from the architectural designer. This understanding is crucial for navigating a unique and original creative process utilizing various continuity mechanisms that manifest identity and effectively address the current demands, is illustrated in Figure 28 (No. 1). The most crucial requirements for realizing the proposed vision include Figure 28 illustrates the interrelation of these elements:
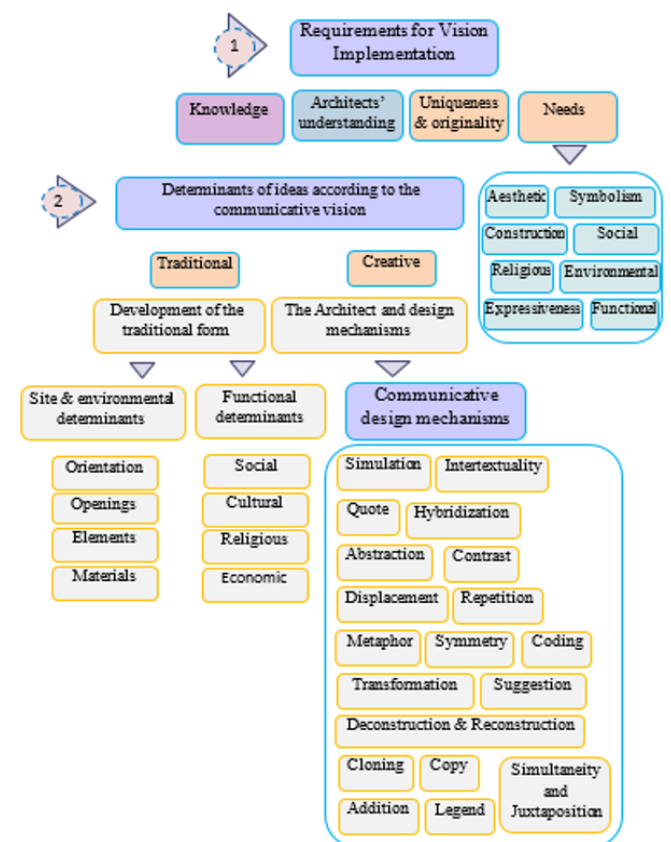


**Figure 28.** Requirements for vision implementation

### i. Knowledge

The familiarity of the architect is facilitated through access to a diverse range of knowledge sources, including research, theories, reports, and publications within their field of specialization. Additionally, hands-on field experiences, encompassing both heritage and contemporary contexts, play a crucial role.

### ii. Architect understanding

The design is represented by the way the designer thinks by adopting two basic aspects, the creative side (the designer's imagination) and the methodological side (information and knowledge analysis), and the understanding and perception of the designer are achieved through several determinants of understanding:

a. Understanding the project aspects, purposes, and functions and collect all information about its different parts.

b. Recognizing the user's needs, desires, and cultural and social identity. Establishing a clear understanding of the relationship between the building and the community, emphasizing key aspects of interaction.

c. Understanding the site and its surroundings, establishing a connection between the building and the natural and urban environment. Considering the symbolic significance of the site.

d. Being aware of the cultural, social, and religious identity of the community and understanding of the needs and their human dimensions.

e. Being aware of the natural and built environment and translating creative concepts into tangible ideas. Transforming imaginative assumptions into objective reality.

f. Generating the concepts that bring creative visions to life by transforming speculative ideas into concrete realities.

### iii. Exclusivity and originality

Innovative architects begin with a design concept rooted in authentic ideas, seeking renewal and creativity within the context of their personal experience and the ability to generate fresh perspectives. This process imparts a distinctive identity to their architectural or urban work, rendering it unique and establishing a dialogue between familiar ideas (heritage) as a wellspring of inspiration. These ideas are then reimagined in unfamiliar ways and relationships that encapsulate the essence of identity and contemporary trends. As time progresses, these ideas and designs evolve into familiar concepts, each marked by unique features to retain original values over time. In this way, they become creative works that shape both form and space, serving as enduring models and patterns.

### iv. Need

The primary emphasis revolves around the human experience, and the core of creative design ideas lies in addressing a wide range of human needs while ensuring environmental compatibility with human behaviour, beliefs, and psychology. The objective is to attain architecture that resonates with human experience, where design concepts stem from a spectrum of individual needs, encompassing (aesthetic, symbolic, structural, social, religious, environmental, expressive, and functional considerations) illustrated in Figure 28. Developing cohesive architecture hinges on the designer's ability to creatively translate the current needs of humans (the recipients) into tangible forms, thereby guaranteeing the embodiment of identity.

## 4.4 Determinants of ideas according to the communicative vision

Discussing the categorization of design ideas for the development of communicative architecture presents challenges owing to individual differences in thinking and expression. However, a connection among ideas exists, imparting a unique intellectual orientation or aligning with specific architectural schools, both in general structure and intellectual characteristics. As a result, classification is not rooted in the ideas themselves but rather in their source and implementation methods. The determinants of design ideas, according to the proposed communicative vision, can be categorized into:

### 4.4.1 Traditional

It is contingent upon the gradual transformation of the traditional form, shaped by a combination of site-specific factors, environmental considerations (such as orientation, holes, elements, and materials), as well as functional, social, cultural, religious, and economic determinants, illustrated in Figure 28 (No. 2).

### 4.4.2 Creative

The architect employs various communicative design mechanisms, including symbol, displacement, inscribing, alignment, reference, hybridization, and abstraction. Drawing inspiration from diverse fields such as nature, arts, human-made drawings, and architectural landmarks, the architect explores their formal characteristics, implications, and semantic and symbolic meanings (Figure 28 (No. 2)).

## 4.5 Guidelines for architectural ideation based on the proposed communicative vision

The prospect of crafting designs that seamlessly integrate heritage and exotic architecture from various civilizations and cultures is attainable through communicative design mechanisms employing creative processes. This entails blending traditions that span both time and space, culminating in a hybrid language that effectively articulates a distinct sense of identity. This can be achieved through:

1- The dimension of physical synthesis, conveyed through form, acts as a representation of identity by incorporating elements that signify heritage, change, development, and adaptation. The objective is to seamlessly integrate these visual components into modern production, establishing a visual continuity that spans across historical and contemporary contexts (Figure 29).

2- The semantic contents and ideas that the designer seeks to communicate are expressed through the interplay of elements and relationships between forms, encompassing both heritage and modern influences (Figure 29).

The primary guidelines for generating design ideas within the proposed communicative vision include:

### 4.5.1 Determining the foundational design needs

The incorporation of formal references to address human requirements, spanning the aesthetic, symbolic, functional, environmental, economic, religious, social, and technological dimensions, lends a moral dimension to the form with semantic and expressive implications return to Figure 28 (No. 1), and shown in Figure 29.

1- Aesthetic: Deriving inspiration from elements, forms, and contents of heritage and local architecture and reformulating them to meet contemporary requirements imbues the design and production with aesthetic value. This expression reflects societal values and a sense of belonging to

the local identity.

2- Symbolism: Selecting and drawing inspiration from symbolic elements across various contexts (customs, myths, traditions, architecture, nature, and heritage) and embodying them with a symbolic landmark contributes to identity stability. These landmarks become integral to individual and societal identity formation, with embodiment options ranging from familiar expressions to hybrid or original innovative forms.
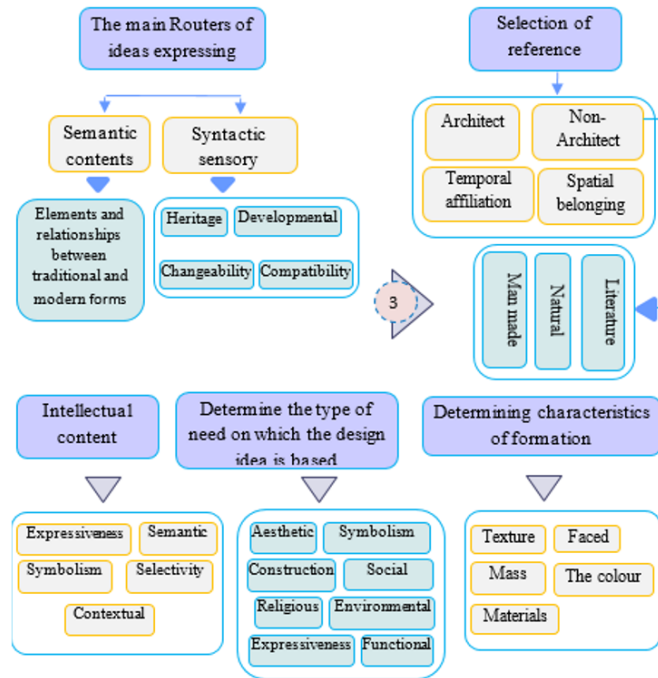


**Figure 29.** Guidelines for architectural ideation based on the proposed communicative vision

3- Functional: Ensuring design ideas align with functional, aesthetic, climatic, and environmental requirements define architectural identity. This alignment is embodied through styles, patterns, symbolic expressions, and intellectual connotations, seeking innovative solutions to meet human needs.

4- Environmental: Drawing inspiration from heritage architecture, particularly its environmental and climatic solutions, contributes to creating favourable climate conditions in contemporary environments. This approach emphasizes sustainability and the integration of effective urban and architectural treatments.

5- Economic: Learning from heritage architecture's economic aspects, including leveraging natural resources, recycling materials, and harnessing renewable energy sources like wind and sunlight, informs contemporary design. This approach aims to reduce economic costs while enhancing human comfort.

6- Religious: Recognizing the intellectual and ideological focus within forms, especially their enduring nature and influence on human thought, is crucial. Religious values, unchanging over time, find resonance in fixed architectural style, with evolving forms reflecting changing contents.

7- Social: Addressing the diverse needs of society, encompassing privacy, social traditions, and customs, involves creating communicative architecture inspired by heritage. This expression captures the societal reality, showcasing the relationship between individuals and their societies, adapting to changing needs across different societies.

8- Technological: Crystalizing design ideas in alignment with contemporary needs ensures compatibility with rapid developments, changes, modern techniques, methods, craftsmanship, and levels of mastery. This approach emphasizes staying current with evolving technological landscapes.

### 4.5.2 Selection of reference

The process encompasses the architect creating a reference for the design that may be drawn from architectural sources, nature, literature, or human creations. Additionally, the architect considers temporal or spatial affiliations, or a blend of both, such as modern or ancient contexts, to convey a distinct sense of identity. Architecture functions as a dynamic expression of human interaction with the specific time and place they occupy. The form embodies a variable expression that evolves in tandem with changes in time and place, whereas the content provides a stable expression of the identity and personality inherent to the place (refer to Figure 30).
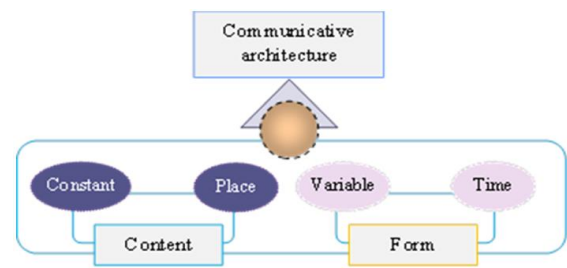


**Figure 30.** The relationship between time and place

Achieving continuity in architecture involves selecting and drawing inspiration from a particular era or civilization - be it ancient, modern, communicative, or a combination of ancient and modern elements. This inspiration can be drawn from various sources such as architecture, art, literature, events, legends, or symbols. The architect then reformulates and embodies these influences in forms or contents that adapt to evolving stylistic preferences while retaining familiar meanings. An individual's sense of belonging to a community or place is fostered through the incorporation of forms, symbols, and implicit semantic meanings in the environment. These elements contribute to strengthening an individual's sense of connection to both society and place, aligning with a set of requirements and needs (Figure 29).

### 4.5.3 Types of intellectual content

Intellectual content encompasses thoughts, feelings, philosophy, and emotions that articulate architectural formation. These contents manifest as connotations in the mind, exhibiting expressive, semantic, symbolic, and contextual variations, acquiring their distinct properties through interaction and integration into the form illustrated in Figure 29.

1. Expressive contents: Communicative achievement occurs on two levels: formal, which pertains to the structural composition of the building, and content, which relates to the design idea through expressive connotations conveyed by the building. These connotations may vary between development, adaptation, change, or identity consolidation.

2. Semantic implications: Principles that construct meaning and changes within the architectural context define semantic implications. Buildings, elements, or forms may allude to implications related to time, emphasizing the temporal aspect

of architectural expression.

3. Symbolic implications: Heritage architecture is rich in symbolic meanings, perceived by individuals and societies directly and indirectly. Symbolic forms draw their spirit and values from the civilizations they originate from, forming a profound connection to cultural and historical contexts.

4. Selective contents: Involves the selection of forms or elements from heritage architecture, integrating them with modern architecture, or combining multiple architectural styles to create innovative structures. This process results in new products that align with the values and aesthetic characteristics of architectural composition.

5. Contextual implications: Involves the use of heritage forms or elements in modern and unfamiliar contexts, or vice versa, to harmonize with the familiar formations of the traditional city. This approach aims to deepen understanding and usage through the interaction between the physical form and its social connotations.

4.5.4 Determining the characteristics of architectural formation

The architectural formation encompasses a range of compositional elements such as blocks, façade, elements, materials, colour, and texture, which exhibit plastic characteristics and sensory relationships both holistically and at a detailed level. The creative process of formation involves selecting visual elements from traditional and modern sources, be they technical, selective, or abstract. These elements are then crafted into a harmonious and interconnected unit, with a focus on addressing the spiritual and aesthetic dimensions of the human experience. This endeavour encapsulates intellectual, expressive, semantic, and symbolic contents, aiming to meet contemporary requirements illustrated in Figure 29.

4.5.5 Formation of communicative architecture through design mechanisms

Communicative design mechanisms stand as pivotal strategies contributing to the conception of design ideas derived from heritage architecture. This adaptation occurs at the levels of general composition, elements, and urban and architectural characteristics, drawing inspiration either from nature or human-made creations. The objective is to reimagine and reformulate heritage simulations into contemporary styles, intending to convey meanings and connotations aligned with the recipient's culture, heritage, and modern values. This is achieved through social interaction, resulting in communicative patterns that foster cultural continuity and interdependence with heritage illustrated in Figure 29.

This stage follows the designer's extrapolation, analysis, and inference processes, leading to the conscious and selective adaptation of mechanisms to the available data. The outcome is an architectural style that goes beyond replicating heritage elements as they are. Instead, it produces a local architectural and urban character that seamlessly integrates with the cultured environment. Figure 30 serves as an illustration, outlining the key mechanisms crucial for shaping a design idea that realizes communicative architecture at both the formal and content levels, effectively expressing identity.

## 5. CONCLUSION

The following points can be concluded based on the study's

comprehensive architectural exploration, delving into the philosophical aspects of architectural form evolution throughout history the evolution of style regarding form and content: Firstly, (i) The essence of architecture lies in the symbiotic relationship between form and content. Form devoid of meaning lacks aesthetic value, and meaning, without form, loses its expressive power. (ii) Throughout successive civilizations, the interplay between form and content manifests in three distinct positions: the dominance of form (exemplified by periods such as the Renaissance, Baroque, and Rococo), the supremacy of function (evident in modern architecture), and a balanced interplay (observed in architectures such as Mesopotamian, Islamic, and postmodern styles). Secondly, regarding the question regarding the case study Sana'a City (old city & modern city) respectively, the architecture of Old Sana'a serves as a prime example of a harmonious equilibrium between material requirements (form) and emotional/spiritual needs (contents). It showcases functional competence and a profound alignment with civilized values. Moreover, the urban and architectural character of Old Sana'a has evolved through the intricate interplay of human interaction with societal values, customs, traditions, spiritual beliefs, environmental considerations, religious principles, economic factors, and aesthetic preferences. In contrast, the rapid urban development in recent years has ushered in intellectual and cultural shifts, marked by subjective tendencies that have, at the compositional and semantic levels, abandoned traditional architectural forms, thus reflecting on the lack of modern Sana'a architecture a substantial connection with the cultural past, limited to the use of traditional building materials and simplified forms, lacking intellectual depth and expressive contents. Thus, physical values (form) dominate over spiritual and human values (contents) in modern architecture.

## 6. RECOMMENDATIONS

The research has led to several important recommendations, highlighting key areas for consideration:

1. Place emphasis on the intellectual selection of elements from diverse sources that align with local values. Develop and modify these elements by preserving the spiritual values embedded in heritage and local architecture.

2. Focus on devising creative measures for the architecture of Old Sana'a to preserve the historical privacy features inherent in traditional residences over centuries, and to harmonize with contemporary developments, thereby fostering the creation of innovative building patterns capable of meeting the people's needs in the modern era.

3. Exercise caution when incorporating Western intellectual elements, considering the differences with Sana'a's local architecture, by dealing with the philosophical roots of Western proposals rather than merely dealing with the formal outcomes.

4. Stress the importance of architects being aware of the contents and meanings embedded in the heritage architectural environment of the old city of Sana'a. This involves interpreting and understanding the formal structures and their semantic contents, aligning them with contemporary architectural practices.

5. Discourage explicit transfer from heritage architecture and shift the focus to the essence and content of inherited architectural style. The emphasis should be on understanding and embodying the underlying principles rather than

replicating specific elements.

6. Place a significant emphasis on devising creative measures for the architecture of Old Sana'a, with the specific goal of preserving the historical privacy features deeply embedded in traditional residences over centuries. This strategic approach seeks to align with contemporary developments and cater to the evolving requirements of the times. The aim is to cultivate innovative building patterns that effectively meet the needs of the people in the modern era.

7. Advocate for the engagement of academics and competent authorities in endorsing the proposed vision of continuity mechanisms with heritage within design processes. This involves promoting a comprehensive understanding of heritage, encompassing its values, diverse contents, and contemporary societal needs. Such efforts aim to enhance knowledge and encourage a unique and original creative process in architectural design.

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