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Structural Analysis of the City Semiology

(Case study: Yazd City)

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ABSTRACT: Integration and coherence within a city's physical structure have become an issue for towns and cities as they rapidly expand, incorporate new elements, and undergo incessant changes. At present, we are facing an extensive accumulation of signs and traits in modern urban patterns; many unaccustomed to and incongruous are affecting the socio-cultural and physical characters of cities. Here, we will be discussing whether it would be feasible to create a system of domestic signs which would reflect domestic social values and mental images held and entertained by citizens, and thus to re-create the sign system of cities. We will also discuss factors involved in interpretation of signs and symbols within a city structure. To prevent emergence or exacerbation of contradiction and disunity within syntagmatic urban structures which have been formed through centuries, we must acquire the knowledge and skill necessary to contain the newly adopted elements and assimilate them into a meaningful and coherent whole. In line with this goal, we have conducted a study of changes of physical structures of the city of Yazd through time (a diachronic analysis) with the aim of identifying sustainable parts of the city's sign system and with an emphasis on the extent in which it has been formed. The questions which were the motivations behind this work and which we will be trying to answer are: Can the sign system within a city be used as a means for creating an alternative structure within the city's physicality? Is the sign system (as a tool) characterized by specific patterns on whose identification the coherence of the physical structure of a city depends? How can we achieve an appropriate paradigm within an urban sign system? Here we will try to identify processes of integration of modern urban structures into a city structure, and we will do it through combining views held by semiologists with the ideas of urban incongruity and contradiction, which arise as a result of introduction of modern structures into old cities. To transform the medley into a coherent entity, we need to be aware that cities possess markedness. To this end, we have employed the structuralist analytical method with an emphasis on identification of syntagmatic structures (identifying the structural elements and their relative positions within a city) and of paradigmatic patterns (the ways in which elements substitute for or replace one another). Our main aim here is to extend the scope of studies of urban semiology and introduce analytical tools including the use of structuralism theory in the analysis of urban patterns. We have conducted an in-depth analysis of subjective and objective causes of appearance of signs within cities. We have then conducted case discussions as well as discussions about backgrounds and have tried to establish past and current trends of these signs and symbols in Yazd. Extended data were analyzed based on theoretical notions, paradigms and principles governing systems of signs and symbols have been sought.

Keywords: *Structural approach, Semiology, Syntagmatic analysis, Paradigmatic analysis, City physical, Yazd.*

INTRODUCTION

Semiology is the study of signs and their interpretative process. Its application is mostly in contextual analysis.
One of its characteristics thus focuses on structural analyses. Such analyses include recognizing elements that constitute a semiological system (a context or a socio-cultural process) and determining structural relations (oppositions, inter-dependence, logical relations) among them (Culler, 1971, 14).
To understand the science of urban semiology, we must understand the rules of the game of signs. A city is a structure where signifiers are used throughout. The science of urban semiology involves paying special attention to the way these signifiers are used.
In semiological analysis, meaning is discovered through representation of the sign system. Our interpretation thus goes beyond metaphor to the explanation of signs and symbols. Generation and interpretation of signs create meaning. People think in terms of signs and symbols. Signs appear in different forms, including objects, movements, etc. These, however, are not innately meaningful and take the meanings assigned to them by the community (Chandler, 2007b, 219).
When the concept of a city is being discussed, what we understand of it is beyond what we see or what we sense while sightseeing. A city is a product of time. Traits of each generation are manifested in its multitude of layers.
In a historical sense, a city is an agglomeration of social interactions and the focal point of a community's culture and power. In a city, human experience is translated into lasting symbols and signs, behavioral patterns, and sets of regulations. Time becomes actualized in a city. Buildings, monuments, and urban spaces constantly remind us of the passage of time (Mumford, 2006, 21-30).

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Forming a city is based on the behavior, activity, and needs of its inhabitants. Human behavior is basically regulated by culture and culture is the set of intellectual as well as material and spiritual achievements of a society, which include virtues, traditions, ceremonies, technology, etc. It affects the shape and architecture of urban spaces. These cities, in fact, are crystallized forms of the mentioned concepts.

To represent the repetitive pattern of signs or in fact the semiology of a city's physical structure, we first need to understand why there is a semiosis within a city and how the whole concept can be categorized in a system of signs based on social patterns and contracts or based on the signification processes.

Then, we can understand how meanings are formed within this sign system (their origins and the principles according to which they are formed).

The main aim of the paper is not only to expand the scope of urban semiology and provide analytical tools which can be used in the analysis of a city and but also to apply the structuralism theory to the analysis. We will thus be covering a wide range of issues, some of which can be expressed as follows:

Detection and identification of paradigmatic patterns in syntagmatic urban syntagms. These patterns emanate from conditions, which make their existence feasible, from social values and from prevailing modes of thought among civilians, and they should be amenable to an integrated city's physical structure.

A set of preliminary answers is conceived of and reviewed after views and theories on semiology and urbanism are studied. The following theory is forwarded as the hypothesis: It seems that the structuralism analysis in semiology, which is based on syntagmatic structural analysis and paradigmatic patterns, is an appropriate way of achieving the latent integrity in urban structures.

Applied – Developmental research method is used here. First, basic definitions and their theoretical importance in the fields of semiology and urbanism are given, and then a method for identifying syntagmatic structures and paradigmatic pattern is forwarded. The paradigms and principles of this approach, as far as they are applicable to the city structure and markedness as a unified whole, are then discussed, with the greater emphasis put on ancient historical Iranian cities.

Hence, we first have to define sign and structure as these two concepts are related to a city, and then discuss known structuralism approaches from a semiological viewpoint.

The aim has been to offer an analytical model for change and continuation of the semiology in the urban structure of the city of Yazd. Repetitive and recurring patterns and elements can be then recognized, and categorization of signs within the city's physical structure will then be achieved.

MATERIALS AND METHODS

Basic definitions in structure -oriented analysis (theoretical frame work of the research)

Sign

A sign is a unit of information. Signs may be configured into meaningful wholes. Swiss linguist Ferdinand de Sassure and American philosopher Charles Sanders Pierce conducted early studies on sign systems. Their definitions and explanations are still considered valid and have always been platforms for future developments. First, we will present explanations for the internal structure of signs and for their position within the totality of semiology, as put forward by Saussure and pierce (Sojoodi, 2004, 22-40).

Some early ideas about signs are outlined in Table 1.

A sign is thus a generic term, which covers symbols, indexes and icons (Chandler, 2007b, 70).

Here we will clarify this through some examples.

Symbolic signs: Signifier and Signified do not have apparent similarities and their relation should be indirectly deduced. A palm date is thus a symbol of reverence toward saints. Paintings on pottery signify features of deserts or features, which complement a desert. The image of sun or of birds or of fish serves such a function. The first two are features of desert and the third is a feature of which a desert is typically devoid.

Iconic signs: Due to their outward appearance, we can easily understand what an iconic sign signifies. Sometimes the signifier is an imitation of the signified. Seeing, hearing, smelling, tasting, or touching the signifier recognizes the signified. The signifier resembles the signified in that it is possessed of some of qualities of the signified. Portraits, effigies, replicas, etc. are examples of iconic signs.

Table 1: Sign as viewed by early thinkers.

	Internal Structure of the Sign	Position of the Sign Within the Totality of the sign system
Ferdinand de Sassure	Two dimensional pattern. A sign is an expression of the relation between the signifier and the signified. The relation between the signifier and the signified is called signification. The two dimensions of the sign are interdependent, are of the same value and neither one dominates. A sign has no innate value independent of its context.	Signs in fact are referent to one another. Value and meaning of a sign stem from its relation to other signs. Structuralism Semiology characteristics: The main principle in structuralism theory is the relative identity of signs. Signs have significance only in relation to one another and within a semiosis. In the structuralists' analysis, emphasis is on structural relations.
Peirce	Three dimensional patterns (representamen, interpretant and object). Interaction between representamen, interpretant and object is called semiosis by pierce. Tripartite categorization: (symbolic, indexical, iconic). The role of interpreter: what is signified by signs depends on whom is referred to by them.	Whether a sign has symbolic, indexical or iconic function depends on the way it is used. Signs cannot be assigned to any of the above categories but according to their functional context.

Indexical signs: In this type of signification, the relation between the signifier and the signified is not arbitrary. It is rather a cause and effect relation (Thunder signifies lightning, smoke signifies fire, footprints signify presence, etc.). Other examples are the orientation of buildings and the material used in building, which signify climatic conditions.

Syntagmatic and Paradigmatic Axes

Semiological analysis deals with identifications of constituent elements in a sign system and determining relations among these elements (logical relations and relations with respect to meaning). Meaning is the result of distinction between signifiers. This distinction is either of syntagmatic type (relative positioning of elements) or of paradigmatic type (The way elements can replace one another) (Sojoodi, 2004, 70-71).

Distinction is a key aspect of structure-oriented semiological analysis. The two dimensions, syntagmatic and paradigmatic, are usually thought of as axes in this approach, the horizontal axis being the syntagmatic and the vertical axis being the paradigmatic.

Syntagmatic relations make combination feasible while paradigmatic relations are manifest in "selecting from among elements" and include comparison and distinction.

Syntagmatic relations are about "being contextually related to other signifiers in the context" while paradigmatic relations are about intertextuality and refer to signifiers which are absent from the context.

The "Value" of a sign is determined by both of these; paradigmatic relations can act on both the signifier and the signified. A collection of paradigmatic elements (paradigms) is a set of inter-related signifiers and signified entities whose members are collectively a part of a certain purview but one is distinct from the other.

Each collection or set of syntagmatic elements can contain other collections or sets of syntagmatic elements.

Syntagmatic relations are different ways in which elements within a context are bonded together.

Syntagmatic relations emphasize element-to-whole relations. Saussure was of the opinion that a whole is dependent on its constituent elements, and these elements are dependent on their inclusive whole.

Structures of all cultural contexts and processes include both syntagmatic and paradigmatic axes.

Roland Barthes (1967), for example, has discussed paradigmatic and syntagmatic elements within the system of clothing. Paradigmatic elements here are pieces of attire, which cannot be simultaneously put on, such as two different hats.

The syntagmatic dimension within the system is the process of wearing different pieces of clothing in a set, as, for example, a set of clothing which ranges from head wear to foot wear. Within the purview of a genre, when the syntagmatic dimension has contextual structure, the paradigmatic dimension will cover the selection of the subject itself.

Within this framework, form constitutes the syntagmatic dimension while content constitutes the pragmatics dimension. Form can also be the subject of paradigmatic selection and different contents can be arranged into a syntagmatic order (Barthes, 1967).

Both Syntagmatic and paradigmatic methods deal with signs as a part of a system. While the two modes of relation are dealt with separately here, it should be borne in mind that, in semiological analysis of a collection or a context, the system is dealt with as a unified whole. These two dimensions cannot be analyzed in segregation.

Explanation of a sign system should include identification of all members of all sets of paradigmatic elements and identification of all possible combinations between two or more of these sets on the syntagmatic axis. The system as a whole is our point of departure, from which we will identify its constituent elements through analysis of processes involved.

Roland Barthes is of the opinion that the main part of a semiological work consists of dividing a context into its smallest possible signifier units, reorganizing these units into sets of paradigmatic elements, and finally categorizing the syntagmatic relations which bond these elements together in the mentioned sets (Chandler, 2007a).

In practice, though, the analyst may be forced to move from the syntagmatic to paradigmatic method and vice versa over and over again.

Structure

A structure is a set of inter-dependent relations and processes between elements. In other words, a structure is a network of relations among positions of elements, which emerges as an outward appearance or form (Grichting, 1984).

Structures are sets of inter-dependent elements. Reciprocity and simultaneous co-ordination between elements induced objectively and subjectively by a common goal are characteristics of a structure.

The nature of a structure is determined by the set of inter-dependent rules, which define that structure. The structures are innately progressive, and the result of the reciprocity within a structure is the drive behind creation of another whole.

In this way, each structure has its own function, and its form plays an important role in facilitating its function (Bohm, 1984, 14).

Structure within a City

Structure within a city is the result of the syntagmatic of different layers, each comprised of certain elements and relations. Each of these layers is formed based on certain principles.

Structures within a city are not fixed entities. Patterns can be recognized within each structure. These usually result from gradual physical development.

In the current study, we use the term "sign" in an analytical sense. To carry out the analysis, the analyst treats city as a structure and uses the concept of sign and its syntagmatic relation to other signs in a system of signs.

The structure of a city is in fact a regulated system of signs whose elements or inter-dependent units constitute the system. The combination of these inter-dependent components creates the context of a city.

The aim here is to present and demonstrate phenomena involved in the formation of the sign system which is city structure. The focus will be the structural relations generated in a system of significations. In line with this goal, structural relations among layers comprising the sign system of a city's physical structure (logical relations, contradictions and inter-dependence) are studied and discussed here.

Syntagm

Syntagm is a recurring term in semiology. It can denote a piece of literary text, a building constructed in a specific style

during a specific era of a city's physical development or a movie or other pieces of art-work which is an orderly combination of interconnected signifiers which constitute a meaningful whole.
Saussure emphasizes on this hierarchical nature of syntagms. He writes that there are always larger units, which are constituted of smaller ones, and there is interdependence between the two groups. Syntagms can thus incorporate other syntagms.
Syntagmatic relations are in fact different ways through which elements within a context are bonded together. By that we mean that signs are chosen from sets containing paradigms and are put together on the basis of some rules and principles, form constructs and, eventually, form contexts.
Syntagmatic relations demonstrate the importance of element-to-whole relations. As Saussure puts it, the whole is dependent on its constituent elements and elements are dependent on the whole, which they comprise. A collection or set of syntagmatic elements (a syntagm) is an orderly combination of inter-related signifiers, which signify a meaningful whole within a specific context (Sojoodi, 2004, 70).

Syntagmatic Axes and Their Analysis

During the past century, the structuralist semiologists have produced many outstanding works on the analysis of different sign systems based on structuralism principles.
Context, from their viewpoint, is a structure, which is realized or actualized based on syntagmatic relations. Analysis of syntagms within a context (whether verbal or nonverbal) is accompanied by a study of structures and inter-relations among elements. Structural semiologists focus their attention on identifying essential elements, which construct a context, i.e. its syntagms.
They, in fact, try to arrive at rules of combination by studying syntagmatic relations. These rules of combination are the foundation of production and interpretation of contexts. Many contexts are comprised of more than one syntagm, even though one syntagm may be dominant relative to others.
Structuralists study context as a set of syntagms. Syntagmatic analysis of a context includes studying its constituent syntagms and inter-relations among its components. Structuralist semiologists try to arrive at primary identification of a context's constituent components on the syntagmatic axis. Selecting one syntagm in a context and preferring it to other syntagms present is an important factor in the generation of meaning (Sojoodi, 2004, 72-73).

Paradigmatic Axes and Their Analysis

Paradigmatic relations are about opposition among signs, which belong to one and the same set or purview. Semiologists are usually concerned with the question of why a particular sign from a set is chosen to signify a meaning in a specific context rather than other signs. In other words, why is one sign present and others absent?
Analysis of paradigms deals with comparisons between signs which are present in a context and signs which are absent but could have been chosen to signify something and thus to be present, conditions being similar to the existing ones. It seems that it is possible to perform analysis of paradigms in every level of a sign system. The analysis may pertain to choosing a word or a picture or an image or to such fundamental selections as selecting the style or genre or architecture or structure of a city. Analyzing paradigmatic relations helps us determine the value of each specific unit within a context. While syntagmatic analysis deals with current structures in a context, paradigmatic analysis deals with identification of commensurate sets, or existing sets of signifiers, which can signify the content of a context (Sojoodi, 2004, 86-87).
Semiologists are usually concerned with the reason why a certain signifier is used in a certain context to signify something at the expense of other signifiers, which were just as eligible for selection. They are thus concerned mainly with the phenomenon of absence. Paradigmatic analysis includes performing comparisons between present signifiers and absent signifiers, which could have been chosen in their stead, conditions being the same. Paradigmatic analysis also deals with significations, which have resulted from the current selection. The analysis can be performed in connection with all levels of a sign system (Chandler, 2007b, 154-155).

Analytical Model of the Study

The analytical model functions as a chain piece, which connects the theoretical expression of the issue under study (as prepared for the particular research) to the next phases of the analysis (which are observing and analyzing the existing data). By creating a connection between definitions (as compiled from the theoretical frame work of the research) and hypotheses, an analytical model forms a coherent and unified framework for the analysis. Assumptions are the criteria based on which data are chosen and verified. The analytical model thus created based on these hypotheses is itself tested through time (Quivy, 1998, 111- 112).
Theoretical expression of the problem under study, analytical model, assumptions and definitions cannot be used in isolation. An analytical model is a system of assumptions, which are logically related to one another. Assumptions forecast relations between definitions. An analytical model is a collection of definitions logically related to one another on the basis of certain assumed relations. The sequence of analysis in the current study shall be as follows (Quivy, 1998, 132- 133):
Articulating definitions and concepts used in the structuralist analysis in semiology (these concepts include syntagms and paradigms)
Presenting the structuralism method of analysis as applied to the sign system of a city's physical structure. Structuralism analysis, as applied to cities, focuses on those structural relations, which are important for the identification of constituent elements of the sign system of a city. These structural relations (contradictions, interdependence, logical relations) are dealt with in terms of the two generalized purviews of syntagmatic and paradigmatic sets (Fig. 1).
Other aspects of the issue should be given clear definitions if a coherent and tangible urban physical structure is to be arrived at. The first aspect is the awareness that appropriate paradigms are derived from the markedness of a city's paradigmatic syntagms through time.
The second aspect is the awareness that suitable paradigms are those that result in synchronic continuity in paradigmatic syntagms. The lack of experience continuity in paradigmatic patterns results in reduction of correlation within syntagmatic structures. Also, lack of synchronic continuity within syntagmatic axes may itself result in reduction of correlation and lack of coherence in paradigmatic patterns.

Hypothesis: Structuralism analysis in semiology, based on syntagms and paradigms is a proper method for recognizing the unified physical urban structure within the entirety of a city.

First step: A city is an orderly system of signs whose components interact with one another and are interdependent on one another. Combination of these components and their interrelation create the texture of the city. Here we will try to demonstrate the process of generation of the sign system within the city structure with an emphasis on structural relations. In line with this goal, structural relations among layers of the sign system of a city (contradictions, correlations and logical relations) are identified and constituent units of sign systems and their interrelations (logical relation or relation with respect to meaning) are presented.

Second step: Analysis of syntagmatic relations (The way elements are positioned next to one another) deals with signifiers which are present in one and the same context and in fact with different ways that elements within a context are bond together. By studying syntagmatic relations, we will be able to understand rules and conventions of combination. Syntagmatic relations are temporal – sequential or, in other words, are chain relations. Syntagmatic relations may also be spatial (spatial relations can be discerned in some sign systems). Architecture and urban development utilize temporal and spatial syntagmatic systems simultaneously. Syntagmatic and paradigmatic relations are often presented as axes, the horizontal axis being syntagmatic and the vertical axis being paradigmatic.

Third step: Analysis of paradigmatic relations (how elements replace one another) helps us determine values of special units within a context. Analysis of paradigmatic relations includes comparison between elements and recognition of their distinctness. A collection of paradigmatic elements is a set of interrelated signifiers and signified concepts. Members of this set are all components of a certain context (paradigmatic relations are based on interactions among signs which belong to one and the same set or purview). Value of a sign is determined by both syntagmatic and paradigmatic relations. These two axes comprise a structural context through which signs are organized into codes.

Fourth step: Analysis of syntagms and paradigms: syntagms are the result of systematic combination of signifiers which interact with one another and which constitute a meaningful whole within the urban structure. Syntagms may themselves contain other syntagms (interdependence between larger and smaller syntagms). Signs are chosen from paradigms and are positioned next to each other on the basis of specific rules and eventually constitute syntagms. Syntagmatic analysis is focused on the current structure of a context while paradigmatic analysis deals with comparing signs present in a context with signs which are not present but which could have been chosen and present in conditions similar to existing ones.

Fig. 1: Relations among concepts defined and used in the theoretical framing of the analytical model.

Structuralism Approach to the Sign System of a City's Physical Structure in Urbanism

When we look at the myriad of elements which comprises a city, we perceive to select a few of these elements, which are crystallized in a unified meaningful whole before our eyes. Selection and unification for structure creation are the way humans perceive and live. They subconsciously search within their minds for sign systems, seeking to understand structures in their entirety. Emphasis on the relations between the signifier and the signified and recognizing them lead to find, within a city's physical structure, a sign system whose indexical aspect is prevalent.

Alexander, who is a harbinger of the structuralism approach, believes that unification of processes within a city is the result of certain principles.

A city is a collection of processes and it is important to understand principles according to which these processes are unified into a whole (Alexander, 1987, 15).

The image one has of a city is comprised of subsets, each one being an important physical unit.

These elements or units and the relations between them constitute a structure.

Alexander states that development of a city structure should be based on a recognition of previous patterns and an insight into principles and patterns involved in interconnecting processes (whether physical or socio-cultural or other processes) which collectively constitute the city structure as a unified whole.

Lynch is another believer in the structuralism approach. He has discussed inhabitants' mentality and how it affects the realization of a mental image comprised of elements, which are bonded together to form the image of a city.

He conducted interviews , studied results obtained through questionnaires and reached the conclusion that places in a city are discerned in one of the five following ways:

Roads (which direct movement),

Edges (boundaries which delineate each territory or area and which frame routes and cause their continuity),

Areas (which are delineated based on function),

Nodes (places of congested activity),

Signs (which are focal points within a city).

Signs fulfill the following four main functions:

They are distinct from their surrounding mass and can thus help stabilize urban system,

They function as symbols and thus help memory,

They give continuity to existing distances,

They improve intelligibility of features and give identity to a city.

As well as the indexical dimension, Lynch lays emphasis on the symbolic dimension of signs within the sign system of a mental image of a city. He believes that generation of a mental image of a city improves communications and helps preserve collective memories (Smith, 1977, 173).

This mental image is the foundation of interaction between inhabitants and the environment and it is the task of urban

planners and urban designers to help clarify the essence of this mental image (Lynch, 1972, 7).

Bacon, who is a well- known name in contemporary urbanism, has discussed terms such as unity, connection, communication, coherence, bonding and continuity. These are terms whose understanding is imperative if Bacon's thought is to be understood.

Bacon tries to establish a relation between urban components and elements and between mass and space and to eventually bond elements together into a bigger whole. He lays emphasis on expansion of urban structures in a way that the inhabitants generate a coherent experience of spatial organization and conformity of mass and space.

To understand the common sign system within the structure of a city ,it is imperative to realize how important the role of street networks is. Bacon considers it necessary that we acquire an awareness of space in the following three respects:

Relation between mass and space: space prevails everywhere. There is movement and movement has consequences.

Sustained experience: A continuous, sustained and coherent experience is generated as a result of movement through space.

Synchronic continuity: space is experienced as a set of commutation networks in city through which movements is done with different speeds and in different ways.

People who move through streets and roads continuously and synchronically experience space (Bacon, 1974, 33- 35).

A review of opinions of structure-oriented theorists in urban analysis and a synthesis of their thoughts revealed to us the determining components and their mode of combination which affect the sign system within the city's physical structure as well as the logical relations and significations manifest in the three dimensions of sign, namely, symbolic signs, iconic signs and indexical signs (Fig. 2).The determining components can be categorized into three main categories:

General pattern of the physical structure in each era.

Spatial organization.

Mass of buildings.

It is possible to arrive at recurring principles and persistent paradigms in the urban physical structure by closely studying these three categories.

We will now turn to the issue of change or continuation within the sign system of the physical structure of the city of Yazd, with the aim of recognizing and categorizing sustained components and patterns, and compiling the existing sign system on the basis of the above model, and with an emphasis on elements, and logical and causative relations among them.

RESULTS AND DISCUSSION

Structural Evolution of the City of Yazd

The city of Yazd is comprised of three distinct parts. The core of the city and its sign system have undergone changes throughout history. The inner part which is the old city achieved its current form by the time of Pahlavis. It consists of a grid network of streets and nodes. The city center has moved on and over this intertwined network of nodes and streets in a fluid manner throughout time. This general pattern is the most significant of the general structure of this part of Yazd. Physical development and evolution of the inner city

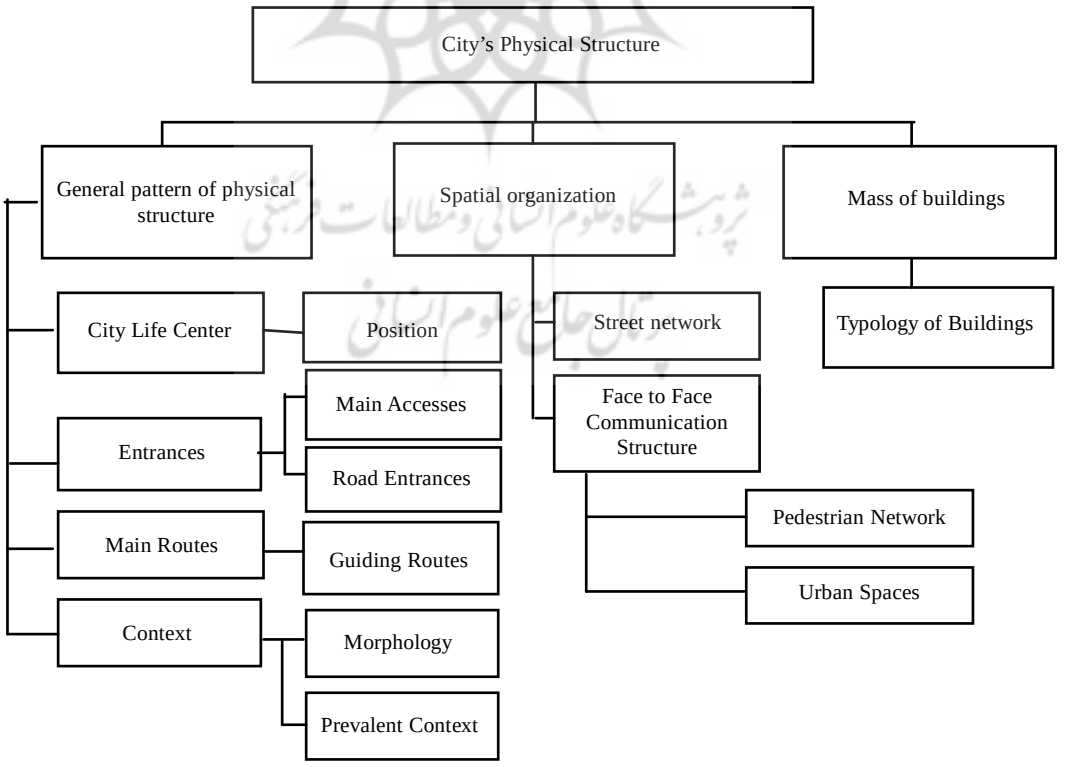

Fig. 2: Comprising units of syntagms and their mode of combination within a city's physical structure .

has proceeded over a thousand years. Three distinct evolutionary eras can be recognized there.
These are:
The inner part: Pre- Islamic and early Islamic times (from the time of Deilamian until Gorkani time (4th to 10th century after Hijra) and from Safavid time until Qajars (10th to 13th century after Hijra)) (Hanachi et al., 2007) (Fig. 3 and 4).
The middle part of the city was formed during the first 3 decades of the current century (14th century after Hijra) and in late Qajar and early Pahlavi times on the margins of the inner part. Their formation was faster than that of the inner part but slower than that of the outer part. This part has a grid network formation, too, which is the result of different land uses being assigned to plots of land along streets and avenues of the inner part, streets and avenues which were themselves constructed in an irregular grid network pattern. One characteristic of the middle part is that parts of the general structure of the inner city have been carried over to the middle part (Kalantari, 2006) (Fig. 5).
The outer part of the city was formed as a result of fast, irregular and variegated development and expansion during recent decades, accompanied by attachment of nearby villages, implementation of the grid network pattern, and zoning of the services and their concentration in certain districts. Zoning of services and their concentration in specialized localities are in stark contrast to the evolutionary patterns seen in the inner and the middle parts (Kalantari, 2006) (Fig. 6).

Semiology Rules Discernible within the Structure of the Inner Parts

Understanding spatial organization and face-to-face communication venues including urban spaces and pedestrian spaces is a prerequisite of understanding the factors, which

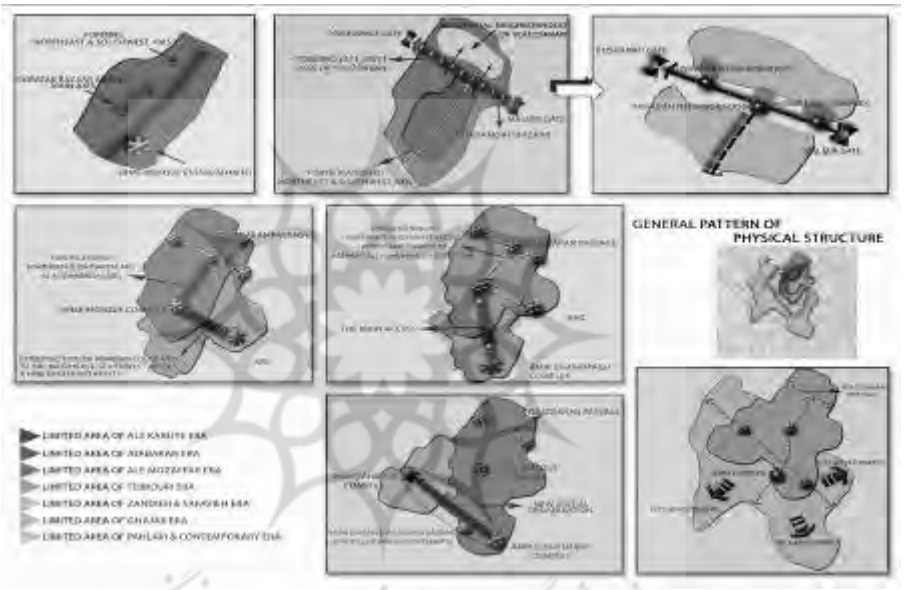

Fig. 3: General pattern of physical structure.

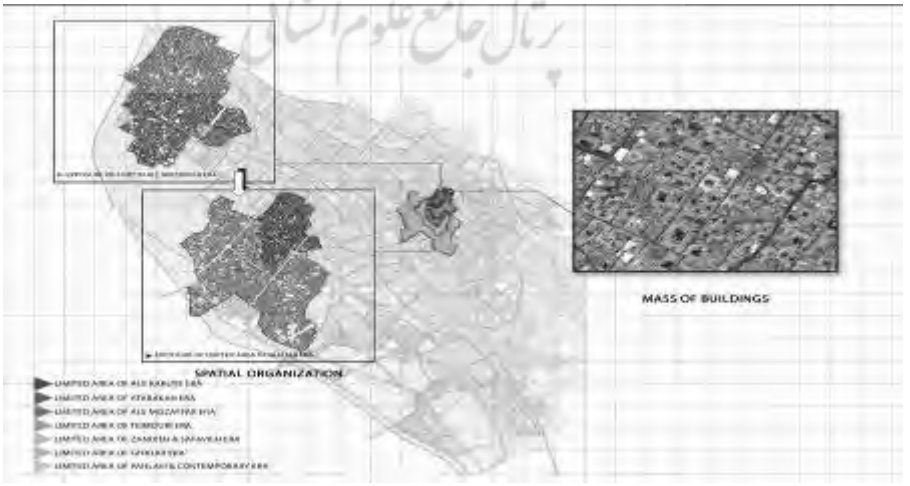

Fig. 4: Spatial organization and mass of building.

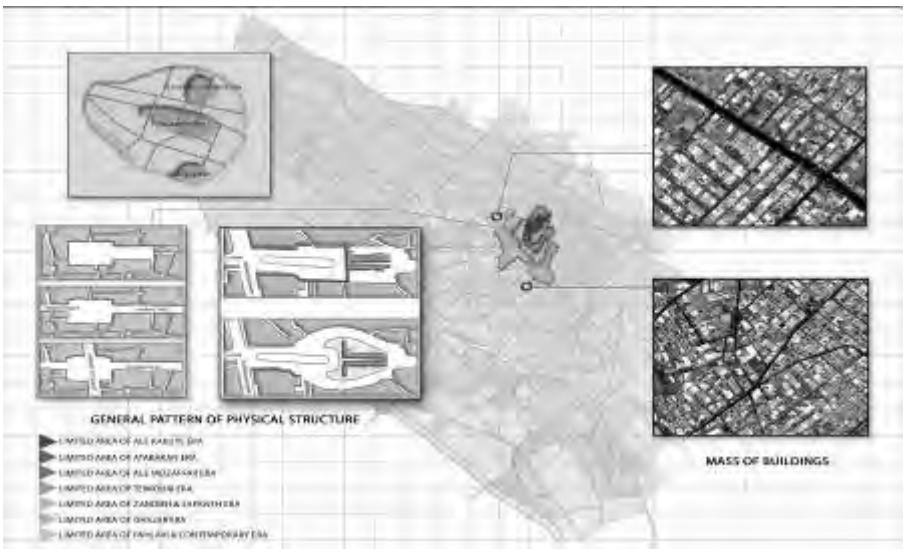

Fig. 5: General pattern of physical structure and mass of buildings.

affect the evolutionary changes in the sign system of the city of Yazd.

A study of the spatial organization within the city will lead us to principles, which govern the sign system of the inner part of the city. These include:

Conformity with Natural – Geographical Conditioning

Introversion of residential buildings and urban fabric, which is a result of climatic conditions of Yazd, has produced a unique pattern in internal architecture of houses in the inner part and (to some degrees) in the middle part. Residential buildings in these parts constitute a central court yard enclosed with living spaces.

Urban fabric such as open spaces, squares and shared space in the inner and middle parts are enclosed by shops, public baths, mosques or other such buildings or by private residential buildings.

Alternating roofed and unroofed spaces along a traverse or turns in an alley create light and shadow sequences. This pattern conforms to climatic considerations and creates a heterogeneous space pattern as well. Enclosure is a recurring feature.

Modes of enclosure are different with respect to scale, form, access, enclosure medium, etc. Enclosed bodies are more shaded and more becoming in a hot and dry climate such as we encounter in Yazd. Enclosed and cramped spaces are also

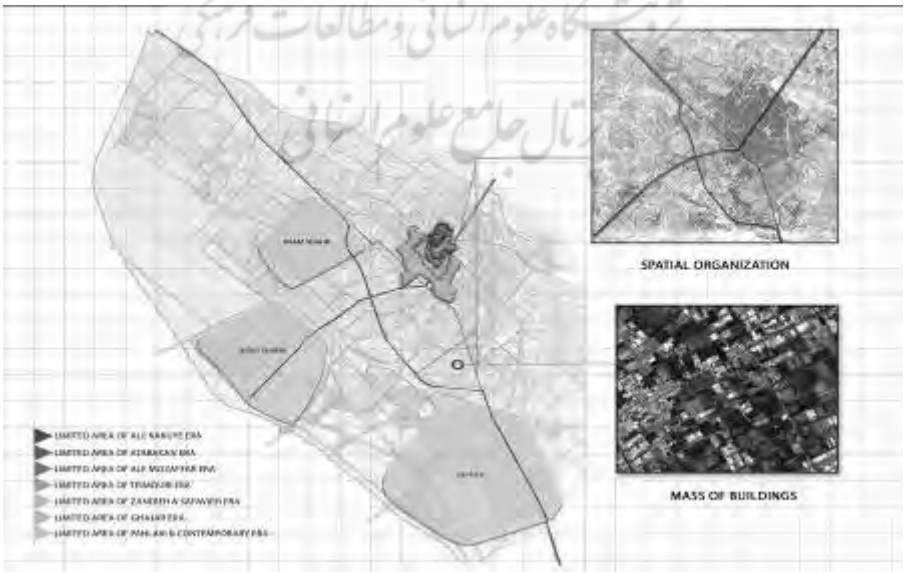

Fig. 6: Spatial organization and mass of buildings.

more secure and are more compatible to the environment (Saraee, 2007) (Fig. 7).

Conformity with Socio – Cultural Conditioning

Introversion is a result of socio – cultural norms as well as climatic conditions and is perpetuated to a large part by beliefs and values held dear by the society.

Another noticeable aspect is the outward appearance of buildings in the city of Yazd, which is a result of inhabitant's concern for socio – cultural issues.

In the inner and middle parts, facades of buildings are particularly simple. With the exception of houses owned by Zoroastrians, other buildings are of nearly the same height and volume, lack empty spaces in the front facade and alternation of light and dark appearances caused by façade nook.

Zoroastrians' buildings are distinct from others with regard to volume and height. One distinct feature of houses in Yazd is the windward height. Another is the entrance. Windward heights are visible from shared streets. Basically, spaces are built on a human scale and are well proportioned when compared to the size of human body (Hajighasemi, 2004).

Diversity of Patterns along with Convergence and Unity on Both Small and Large Scale

A transition from organic to geometric order can be perceived in the inner part of the city.

This trait is observable in the spatial sequence of paths and squares.

Narrow and semi- dark alleys, which are the result of organic urban development and which preclude forward view abruptly open into wide, spacious squares, which are built according to a geometric order, and which, allow unhindered view and fast recognition of the surroundings. This is a recurring pattern in this part of the city.

Physical structure of the inner part shows a wealth of variegated and contrasted spaces. There are spaces, which are different from one another with regard to height, width or length or surrounding and bounding elements.

Two main distinguishable transitions, which generate the contrast, are narrowing or widening of a space and transition from passage to archway (and vice versa).

The three elements – small square, passage and archway which occur in sequences and in alternating size , width and height give the beholder a nice feeling of spatial contrast and give the inner part a distinct character and at the same time fulfill the most important requirement of spatial organization which is continuity.

The most important factor in this continuity is the set of elements, which cause continuity of movement in the physical structure of the city. These elements are guiding routes (axes) which connect gates and trading area within the inner parts and which have been the routes (axes) for pedestrian commutations as well as for carrying goods. These routes have interconnected all districts within the inner part (Mobarhan, 2009).

Elements and sets have been connected via axes and especially through the Bazaar.

A form of spatial continuity has in fact existed along the main routes (axes). Just as urban elements and residential units have followed the principle of interconnection, the interwoven network of passages and roads possesses characteristics such as interconnection and integration while connecting centers of districts together.

Introversion, enclosure, proportionality and scale, simplicity of facades, spatial contrast, etc are distinguishing traits of the sign system of guiding routes which generate their general pattern. The nature of routes in this part of the city is based on unified formation, in a way that spatial inter – connection and continuity among elements can exist and persist (Fig. 8).

Fig. 7: Images of patterns used in the inner structural part of Yazd in response to geographical – natural conditions

Fig. 8: Pattern of axes – in line with continuation of movement within the internal part of the physical structure the city of Yazd

Recurring Elements and Sets

Presence of similar or recurring patterns in different scales and sizes in the inner and middle parts and also of homogeneous urban spaces (with respect to their position in the city) in macro – scale creates rhythm.

The old center of the city included bazaar and the Friday mosque complex. District centers themselves had their own smaller mosques and bazaars and squares and religious spaces such as mourning halls and Hosseinieh shrines and other such elements. These district centers have been a recurring feature throughout time and through the course of evolution of the inner part (Afshar, 1995).

Homogeneity, unity and continuity of form are generated by the existence of facades for urban spaces, such as porches and verandas along alleys and chambered and roofed facades of squares and of Hosseinieh shrines which are repeated in a continuous, orderly sequence.

Dome shaped roofs, multiple windward heights and high buttresses around roofs are among other conspicuous patterns within the sign system of the physical structure of the city of Yazd. These patterns reflect environmental as well as cultural necessities (material deprivation, veiling and concealment, etc).

Among other patterns are date palms in Hosseinieh shrines, which are signs of inhabitant's deferment to and respect for Shiite saints; a respect and reverence common to all inhabitants whether Muslim or Zoroastrian. These date palms are carried round shrines where mourners install them, during religious festivals.

As motor vehicles were introduced into the city of Yazd, meandering paths were widened and turned into modern streets. Part of the old city structure was demolished in the process. Creation of the new streets has resulted in destruction of the city's physical fabric.

Newly constructed streets sometimes coincided with traditional axes for transport or access to business areas. There were other places though, where new streets were plowed rights into the old urban fabric.

Constructing roads and streets over the old city and assigning new land uses to the land on the sides of these newly constructed streets without taking heed of the old and established structures (first section of Pahlavi street from Darulhokoomeh 200 meters in the direction of the city center in 1928, Pahlavi street from Daraee to Pahlavi square in 1935, Shah Street from Amir Chakhmagh square to Shah square in 1943, Kerman street between Pahlavi square and Markar square in 1944, Soraya street from Amir Chakhmagh arcade to the east in 1946, Pahlavi street to the north in 1946), and addition of round square to the collection of structural nodes were among first steps in altering the city's urban spatial organization.

Round squares (Falakeh) were geometrically designed to be intersections or junctions. From now on, implementations of the regular grid pattern in the construction of inter – city access routes are intensified and accelerated.

The prevalent theme in the older, inner fabric consists of masses of buildings. Spaces within this texture are in conformity with the climate and environment of Yazd.

Toward the middle city, this theme is gradually transitioned and space becomes prevalent.

Manner of movement becomes the decisive factor here and the theme becomes a network of streets which are flanked by buildings. This change from masses of buildings to spaces is more obvious in the outer part of the city where streets are flanked with buildings constructed on lands segregated into pieces and parcels according to more modern patterns (Forouzanfar, 2003) (Fig. 9).

CONCLUSION

Considering rules and principles on which the physical structure of the inner and (to some degree) middle parts of Yazd city is based, we will be able to arrive at common and recurring patterns which are the theme of the sign system there and in fact continuation and perpetuation of the signs are a result of their existence.

We are encountering a continuation of consistent experiences in these two parts, meaning that it is possible to easily distinguish elements and components of the city's physical structure, and to relate them to one another within an integrated and continuous whole. This possibility is a result of consistency with regard to physical form, function and meaning.

Adherence to socio-cultural and natural – geographical conditioning has generated unique patterns in the inner and to some degree in the middle part. Sign system within the physical structure possesses very obvious traits including confinement, introversion, proportionality and scale and simplicity of facades.

The most important factor in formation and continuation of the current sign system in the inner and middle parts is the existence of balanced, consistent and coherent spatial connections. Guiding routes (the paths network) are the elements, which have caused this spatial synchronic

Fig. 9: Recurring elements and sets in the inner part of the physical structure of the city of Yazd

continuity within the city structure. The principle of hierarchical spatial connection within the paths network of these two parts is very obvious.

Eventually, recurring elements and sets, which have generated patterns of similar forms but different scales in these two parts, together with homogenous urban spaces, have created a sign system, which has uniformity and continuity.

Drastic changes in paradigmatic patterns can be perceived as we enter the outer part of the city. These changes have affected the sign system of the physical structure of the city. Divergence from the prevailing patterns of the inner and middle part can be seen everywhere and in every scale.

Neglecting natural causes of formation and expansion of the city has resulted in an incongruous expansion (with respect to climatic conditions) in all directions. An expansion facilitated by the employment of modern technology.

The prevalent theme, which was the mass of buildings in the inner part, is space here. This is not consistent with geographical natural or socio – cultural conditions of the city.

Rapid expansion and inclusion of nearby villages in the outer part have obfuscated the city boundaries and its main accesses and gateways.

Guiding routes (axes), which were a main feature of the physical structure of the inner and middle parts are replaced here with routes, which are of the same function and value and, that, are, being merely means of transport and access.

The city's spatial organization takes a new form and the hierarchy of access is defined based on the width of roads. The network of pedestrian routes becomes integrated in the network of roads and streets, margins being allocated to pedestrian traffic on the sides of streets and pedestrian routes are no longer designed as separate elements.

The pattern of urban spaces is drastically altered. Positioning urban spaces and their spatial quality which create the direction and legibility and the serial vision and the unique urban fabric in the old, inner part give way to the ribbon - line functionality of street margins.

A dispersed fabric consisted of separate buildings situated in open spaces and demonstrating extrovert patterns takes over in the outer part.

Substitution of an extrovert pattern for an introvert one, which is in stark incongruity to the climatic and socio- cultural conditions of Yazd, has completely changed the sign system of the physical structure of the outer part of Yazd.

A new mental image with different components thus emerged of the city as the actual and virtual structure of the city changed.

If the sign system of a city is known and implementation of appropriate paradigms is taken into consideration, it may be possible to organize and control future expansion of that city.

Some may argue that the era of recurring and all-inclusive patterns and their preservation in historical districts of cities has expired, thanks to contemporary urban development processes as well as globalization.

The very existence of historical towns and cities and the people's adherence to them is, however, a good indicator of how committed inhabitants of these cities are to their respective sign systems.

It cannot be denied that we are faced with the rise of new signs within our urban physical structures.

Traditional patterns are being replaced with global ones, which are characterized, by better functionality, new functionalities, time saving, etc.

To avoid total, unconditional submission in the face of this trend it is imperative that we detect and identify homegrown sign systems, which are emanated from domestic social values and beliefs and conditions of regions where they appear and persist and that we remain diligent in preserving these sign systems.

Future expansions of cities should be base on identification and recognition of the sign system within each city because each land has its own unique patterns and signs.

What should be seriously avoided is an urban expansion, which is a bind and unilateral emulation of foreign views if a balanced and coherent urban development is to be

maintained. The nearer we get to an imported model of urban development, the farther we will be from the nature of the sign systems in our cities.

Coexistence of a domestic and an imported sign system will only exacerbate the situation by worsening the structural contradictions.

To avoid such an outcome we can, on the one hand, present an up- to -date picture of sign systems within our cities and, on the other hand, instead of imitating the outcome of an imported process of urban development, try to understand the intellectual and experimental endeavor which is culminated at the existing sign systems throughout the world. Otherwise our cities will turn into incoherent and disrupted parts, which are increasingly disunited with the sign system within. Disregarding this necessity can in time annihilate traditional sign systems and turn cities, which are demonstrations of their inhabitants' beliefs, motivations, will and identity, and expressions of their natural and social needs as well as their cultural values and principles, into functional units replete with unfamiliar and foreign signs.

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