The multiplicity of built form manifestations:
Situating the domestic form within interwoven syntactic and semiotic domains

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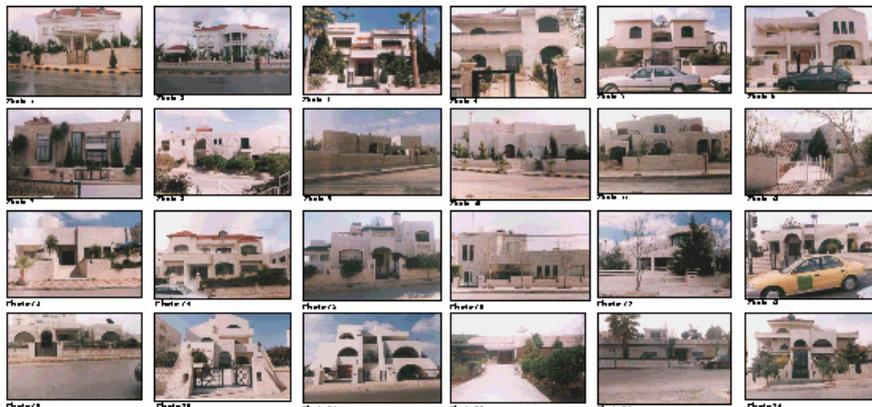University of Petra, Jordan

Abstract

Transformations in Amman's economic and political status have triggered a number of fundamental changes in the socio-cultural and urban forms of the city. Nourished by the oil-boom of the 1970s, Amman, the capital of Jordan, has been subjected to accelerated processes of change at every scale, creating a novel physical and socio-cultural environment which bears little affinity with its older counterpart (Fethi et al, 1996: 173). Post-oil-boom domestic villas have displayed formal stylistic features of extreme eclecticity, ostentatiousness and extravagance, not readily comparable with those of any previous era (Figure 1).

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Figure 1: Amman's stylistic variety

Amidst these representational stylistic varieties of villa form, the architectural research in this paper is primarily directed towards the investigation of stylistic differences as indicators of socio-architectural preferences within the contemporary dynamic. Although understanding built form is an integral part of the objective of any built-environment paradigm, a methodical understanding of how its architecture is influenced by different socio-cultural aspects has been notably lacking. Most researchers have treated the different tangible and intangible components of form in isolation; their studies focused on one aspect of the multiplicity of built form manifestations, spatial, stylistic or semiological, ignoring others or leaving them to related yet independent research, without trying to situate the domestic form within interwoven domains. The analytical and empirical methodology used in this paper, for investigating the eclectic architecture of modern Amman-Jordan goes some way towards rectifying these deficiencies. It was concluded that it is necessary to

reconceptualise the different manifestations of architectural form from a semiological point of view, and to decode their components within a perceptual and analytical perspective. Domestic forms are accordingly analysed at three levels: the stylistic rules that operated to produce their facade complexity, the syntactic spatial principles that structured the configurational properties of the layouts, and the semiological perceptions which defined the way in which the architectural variety is grasped by the owners.

1.Past research

In general as well as specific architectural literature, the subject of domestic architecture has been extensively examined. The home has been described by many authors as the most multi-dimensional territorial centre (Saegert, 1985). Despite some pioneering ideas which tried to bridge the gap between architecture and society (Bentman et al., 1970), the majority of the examined approaches remained unable to investigate the multi-faceted nature of the built form of the home, because they based their approach either on formal building criteria, which included purely stylistic or dimensional aspects, or on functional criteria, which accounted for the socio-cultural dimension of architecture, superficially borrowing from one criteria to use in another context (Jencks, 1978; Steadman, 1983; Krier, 1991; Mitchell, 1994).

Alternative approaches to the study of domestic form have sought an understanding of the psychological and social-symbolism of the architecture of the house (Goffman, 1978; Cooper, 1974; Appleyard, 1979: 4-20). Despite psychologists' and other social theorists' enthusiasm for integrating architecture and psychology (Kennedy, 1975; Rapoport, 1981: 6-35; Warren&Fethi, 1982) the way in which the relationships between the socio-cultural matrix and the spatial and the formal dimensions of the house appeared in their work does not go beyond the assumption that the house is merely 'an expression of the self'.

Environmental and semiological paradigms provided alternative approaches to the study of forms and tried to offer a theoretical framework relating physical and psychological factors operating on the aesthetic experience of forms (Canter, 1993, p659-698; Nasar, 1989 Groat, 1983: 31,58-60). Although environmental and semiotic explanations are believed by many to be one of the tools to link behaviour and architecture (Leach, 1997: xv), what seems to have happened is a failure to establish a satisfactory link between social relations and architecture (Baudrillard, 1997: 217).

The literature showed that while formal visual procedures have concentrated on the particularities of form at the expense of content, behavioural, psychological and semiological studies seem to have exhausted a converse approach, producing an extensive body of socio-cultural, abstracted knowledge, which does not explain the particularity of form.

2. The theoretical perspective

The most suitable methods to the analysis of the domestic forms of this research seem to be those which allow villas to be examined, described, and analysed within their socio-cultural context and which stress the insights of forms over the primacy of their basic and physical structures. The actual interest of this research is not in the traditional scale drawings of plans and facades, but in how the spatial layout of certain classes of plan illustrate the social concepts involved, and how the visual perception of the different forms of facades and their components might activate the universe of the signified in viewers' minds.

Glassie's approach provides a comprehensive conceptual framework for the investigation of the different facets of change, and attempts to understand the hidden logic of architectural elements, by focusing on the semiotics of the syntax of forms (Glassie, 1975). However, and despite its theoretical strength, it does not develop very far, from a methodological perspective. Although Hillier et al.'s syntactic approach provides a powerful tool for the analysis of socio-cultural expression as embodied in the spatial patterns of domestic forms, where spatial layout is described structurally and comprehended objectively within a semiological framework (Hillier, et al., 1987; Hillier, 1996; Hanson, 1998), the representational and stylistic parameters of architecture are largely ignored. The literature has shown that there is no single comprehensive tool that successfully allows investigation of the meanings and compositions of facades, or integrates the semiotics and syntax of facades within one tool, similar to that of space syntax. While some authors try to depict the internalised cognitive semiotic structures of forms in terms of associations (Osgood et al.'s, 1957), others provide methodological and analytical tools for the perceptual comprehension of facades (Kiemle in Krampen, 1979; Chan, 1995). Very few attempt to join the universe of signifiers of the visual images of forms in perceivers' minds with the universe of signifies and the meanings and feelings the images might arouse. While Kiemle's conceptual layering of a facade's formation allows categorisation of a variety of facades with respect to their perceived organisational rules, together with portrayal of their levels of complexity, Chan's method of the investigation of the features of styles allows recognition of the variety of features and their impact on the perceived composition of a facade in a fashion very similar to that of Kiemle's. These two proposals allow the 'syntax' of facades to be read objectively while Osgood's and Krampen's approaches allow reconstruction of the semiotic structure of these facades as built in people's minds.

Hence, by wedding Glassie's conceptual framework with Hillier et al.'s theory for the study of spatial analysis, together with the ideas of Kiemle and Chan for comprehending the syntax of facades, and those of Osgood and Krampen to depict

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the semiotics of facades, an integrated framework can be proposed. The following sections discuss the layers developed by this research and then demonstrate how interrelations between the multiplicity of their formation could occur.
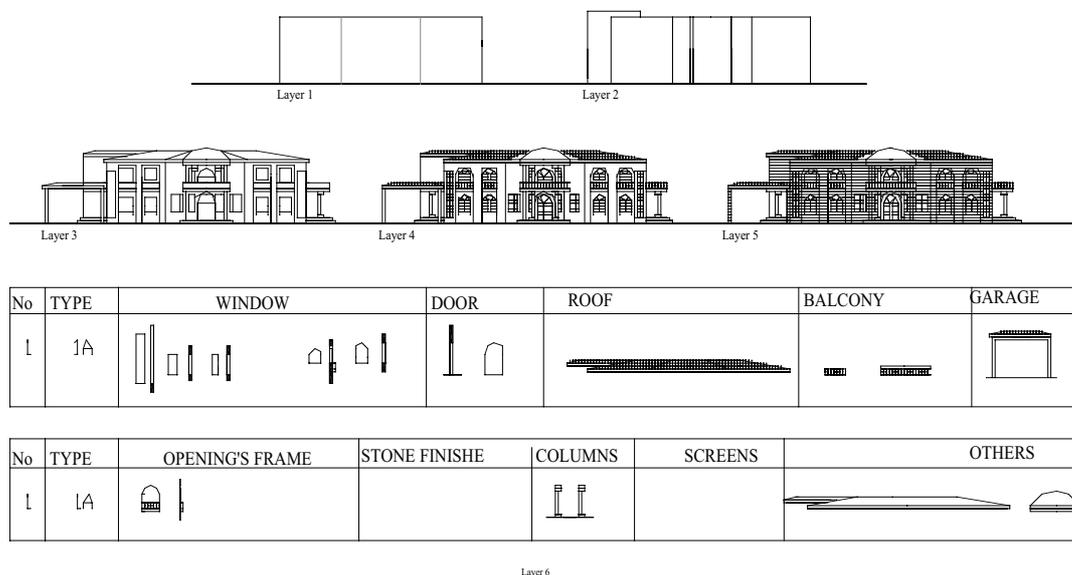
2.1 The stylistic layer

In the light of the literature review, the aim here is to establish an appropriate model for the description and classification of Amman's forms. By responding to the strengths of each of the ideas mentioned, it became possible to develop a compound theoretical and methodological logic that can read the variety of Amman's facades which: a) responds to the architectural and perceptual aspects of material artefacts and relates to the characteristic context of facades b) accounts for the way in which perception of forms affects recognition of the stylistic criteria; c) develops a mixed matrix method that can describe the different levels of similarity and difference between facades and accounts for the importance of elements, features and masses whether perceived separately or collectively.

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Two main dimensions of vocabulary are used; the 'formal basis', or the 'proportion expressed in the main facade and its massing', and the 'stylistic feature', or 'stylistic element expressed on the main facade'. The main difference between the two is that while the 'formal basis' registers the information found in the very basic form of facades when stripped of their additional components, and is analytically used to marshal the variety of villas into a manageable number of similar groups, the 'stylistic features' capitalise on difference, and the phrase is used to allow the degree of variety to be expressed. The degree and quality of information in 'formal basis' and 'stylistic features' are of completely different orders, and hence can occur independently of each other. By combining the different scenarios of possible alternatives of 'formal basis' with 'stylistic features', a method of recording stylistic diversity is created. The data base for this task consisted of over two hundred randomly selected villas. These represent 10% of the villas of the modern neighbourhoods of Amman.

As in any building classification system, analysis began by recording all the exact details of each villa's facade, then each facade went through different levels (degrees) of abstraction to register its features at each stage of this facade making. A pilot analysis was performed at different levels of generality for the assessment of the architectural facades by the following two approaches; the first investigated villas at the level of complexity and gradually reduced the information gained in a reductive process until their very basic initial form was revealed, and the other inverted

the processes and investigated how the elementary form evolved to produce the final complex facade. Finally this research developed its method along the following layers of abstraction / cumulative complexity (Figure 2):

No	TYPE	WINDOW	DOOR	ROOF	BALCONY	GARAGE
L	1A					

No	TYPE	OPENING'S FRAME	STONE FINISHE	COLUMNS	SCREENS	OTHERS
L	LA					

Layer 6

Figure 2: Layers of abstraction / cumulative complexity

Layer 1: the architectural composition of the facade is outlined at this first layer to clarify the basic structure which generated the form.

Layer 2: this level enhances the articulations on the basic masses of the facade, so that the major volumetric alterations within or on the basic masses and resulting in an addition to or subtraction from the basic form are presented.

Layer 3: this stage reinforces the perception of variety across buildings; it began by adding basic piercing(s) of the structure of the facade and extended to include all basic attributes, such as false screens and attached garages.

Layer 4: this stage focuses on appearance in more detail; it selects and organises the geometric description of piercing(s), showing the contextual relationship of piercing with each other and with surrounding walls.

Layer 5: at this stage, the constructive and decorative details of stone finish, columns, cornices and roofing are added to provide the final image.

Layer 6: along with these five stages, a sixth stage was developed to give an account of the entire range of stylistic features appearing in each villa. In order to support analysis, these dependent forms were removed from their real facades and grouped into a category labelled 'stylistic features'.

Based on the frontal aspects of buildings, "the proportion expressed on the front façade" and "massing", it was possible to classify 202 villas of the 230 stylistic villas into eleven different types (Figure 3). Twenty eight villas were puzzling and difficult to place, therefore, type twelve was generated to combine the villas which allow of no formal principle or other alternative to explain their composition.
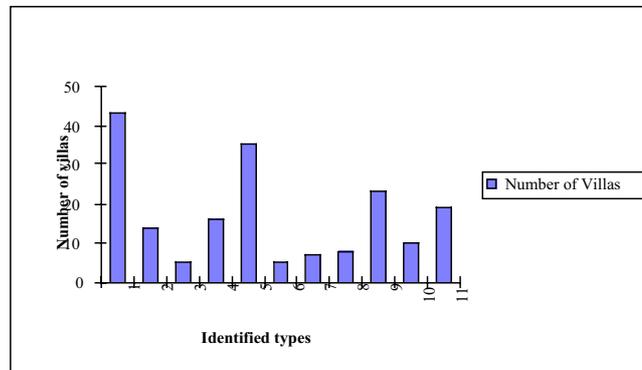

Figure 3: Distribution of the identified types

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2.2 The perceptual layer

Despite the analysis in the previous stylistic layer, which identified the stylistic typologies of west Amman, the findings of these analyses remain incomplete, because their initial concern has always been the syntax of facade. Although investigations were conducted within a framework which draws heavily on the perceptual recognition of forms, these investigations did not delve into the second stage of perception, which involves the meanings of forms. Within this context, the question arising is: are there certain shared feelings and generated symbolic vocabularies that can enrich the knowledge gained about investigated facades and thus suggest a new way of looking at forms?

To determine the extent to which particular types of stylistic expression may be consistently perceived as similar to or different from each other, and to find which of these recognised design strategies are preferred over others, it was necessary to focus on how people recognise the variety of Amman. A "Piling task" was designed in which interviewees (29 villa owners) were presented with colour photographs of twenty-seven stylistically diverse villas, covering the different stylistic types identified in the stylistic layer. Interviewees were instructed to attend to the nature of these forms, and to sort villas into as many piles as necessary, so that the villas in any pile were more similar to one another than to villas in any other pile. The whole twenty-seven photographs were presented at one time, to help interviewees anchor their judgements (Naser, 1989).

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Figure 4: Diagrams representing sets - A,B,C, and D - in the twenty-seven photographs piled by owner respondent groups

By reviewing the way in which each of the twenty-nine owners interviewed piled the twenty-seven photographs of the diverse villas, it became possible to formulate a clear picture of people's recognition and clustering of forms, and the extent to which the logic which developed these clusterings is different from or similar to that used in architectural circles. Interviewees clustered the villas into four sets (Figure 4). While piling, interviewees did not seem to pile the photographs in a random manner; rather - and as the limited number of produced sets suggests - pictures were clustered in consistent, and most importantly, widely agreed-upon sets. This suggests that while sorting, respondents were referring to clear and well-identified schemata in their minds.

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When the respondents were asked about what were their criteria for making these piles? and; is there an order of preference within these piles? It became clear especially after using semantic- scale investigations that it is possible to put respondent groups of west Amman into two diverse categories: one which found set A the most desirable, because, as they argue, all its villas are distinguished by their grandness, expansiveness, and status; and one which found this same set the least preferred and even the most distasteful because its villas manifest a noveau-rich approach to the search for socially appreciated status. By referring to the clustering and preference judgement of the four sets combined, it becomes clear that while some sets occupied different positions in people's preferences, and were symbolically loaded with diverse social connotations, other sets have similar preference profiles and occupied the mid-scale of groups' judgements. Nevertheless, and despite the variety within the norm of the findings, what remains significantly consistent, is respondents' piling, regardless of the attached symbolic meaning of the villas and heedless of their background. This confirms that inhabitants' recognition of stylistic forms is almost identical. Inhabitants do not recognise the variety of forms of Amman as being as wide.

2.3 The spatial layer

In the light of the identified stylistic and perceptual types of Amman, the main objective of this section is to determine whether the observed external visual variety between villas is paralleled by a similar internal spatial difference, or whether such differences are merely stylistic elevational variations, essentially enclosing one underlying spatial pattern. Because the aim of this research is to comprehend the architecture of Amman within the context of the socio-cultural dynamics of the society, it is necessary to go beyond the facades of the villas into their internal spaces. It was equally important to exceed the limited time-frame of the appearance of diversity and to step back into earlier eras to gain general knowledge of the development of the syntactic properties.

By relating to space syntax, the discussion in the following paragraphs is structured analytically to address the following objectives: a) to explore the existing organisational structure of the spatial arrangement of the older as well as of the modern villas, to uncover possible common underlying spatial themes developed within each of these two chronological periods. b) to examine the extent to which the older villas of Amman are similar to or different from their modern counterparts. c) to investigate the extent to which the stylistic understanding of the stylistic and/or perceptual types mentioned in the previous sections could be extended to suggest parallel spatio-morphological differences. d) to evaluate the spatial affinity between villas of one stylistic type and with the sample as a whole, to determine whether a correlation exists between the stylistic expression of villa facades and plans or whether these occur independently of each other.

2.3.1 Older villas:

Prior to gathering the architectural data for this research, a decision was made to include a sample of older villas to give the whole study a credible historical dimension. These villas were built between 1920s and the late 1960s (Rifai et al., 1987; Amman Municipality archives). As Figure 5 shows, the earlier examples of the 1920s through to the 1950s are generally of one storey. The layout is usually structured around a relatively large central hall which performs a dual role: as a functional space, and as a transition space. Most of the rooms are not restricted to a specific function, but instead function as a multi-functional space, used by all the members interchangeably to fulfil their daily requirements.
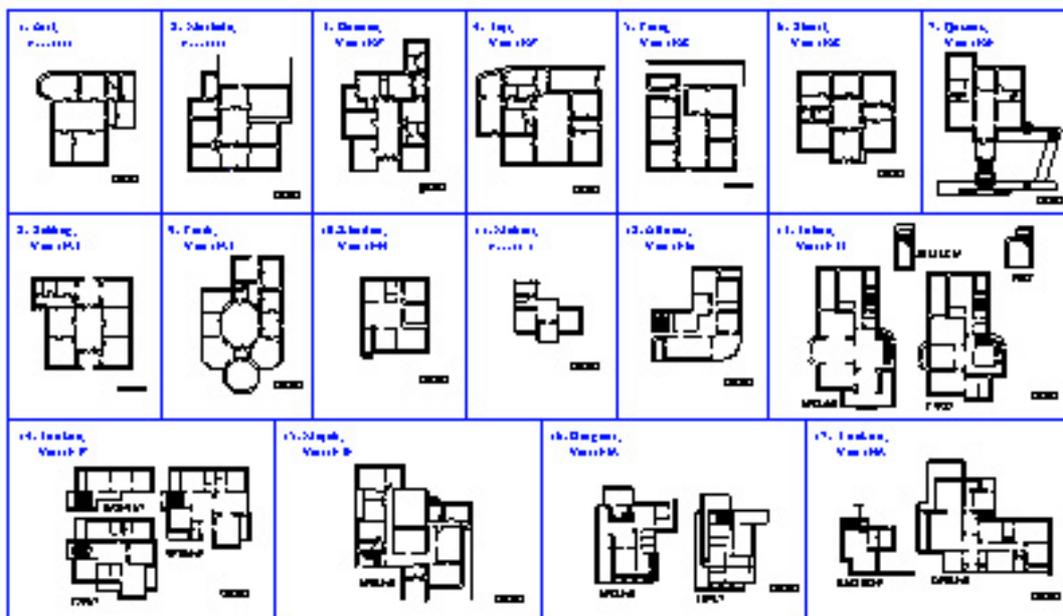

Figure 5: Older villa layouts

In the villas of the 1950s through to the 1960s, one can notice a clear shift in the way in which the plan is structured. The villas are now characterised by the inclusion of more than one floor for the same family; the upper floor accommodates the private zones while the ground floor accommodates the public reception halls and service sectors. Spaces were capable of clear functional categorisation and rooms are identified by clear functional use. Circulation areas, became clear; the villas include new forms of open plan bounded spaces, with reception halls of several functional convexly identified spaces. The living rooms are of varied shapes and sizes and appear to be spatially structured in a manner that differs from that of the older main central hall.

In the light of the principles of the syntactic theory, the findings shown in Tables 1 and 2 suggest the existence of two different genotypes: one with the entrance lobby (EL), and the second with the living room (TL) as the most integrated space, however, with variations which constitute phenotypes under the umbrella of these two main genotypes.

Owner	Code	Built up Area(m2)	Year	Convex	Boundary	Mean	Min	Max	BDF
Mehiar	SOA46	82	1946	7	7	1.178	0.39	1.57	0.69
Arif	O5	219	1923	10	10	0.964	0.55	1.36	0.84
Murtada	O4	255	1925	10	10	1.236	0.55	2	0.71
Faraj	O2	299	1928	11	9	1.165	0.45	1.73	0.7
kherfan	SOF44	158	1944	11	10	0.891	0.3	1.06	0.73
Sharif	O9	253	1928	11	11	0.836	0.23	1.13	0.62
Qasous	O6	244	1929	12	12	0.862	0.45	1.21	0.82
Sabbag	O8	175	1935	12	9	1.127	0.51	1.6	0.78
Fraih	O7	252	1935	14	13	0.954	0.43	1.78	0.65
Al-Faiez	SOM50	244	1950	15	10	1.088	0.51	1.53	0.79
Taji	O3	342	1927	16	13	0.92	0.34	1.25	0.72
Ganam	O1	261	1927	19	18	1.218	0.57	2.13	0.69
Gargour	SOL63	263	1963	19	16	1.54	0.96	2.29	0.86
Majali	SOH59	367	1959	22	17	1.236	0.62	1.84	0.79
Tukan	SOB63	487	1963	25	19	1.244	0.63	2.05	0.75
Tabbaa'	SOT55	859	1955	32	22	1.341	0.84	2.12	0.83
Malhas	SOA57	542	1957	34	24	1.407	0.74	2.25	0.78

Table 1: The general characteristics of the floor plan of the older villas using the whole living complex of each villa with the carrier included

Code	year	Order
SOF44	1944	TS < EL < TL = BR < K1 < C
SOA46	1946	TS < K1 < C < BR
SOM50	1950	EL < C < TS = D < TL = K1 < BR < M1
SOT55	1955	TL < EL < TS < K1 < M1 < BR < D = C < KB < B
SOA57	1957	TL < LS < K1 < EL < D < C < M1 < KB < TS < MD < BR < B
SOH59	1959	EL < D = TL < C < TS < K1 < BR < M1 < KB
SOL63	1963	TL < LS < TS < C < K1 < D < MD < M1 < BR < KB
SOB63	1963	EL < E < TL < TS < D < C < M1 < K1 < BR < MD < P

Key:

EL - Entrance lobby , E - Entrance	TS - Average sum of accommodated saloons	SS - Private separated saloon
D - Dining room	TL - Living room	LS - Living second
K1 - Main kitchen	KB - Side entrance through kitchen balcony	M1 - Master bedroom 1
BR - Bedroom 1	MD - Maid bedroom	GB - Guest bedroom
P - Play/multi-purpose room	B - Boiler room	C - Carrier

Table 2: The order of integration of the functions of the older villas of the forties through the sixties, with the carrier included

The questions now are, what are the impacts of these identified spatial types on the developments of the modern villas? Have the spatial patterns of the modern era sprung from these types, or have they, in contrast, shifted in a manner similar to that which occurred in the older era? To address the questions raised.

2.3.2 Modern villas:

The villas examined in the following sections are these identified in the stylistic layer section, and believed to be representative of the eclectic variety of Amman. These modern villas are sited on private land plots that varied in size between 400 - 1000m2 during the 1970s through to the late 1980s, to as high as 1500m2 s in the 1990s. Although some villas consist of one or four storeys, most consist of two or three.
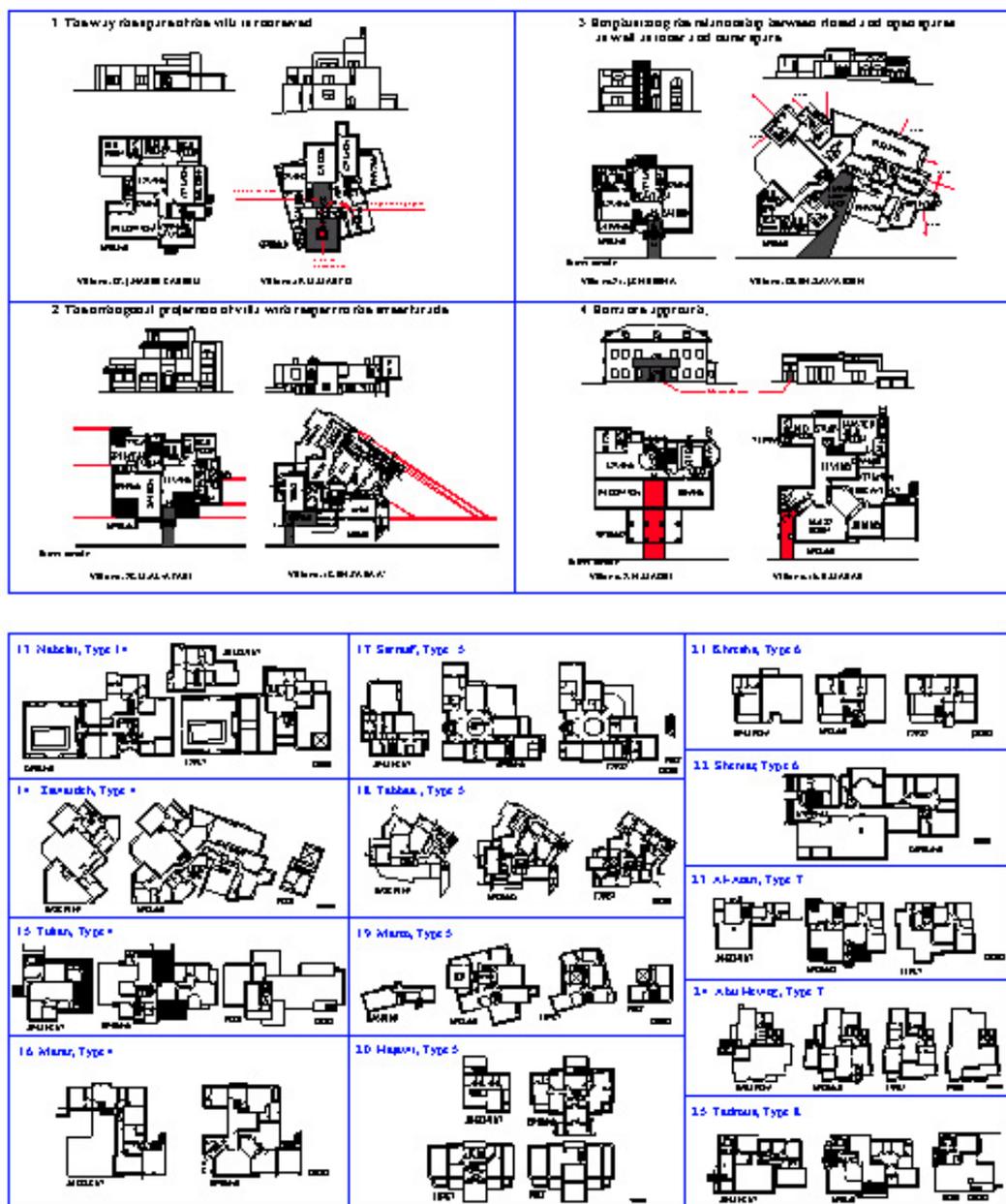
Figure 6: Illustrations of a group of visual , spatial and functional differences within the modern sample

Code	Style Type	Order
Genotype 1		
5	1B	EL < C < K1 < TL < D < BR < TS < P < B < LS < M1 < MD
8	2	EL < C < TS < TL < K1 < LS < KB < D < BR < B < M1 < MD
14	4	EL < C < TL < D < B < TS < K < GB < M1 < P < BR < M1
31	9	EL < C < TS < TL < MD < K1 < KB < M1 < D < BR
35	11	EL < C < BR < TS < K1 < TL < M1 < D < KB
48	2	EL < C < TL < KB < TS < K1 < D < M1 < BR < B < P
3	1A	EL < D < C < TL < TS < B < K1 < LS < BR < M < P
12	3	EL < K1 < LS < BR < C < SS < D < B < P < TS < M1
29	9	EL < K1 < TL < C < M1 < D < TS < BR < P < B < GB
20	5	EL < LS < TL < C < KB < K < BR < GB < TS < M1 < D < MD < P < B
16	4	EL < TL < C < TS < K1 < D < BR < GB < M1 < B
21	6	EL < TL < C < TS < B < K1 < D < LS < M1 < GB < BR < P < B
24	7	EL < TL < D < K1 < C < TS < LS < KB < B < GB < BR < M1 < MD
37	11	EL < TL < C < D < KB < K1 < TS < BR < M1 < B
Genotype2		
26	8	TL < D < EL < K1 < TS < C < LS < GB < KB < BR < M1 < B
34	10	TL < D < P < C < TS < EL < LS < BR < MD < B < K1 < KB < M1 < GB
2	1A	TL < EL < D < C < LS < TS < SS < P < K1 < B < BR < M1 < MD
6	1B	TL < EL < K1 < TS < C < D < KB < BR < B < M1 < MD
10	2	TL < EL < K1 < LS < C < TS < B < D < M1 < BR
22	6	TL < EL < K1 < C < KB < TS < D < B < M1 < BR
15	4	TL < K1 < EL < SS < KB < TS < C < D < GB < MD < B < M1 < BR
23	7	TL < K1 < C < EL < LS < KB < D < TS < B < P < BR < M < MD
30	9	TL < K1 < EL < KB < C < BR < TS < D < B < MD < M1
7	1B	TL < LS < K1 < EL < D < TS < C < M1 < KB < BR < B < MD
40	12B	TL < LS < EL < KB < D < C < K1 < TS < BR < P < MD < M1 < GB
44	SothA	TL < LS < EL < C < K1 < D < TS < BR < B < MD < M1
Other Genotypes		
18	5	K1 < C < EL < KB < TS < P < MD < LS < BR < D < B < M1
36	11	K1 < TL < EL < BR < C < D < TS < KB < M1 < MD
19	5	LS < K1 < BR < C < EL < M1 < D < B < TS
4	1B	LS < TL < EL < C < D < TS < SS < B < BR < K1 < MD < M1
11	3	D < LS < TL < C < E < TS < K1 < M1 < MD < BR < B
28	8	D < TL < EL < C < K1 < TS < BR < B < M1 < MD
9	2	C < EL < D < TL < B < P < TS < K1 < MD < BR < KB < GB < M1
39	12A	C < EL < D < LS < TS < K1 < TL < BR < P < M1 < MD
33	10	P < C < D < EL < TS < SS < B < LS < K1 < MD < M1 < BR

* The villas which belonged to the same genotype categorizing whether the carrier was included or excluded

Key:

EL - Entrance lobby	TS - Average sum of accommodated saloons	SS - Private separated saloon
D - Dining room	TL - Living room	LS - Living second
K1 - Main kitchen	KB - Side entrance through kitchen balcony	M1 - Master bedroom 1
BR - Bedroom 1	MD - Maid bedroom	GB - Guest bedroom
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Table 3: Data on the possible spatial types of villas, including the carrier

A look at a representative sample of the layouts of these villas in Figure 6 suggests that although they appear to be similar in the living functions they contain, a group of visual and organisational differences makes it extremely difficult to describe the visual patterns of Amman's villas. It is here that the syntactic analysis can be used to explore the morphological structure of villas' spatial arrangements, and to uncover their underlying spatial configuration. Within this context, the general spatial properties of these modern villas have been examined. The findings suggest the existence of two genotypes. A look at the genotype of the entrance lobby (EL)

the most integrated, shown in Table 3 and at the genotype of living room (TL) being the most integrated with the carrier included or excluded reveals that the string of the genotypes identified in the previous paragraphs is not long. The values of the 'base difference factor' BDF for a group of socially significant was accordingly calculated. The values generated showed that villas have relatively high BDF values, or in other words, weak differentiation. These findings suggest that although Amman's villas belong to two clearly identified genotypes, these genotypes are relatively weak and include within their structure a group of phenotypes.

It should be acknowledged here that although the spatial analysis has clustered modern villas into two groups of genotype, with a third nongenotype, in a grouping which appears to differ from the stylistic or the semiological identification of these villas, the extent to which these spatial findings are related from the evolutionary point of view, is not yet clear. In addition, the nature of the relationship between these three spatial types, the twelve stylistic types identified earlier in the stylistic layer, or the four perceptual clustering of the perceptual layer, is not yet clarified.

2.3.3 Spatial chronology:

The spatial results of the older and modern samples are now examined to answer the following questions: what are the actual moments of change in the architectural history of Amman? What are the points at which the evolutionary process was initiated which leads to the diversity of modern Amman?

The distribution of functions of the earlier villas through the years 1920 – 1960, shows that it was only after the years of the late 1950s that new sets of functions began to appear. A look at the facades of the villas of the same period showed that they began to divert from their older stylistic trends at the same time as their plan layouts changed. The genotypical identification of the two spatial patterns of the 1950s and which contradict the identified genotype of the 1920s through to the 1940s, works in synchrony with these developments. These parallel findings suggest that the spatial changes at the plan level from the seem to have been consciously implanted as clear new spatial types. Consequently one can refer to the late 1950s as the period in which a major turning point in the history of the villa architecture seems to have taken place.

Along these lines, the findings of the later modern period, which followed in the 1970s through to the 1990s, emphasised the existence of two apparent spatial genotypes. It also witnessed the emergence of new spatial organisations which remained individualised and limited in number thus remaining within the nongenotype group. Neither of the two dominant genotypes of the eclectic city was brought about

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by the impacts of the oil-boom. What modern layouts proposed is a more subtle articulation of the relationship between the architectural spaces present in their counterparts of the 1950s, together with the introduction of sets of new spaces.

Detailed investigations showed that despite the consistency in definition of the genotypes within the modern era, consequently resulting in a wider group of phenotypes. While the older villas (1950s-1960s) belonged to two genotypes with minor phenotypical variations, the modern villas belonged in fact to the same two dominant genotypes, however, with many phenotypical variations. The finding that the genotypes of modern Amman are the same as those of the 1950s, despite the geometrical differences and the expanded space variety, is a new way of revealing reality through space configuration. What the modern villas express is not so much a new way of living but, in contrast, a new way of expressing self, most clearly seen if the two genotypes of the 1950s, expressed in one stylistic expression, were compared with the same genotypes of the 1970s through to the 1990s, however many the phenotypes and however unlimited the stylistic diversity.

2.4 Spatio-stylistic synchrony

The following paragraphs attempt to focus on the nature of genotypical and stylistic affinities which exist between villas. Only the modern period is discussed, because it is the era which witnessed spatio-stylistic inconsistencies.

It is believed that consistency in spatial results of the modern period in relation to one facade type and across the whole sample, is fertile ground for spatio-stylistic investigations. This is especially true, given that the genotypical identification of Amman's villas into two genotypes and one nongenotype (Table 3), while the findings of the stylistic and perceptual layers indicated that the villas facades can be grouped into 12 stylistic types and/or 4 perceptual clusterings. Nevertheless, since the analysis indicated that these genotypes are characterised by shortness of the length of their string and by variability in resultant phenotypes, this research needed to sharpen its tools to allow investigation of the ways in which the spatio-stylistic relationships develop.

Based on Hillier and Hanson's criteria setting the rules for the identification of genotypes, this research developed its own tool, which allows production of a numerical value that could measure the degree of spatial affinity across the villas when compared in pairs (each villa of the sample is compared with each of the other villas in the same sample). While Hillier and Hanson consider the order of integration of the functions of the villas investigated, and search visually for the existence of such order - regardless of its length - across the different villas, this research

developed a tool based on Spearman's rank order and used in AL-Bahar's analysis (AL-Bahar, 1990: 355). It can produce a correlation value which varies between -1 and 1 and which indicates the degree of negative or positive weak, or strong correlations that the orders of the different pairs of villas and the integration of their functions might have. In this tool, comparisons occur only across two examined pairs and thus it measures thoroughly the degree to which the integration order of the full living complex of the first villa is similar, or in other words correlated with, the integration order of the other villa. It searches both for the genotypical and for the topological forms of affinities which exist between investigated pairs. The difference in these comparisons from those of the space syntax theory is that here villas are investigated in pairs, to search for the different degrees of genotypical or topological similarities. Most importantly, the results are tabulated in a comparable matrix form in tables (Table 4) or figures.

Function	Villa	No.1	Villa	No.2
	Rank *	Integration**	Rank	Integration
C	1.0	0 .064	6.0	1.020
EL	2.0	0.720	1.0	0.660
BR	3.0	0.770	2.0	0.720
K1	4.0	0.820	3.0	0.820
TL	5.0	0.930	4.0	0.910
M1	6.0	0.990	5.0	0.990
KB	7.0	1.050	13.0	2.230
B	8.5	1.110	7.0	1.100
P	8.5	1.110	8.0	1.120
TS	10.0	1.430	12.0	1.660
MD	11.0	1.680	9.00	1.250
SS	12.0	1.770	10.0	1.330
GB	13.0	2.110	11.0	1.450

* 'Rank': Correlation value
**'Integ.': Correlation value

Integration values of villas compared

Integration	0.64	0.72	0.77	0.82	0.93	0.99	1.05	1.11	1.11	1.43	1.68	1.77	2.11
Villa No. 1 :	C <	EL <	BR <	K <	TL <	M1 <	KB <	B =	P <	TS <	MD <	SS <	GB
Rank	1	2	3	4	5	6	7	8.5	8.5	10	11	12	13

Integration	0.66	0.72	0.82	0.91	0.99	1.02	1.10	1.12	1.25	1.33	1.45	1.66	2.23
Villa No. 2:	EL <	BR <	K1 <	TL <	M1 <	C <	B <	P <	MD <	SS <	GB <	TS <	KB
Rank	1	2	3	4	5	6	7	8	9	10	11	12	13

Table 4: Comparing the rank order and the integration values of the full living complex of two pairs of villas

As soon as this technique was developed, each pair of villas was investigated and four values for each pair of villas were produced: 'Integ.' and 'Rank' correlation values which measure the degree of correlation between any two pairs of the 52 villas with the carrier included, and 'Integ.' and 'Rank' correlation values which measures the case with the carrier excluded (Figure 7). This form of 'one to one' genotype comparison is conducted because, it is necessary to investigate in more detail how compared spatial layouts are stylistically expressed. This moves the scope of analysis from purely syntactic spatial analysis to spatio-stylistic investigations at

one stroke. In this regard, the subject of comparisons moves away from the general clustering of spatial patterns into that of the specific degree of correlation between the stylistic expression and the plan layout of focused pairs. The results are schematically shown Figure 7.

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WITHOUT CARRIER

(52 × 52 lower-triangular correlation matrix of villas grouped by Type 1–12 and "Others")

WITH CARRIER

(52 × 52 lower-triangular correlation matrix of villas grouped by Type 1–12 and "Others")

Figure 7. The various degrees of spatial correlation which occur across 52 villas of the modern sample when compared in pairs.

The distribution of the relatively high correlation values which occurred between the pairs of compared villas - highlighted - for each of the shown sets matrices in Figure 7 shows clearly that similarities between villas could occur between villa pairs, irrespective of their identified stylistic types. The results indicate that a large percentage of villas act in the spatial arena in a manner irrespective of their stylistic type. When the 'stylistic/semiological' clusterings of Amman's facades identified in the perceptual layer were examined in a search for any 'spatio-stylistic/ semiologically based' correlation it was again difficult to identify any sort of synchrony which could suggest that the genotypical understanding of west Amman's villas could extend to a parallel spatio-stylistic/semiological understanding. Based on this spatial clarity, analyses have confirmed that it is difficult to refer to a broad genotypical-stylistic framework that could describe its architecture.

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3. Conclusions

The findings of this paper show that the villas of Amman could be spatially comprehended within the context of traditional/modern, rather than within the context of older/modern samples. The comparative examinations showed that there are striking differences in spatial forms between the two chronological periods of Amman's pre-1950s and post-1950s villas. In addition, the review of change over time, suggests that the evolutionary process at the spatial level which ended by producing the stylistically diverse architecture of Amman, has in fact been in progress since the 1950s. The fact that some villas of modern Amman have shown lesser degrees of genotypcial affinity and belonged to non-genotypes in terms of their spatial organisation could have some bearing on the pattern of the social evolutionary change in Amman's society, always marked by minor clusters of socially or culturally diverse groups.

Irrespective of the general emergence of some spatial and functional trends at certain periods, and despite some of the gradual and functional changes in the plan layouts, there is a clear degree of spatial stability, both through the first half of the twentieth century and through its second half. Moreover, relating these clear spatial trends to the stylistic classification of Amman's forms, the picture all together changes. While the traditional period of the 1920s through to the 1950s is distinguished by its spatial and formal stability, where one traditional spatial genotype is expressed stylistically by one traditional elevational expression, the period of the 1950s through to the 1970s is distinguished by two emerging genotypes, stylistically expressed by one formal international style. This norm sharply changed in the late 1970s through to the 1990s, when the relative stability of the genotypical arena was overshadowed both by stylistic elevational diversity and by spatial phenotypical

inconsistency. Spatio-stylistic analysis reflected that, in the same way as details of facade intensify the differences across the same type of facade, and create out of the similarly composed massing completely diversified facades, investigating the details of the genotypes magnifies dissimilarities among plan layouts and reveals many phenotypes within the modern sample. With all these possible inconsistencies in the foreground, and even when the combinations of layout-facade are restricted to the 12 stylistic categories, and to the two genotypes and the one non-genotype identified, analysis shows that there is a pronounced breakdown in the relationship between the spatial and the stylistic expression of Amman's residential forms. It is almost impossible to infer a villa's facade expression from its spatial pattern, no matter what analytical criteria are used, and whether the criteria respond to the identified stylistic types or to their semiological clusterings or not. It appears that it is along these juxtaposed variations of stylistic expression and spatial patterns that the evolutionary architectural forms of Amman have developed, interpreting these stylistic-spatial variations in conjunction with the way in which the three evolutionary identified genotypes of Amman have developed: from the simple main lobby hall as the most integrated during the 1920s, to those of the 1950s through to the 1990s, where the living room is the most integrated, followed by the entrance hall, or alternatively where the entrance hall is the most integrated and lavishly decorated.

One can argue that this wide variety, stylistically expressed through facades, syntactically through varied versions of phenotypes, or genotypically through emphasising the lavish entrance hall, might have some relevance to the symbolic intention of the owners of these villas. With the introduction of the category of foreigners as visitors, and with the new demographic make-up of the rapidly changing society, it seems that differentiations between groups was no longer based on social knowledge about the individual. The spatial and the formal image of the domestic space seems to become the strongest means through which the evaluation of the individual is conducted.

This paper shows that while each layer of form manifestation could generate its own wealth of findings, these findings remain local and partial in their explanations, because globality of interpretation could only be achieved when findings on the layers of the syntax of facade, semiotics of facade, syntax of space, and semiotics of space, are examined against each other and juxtaposed in a manner which allows the socio-cultural impact of the society to be captured.

The findings of this paper makes a contribution to the man-environment paradigm by methodologically interweaving the different aspects of the concept of the multiplicity of built form, and by focusing operationally on how the structures

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of syntax and semiotics could be constructed in relation to one another. Without findings about how the different layers of form manifestations actively engage with each other, the credibility of such interpretations, this research has shown, is questionable.

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