INFILL DESIGN IN HERITAGE SITES
STUDY OF EXPERTS PREFERENCES AND ATTITUDES

Abstract

Heritage sites represent the memory of the society, its culture and history, as well as the multiplicity of values, whether cultural, social, social, occupational or otherwise. Preservation of the integrity of the visual image of the heritage sites is one of the most challenges that face the urban designer to preserve the identity of the place. There are many influences and innovations that may affect this image including infill buildings that are built or added in these sites.

The research questions how the infill design interact with the heritage context. The architects and urban designers differ in their visions and attitudes dealing with this issue, where some believe that fruitful interaction achieved through the integration of new buildings with the context, and others believe that the priority of infill design is to respond to its own time as architecture must always reflect its period.

Therefore, the study aims at analysing some examples of buildings that were added in heritage sites that show the extent of the variation in the approach to dealing with the heritage context, beginning with the literal transfer of traditional architectural vocabulary through abstraction and simplification to the total contradiction with the context.

Keywords

Urban Heritage, Infill Development, Context

1. Introduction

The city is characterized by continuous change and transformations over time. This transformation of the city urban is only a reflection of social, economic and political conditions. It is necessary to try to achieve integration by managing these changes over time. Successful development emphasizes the identity and spirit of the place, despite the change (Ostanevics, 2017).

The existing architecture is the first reference to new architecture. Where the added urbanization should be a continuation of the former urban in a contemporary manner that is compatible with its location and its architecture and reflects the time, it was constructed. As Aldo Rossi stated that (architecture is the product of earlier architectures) (Rossi,1984). New building in a Heritage site may perform as a face of continuous development of the city over time.

The nature of the city is characterized by the complexity resulting from the overlap and interrelation of influences and factors affecting it. The human use is the greatest impact on the appearance of the city, which varies according to the needs and attitudes. Achieving the interdependence between the past with its values and the present with its advanced potentials is the most important goal of the development.

2. Context in architecture

The context can be seen as a product of a combination of events, circumstances and facts together to create a comprehensive environment of its own. It is necessary to take into account each building that is built in this context and its values. There is no denying or ignoring the fact that each building affects the context and is influenced by it.

The context is characterized by its dynamic nature and the reason that it has been formed over time by the various social, political, historical and economic conditions changing in the degree and manner of its impact on this context.

Contextualism in architecture is a design approach that take into consideration and respond to the place circumstances and conditions. The building design is selectively connected to the instant cultural or physical context - the place history. Properly, the design of buildings emphasises the features of city and place by spreading them.

Recognition of current architectural fabric is the first stage in this methodology to take it into consideration when adding new architecture and to assure that the new design respect the existing fabric as significant to the city urbanism.

The aim of Contextualism is to create a unity dialogue; a concept that seeks to move in a coherent way in its wholeness while making a stamp for itself. The architecture reflects the components of the context, its concepts and its changing parts from the architect perspective. The respect to the context and contextual design always try to relate new architecture to the existing, so, enclosing it in a continuous progress of whole.

3. Infill development in heritage context:

The uniqueness of the heritage sites comes from that these sites are rich expression of the civilizations, cultures and events that have passed through the city. The urban fabric of these sites is distinct by the architecture and spaces with a lot of meanings and symbolism which formed the unique spirit of the place. Now, the deterioration of spatial quality has led to absence of this spirit.

The spirit of the space is one the most important qualities of heritage context. Various threats affect this spirit and harms the cultural heritage (Rai, 2008). The management of heritage sites is the most important and powerful element in preserving the continuity of this heritage with its values. Although many preservation efforts seek to preserve the monuments and houses and not pay attention to the rest of the elements and how to manage the context as a whole to coincide with the change of time. Architects differ in their interactions with this heritage environment. Some of them believe that the place and spirit that characterizes it must be respected when making any development in the heritage domain, such as Raymond Erith and Norm Tyler. On the other hand, there are architects who see the best behaviour in the development of these areas is that the building expresses its time, regardless of the spirit of the heritage site. These architects make a complete separation between the building and the heritage, as Frank Gerry and Daniel Lipskind. As experience accumulates and the general orientation of architecture changes, the ability to balance the two directions varies (CABE, 2001). The intervention in heritage sites by these both opposite attitude sometimes leads to unpreferable results (Semes, 2009).

4. Infill design strategies in urban heritage context:

Attitudes toward architectural design, generally, express the preference of the architect in contemporary design and also it is ruled by the guidelines determinated by related bodies, organizations, and/or regional councils. The vitality and viability qualities of the added design to the context are the significant measure of how this design fit in its place and context (Abdullah, 2008). or its responsiveness to the setting (Bentley, 1985).

Creating a compatibility with adjacent structures might be realized through different procedures, despite, commonly two key basic approaches are usually settled simultaneously at the first stage of design and implemented with different degrees: contrast or replication (Eleishe, 1994). Brolin (1980) explained: "There are a diversity of techniques to design a new building so that it is considerate to its architectural context . . . One may literally copy the architectural element from the surroundings; or, one may use totally different forms to evoke, may also enhance, the visual flavour of existing buildings". Following are some of these techniques:

The design approach for intending new construction in a heritage setting could be one of these strategies which depends on the attitude towards the context: starting from literal replication then invention with the same or a related style, abstract reference, or intentional opposition (Semes, 2007). These alternatives offer a variety of reactions to the demand of "differentiated" yet "compatible" designs for infill development in heritage settings.
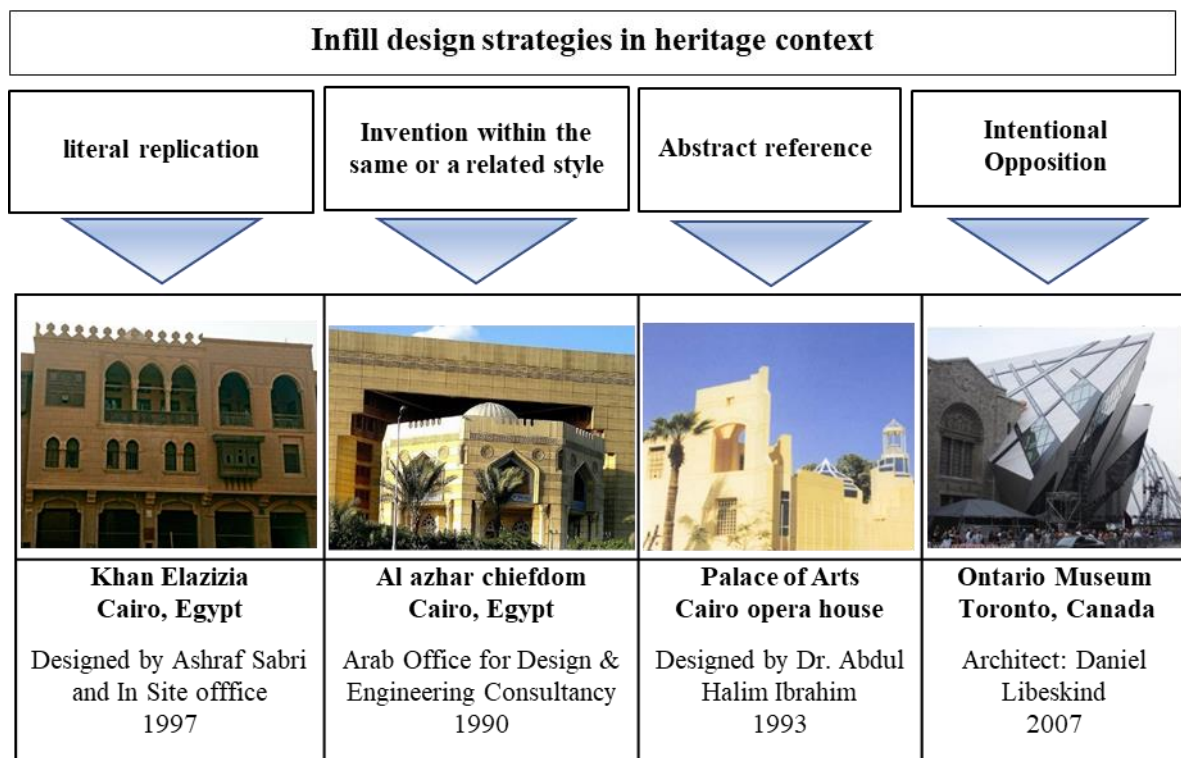

Fig. 1 Strategies of Infill design in Heritage context
Source: Author

5. Materials and methods:

This research focuses on the qualities of new architectural design in heritage context. The study attempts to identify the factors influencing the relationship between the building and the context, whether on the urban or architectural scale, and the importance of these factors from the point of view of the experts.

5.1. The approach:

Methodologically, this research adopts case study approach, three cases were selected in heritage sites in Cairo. The research uses the survey approach to explore the aspects that architects may take into consideration in their perceptions of added buildings' relationships with the context and their preference and attitudes toward infill design in heritage context. A Questionnaire was designed to investigate the variation in experts' visons. It was addressed to architects and urban designers who are were involved in projects in heritage areas or heritage-related research.

5.2. Questionnaire development

The first part of the questionnaire deals with basic information about the participants from architects and urban designers, then their background about the subject. The second part asks about the preferences of the participants in dealing with the heritage context starting from the Literal replication to the complete separation from the heritage. The questionnaire is then shifted to evaluation of selected case studies from the perspective of experts. Then they were asked to indicate a successful example of infill project in heritage site.

5.3. Data analysis

The research utilized Microsoft Excel program for recording and organizing the data of the survey then conducting the statistical analysis. Odd data were excluded, and incomplete surveys were ignored.

6. Results and discussion:

6.1. Respondents demographic characteristics:

Throughout the survey, at the beginning of the questionnaire, there was a set of questions aimed at identifying the demographics of respondents in terms of gender, age, occupation and educational level. The following table shows the demographic characteristics of the 78 respondents. Of the surveyed people, 46.2% were males and 53.8% were females, while the average age of respondents was 40 years. The majority of respondents (69.2%) had completed PhD degree, (23.1%) had the master degree and only (7.7%) had completed the bachelor's degree. Most of those surveyed were academician (47.7%).

Gender	(%)	Age	(%)	Education Level	(%)	Profession	(%)
Male	46.2	18 - 25	3.8	phd	69.2	Academician	47.7
		26 - 35	26.9	master degree	23.1	Architect	27.3
Female	53.8	36 - 45	46.2	Bachelor of Architecture	7.7	Urban designer	15.9
		more than 45	23.1			Planner	6.8
						Developer	2.3

Table 1: Characteristics of the sample (Sample size, 78), Source: Author

6.2. Experts perceptions and preferences toward infill development in heritage context:

For this part of the questionnaire with experts, the first finding was that the most preferred attitude toward the existing setting in heritage context is "invention within the same or a related style" with a percentage 39% and the least chosen choice was literal replication (15%) as shown in (fig. 2).
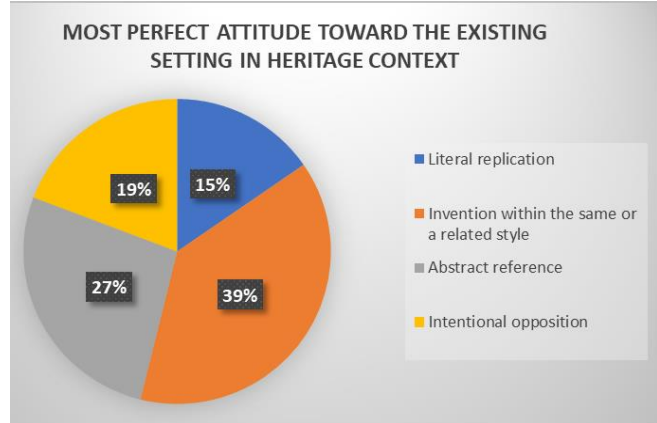
The second result was that the most two significant design aspects of design among the professionals toward realizing aesthetic fitness in heritage context are the perceived visual harmony and meaningful.as shown in (fig. 3)

Fig. 2 Percentage of experts' preferred attitudes toward the existing setting in heritage context Source: Author

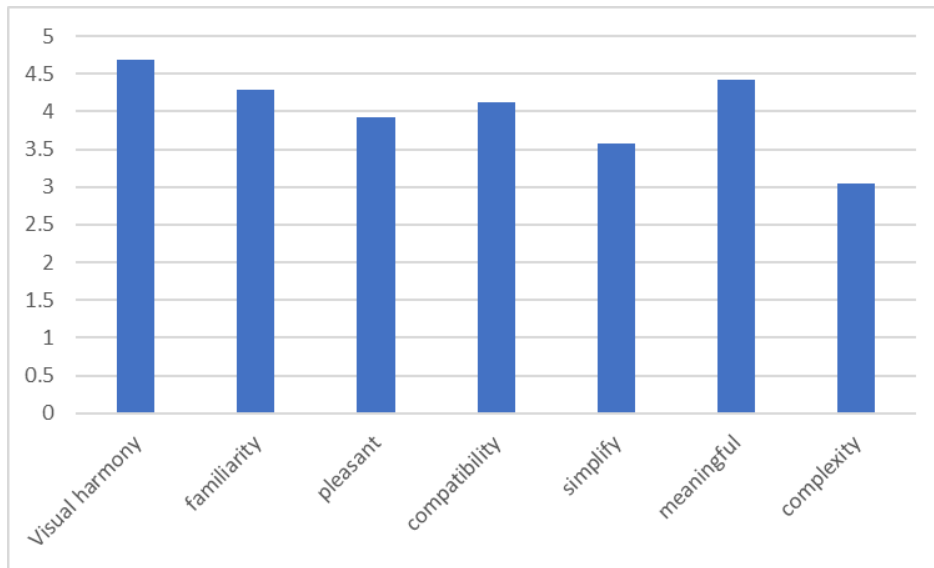**Fig. 3 Experts opinions on the importance of design aspects toward achieving aesthetic fitness in heritage context, Source: Author**

6.3. Case studies of infill design in heritage context:

Three case studies were selected from different places in Cairo: New central Library in Cairo University, Bank Misr Overseas Branch in Cairo down town and Citadel Plaza facing Cairo citadel. (As shown in Table.2&3)
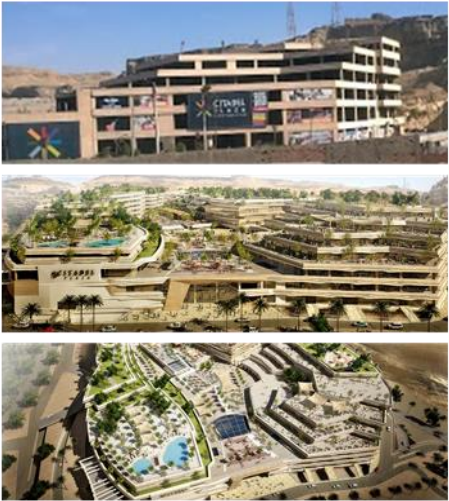
Cairo University New central library		The building is **located** in Cairo university campus which is one of the largest and oldest Egyptian and Arab universities. **The architect** of this building is Dr. Aly Raafat. **The building** consists of six floors basement, low ground floor, high ground floor and five typical floors and the building on an area 3200 square meters. The construction of the library was finished in 2008
Bank Misr Overseas Branch		The building is **located** in Cairo downtown (Khedivial Cairo) which distinguished by its European style. The building was built next to the heritage building which is the main branch of Banque Misr. It is a high-rise building that consists of more than 20 floors.
Citadel Plaza		Citadel Plaza is **located** in the foot of the Mokatam hill. It is overlooking a World Heritage site offering breathtaking & unique views of the most prominent landmarks of Cairo's history, notably the Citadel, surrounded by Islamic & Coptic Fustat, and Cairo's "historical Kernel". The project still under construction by Alkan Holding.

Table 2 (Research case studies)

Table 3 (Case studies Surrounding)

In this part, the data is analysed by Correlation Analysis.

Table (3) shows the relationship between the design elements of the building and the relation of infill design with the heritage context. As well as the reciprocal relationship between elements influencing the compatibility of the building with the context.

Cairo University New central library

	contextual des	building sitti	function	Hight	orientation	materials	color	surface	proportion	opening	arrangement	shape	scale	linear	plane	enclosures	style	order
contextual	1																	
building s	0.324354	1																
function	0.191159	0.653997	1															
Hight	0.425479	0.324723	0.232719	1														
orientation	0.098193	0.243951	0.235929	0.478252	1													
materials	0.474494	0.242602	0.172326	0.8255	0.506024	1												
color	0.385488	0.270652	0.223448	0.57449	0.735681	0.761249	1											
surface	0.419396	0.343023	0.240426	0.697398	0.431831	0.877365	0.755163	1										
proportion	0.537549	0.459057	0.111963	0.798792	0.380811	0.748838	0.482706	0.756667	1									
opening	0.348394	0.043433	-0.0383	0.474297	0.501745	0.572892	0.430004	0.475115	0.544903	1								
arrangement	0.587638	0.609761	0.429082	0.761571	0.338326	0.661167	0.381726	0.57529	0.819645	0.55061	1							
shape	0.313248	0.436741	0.20167	0.499387	0.238833	0.428222	0.255435	0.608954	0.760759	0.425657	0.558371	1						
scale	0.518651	0.61615	0.431863	0.658851	0.585556	0.631684	0.555145	0.627549	0.710251	0.503657	0.706804	0.688011	1					
linear	0.431041	0.232224	0.246644	0.662963	0.511367	0.671397	0.385132	0.580594	0.693333	0.643275	0.749308	0.70986	0.682733	1				
plane	0.15552	0.447671	0.034052	0.450909	0.30567	0.226387	0.108639	0.173899	0.521656	0.281176	0.499809	0.39474	0.450577	0.555354	1			
enclosure	0.290407	0.535488	0.357965	0.588382	0.455087	0.554845	0.332907	0.576173	0.645014	0.702428	0.712492	0.64212	0.744591	0.703051	0.570572	1		
style	0.512333	0.601758	0.419128	0.71817	0.37869	0.64279	0.523298	0.710463	0.782659	0.534957	0.775645	0.775028	0.82362	0.680254	0.550615	0.827362	1	
order	0.327942	0.446275	0.302773	0.525512	0.334146	0.38993	0.27031	0.519269	0.759119	0.462214	0.67471	0.848463	0.717376	0.596554	0.352777	0.657163	0.771248	1

Bank Misr Overseas Branch

	contextual des	building sit	Building funct	Hight	orientation	materials	color	surface	proportion	opening	arrangement	shape	scale	linear	plane	enclosures	style	order
contextual	1																	
The buildi	0.509123	1																
Building f	0.078588	0.299906	1															
Hight	0.558931	0.510809	0.08351	1														
orientation	0.080495	0.427596	0.310473	0.310486	1													
materials	0.576311	0.605005	0.230614	0.445276	0.453097	1												
color	0.196491	0.420928	-0.02714	0.319598	0.40954	0.607489	1											
surface	0.58333	0.66227	0.222655	0.499823	0.596487	0.782026	0.808702	1										
proportion	0.365982	0.47905	-0.06915	0.748746	0.322919	0.4774	0.600661	0.634105	1									
opening	0.326717	0.746402	0.110531	0.42424	0.522622	0.591017	0.715931	0.793248	0.509435	1								
arrangement	0.470065	0.616433	0.16812	0.56049	0.652218	0.599843	0.718574	0.868031	0.580977	0.742423	1							
shape	0.520435	0.334754	0.002581	0.519225	0.346421	0.614755	0.413099	0.560897	0.517862	0.343134	0.62191	1						
scale	0.496827	0.478884	-0.12661	0.792829	0.272586	0.410087	0.435545	0.53827	0.847232	0.390509	0.597013	0.651577	1					
linear	0.55719	0.444117	0.052596	0.594344	0.431892	0.594066	0.777544	0.843823	0.593046	0.493013	0.721995	0.64338	0.732832	1				
plane	0.436178	0.561801	0.097349	0.619496	0.602216	0.752727	0.714147	0.773372	0.623833	0.632687	0.796611	0.614631	0.663872	0.887151	1			
enclosure	0.544921	0.607202	0.183535	0.609225	0.443597	0.553257	0.624537	0.784842	0.510412	0.494988	0.794356	0.499992	0.609225	0.878829	0.793172	1		
style	0.529104	0.529679	0.071233	0.632095	0.30836	0.644186	0.471685	0.609679	0.600977	0.514589	0.59432	0.773978	0.667212	0.714686	0.75242	0.598126	1	
order	0.394713	0.498318	0.039579	0.303652	0.352038	0.490911	0.637461	0.795651	0.508998	0.568269	0.630777	0.292151	0.430479	0.82009	0.612142	0.717295	0.419204	1

Citadel Plaza

	contextual des	project sitti	building funct	Hight	orientation	materials	color	surface	proportion	opening	arrangement	shape	scale	linear	plane	enclosures	style	order
contextual	1																	
project sit	0.825432	1																
building f	0.632172	0.776465	1															
Hight	0.819617	0.662423	0.561594	1														
orientation	0.664827	0.610162	0.538138	0.771946	1													
materials	0.779069	0.677283	0.56892	0.869893	0.689777	1												
color	0.496322	0.371486	0.268438	0.739626	0.438529	0.71497	1											
surface	0.598002	0.260538	0.328719	0.7035	0.556628	0.654119	0.700592	1										
proportion	0.680954	0.469497	0.342208	0.818656	0.63162	0.810114	0.78278	0.710997	1									
opening	0.615539	0.420934	0.211302	0.68017	0.57492	0.675836	0.712511	0.52776	0.806119	1								
arrangement	0.646635	0.654546	0.552336	0.702863	0.768929	0.810114	0.508807	0.51744	0.724265	0.583024	1							
shape	0.508399	0.540456	0.532291	0.718643	0.608698	0.678633	0.734847	0.619139	0.65192	0.496437	0.715834	1						
scale	0.684286	0.581882	0.426759	0.7811	0.75175	0.684286	0.676278	0.69462	0.676031	0.555082	0.676031	0.800029	1					
linear	0.33353	0.180286	0.178995	0.519707	0.565349	0.485796	0.403457	0.332871	0.403457	0.595719	0.692491	1						
plane	0.602641	0.590222	0.38142	0.690984	0.591946	0.669855	0.666042	0.575319	0.574196	0.47414	0.574196	0.7686	0.76556	0.729238	1			
enclosure	0.573604	0.55033	0.389747	0.6931	0.634545	0.56654	0.559846	0.521071	0.434191	0.391123	0.535322	0.766542	0.718112	0.585447	0.797009	1		
style	0.758368	0.629224	0.599579	0.681801	0.542802	0.767075	0.610746	0.655081	0.743255	0.651391	0.647639	0.6383	0.565855	0.332883	0.678332	0.436259	1	
order	0.769581	0.538584	0.466355	0.801546	0.769568	0.671369	0.53878	0.725748	0.725404	0.69319	0.574781	0.559317	0.686716	0.530395	0.698562	0.608571	0.784725	1

Weak relation 0 — 1 Strong relation

Table (4) Correlation Analysis: the reciprocal relationship between elements influencing the compatibility of the building with the context.

Table 4 shows that there are already mutual relations that need to be considered in the design of buildings added in a heritage context. By examining the influence of the elements on the compatibility of the building with the heritage context, some elements had the most influence. Answers were rated using a 5-point scale, a rating of 1 was the lowest or the most negative assessment and a rating of "5" was the highest or the most positive. From the application of the study to the three examples, the research concludes the following:

6.3.1. New central Library:
The mean of experts' assessment of the compatibility of the building with the context is (3), while specialists opinion of the building sitting in relation to the surrounding buildings and in the urban fabric (2.8) and evaluation of the building function in the context (3.3). The study of mutual relations showed that the most design elements that have an impact in the opinion of specialists in the compatibility of the building are: arrangement, proportion and scale.

6.3.2. Bank Misr Overseas Branch:
The mean of experts' assessment of the compatibility of the building with the context is (2.3), while specialists opinion of the building sitting in relation to the surrounding buildings and in the urban fabric (2.3) and evaluation of the building function in the context (2.6). The study of mutual relations showed that the most design elements that have an impact in the opinion of specialists in the compatibility of the building are: surface, materials and Hight.

6.3.3. Citadel Plaza:
The mean of experts' assessment of the compatibility of the building with the context is (3.7), while specialists opinion of the building sitting in relation to the surrounding buildings and in the urban fabric (3.4) and evaluation of the building function in the context (3.6). The study of mutual relations showed that the most design elements that have an impact in the opinion of specialists in the compatibility of the building are: project sitting, materials and Hight.

7. Conclusion:

This study examined Experts perceptions and preferences toward infill design in heritage context in the city of Cairo, Egypt.
Results have shown that **"invention within the same or a related style"** is the most preferred attitude toward the existing setting in heritage context for experts. While, **literal replication** is the least preferred attitude.
This study showed that:
 sociodemographic characteristics influenced the respondents' preferences toward infill design strategies in heritage context. The age of respondent influenced the preferences of experts; For example, most of those who preferred that the infill design has to differentiate from the heritage context "intentional opposition" were less than 40 years old and most of those who preferred literal replication in infill design were more than 55 years.
From the study of the selected cases, it became clear that there is a **positive** relationship between the elements of the design (**Hight, orientation, colour, materials, surface,**

proportion, opening, shape, arrangement, enclosures, scale, linear, plane, order, style) and the compatibility of the building with the context that differs in the strength of the relationship from one building to another.

The author believes that further studies with a larger scale of infill development and more diversity are recommended.

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