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Morphological Study Through Computer Modelling Of 18th Century Indian Bazaar Street: A Case Of Holi Gate Market, Mathura

[1]Poornima Singh, [2]Sankha Subhra Nath

[1]M. Arch final year Student, [2]Assistant Professor

[1]Faculty of Architecture & Planning,

[1]Dr. APJ Abdul Kalam Technical University, Lucknow, India

Abstract: Marketplaces have been a place of social interaction, a rich repository of the architecture of its time, as the main center of progress around which the development took place. The marketplace has always been an integral part of the community and residential area; it has been the oldest core of the city with newer development taking place around it. Historic marketplaces of India have a distinct architectural and cultural identity that is being destroyed by urban growth. This paper attempts to assess one such marketplace located in Mathura through modeling and assessment method developed by Mustafa Korumaz. The assessment is done on four parameters i.e. space authenticity, mass relation, old-new relation, and new building design approach. The resultant originality index shows the extent of the impact on building façade by building use. The study also recommends for adaptive uses of buildings in those areas.

Index Terms **- Morphology, Mathura, originality index, façade.**

I. Introduction

Some cities of India were developed in the 17-18th century. These cities were developed according to local people, customs, beliefs, material, architecture, etc. Every city has its distinct characteristics in terms of culture, religion, architecture, cuisine, an art form, etc. These cities transformed for the last 300 years. The cities were developed according to the needs and the lifestyle of that period which continuously changed over time. Today, the historic core of these cities are suffering from major problems like congestion, parking, overcrowding, sewerage, etc. which degrade the historical value of the area. This condition is forcing the degradation of architectural value in the core of the city.

Mathura is one of the oldest cities in India. The holy city most popularly associated with Lord Krishna. It is a pilgrim center for Hindus, Buddhists and Jains alike. It has a long and chequered history, having been invaded several times and razed to the ground on four occasions. Despite this, the city came up again and again, faster than it was destroyed. Today, Mathura is not only a pilgrim center but also a rich treasure trove of various forms a relic of several faiths that are part of the Indian Sanskriti. It was a flourishing business center, situated as it was at the junction of Daksinapath (southern route) and Uttarapath (modern route). Earlier, caravans used to break the journey and camp here. Due to this activity, elegant buildings and temples came up in the city. The rulers of the city also contributed to some of its most striking buildings and public facilities.

It was observed that the old buildings of Mathura, built-in the 18th century, are changed in many ways. The building use and the façade, both are changed with newer ones in these buildings. Most of the facades of these buildings are also retrofitted with newer materials like glass, ACP sheets, cement jaali, etc. The newer additions look like patchwork between the old structures within the marketplace. This situation compels me to study the old structures of Mathura because of their architectural value. This paper attempts to assess the architectural value of one important street of Mathura using a method developed by Mustafa Korumaz. The study tries to classify buildings according to their space authenticity, mass relation, old-new relation, and new building design approach (Korumaz, 2003). The study tries to establish the relationship between façade and building use of 18th century marketplace of Mathura.

II. Profile of Study Area

One of the oldest marketplaces of Mathura is the Holi Gate market also known as Chatta Bazaar is situated in the core of the city. The bazaar has a special significance in the city of Mathura. It is a linear stretch with mixed-use buildings on both sides. The bazaar is in the midst of a dense residential area. The area includes the street starting from the Holi gate to Dwarkadeesh temple, see Fig. 1. The bazaar is known by two different names; Chatta Bazaar at the starting and Vishram Bazaar at the end. The Dwarkadeesh temple is of historical significance as it is one of the few surviving historic temples built in the late 19th century (Mittal, 1975). It has an identity as an indigenous adaptation of a Hindu temple and mosque coexisting in unison. The market is of immense cultural and associational significance because of its association with Lord Krishna and his birthplace. It also displays unique architectural significance. The residences in the area are

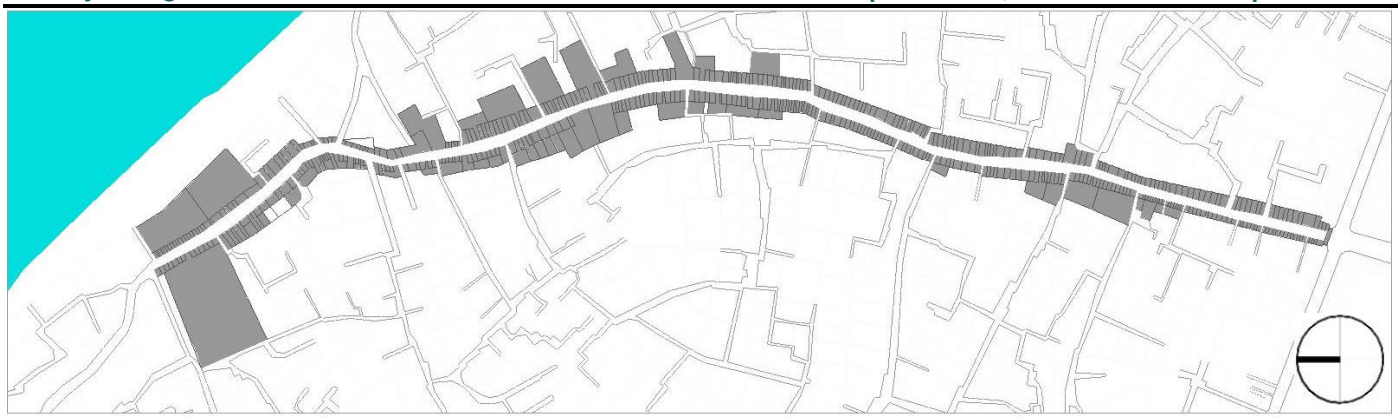

Figure 1: Holi gate market stretch (Source: Author)

constructed in the 18th century. They are made with bricks, stones, and wood. The stone facades of buildings are ornamented in nature. The residences have several floors (Growse, 1874).

Over the years there have been further additions over these heritage structures. Bharatpur Haveli also is known as Yamuna palace is now used as a hotel for the visitors. The façade of this building has been changed by the addition of hoardings, electric poles, and wires. Dwarkadeesh temple, the oldest temple in the stretch, is also modified over the years. On the ground floor, the shops like kanthi mala (prayer beads), Sringar (deity clothes and make-up), metal idols, ritual utensils, and traditional sweets, have come up due to which the façade has been covered by the hoardings. In this situation, it is important to at least identify the architectural value of the historic buildings in the precinct.

Among these buildings, two patches are selected for the assessment of the originality index. The first patch is having the buildings with prominent architectural features that were not altered over time, see Fig. 2. The original structures were retained. Another patch is taken which has newer development over the old buildings or a whole new construction, see Fig. 3. The study is conducted on these patches.

Figure 2 (a). Plan of patch 1 (Source: Author)

Figure 2 (b). Key plan of patch 1 (Source: Author)

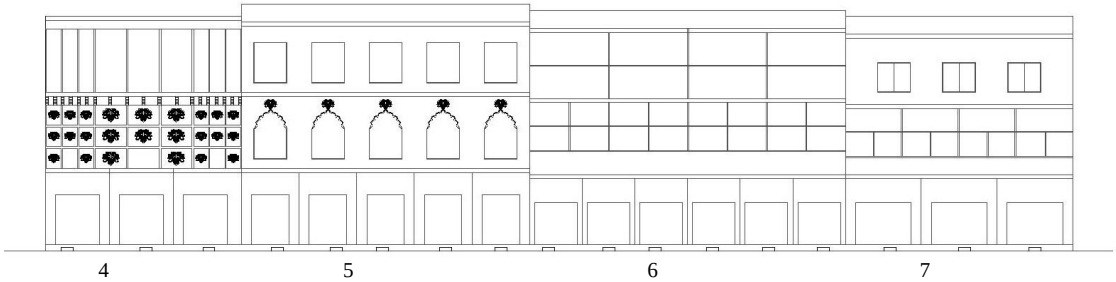

Figure 2 (c). Elevation 1 of patch 1 (Source: Author)

Figure 2 (d). Elevation 2 of patch 1 (Source: Author)

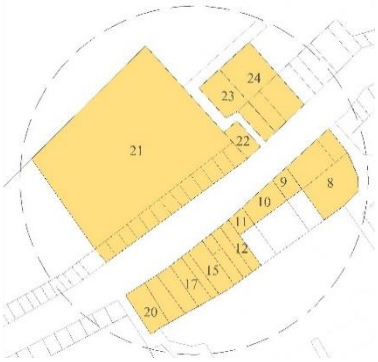

Figure 3 (a). Plan of patch 2 (Source: Author)

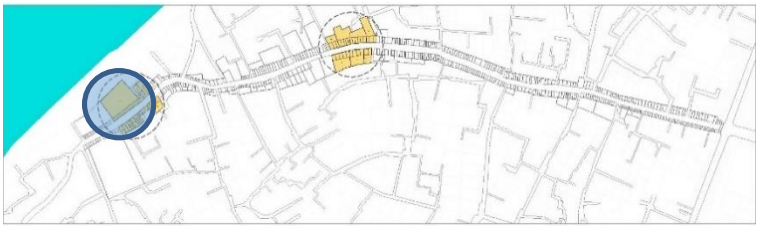

Figure 3 (b). Key plan of patch 2 (Source: Author)

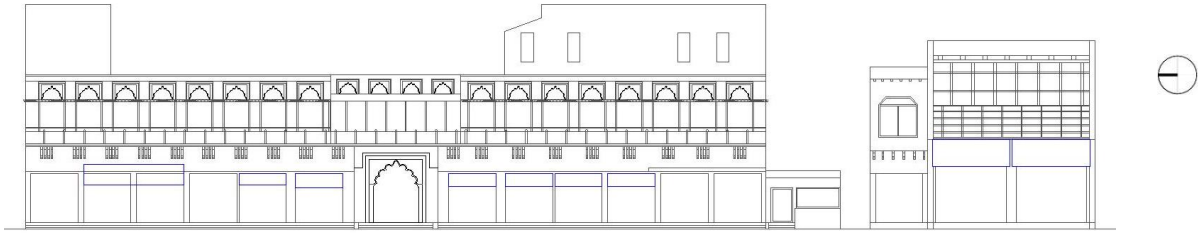

Figure 2 (c). Elevation 1 of patch 2 (Source: Author)

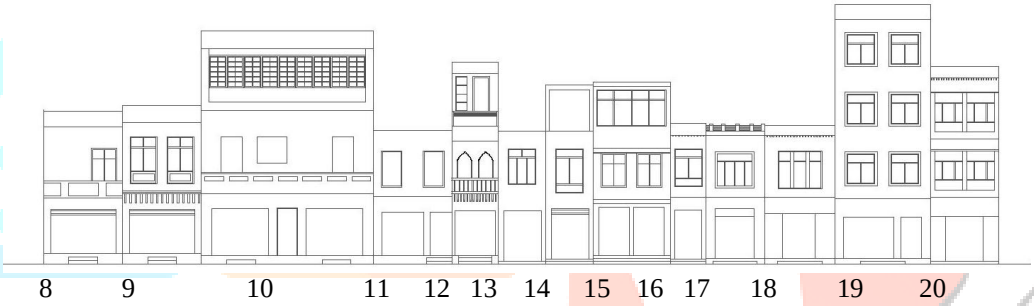

Figure 3 (d). Elevation 2 of patch 2 (Source: Author)

III.DATA & SOFTWARE USED FOR MODELLING

The study of the area is done by mapping the buildings of the area using AutoCAD 2019 and Google Earth Imagery. Two stretches have been identified for the study. The character of the buildings is identified using primary data collection. It is done by a pilot survey for the assessment of the condition of the buildings and living conditions of the people. Photographic documentation and measure drawings of the buildings were carried out and the use of the buildings was mapped and assessed.

IV.METHOD

The study area is analyzed through the method developed by Mustafa Korumaz. The following parameters are used for the study; space authenticity, mass relation, old-new relation, and new building design approach (Korumaz, 2003).

4.1 Space authenticity (SA)

Space authenticity is defined as form, material, tradition, function, and soul. It is divided into indoor authenticity and outdoor authenticity which is further divided into authentic and altered. It is evaluated through the binary number “1” and “0”. “1” indicates positive and “0” indicates negative. The weightage of space authenticity is taken as 0.40 (Korumaz, 2003).

4.2 Mass relation (MR)

The mass relation is defined as the ratio of new construction with the old original constructions. It is evaluated through the binary number “1”, “2” and “0”. “1” and “2” indicates positive and “0” indicates negative. The weightage of the mass relation is taken as 0.20 (Korumaz, 2003).

4.3 Old-new relation (OR)

The old-new relation is defined as the relation between the changes in façade developments between the original and the additional newer construction. It is evaluated through the binary number “1” and “0”. “1” indicates positive and “0” indicates negative. The weightage of the old-new relation is taken as 0.20 (Korumaz, 2003).

4.4 New building design approach (DA)

The new building design approach defines the nature of the new constructions taken up if the new construction is in contrast or homogenous. It is evaluated through the binary number "1" and "0". "1" indicates positive and "0" indicates negative. The weightage of the new building design approach is taken as 0.20 (Korumaz, 2003).

4.5 Relationship between space authenticity, mass relation, old-new relation, and new building design approach

The relationship between the mentioned 4 parameters are established through the following equation (Korumaz, 2003):

$$\text{Originality Index (OI)} = (0.40 \text{ X SA}) + (0.20 \text{ X MR}) + (0.20 \text{ X OR}) + (0.20 \text{ X DA}) \quad (4.1)$$

V. Result and Discussion

Table 1 shows that among the 7 buildings in the first patch, the derived value of originality index (OI) shows that, 4 buildings have value > 1 while 3 buildings have values 1 and above. The average value of the patch is 1.17. In the second patch, includes 17 buildings, the derived value of originality index (OI) shows that, 10 buildings have value > 1 while 7 building have values 1 and above. The average value of the patch is 0.82. The result shows that the first patch has more buildings that are unaltered, whereas the second patch has more number of altered buildings. The result shows that the first patch, having buildings like Haveli and Radhakishan Kanthimala, has a negligible change in the building used for the last 100 years. Hence the façade is retained. On the other hand, in the second patch, which has Bhavan, Bade Chaubey Haveli, and Sukh Sancharak Co., building use has been significantly altered and hence the change in the façade occurred in the buildings.

The study reveals some recommendations. For example, the outer façade of the building should relate to the indoor functions of the building. The mass relation of the old and new constructions should not exceed more than 50% of the mass of the old structure to maintain the authenticity of the design. This should be done so that, newer additions should not overshadow the originality of the structure. The mass relation to be governed by deciding the FAR of the building in the area. The pattern of the elevation should not be altered much in terms of functionality or to introduce new infrastructure facilities. New facilities should be concealed from the view. The focus on the pedestrian should be there. They should be facilitated with amenities like toilets, drinking water, and benches at regular intervals.

VI. Conclusion

Historic marketplaces nowadays are facing newer issues in the form of infrastructure failure, congestion, etc. The marketplaces were originally designed with a different though but with modernization, the needs have evolved resulting in a clash between the old and the new. Most of the historic marketplaces are facing the issues of deterioration of the original façade structure, retrofitting of the new development over the old ones creating a more inhabitable and complex space. The reasons for these problems have been uncertain and have different causes in a different context.

The importance of the old marketplaces has to be revitalized and developed as historic centers as a live repository of the history and architecture of time-specific. The development of such marketplaces has a significant impact on boosting the tourist footfall in the marketplace. Conserving the heritage is very much important as it shows the development stages according to the time and place. Retrofitting or introducing new elements cannot be a solution to increase the value of the market but it would be understanding the true value in terms of usage, originality, features, and functions would be a positive way of development. The user experience can be enhanced when the user visits the streets and on foot and enjoys the architectural aesthetics of the space rather than traveling on a vehicle. The originality and authenticity of the markets have to be maintained which is the only solution to bring back the original experience of the historic marketplace and regain its value back.

Table 1: Originality Index Calculation (Source: Author)

Building	P=0.40				P=0.20			P=0.20		P=0.20		Originality Index (OI)	
	Space Authenticity (SA)				Mass Relation (MR)			Old-New Relation (OR)		New Building Design Approach (DA)			
	Indoor Authenticity		Outdoor Authenticity										
	Authentic	Altered	Authentic	Altered/ Reconstruction	Addition is taller than historic part	Equal	Addition is smaller than historic part	Positive	Negative	Neutral, Contrast, Harmonic	Inharmonious, Replica	Results	Average
Point	1	0	1	0	0	1	2	1	0	1	0		
1	1		1				2	1		1		1.6	
2		0					2	1		1		1.2	
3	1			0		1			0	1		0.8	
4	1						2	1		1		1.6	1.17
5	1						2	1		1		1.6	
6	1			0	0				0	1		0.6	
7	1			0	0				0	1		0.8	
8		0		0		1			0	1		0.4	
9		0					2	1		1		1.2	
10	1			0	0				0	1		0.6	
11		0				1		1		1		1	
12	1						2	1		1		1.6	
13	1			0	0				0	1		0.6	
14		0		0	0				0	1		0.2	
15		0		0	0				0	1		0.2	
16	1			0		1		1		1		1	0.82
17	1			0		1		1		1		1	
18		0					2	1		1		1.2	
19	1			0	0				0	1		0.6	
20	1			0	0				0	1		0.6	
21	1						2	1		1		1.6	
22		0				1			0	1		0.8	
23	1			0		1			0		0	0.6	
24	1			0		1		0		1		0.8	

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