

Modelling for vernacular settlements

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Abstract

With the advent of the new technologies' day by day the method of construction and technologies related to it is also changing at a fast pace. The materials used nowadays should be sustainable, environmentally friendly and can be reusable. The customization property of a particular material makes them unique. All these properties are generally found in all the vernacular settlements across all over the world. There were various methods used from the very old days to make these settlements more effective in terms of design, in terms of suiting the climatic condition of that area. A better design will make the building more efficient, there will be better circulation of air, a good sunlight for the rooms. Nowadays, various modeling methods are used in the construction industry, so researchers have the desire to use modeling methods for vernacular construction. The researcher believes that by involving various methods and techniques, more innovative design can be developed. The main challenge is how the modeling method can get connected with the local artist and worker who are going to construct the vernacular houses and buildings. How these modeling methods can reduce the time and involve new methods of innovation. The study in this paper was taken from the Bhogha houses in Rajasthan, a state in the north western side of the India.

Bhogha houses are unique kind of houses developed in the Rajasthan. The local tribes who belong to this area use these settlements for living. They have a unique set up and were environment friendly as well. They are made by using the local materials available nearby the area. The cost of construction is also very less. To construct similar kind of housing in the areas which are having the similar kind of condition either require the same kind of craftsman or the people to construct or the method of construction to be shared with everybody.

Keywords: Construction, Vernacular Technology, Modeling, Bhogha

1. Introduction

This paper will discuss how the researcher can propose some modeling methods which can be used in vernacular settlements. The modeling methods will discuss the various techniques to be used in vernacular settlements. The researcher proposes to use a Design Structure Matrix modeling method. This method is generally used in various construction management methods. The DSM method is generally used in the qualitative kind of research. The data for this method was collected with the help of interviews, group discussion and some of the questionnaire filled by the researcher in understanding the construction process. It involves the local materials and the local people who are either staying in those settlements or the people who stay or follow the same kind of customs in the nearby area. The open-ended interviews were conducted by researchers from the people who were involved in making the houses and other informal settlements in the nearby area. After conducting the interviews, a pattern was observed. The pattern generated with the interviews conducted at the different stages of the design resulted in the new set of observations for the vernacular settlement. The one on one interview conducted at the various stages of the construction of the house in the vernacular settlement. The Bhogha kind of vernacular houses constructed in the state of Rajasthan were studied to understand the material used and the construction methodology adopted by the local artisans for constructing such kind of housing.

2. Research Methodology

The qualitative method of research was done in this paper. The research first started with the initial questions and then interviews were conducted at the various stages of the construction. The first thing which was done is mentioning the stages of the construction and what kind of materials is used in the construction and the amount of the time and cost occurred at that time. The researcher listed all the things and put in the Design Structure Matrix for modeling the whole process. Once the initial questions were asked, then informal discussions are done with the various participants associated with the project. The stages of the construction in a simple vernacular house are enlisted. The enlisting of the various construction stages remains the same, but the materials changes. Since the material is changing, so because of that thing the time of completion of a house also changes. The materials mostly depend upon the things available nearby to that area.

3. Ground Observation Study:

The ground observation study was done by visiting these Bhogha tribe house in the state of Rajasthan in India. To understand the way these vernacular houses were constructed and type of material used for construction. The methods adopted by these houses to bear extreme heat conditions at the day time and sudden change in the temperature at the night time. It helped the researcher in understanding the skin of these settlements. The stages of construction adopted in these kinds of vernacular houses. There was different technique adopted to live in the hot and humid regions. Generally, house in the rural area are made of mud and locally available materials. Mud mixed with grass is commonly used in the walls. The roof is made up of bamboo, grass and twigs. All these houses are circular in shapes. The houses which were constructed in this region have a different kind of foundation. The image shown below gives an idea about the houses. The lifespan of these houses is around 18 to 20years. One of the main reasons is that this area has a very less rainfall.



Figure 1: Vernacular Architecture built by Bhogha Tribe, made of mud, husk, grass and twigs
Photography by Mr. Ashish Patil, Bhogha Tribe, Rajasthan India

4. Vernacular Settlement

Vernacular architecture is a term used to categorize methods of construction which uses locally available resources to address the local needs. The area chosen for the collection of data for the vernacular settlement is central India region. This region has a tropical climate. The people here generally used locally available tools and equipment. The table below shows the stages of construction and also the local available materials used for construction.

Materials used in the Vernacular Housing: Bamboo, wood, mud, grass, mud mortar, sand, locally available materials.

Foundation : They dug, they use the bamboos, walls were made by connecting with the help of ropes and bamboos. After this they put the mud mortar over the whole area. Local internal plaster will be done mud, grass, and sand.

First they made the structures; they cut small pieces of bamboo in round shape and they use the mud mortar for connecting these bamboos together.

Life: Approximately life is about 18 to 20 years, due to very less amount of rain in this dry area. Maintenance of this kind of housing can be done with the help locally available materials.

Table 1: Stages of Construction

S.No	Stages of Construction	Local Materials
1	Development of the ground area	Mud mortar, Copra (material just like bitumen), locally available stones, bricks
2	Construction of foundation	Boulder stones available in the nearby area.
3	Development of the walls	Using mud bricks made in the local oven, plastering them with the lime and mud mortar.
4	Construction of shelves at the time of construction of walls	Creating spaces inside the wall, so that the materials can be kept in the walls.
5	Development of flooring	Flooring is done by using cow dung, mud mortar and grass.
6	Construction of roof	Wood, timber, bamboo, husk, and other items are used to construct the roof.

5. Amalgamation of Modeling with the Vernacular Settlements:

The Modeling methods can be used in the various vernacular settlements for future use. The time and cost will remain the same for most of the projects. The quality may improve because of the visualizations in the modeling format. The Design Structure Matrix modeling is adopted in various projects.



Figure 2: Vernacular Architecture built by Bhogha Tribe, made of mud, husk, grass and twigs (another view)

Source: Mr. Ashish Patil, Bhogha Tribe, Rajasthan India



Figure 3: Vernacular Architecture built by Bhogha Tribe showing the skin of the hutment.
Source: Mr. Ashish Patil, Bhogha Tribe, Rajasthan India

Figure 3 shows the skin of this whole structure. The researcher was able to see the wood, husk, how woods were tied with the mud mortar. The roof also comprises of the various materials such as twigs, husk, bamboo etc.

6. Conclusion:

Vernacular settlements were totally based on the local available materials and local methods. The insertion of a modeling in this kind of project is a new thing. It is something which was not acceptable to most of the researchers. The researcher however things that to maintain the quality and also to have a proper documentation of the project, may be the modeling can be adopted. The new house made in the village, semi urban and urban areas can be made with the involvement of modeling in the vernacular settlements. The main issue in constructing similar kind of settlement in the rural and urban areas is the availability of the local craftsman and artisans who can construct such kind of vernacular houses.

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