Space Syntax Theory: For Spatial Configuration of Offices

Abhidha Jain[1], Ridhima Madan Seth[2], Soma Anil Mishra[3]

[1,3]*Student Department of Architecture, SDPS Women's college, Indore, India*
[2]*Assistant Professor, Department of Architecture, SDPS Women's college, Indore, India*

Abstract—**Most people spend a substantial duration at work. Despite this paramount role, some functional and environmental quandaries are optically discerned in offices for users. The aim of this study is to utilize space syntax theory and techniques for enhancing the spatial configuration of offices on the caliber of functional efficiency. The first part of the study is the literature review of space syntax theory and techniques for building space, whereas the second part shows the utilization of space syntax which describes the enhancement of an office spatial configuration on the substratum of movement, visibility, accessibility, and interconnections. The result of this study is the contribution in better office building design.**

Index Terms—**Space syntax, Office building, Spatial configuration**

I. INTRODUCTION

In Architecture, a design is a kind of activity that is learned by practice and experience. It commences by engendering abstract conceptions and perpetuates by transforming them into concrete spatial formations. Sometimes due to spatial configuration, the design does not function as intended. The configuration matters for the functional efficiency of an intricate environment. To know if a building is fit to its purpose and its context there are two toolkits first Syntactic (Space Syntax for architecture) and the second one is Configur banist (Network analysis for Urban Configuration). Here we are going to discuss Space syntax for Architecture. Space Syntax Theory includes a set of theories and techniques for the analysis of spatial configuration. These techniques are for depiction, evaluation, and clarification of spatial configuration in buildings. It endeavors to decode spatial formation and their impacts on human activity. The theory is mainly utilized in urban spaces which avail in the identification of fundamental links between partial layout and the social, economic and environmental performance of places. A theory and analysis The three basic conceptions of space are:

1. Convex space
2. Axial map
3. Isovist map

II. CONVEX SPACE

The conceptions of Visual enclosure had a vigorous connection to Building spaces. In space syntax, convex space comprises of the conception of the visual enclosure. They are areas in shape of a polygon in which all points are mutually visible to each other. (Hillier and Hanson, 1984) For devising the graph, convex spaces in the map are converted into the nodes of a graph and their connections are converted into edges of a graph. According to Peponis and Wineman (2003), variation in floor level and ceiling height may withal be treated as vertical boundaries like walls. In addition, some researchers utilized the function of a room as the social boundary to define a space entity. Convex map graphs are acclimated to investigate the configurationally relationships between rooms. (Dawes and Ostwald, 2013a). Since the largest spaces which are fewest in number are considered for a convex map, this approach is best felicitous for building interiors.
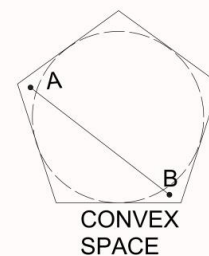

Fig. 1. Convex space

A. Axial Space

Define abbreviations and acronyms the first time they are used in the text, even after they have already been defined in the abstract. Abbreviations such as IEEE, SI, ac, and dc do not have to be defined. Abbreviations that incorporate periods should not have spaces: write "C.N.R.S.," not "C. N. R. S." Do not use abbreviations in the title unless they are unavoidable (for example, "IEEE" in the title of this article).

B. Primal Axial Map Graph

It shows the behavioral characteristics of spatial settings and shows the ideal paths of movement within a space (Bafna,

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2003; Dawes and Oatwald, 2013a). But the geometry of building spaces is neglected in primal axial mapping.

C. Dual Axial Map Graph

It is the inverted version of primal fewest lines graph and is termed as dual (Batty 2004). The intersections in this approach genuinely represent a precise spot in the space by representing the segments of axial lines which annex the intersections.
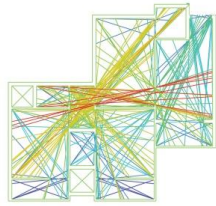
AXIAL LINE MAP
Fig. 2. Convex space

D. Isovist Mapping

Each point has a unique visual property in space due to its unique geometrical relationship with its surrounding. In the floor plan, a unique property of each point is the area visible and accessible from that point this area is termed as isovist (Benedict, 1979). Considering each point is quite impractical due to which space is articulated into a fine grid. A graph is then developed with the cell as its nodes and the existence of visibility between cells as its edges. The visibility graph analysis reveals the properties of the points in space. These include enclosure, compactness and trans-visibility and visual control. The visibility graph is essentially derived from a defined area. It is consequently suited to building interiors. (Dawes and Ostwald, 2013a)
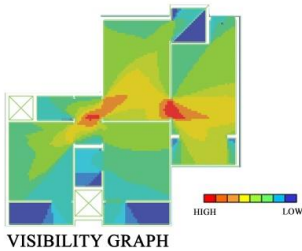
VISIBILITY GRAPH
Fig. 3. Visibility Graph

E. Depth

BUILDING STRUCTURE
GEOMETRY

SPACE STRUCTURE
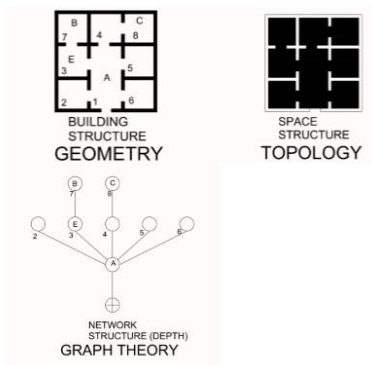TOPOLOGY

NETWORK STRUCTURE (DEPTH)
GRAPH THEORY

Fig. 3. Building Structure

The direct connection between nodes defines the state of their adjacency. From this property, the shortest possible path between the nodes can be defined as depth. Most topological measurements such as mean depth, integration, and centrality are based on depth value.

III. SUMMARY

Space syntax theory consists of different techniques. These techniques consist of a variant of standard measures. Few of these techniques are felicitous for building spaces whereas others are more felicitous for urban spaces. The techniques have a similar procedure where the 3d architectural spaces are abstracted, quantified and interpreted. But these differ in detail procedure. With the varying purpose of analysis, the abstraction of spaces differs.

IV. CASE STUDY

A. Case I

The four-story architect's office building 'Manish kumat design cell' is located in Indore. The staircase and elevator are accessible and visible from the entrance of the building. Core located nearest to the main entrance provides more private space to other building parts. The design studio and principal architect's cabin are located on different floors. The design studio has been organized in an open plan arrangement which provides high flexibility. The Separate meeting room has been provided at each floor.

1) Observations and Questionnaires

The exterior of the building doesn't have the necessary coordination with internal organization. The route from the entrance to the staircase is strong and legible, which provides good visibility. For the visual access to the upper floor of building open space is provided on the second floor. The result of the employee questionnaires shows that they are satisfied with visibility and interaction with colleagues. They were provided with sufficient circulation space. The office had ample space for interaction between employees. Only because of the location of head architect cabin on other floors they didn't have many informal interactions with him. But the client's perspective is quite different from it. The main entrance of the building was confusing. There was no waiting area for them on the ground floor. Next direction to the main architect's cabin was selected as a major problem. According to the clients, the entrance, the exit, the stairs, and the elevator are the most recognizable parts of the building.

2) Space syntax analysis

Based on visual analysis graphs the most integrated areas are stairways and elevator. The visibility, connectivity, and integration are strong from the route of entrance to the staircase. Axial map analysis shows the connections and visibility of spaces. Warm tones show high visibility whereas cool tones for poor visibility.

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Fig. 4. Axial line map and depth

B. Case 2

Another case study was done of 'Design Avenue' of Ar. Sachin Paliwal. The office is situated on only one floor. This study is subsequently different from the previous case in area, size, and method of a circulation system.

1) Observations and Questionnaires

Due to the small size of the building, less complexity and location of all parts at one floor, there is no complicated way finding challenge. The results of employee questionnaires show that there is not much place for informal interaction. Circulation was easy but due to the location of the main architect's cabin at the end creates a disturbance for employees during working hours. From the results of the client's questionnaire they were satisfied with the way finding. Since space where not complicated it was easy to find the architects cabin.

2) Space syntax analysis

Based on visual analysis graph the most integrated area is near the entrance. The movement and visibility are strong from the entrance to the main architect's cabin
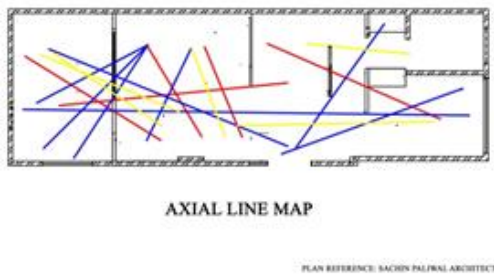

AXIAL LINE MAP

PLAN REFERENCE: SACHIN PALIWAL ARCHITECT
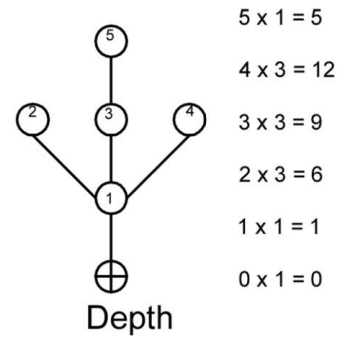
Fig. 4. Axial Line Map

Fig. 5. Depth

V. Conclusion

Space syntax analysis identifies movement, visibility, integration of space. In a literature review of space syntax theory comparison of different techniques showed their importance in the analysis of building spaces. Since in office building the perspective of both employee and client is required the relation to the building for them is important. Since the aspects were physically scaled threw space syntax theory it was more helpful for designing according to these two groups. Space syntax theory can be a helpful tool for designers. It can help them analyze their design. In this study space syntax theory was used as the measurement to understand circulation and visibility of building. It helped in understanding how people use the spaces.

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