

Designing a Responsive Architectural Module for Endangered Community

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Abstract

In the primitive era, man used to search for food and shelter, encountering the ever prevailing forces of nature and wildlife. Gradually, when these needs had met, he grew a hunger for power that ignited the current war situations; affecting climate and nature. Thus raised the question of security for mankind. This study is based on literature studies and comparative analysis of diagrams and systems that aim at improving the socio-economic conditions of endangered communities under constant risk of war, environmental pollution, wrath of nature etc. The purpose of the study is to analyze and design a module based on a responsive, resilient and sustainable wireless technology; ensuring safety for the people of a community; irrespective of time, place and climate.

Keywords: *Responsive Architecture, Resilient, Sustainable system, Scalable, Wireless technology.*

1 Introduction

The first few things that a person need to survive are: food, cloth, shelter, education and medicine.^[1] These are the basic human needs. Among these, food and shelter is indispensable. Without food and potable water a person cannot survive. Immediately after that, in order to secure himself from wildlife, harsh sun, freezing breeze, blazing rain, blinding sand storm; a person needs a shelter.

When a person moves into a new place, he looks for a safe shelter for himself at first out of his need of security of him. According to Maslow's "**Hierarchy of needs**"^[2] we can state that, after one's biological and physiological needs (such as: air, food, water, rest etc) are fulfilled, his first priority becomes security; which includes the need of a safe shelter, with job security and many more.

The aim of this study is to design a responsive architectural module for endangered community, that is suitable irrespective of time, place and people. Responsive architecture refers to architecture that responds and adjusts dynamically to the current needs. These circumstances are often unpredictable, such as : war, natural calamity, radiation etc. It responds to the external stimuli and develops thereby. A responsive architecture is that one, which is accessible to everyone and meets the needs of its users. Achieving such a goal requires an interdisciplinary approach involving modern technology, bio-engineering, science, social science etc.

Responsive architecture system is a vision of architecture that evolves from inanimate and immovable and transforms it into adaptive and responsive. The objective is to assure complete freedom of its users. As well as an ability of functioning in the world irrespective of time, place and people. History has been molded by highly unlikely phenomena. An ability to react to them is both a fundamental feature of every living organism and a criterion of life in general.

Responsiveness refers to the specific ability of a system or functional unit to complete assigned tasks within a given time.^[3] **Resilience** or **elasticity** refers to the ability of something to return to its original shape after a damage or change, or something that is capable of recovering quickly.^[4] **Sustainability** refers to a system that does not completely use up or destroy natural resources and last for a long time.^[5] **Scalability** is the capability of a system, network, or process to handle a growing amount of work, or its potential to be enlarged in order to accommodate that growth.^[6]

3 Methodology

The study is based on theoretical analysis and literature synthesis to aid the solution of the current socio-economic security problems prevailing in the society. It is based on a qualitative research method.

4 Concept

On the basis of above discussions, we can see that, once human grew his need of power; conflicts and restlessness began. Thus grew the need of security. Society emerged thereby to serve this need.

Comparing several existing urban land use models and urban planning theories, a conceptual zoning diagram is planned. The concept is to compare the module with an Egg, "One safe community under one shell". The "Yolk" shall be the "Social Hub", the "Protein layer" resembles the "Service Zone" and the "Shell" represents a technology based "Security system".

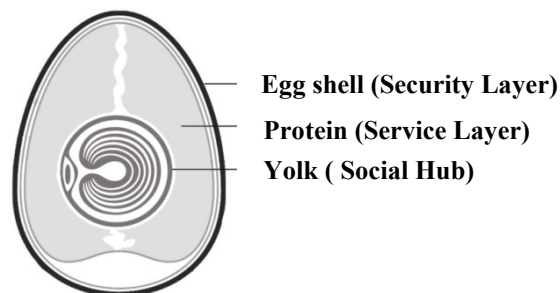


Figure 1. Concept generation

5 Analysis

The analysis is based on the study of several urban models such as: Concentric zone model, Sector model, Multiple Nuclei model, Garden city movement and Neighborhood unit model.

a) Concentric Zone Model (1923): A Chicago based theory by Burgess, which is the first model to give explanation about the distribution of social groups within urban areas in a series of rings with a central business district (CBD) in the center.^[7]

Strength:

- i) Correlation of socio-economic status of people.
- ii) It has a distinct focus of all activities; the CBD.

Weakness:

- i) Does not take into account the physical barriers. Such as: topography, street pattern etc.

b) Sector model (1939): The sector or the Hoyt model, is a Chicago based model, where the social groups are arranged around a series of sectors or wedges radiating outward from the CBD and centered on major transportation lines.^[8]

Strength:

- i) Different area attract different area of activity.
- ii) Centered on major transportation lines.
- iii) Importance on transportation line. Thus improving communication system.

Weakness:

- i) Theory is based on 20th century.
- ii) Does not take into account cars.

c) Multiple-Nuclei Zone Model (1945): A model specially for North America by Chauncy Harris and Edward Ullman, depicting urban land use; where city grows from several independent points or nodes; then merge into one single urban area.^[9]

Strength:

- i) Allows suburbanization, transport development and formation of a large city.
- ii) Reduces pressure on CBD. CBD is not the only generator.
- iii) Specialized and strong regional centers.

Weakness:

- i) Internal heterogeneity instead of homogeneity.

d) Garden City Movement (1898): It is a method of urban planning by Sir Ebenezer Howard in the United Kingdom. Garden cities were intended to be planned, self-sufficient communities surrounded by "greenbelts"; that would house 32,000 people on a site of 6,000 acres. When it reached full population, another garden city would be developed nearby and create a cluster in satellite pattern having a central city of 58,000 people, linked by road and rail.^[10]

e) Neighborhood Unit Concept (1900): The model was conceived as a comprehensive physical planning tool, to be utilized for designing self-contained residential neighborhoods which promoted a community centric lifestyle. The model is for a population of 5000-9000 people based on a principle of centering the school; dedicating 10% land to park and open space and using arterial streets along perimeter to define and distinguish place from neighborhood. Designing and using the internal streets to distinguish between streets.^[11]

6 Design

The functions of the module shall be arranged sequentially in an outwardly growing radial pattern. Where the central gathering space, the CBD and the residential zone together forms the Social Hub; the service zone, transitional zones and the industrial zones together forms the Service layer, finally the Security layer in the periphery to ensure safety to the module. The connection between the modules for growth shall be done by satellite, star, ring pattern or combination of these patterns. The main streets shall be laid in radial organization respecting topography and necessity, ensuring growth and flexibility of the module.

- i) **Central gathering space :** Green space, water body, a socially, culturally or religiously congregational space. Such as: Amphitheatre, plaza, museum, park, lake etc.
- ii) **Central Business District (CBD):** Banks, Offices, restaurants, markets, theatre, shops etc.
- iii) **Residential Zone**
- iv) **Service Zone:** Hospital, health and educational institutes, police stations etc.
- v) **Transitional Zone**
- vi) **Industrial Zone**
- vii) **Second Transitional Zone**
- viii) **Security layer**

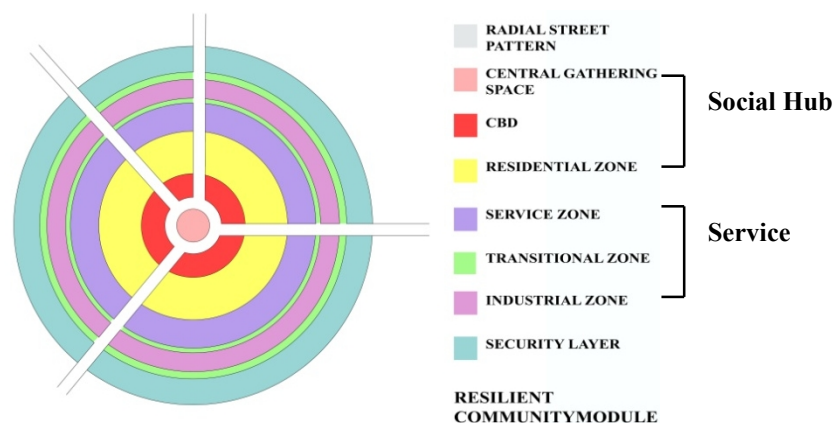


Figure 2. Resilient Module for Endangered Community

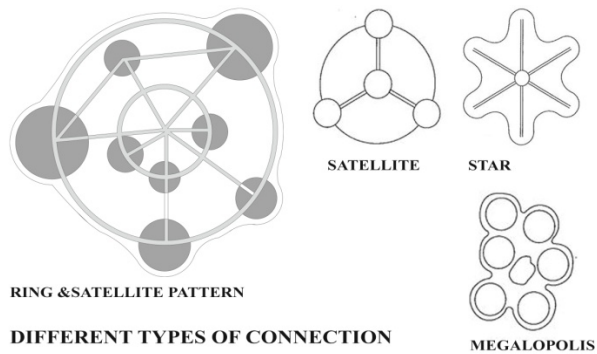


Figure 3. Different Types of Connection Among the Modules

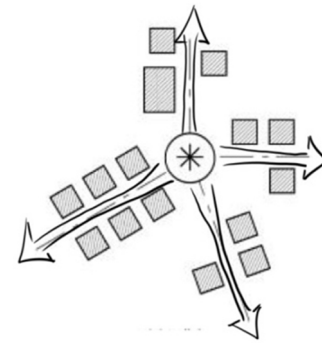


Figure 4. Radial Organization

7 Scale:

According to the Garden City Movement, the central city shall have a population of 58,000 people and the surrounding garden cities have 32,000 people in. The core having an area of 4square km and the reasonable distance to find a new city is 7 km for well connection.

An upgraded study on this topic shows that the optimum size of a neighborhood should be 1200 to 2000 people (300 to 500 families). 5 such neighborhoods shall construct a village of 12,000 to 20,000 people (3000 to 5000 families) and each town should have an optimum population of 1,25,000 people.

The central gathering space shall have a radius of maximum 450 feet (maximum distance for discerning action). So that people moving by that place shall have a visual connection with the people of that space always.

The internal streets that link the houses shall have a width of 12 feet to 20 feet; so that people of both sides of the road can still have a conversation whenever they see each other. Which shall strengthen their social bonding, because 10 feet is the range of conversational distance and close relation. Again, people can recognize face upto 40 feet distance.^[12]

8 Strength of the model:

i) **Security:** Keeping the social hub in the center and providing multiple layer outside of it, consisting of several security layers; the model is made safe and secure from calamities, intruders etc. Again, using every corner of the community constantly prohibits the formation of crime zones. Each module has a security layer in its periphery, when multiple modules are connected with each other; another security layer is added on the peripheral area.

ii) **Scalable:** The model is made scalable by using radial organization for the street pattern and organization of forms; which is fit for growth in any geographic pattern. By using satellite and star pattern for connecting multiple modules to form a larger city or country.

iii) **Resilient:** This model can withstand instant harsh effects of calamities or intruders, with the help of its multiple security layer and several transitional zone in each module. The central social hub, where people resides, shall have enough time to withstand the attack. Again, when several modules are combined into one, having a continuous security band in the periphery and internal security system of themselves, shall be able to resist any intrusion. When one module lacks resource or requires any kind of support, other modules can help it recover from the loss. This way, the module is resistant to any adverse effect and can ensure quick recovery.

iii) **Communication and Sustainability:** A central gathering space having an open space, religious or culturally important space at the center. So that the CBD is never an unused or dead place, and have visitors at any hour.

iv) **Socio-cultural development:** Having a culturally important place at the center enhances the socio-cultural development of the community, improves communication of users.

v) **Socio-economic development:** Since the CBD has visitors in the local markets, restaurants, theaters etc. at

any hour; land is constantly under use. Which increases land value and allows circulation of money every moment, improving economic condition thereby.

9. Opportunity: When several modules are connected with each other, each of them can become a specialized zone for a specialized function, yet being self-sufficient. Thereby, multiple community can form a city, and such similar cities can form a nation, federation etc like the Multiple-Nuclei Zone model. These modules when combined into one, may have several varieties, yet have unity among them.

10. Conclusion: The designed module is an improvement of previous models of this kind; which were mostly based on a certain area and effective for a certain time period. Whereas, this resilient module can be used anytime, anywhere. It shall play a vital role in providing a flexible, sustainable community to the future generation.

References:

- <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/6616.pdf>
- https://en.wikipedia.org/wiki/Maslow%27s_hierarchy_of_needs
- <https://en.wikipedia.org/wiki/Responsiveness>
- <http://www.merriam-webster.com/dictionary/resilient>
- <http://www.merriam-webster.com/dictionary/sustainable>
- <https://en.wikipedia.org/wiki/Scalability>
- https://en.wikipedia.org/wiki/Concentric_zone_model
- <http://isites.harvard.edu/fs/docs/icb.topic1050993.files/2-15%20-%20Ernest%20Burgess%20-%20The%20growth%20of%20the%20City.pdf>
- <http://www.dustinstoltz.com/blog/2015/12/02/burgess-concentric-zone-model-of-urban-development>
- https://en.wikipedia.org/wiki/Sector_model
- https://en.wikipedia.org/wiki/Multiple_nuclei_model
- <http://file.ebook777.com/021/MasTheAdaCitComUrbInTheTweCen.pdf>
- https://en.wikipedia.org/wiki/Garden_city_movement
- https://en.wikipedia.org/wiki/Neighbourhood_unit
- Ebenezer Howard, "To-morrow: A Peaceful Path to Real Reform"
- Ernest Burgess, Chap. "The Growth of the City : An Introduction to a Research Project" (1925), Vol. "The City"
- Francis D.K. Ching, "Architecture: Form, Space and Order", 3rd edition
- Karen Lewis, Terry Schwarz, "Diagrammatically : Urban Infill", (Vol.5)
- Kevin Lynch, "The Image Of The City"
- Paul D. Spreiregen, " The Architecture Of Towns And Cities"
- Tom Verebes, Master planning the Adaptive City : Computational Urbanism in the Twenty-First Century