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# Simulating Library Visitors' Experience for Comfort Building Design

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## Abstract

A library is often displayed in spaces originally not designed to be an academic support center. Thus, is common for the library to fail to adequate lighting display conditions, ergonomic space for books, and visitors' mobility comfort. As the potential of education infrastructure visitors demand higher standards for the beauty landscape and more exploring sources of natural lighting. In order to objectively assess if a library meets the required standards it is necessary to establish a proper evaluation method. This study proposes a novel procedure relying on visitor suggestion data and dynamic mobility metrics. The procedure, which considers both education and visitors' needs, can provide librarians with scientific, repeatable data. The validity of the procedure is simulated through its application in a case study: the library is in Rantau, tapin regency, south Kalimantan of Indonesia. The simulation results show that the proposed design can be useful in buildings to effectively control air circulation and improve visual comfort mobility. These simulation data can help librarians, contractors, and building management screen out potential improving until the most adequate.

Keywords: Library, Infrastructure, Simulation, Education, Visitors.

## 1. Introduction

Modeling visitor comfort design involves simulating human behavior, sustainability, spatial layouts, and health issues (Serina Chang et al., 2020). Modeling simulations are helping to predict the ways in which people interact with their designs and operational efficiency during the early stages of design (Mourtzis, 2019). In academia and industry, model-based simulation is increasingly being used to assess user experience and test the effectiveness of building designs (Madni et al., 2019). To achieve the visual comfort of an environment, which has an impact on people's mental state and psychological feelings (Godithi et al., 2018). In particular, places of public study like libraries, demand a comfortable atmosphere that can lift people's spirits and improve work efficiency.

Libraries play an irreplaceable role in learning, work and life for university teachers, students and community members. Modern libraries usually choose fully transparent floor-to-ceiling windows to meet the lighting needs and the aesthetics of the building's façade (Jiao Xue et al., 2021). Mostlibraries designers and architects have introduced distinctive daylight control strategies by environmental friendliness, and effective interior design with pleasant in long-time for visitors. Moreover, the public library should be a provide access to resources dispositions of reading, learning hub to inspire independent learing or research and support the common formal or informal curriculum (Morgan, 2020).

However, in the last decades libraries are no longer seen as a main source of knowledge. In additional, COVID-19 outbreak in last 3 years accelerate availability of the internet and the digitization of the resources affecting the function of libraries nowadays (Rafiq et al., 2021). Furthermore, current growing generation use a lot of communication technology ICT on a daily basis can have a global library on the device connected to the internet (Gamage et al., 2020). All these conditions suggest that, it is important to--design the libraries transitioning from storage of books to supporting learning environtment. Therefore, community perspective are more important than ever to promote libraries as places of production with the health of human circadian rhythms.

In this present study, the visitor opinion, and assumtion experience about comfort a library will be extract and finally design into a new simmulation model. The design principles, the form-giving, and the spatial configuration of the projects constitutethe main themes that are to be investigated. The main factors that determined the composition of the project are examined, in parallel with the corresponding libraries concept stage.

## 2. Literature Review

Public libraries are at a major crossroads in terms of space. Libraries today are expected to do more and more different things while maintaining their traditional functions in the coming decades as collections and resources are digitised. Nowdays, libraries used as cafés and host community groups. It is a highly successful public meeting place and children's play space, and contains an important set of resources for local residents. Obviously, they cannot be all things to all people but library space will need to be new direction.

Some interesting relationships have been found between space use and space quality. Beckers et al. (2016) suggested that libraries need to provide at least two types of space to support individual study: busy, open space and quiet, closed space. Students use spaces that can better support their learning activities between the spaces for individual study and collaboration (Hong et al., 2021). These studies demonstrate that in an academic library, there are many spaces with different space qualities that are related to space design and planning in terms of their function, aesthetic appearance, furniture, geometry, window view, etc. Although such studies-

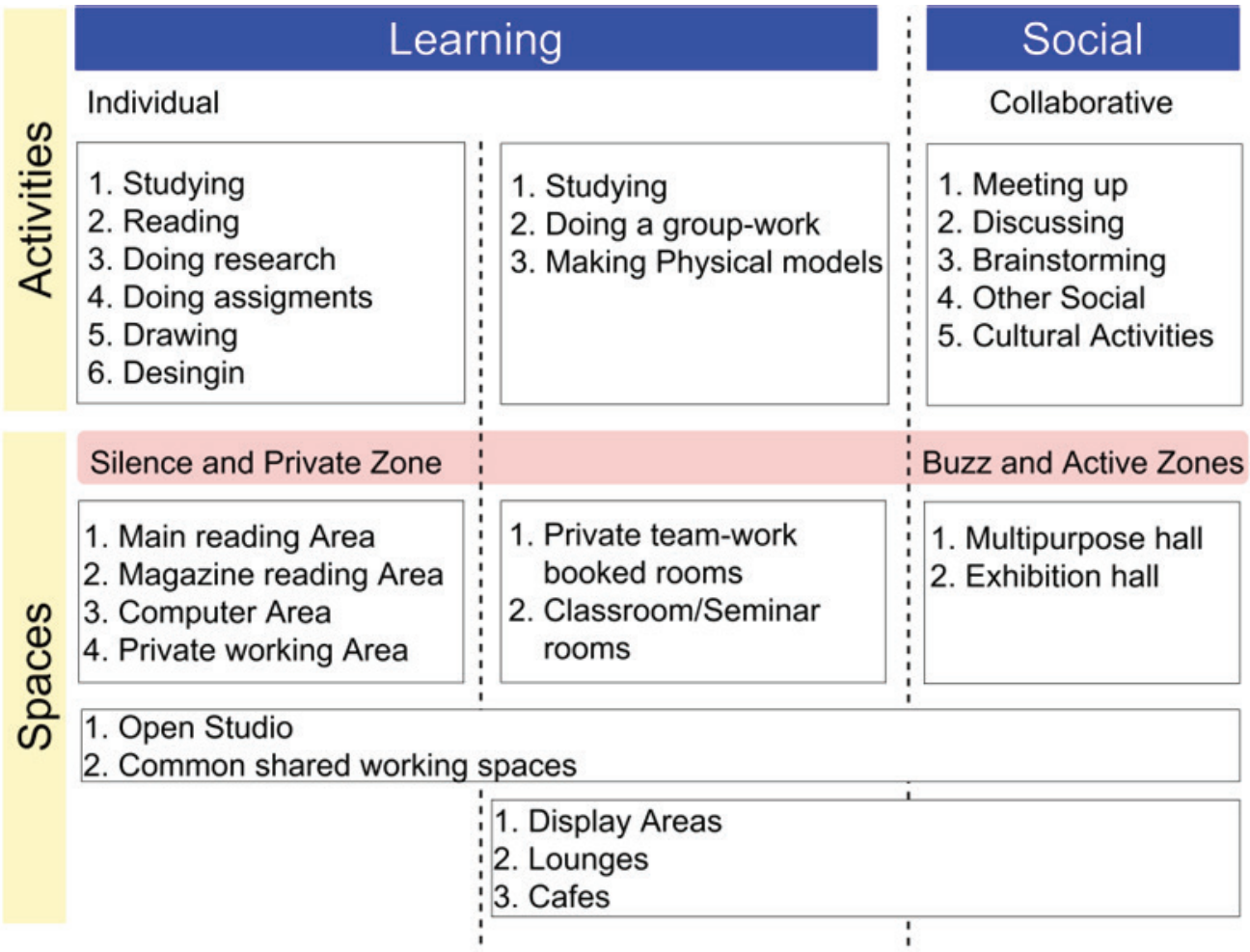



**Figure 1. Range of activities and spaces in a library environment (Lotfy et al., 2022)**

-provide useful information on library space use, little is known about which attributes of the physical space determine students' spatial choices in a library in a comprehensive manner.

One of the most significant elements toward achieving a successful place attachment between students and library spaces is adapting the architecture school library design to meet the public study needs. A study conducted by Abowardah and Khalil (2019) determined the main zones required to encourage the visitors' engagement with library spaces and to enhance the visitor's sense of place attachment in a library. These main zones are individual reading and studying zone, group workspaces, printing zone, open studios, magazine reading areas, model display areas, and open computer labs (Lotfy et al., 2022). In the graph below Figure. 1, the main zones required in-the public library are determined and classified according to different learning activities and uses needed in a formal or informal education environment.

## 3. Method

The data collection and analysis approach involved observation using the proposed checklist as well as an electronic survey conducted among the visitors to explore the suitability of experience library spaces to fulfill their needs. In the end, all factors are transformed into a design simulation with autocad 2d 2017 and sketchup 2021 enscepa render.

### 3.1. Overview of Problem Solving

Space grouping based on activity and work. Grouped into three zones in the library to support and provide convenience for users and library managers.




**Figure 2. Organization diagram**




**Figure 3. New activity patterns in the library**

## 3.2. About Libraries

### 3.2.1 Public Libraries

A library is a collection consisting of written, printed and other graphic materials such as films, slides, LPs, tapes, in a room or building that is regulated and organized in a certain system so that it can be used for study, research, and reading.

### 3.2.2 Digital Libraries

A digital library is a library that has a large collection of books in digital format. This book can only be accessed by computer. This type of library is different from the conventional type of library which is a collection of printed books, micro films (microform and microfiche), or a collection of audio and video cassettes. The contents of the digital library are on a server computer that can be placed locally, or at a remote location, but can be accessed quickly and easily via a computer network.

## 3.3 Design Method

Changing the library's linear pattern where visitors usually come, read, then go home. So, coming later can do any activity in the library. Creating a flexible and flexible visitor circulation pattern for activities and activities in the library. These activities are group work, eating, even listening to audio first when coming to the library. The goal is to make it comfortable to come to the library and there is no compulsion for visitors to--immediately read books when they arrive at the library. The goal is to make reading a non-monotonous activity in the library.

### 3.3.1 Location and Place

The location is in Rantau, Tapin Regency, South Kalimantan. The study site is the block D area which occupies a location to the north of the planned area with an area of approximately 99.2 Ha. Block D which is developed for recreation, worship, commercial buildings, offices, town squares, settlements.

Determined based on strategic location and has potential, namely the land is located in the city center with a high level of crowds and adjacent to Lake Siring in the form of a city park area. This situation will make it easier to reach and attract the interest of the local community. The library is often known as a rigid, formal and boring place so it is necessary to change perceptions. Later, the library is not only a place for reading activities but also a place for other activities including gathering, recreation and relaxing.

Site adjacent to Lake Siring Jl. Ahmad Yani, North Tapin District, Tapin Regency which has a nice view of green open space. This place will later become the center of the new City Government that has been planned by the Government.

Access to achievement is quite good, because it is close to educational facilities. This place-

-is the biggest potential source of visitors. Activities around the site are quite busy because there are several recreational and commercial facilities around the site. Has 2 different access roads, namely from Jl. A. Yani and Jl. Datu Suban so as to provide an alternative for easy access. The site is located on a busy road that many people pass.

Between the main entrance and service access points are separated to avoid interference from service activities to visitors. Likewise with exit access, service exit accesspoints are kept away from public access, both in terms of placement and visually. Service circulation is placed far from-the roadside to reduce visual contact. While the public circulation is placed adjacent to the main road.

## 4. Results and Discussion

### 4.1 Programmatic Concept

Based on the problems in the design. This library strives to be able to make visitors comfortable and can accommodate visitors in their activities in the library. Then the concept of metaphor is applied which includes Iconic, Space, Building, which can form a Character that makes this library find Visual and Comfort.




**Figure 4. Existing review and achievements**

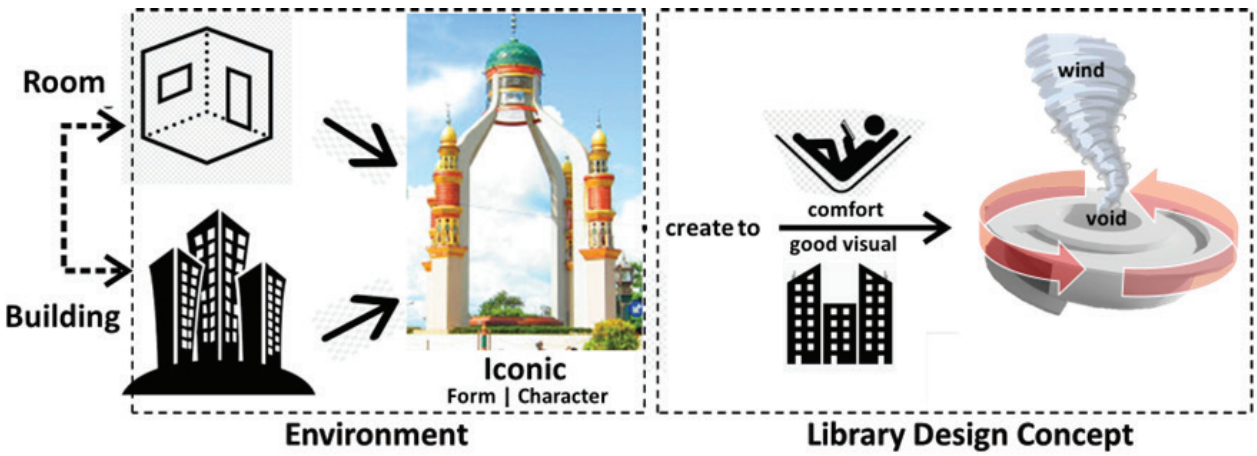



**Figure 5. Programmatic design concept**

### 4.1.1 Mass Pattern

The pattern of building masses is one of the important things to see a circulation and flow in a design. It looks good or bad, with a stable mass setting. This arrangement can give a comfortable impression and make it look easier to achieve access. The arrangement of the mass of outdoor space between buildings and vegetation will be formed in a balanced way to create a fresh and healthy outdoor space. Then the mass is formed based on the nature and organization of space which is arranged to facilitate the achievement between spaces.

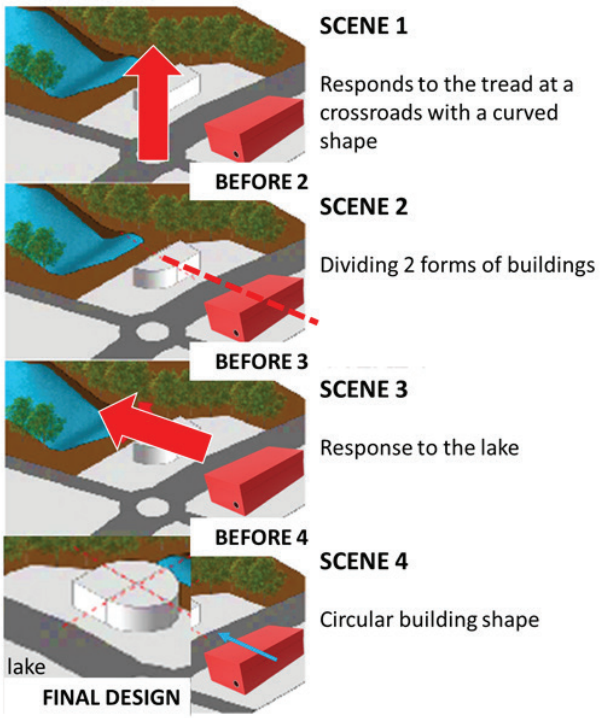



**Figure 6. Space relations and functions simulations**

### 4.1.2 Zoning

The concept of dividing zones in outdoor space based on their functions, activities and designations. The public zone starts from the parking area, garden, reading area and lobby, circulation as well as main room and support room. The semi-public zone is in the form of a management area, as well as spaces specifically used for library administrators. Zone division to clearly emphasize the function of activities and reduce noise generated in the main room forspaces that require low noise levels.

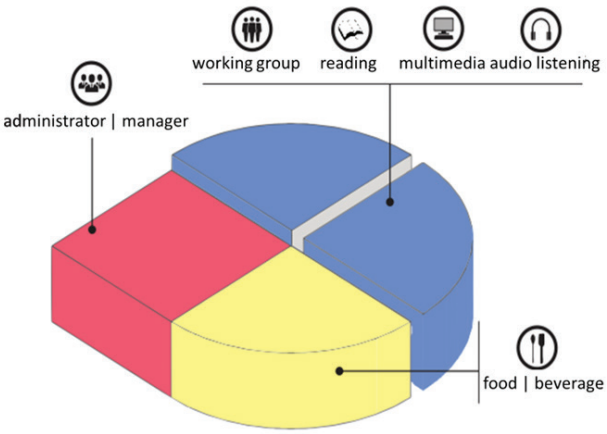



**Figure 7. Building zoning patterns**

### 4.1.3 Interior Concept

The interior with the concept of an open space will add a more comfortable impression to visitors, made open so that it becomes a differentiator from other libraries which are always monotonous with closed reading areas and artificial ventilation, plus small trees around it adding fresh air to visitors.

Not only is the interior open but still using a closed interior, to display more privacy for visitors and readers, but with a different concept. Readers still feel comfortable with the facilities in the library. Tables and chairs are made as comfortable as possible for visitors to feel more comfortable.

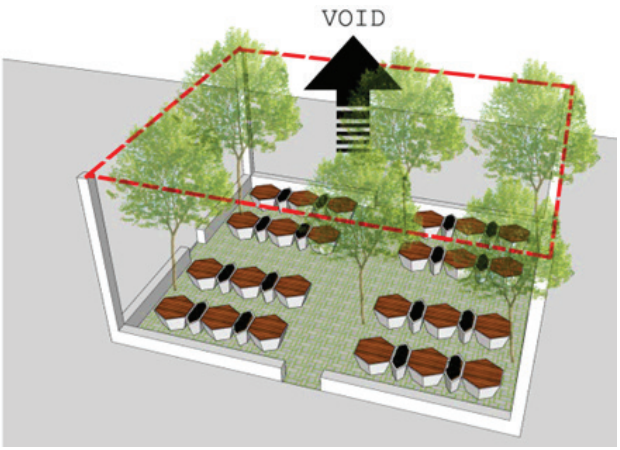



**Figure 8. Open space interior**

### 4.1.4 Eksterior

The exterior is an important part and element to attract visitors to come and see what is in the building, therefore the exterior-

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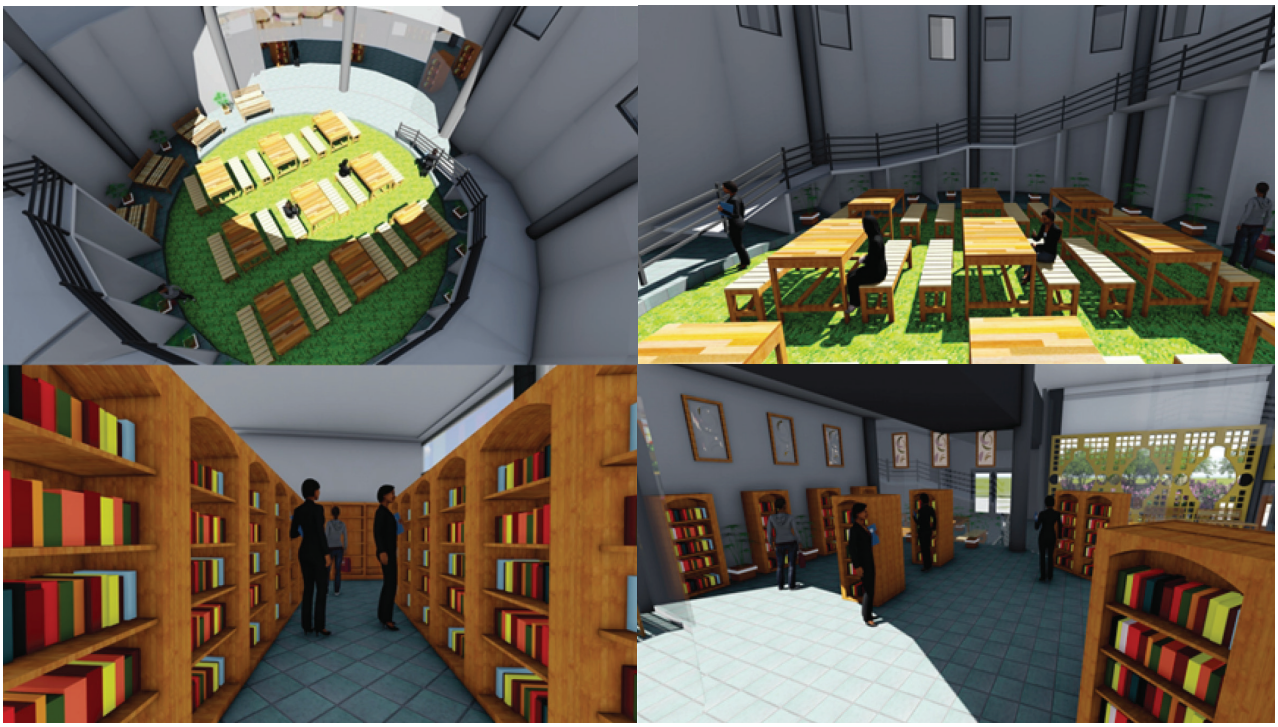


**Figure 9. Interior simulation with circular shape combinations**

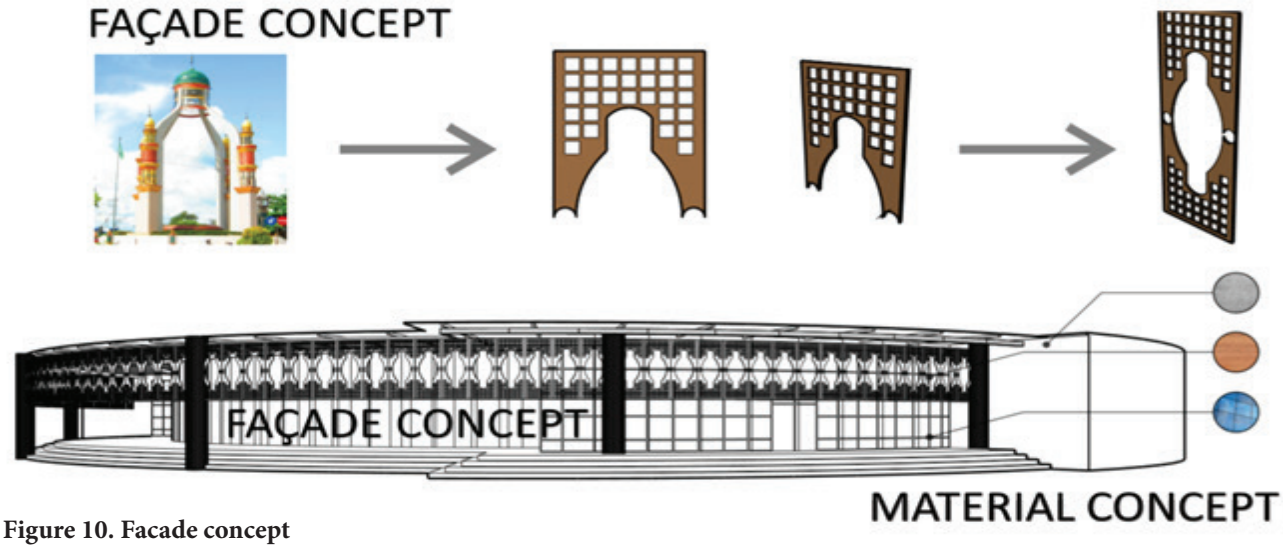



**Figure 10. Facade concept**

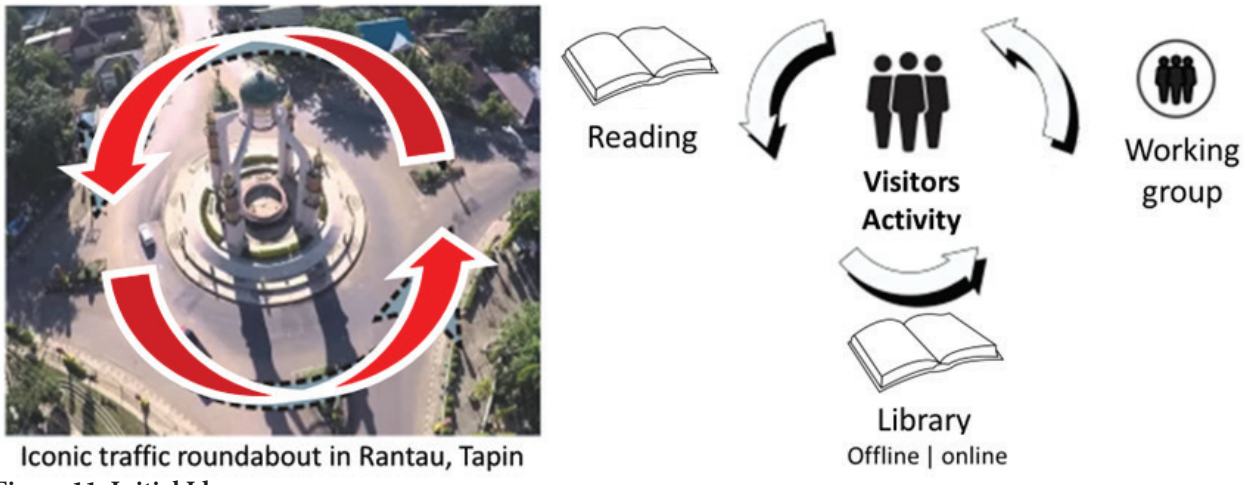



**Figure 11. Initial Ideas**

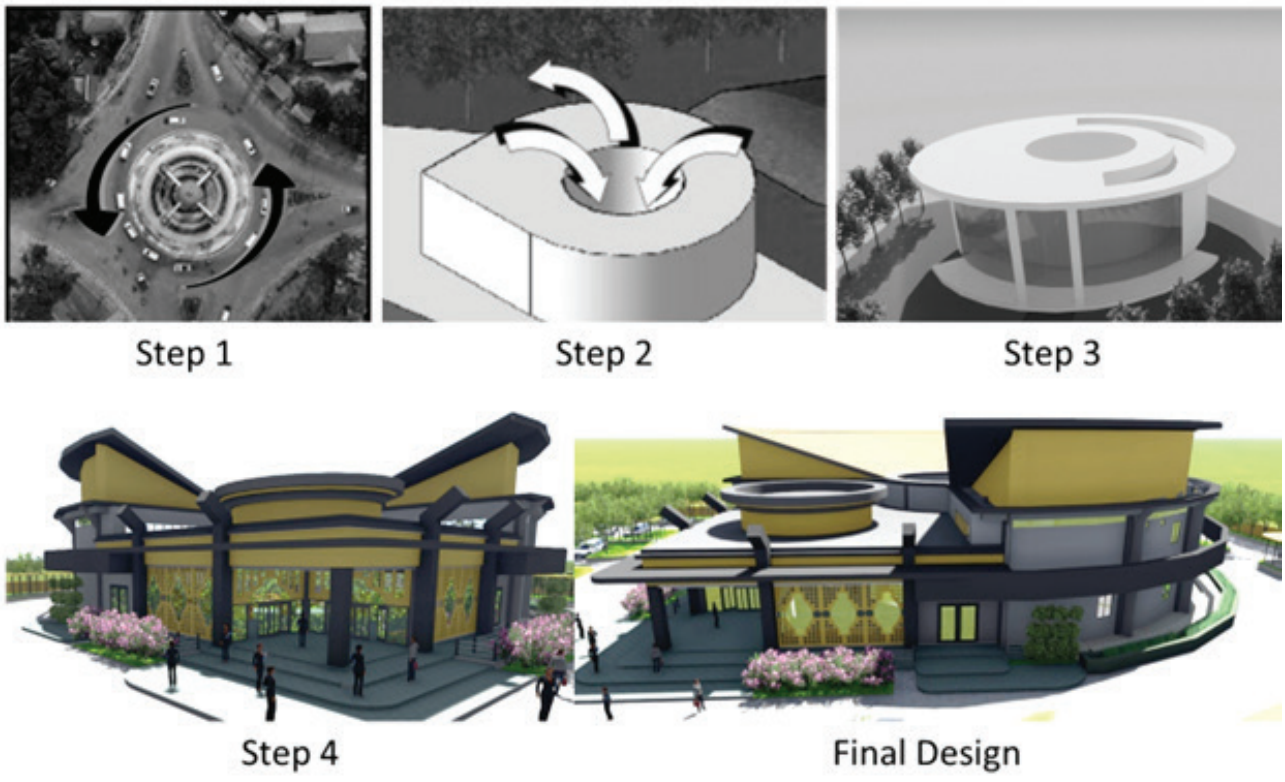



**Figure 12. Building circulation patterns and perspective simulations**

-must feature a design that can captivate everyone who sees it. The initial idea in the library is in the form of reviewing the best reading patterns in the form of learning that does not need to use only one theory. It is assumed that visitors can pick and choose the best from all activities or activities in the library. Likewise with room conditions, such as indoor and outdoor which can be used at the same time if needed. This concept will support the convenience of library visitors.

Interactive Strategy Models and spatial schemes that provide directions for readers to find and build their own meaning of learning based on their wishes.

## 5.Conclusion

Libraries in Rantau use problem-solving methods by raising elements of activity within the library itself to create a comfortable library concept for visitors by paying attention to the activities in it and then translating it into circulation, form and spatial atmosphere. Then the concept of metaphor is applied which includes Iconic, Space, Building, which can form a Character that-makes this library find Visual and Comfort.

The pattern of building masses is one of the important things to see a circulation and flow in a design. The arrangement of the mass of outdoor space between buildings and vegetation will be formed in a balanced way to create a fresh and healthy outdoor space. The semi-public zone is in the form of a management area, as well as spaces specifically used for library administrators.

The interior with the concept of an open space will add a more comfortable impression to visitors. Readers still feel comfortable with the facilities in the library. The exterior is an important part and element to attract visitors. The initial idea in the library is in the form of reviewing the best reading patterns in the form of learning that does not need to use only one theory.

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