

Designing for Behavior: Architectural Approaches to Market Revitalization in Binjai**Muhammad Billi Kautsar Lubis*¹ , Wahyu Abdillah*¹ **¹Departement of Architecture, Faculty of Engineering, Universitas Sumatera Utara, Medan, 20155, Indonesia

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Abstract (English)

The cleanup of regular markets requires a strategy that looks both at practical aesthetic and functional aspects, as user behavior. This paper give insights on how behavior-based architectural perspective could be utilized in designing markets for improved user experience and operational efficiency. The user behavior analysis technique was instrumental in explaining how users interact within the market environment and their needs using case study methods. The results of the analysis fed into the design of solutions which answer behavior patterns. Results show that incorporating behavioral psychology aspects in constructing markets not only enhances the comfort and efficiency of built environment but also add value, appeal and sustainability to an urban market. It provides a base for further understanding the application of behavior-based architectural guidelines in market revitalization during design process investigation which would be useful to researchers and designers who wish to create more humane adaptive environment.

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behavioral architecture,
market revitalization,
behavior-based design, user
experience, operational
efficiency.

1. Introduction

The revitalization of the traditional market is necessary, more so for those markets located in central and strategic urban areas with visits running into hundreds of thousands. This paper discusses the revitalization of a Grade A market in the city center of Binjai, which has many visitors. It was historically busy, but then some factors have made it no longer so; that includes a fire breakout as a result of negligence by the occupant. The incident epitomizes the most critical need, that was to work on the behavioral aspects of market usage.

More so, the current state of the market is degraded with problems such as undisciplined user circulation, vendors outside scheduled selling places that cause congestion, and the wet and unsanitary conditions of the meat-selling areas. These call for comprehensive design in re-designing the market environment.

An architectural approach to behavior-based design is of particular relevance to this project because markets inherently accommodate a wide variety of human behaviors. Good marketing design ought to provide careful consideration regarding how best to regulate, as well as facilitate, movement and interactions by users. By organizing vendor areas according to the types of goods sold, the design can guide customers through a clear, logical shopping path, enhancing their overall experience.

This market has high potential, being a Grade A market and the most significant market center within its region, thus drawing in shoppers from the surroundings. In understanding user behavior, therefore, this study forms the primary objective to enhance comfort and efficiency in the market environment. This research will aim at solutions to eliminating the present disorder and enhancing functionality with an improved appeal by incorporating behavioral insights into architectural design. It proposes valuable guidelines to architects and urban planners while undertaking projects related to market revamping, and thus, such redesigned spaces remain helpful to vendors and customers alike.

2. Literature Review

2.1. Design

According to William A. Shrode (1974), "Design is a means to transform perceptions of environmental conditions into meaningful and orderly executable plans." Paul Davidov (1982) states that "Design is a process for determining appropriate actions for the future through systematic choices."

2.2. Traditional Markets

According to Rahmad Widiyanto in his book *Indonesian Culture* (2009), traditional markets are markets that develop among local or indigenous traders with the community. Traditional markets exist because of the community's need for a place to sell their produce.

Based on Presidential Regulation No. 122 of 2007, traditional markets are markets managed and established by local or central governments, state-owned enterprises (BUMN), regional-owned enterprises (BUMD), and private entities. These markets consist of shops, kiosks, stalls, and tents, which are managed or owned by small, medium-sized traders, community cooperatives, and cooperatives that conduct buying and selling processes through bargaining.

2.3. Binjai City

Binjai is a city located in North Sumatra Province. Binjai has long been known as a trading city due to its strategic position on the Sumatra highway, which connects various districts and cities in North Sumatra with the Aceh Province.

2.4. Behavioral Architecture

JB. Watson (1878-1958) opined, "Behavioral architecture always includes behavioral considerations in the design process. The relationship between behavior and architectural design (as the physical environment) in its application is such that architectural design can act either as a barrier to behavior or as a facilitator of behavior."

3. Methodology

3.1. Observational Studies

The market exhibits high activity levels daily, especially during national holidays such as Eid al-Fitr, Eid al-Adha, and other significant religious events that necessitate increased food supplies. On a typical day, the peak times of market activity are from 6 AM to 8 AM when vendors set up and customers arrive early for the freshest products. After this morning rush, the number of visitors decreases significantly, maintaining a steady but lower level of activity throughout midday. In the afternoon, the market experiences another surge in activity from 3 PM to 5 PM as people finish work or school and come to shop for dinner or the next day's needs.

3.2. User Surveys

Surveys were conducted to produce a flow chart of activities for each sales section. The fresh produce and meat sections are busiest at 6 AM and 4 PM, the dry goods section at 10 AM, the clothing section at 4 PM, the food court at 1 PM, and the electronics section at 3 PM. Common issues faced during rush hours include severe congestion and disarray, necessitating better vendor placement to manage buyer flow. Traditional market issues like unsanitary conditions, especially in the meat section which tends to be wet and smelly, and fresh produce areas becoming muddy during rain, were noted. Another significant problem is the traffic congestion caused by unauthorized street vendors selling on the roadside.

3.3. Behavioral Analysis

Shoppers tend to buy from easily accessible locations, which leads to the proliferation of unauthorized street vendors. Therefore, the market design aims to curb the growth of these vendors by closing off all open roadside areas with gardens and ponds to deter illegal selling. Since placing stalls on the

roadside would violate existing regulations, alternative solutions include exposing key trading areas and creating points of interest at the main market entrance to attract buyers. Additionally, providing adequate and comfortable pathways for all users is crucial.

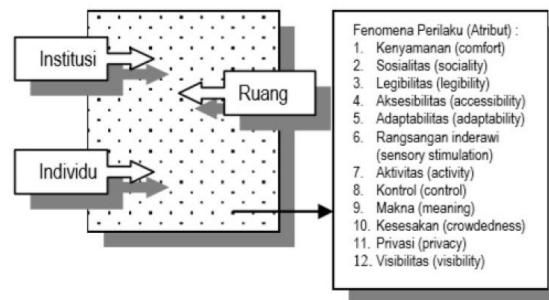


Figure 1 Behavioral Environment System Model.

Source: (Weismann, Gerald 1981) in Dwi Ananta Devy 2009

4. Result and Discussion

The primary goal of this market revitalization is to enable traditional markets to compete with modern markets by enhancing the shopping and activity experience to provide a comfortable and efficient environment. It is anticipated that this revitalization will address the current issues plaguing the market. By applying a behavior-based architectural theme, the user experience can be significantly improved, as user behaviors have been analyzed and translated into an architectural design that offers comfort and ease of use.

4.1. User Behavior Analysis in Different Market Areas

The analysis of user behavior in various sections of the market reveals distinct patterns and needs. The fresh produce and meat sections see the most activity early in the morning and late in the afternoon, aligning with peak shopping times for daily essentials. The dry goods and clothing sections have their own peak hours, typically around mid-morning and late afternoon, respectively. The food court attracts the most visitors around lunchtime, while the electronics section is busiest in the late afternoon. These patterns underscore the need for strategic placement of vendors and the creation of clear, organized pathways to accommodate the flow of customers.

Table 1 User Behavior Analysis in Different Market Areas.

| Area | Average Dwell Time (minutes) | Peak Hours | Common Issues |
|-----------------------|---------------------------------|-----------------|--|
| Fresh Produce Section | 25 | 05.00-09.00 WIB | Narrow aisles, vendors encroaching pathways |
| Meat Section | 20 | 07.00-10.00 WIB | Wet floors, strong odors, insufficient sanitation |
| Clothing Section | 30 | 10.00-16.00 WIB | Vendors outside designated areas, cluttered displays |
| Food Court | 35 | 12.00-14.00 WIB | Insufficient seating, waste management issues |
| Electronics Section | 15 | 13.00-16.00 WIB | Poor lighting, difficulty finding specific items |
| Sembako Section | 20 | 10.00-16.00 WIB | Cluttered displays, irregular placement of vendors |

Source: Author 2024

4.2. Data Analysis

Surveys and observations highlight several critical issues that need to be addressed in the market revitalization:

1. **Traffic Congestion:** The presence of unauthorized street vendors selling on the roadside leads to traffic congestion and narrow pathways, making it difficult for customers to navigate the market.
2. **Disorganized Vendor Areas:** The current arrangement of vendor stalls is chaotic, confusing customers and disrupting the shopping experience. Clear pathways and organized sections are necessary to streamline the flow of shoppers.
3. **Sanitation Issues:** The meat section often becomes wet and smelly due to poor sanitation practices, creating an unpleasant shopping environment. Similarly, the fresh produce area can become muddy during rain, further contributing to an unsanitary market environment.

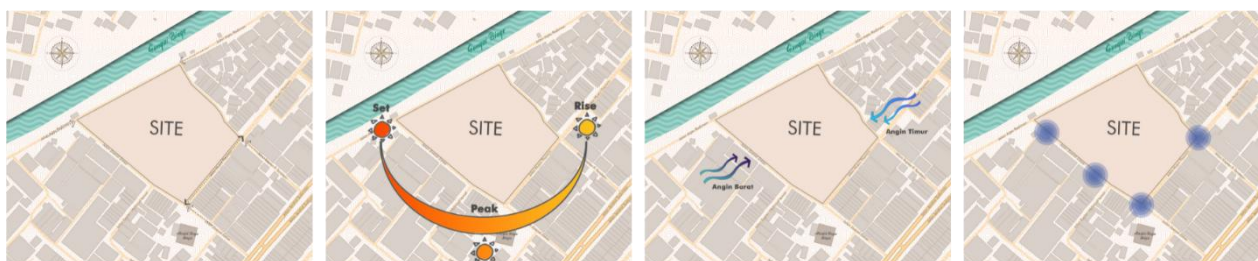
4.3. Design Interventions

Based on the problem analysis, several design interventions are proposed to address these issues:

1. **Eliminating Unauthorized Vendors:** To prevent the growth of unauthorized vendors along the roadside, all open roadside areas will be closed off with the creation of gardens and ponds. This approach not only beautifies the market but also discourages illegal selling that causes traffic congestion.
2. **Organized Vendor Placement:** Vendors will be strategically placed according to the type of goods they sell, taking into account local shopping behaviors. This will create a more intuitive and organized shopping experience for customers, with clearly defined sections for fresh produce, meat, dry goods, clothing, food, and electronics.
3. **Pathway and Stall Boundaries:** Clear boundaries will be established between pedestrian pathways and vendor stalls to ensure that pathways remain unobstructed and accessible. This will prevent vendors from encroaching on walkways and improve the overall flow of foot traffic within the market.
4. **Improved Sanitation Systems:** To address sanitation issues, particularly in the meat section, a comprehensive drainage system will be implemented. This will include piped water systems and small trenches around vendor areas to keep floors dry and clean, thereby enhancing the overall market hygiene.

4.4. Site Information

The market site is located in the city of Binjai, covering an area of approximately 1.3 hectares. Situated in the city center, the site enjoys a strategic position that is easily accessible from multiple directions.



Site Circulation

The primary access to the market is via Husni Thamrin Street, reachable from Jendral Sudirman Street and Zainal Zakse Street. Another route is from Kapten F. Tandean Street. The main entrance is at the intersection of Tandean and Zainal Zakse Streets leading to Husni Thamrin Street. A secondary access is on Aiptu Radiman Street, which is busy with vehicle traffic and can also serve as an additional entrance.

Sun Path

The sun rises from the right-hand side of the site, with the front left side of the building receiving morning sunlight. This makes the front entrance an ideal main access point, as markets are busiest in the morning. The sunset illuminates the back right side of the building in the evening.

Wind Direction

Proper ventilation is crucial to keep the market fresh and prevent decay. Adequate air circulation is needed to expel unpleasant odors from the market to the outside, enhancing the overall environment.

Crowd Density

Congestion is common at the front of the site due to intersections from Sudirman Street and the junctions of Zainal Zakse-Husni Thamrin and Kapten F. Tandean-Husni Thamrin. Zainal Zakse Street on the right side of the site also experiences congestion due to narrow roads and numerous vendors. Distributing vendors more evenly across the market will reduce overcrowding and create a more comfortable shopping experience.

4.5. Placement of The Trading Area



Figure 2 (a) First floor placement; (b) Second floor placement; (c) Third floor placement.

Source: Author 2024

The revitalization of the market strategically uses the available land to optimize vendor space, circulation, and additional facilities while ensuring compliance with building regulations. The total site area is 10,000 m². The ground floor includes a parking lot covering 4,300 m², providing ample space for market visitors and reducing street congestion. The buildable area outside the parking lot is 6,000 m², with 4,200 m² designated for vendors, ensuring a balanced flow of customers with a circulation rate of 60%. Additionally, there is potential to construct a building with an area of 1,200 m² to house market management offices and essential service rooms, estimated to require 1,000 m², based on personal analysis. Green areas are also planned to enhance the environmental quality and aesthetic appeal of the market, adhering to the maximum building coverage (KDB) of 60%.

The second floor, covering a total area of 3,800 m², is entirely dedicated to vendors selling household consumables. This layout caters to the high demand for everyday items and ensures easy access for shoppers. The third floor, also 3,800 m², accommodates vendors selling non-consumable goods. This floor includes an anchor point or a special attraction designed to draw visitors, promoting foot traffic and vendor visibility.

Design considerations include extensive parking on the ground floor for convenient market access, reducing street parking issues, and improving overall accessibility. The careful distribution of vendors across different floors based on the type of goods sold enhances the shopping experience by making it easier for customers to locate the items they need. A circulation rate of 60% on the ground floor ensures smooth visitor movement, preventing overcrowding and making the market more user-friendly. Ramps and wide pathways cater to all visitors, including those with mobility challenges, enhancing the market's accessibility and inclusiveness. Green areas within the site not only comply with building regulations but also create a pleasant shopping environment, contributing to the market's appeal.

4.6. Theme Implementation

The research on behavioral architecture reveals three main characteristics that are essential for effective market design, as proposed by Simon Weisten and Thomas G. David in their book *"Spaces for Children: The Built Environment and Child Development."* These characteristics are pivotal in shaping a market environment that caters to the needs and behaviors of its users.

1. Effective Communication between Humans and the Environment:

The market is located within a vibrant environment that includes both commercial areas and residential housing. The design emphasizes creating effective communication between humans and the environment. This is achieved by integrating the market seamlessly into its surroundings, ensuring that it is easily accessible and welcoming. The layout of the market, along with its visual and physical connections to the surrounding areas, facilitates a natural flow of movement and interaction, making the market an integral part of the community.

2. Facilitating Occupants' Activities Comfortably and Pleasurably:

To enhance the shopping experience, the market is designed with a wide and sloping ramp, approximately 15 meters wide. This design choice is informed by the analysis of shopping behaviors in traditional markets, where accessibility and visibility are crucial. The ramp

allows for easy movement and provides a clear line of sight to the stalls above, drawing visitors' attention upwards and encouraging exploration. This not only makes the stalls easily accessible but also enhances the overall aesthetic appeal of the market. Alongside the ramp, stairs are provided for those needing quick access. These stairs are designed both for practicality and as an architectural feature to attract attention, blending functionality with visual interest.

3. Considering the Condition and Behavior of Users:

The market design takes into account the diverse range of users, primarily focusing on those who visit for shopping, typically aged 20-50 years old. This demographic is generally physically capable, aligning with the cultural context of Indonesia where household shopping is often done by housewives or teenagers. Elderly individuals, who usually live with younger family members, are less likely to shop alone. For those few elderly individuals who live independently, it is common for neighbors to assist them with their shopping needs. The design of the ramps and overall market layout considers these factors, ensuring accessibility and ease of use for all visitors. The ramps are gentle enough to accommodate elderly individuals and those with mobility issues, making the market inclusive and user-friendly.

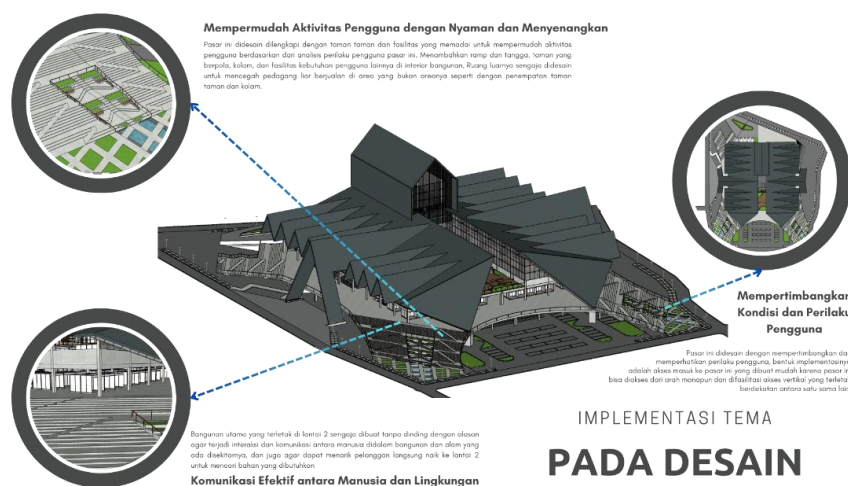


Figure 3 Implementation of the theme in the design.

Source: Author

4.7. Space Requirements Data

This data is derived from calculations based on space requirement standards and the analysis of behaviors occurring in this market.

➤ KEBUTUHAN RUANG PEDAGANG

| Jenis Kegiatan | Kebutuhan Ruang | Besaran | Sumber | Kapasitas | Luas Ruang (m2) |
|---|-----------------|------------|--------|-----------|-----------------|
| Jual Beli | Lods | 2m2/unit | AS | 1.026 | 2.052 |
| | Kios | 4m2/unit | AS | 1.078 | 4.312 |
| | Hall | 0.7 m2/org | NAD* | 1.000 | 700 |
| Total | | | | | 7.064 m2 |
| Ditambah sirkulasi 60 % = 7.064 m2 + 4.238,4 m2 | | | | | 11.302,4 m2 |

Pembagian pedagang per lantai

Lantai 1 = 6.000 m2

Lantai 2 = 3.000 m2

Lantai 3 = 2.300 m2

Luas Site Bersih = 10.100 m2

Kebutuhan Pedagang = 11.302,4 m2

KDB : 60 % = 6.000 m2

| JENIS PEDAGANG | JUMLAH |
|-------------------------------|--------|
| Pedagang sayur dan buah | 729 |
| Pedagang ikan dan daging | 297 |
| Pedagang kain | 213 |
| Pedagang souvenir & perhiasan | 87 |
| Pedagang elektronik | 58 |
| Pedagang sembako | 720 |
| Jumlah | 2.104 |

Figure 4 Vendors' space requirements.

Source: Author

5. Conclusion

This study has elucidated crucial behavioral insights essential for the revitalization of traditional markets, particularly within urban contexts like Binjai. By analyzing user behaviors such as circulation patterns, peak visitation times, and preferences in vendor selection, significant challenges and opportunities have been identified. The findings underscore the necessity of integrating these behavioral insights into architectural strategies to enhance market functionality and user satisfaction. Addressing issues such as congestion during peak hours, disorganized vendor layouts, and sanitation concerns is imperative for creating a more efficient and appealing market environment.

The application of behavioral architecture principles, including effective environmental communication, comfortable activity facilitation, and tailored user considerations, forms the cornerstone of proposed design interventions. By strategically implementing features like accessible vendor arrangements, improved sanitation facilities, and clear spatial delineations, the revitalized market aims to foster a welcoming and efficient space. Such interventions not only cater to current user needs but also aim to future-proof the market against evolving consumer behaviors and market dynamics. Ultimately, this research contributes valuable insights into the symbiotic relationship between architectural design and user behavior, offering a framework for creating sustainable and community-centric urban market spaces.

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