

TOWARDS RESPONSIVE ARCHITECTURE: AN EXPLORATION OF MASSING IN DESIGN PROCESS

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Abstract

Massing study is part of the space organization in design process. The space organization in the study manifests the basic space relationship with the immediate surroundings context. The paper covers the explorative research in the design-based architectural education (DBAE), content analysis and observational analysis as methodology of the research. The aim of the research was to investigate the level of awareness and massing typology amongst architecture students towards responsive architecture. The awareness level among students could be presumed as a reflection of Malaysian architectural education towards the materialization of sustainable issues in *Agenda 21*. The inclusion of the paper offers an exploration of built-form massing in the architectural education in Universiti Teknologi MARA. The findings unfolded in this paper could establish the relationship between awareness level and built-form massing in the design process had influenced the design features. With that, in the future designers shall consider the passive-design approach in design process and not after-thought treatment.

Keywords: *responsive architecture, massing study, space organization, passive design*

INTRODUCTION

Responsive architecture is the micro-scale representation of the vision sustainable urban design approach about balance. According to Thomas, R. (2003), "*sustainable urban design is vital for this century*". In this millennium age, it seems likely over seventy percent of the world's population will be living in the urban zone therefore it is at critical stage to detail out in built-form massing at the preliminary stage in designing building in urban context.

Massing study

In terms of space volume the massing study is focused on solid and void, positive and negative space from the overall space organization. The consideration of allocating the solid versus void in both horizontal and vertical axis of the site study should be by studying-closely to the site natural attributor: orientation, prevailing wind

and sun path, landscape etc. and cultural attributor: neighbourhood context and local by-law.

Space organization

In the process of making the physical space for office operation; a proper zoning for working space ambiance and justification for the end users comfort and satisfaction is essential. Quality of space is prior to end user's needs physically, psychologically and visually rather than just series of human space functions and requirements. The end-users space requirements should be compromised with the surrounding context, social and environmental. The forecast operational cost of the building shall minimize the application of active design.

Passive design and energy efficient design

Passive design and energy efficient design are the available approaches that emphasized in responsive architecture. The design action with consciousness towards the importance on the natural resources: natural lighting and ventilation in order to reduce building's operational cost and energy. Passive solar systems utilize basic concepts incorporated into the architectural design of the building. They usually consist of: buildings with rectangular floor plans, elongated on an East-West axis; a glazed west-facing wall

RESPONSIVE ARCHITECTURE PARADOX

It is important to promote the literacy in sustainable issues and development among architecture students in higher education. It is because they are the future generation of the architecture in Malaysia. The integrative sustainable-based architecture education (SBAE) shall be acted as the model curriculum for producing architecture graduates with sustainable-based knowledge's education. In the globalization age and its impact towards the liberization of architecture; the knowledge and its application shall be part of the soul in designing the *go-green* global architecture. By having the awareness and skills; it is hoped that the nurturing process at university level will contribute towards sustainable development in the future. The understanding on the responsive architecture i.e could be by quick-reaction and enthusiastically act in a positive way to a new way of thinking of climatic-emphathy architecture. However, the interplay of religion, culture, politic and economic to architecture that provides the character of the design of buildings sometimes need to be compromised in the realization of responsive architecture. Its not all about greening or landscaping the building but the deep understanding of local climate such as sun, wind path and natural elements as the surrounding context.

Sanuel Mockbee of Auburn University in 2009 MockBee, S. (2009) stated that: “Sustainable architecture involves a combination of values: aesthetic, environmental, social, political, and moral. It's about using one's imagination and technical knowledge to engage in a central aspect of the practice in designing and building to

be harmonious- balanced with our environment. The smart architect thinks rationally about a combination of issues including sustainability, durability, longevity, appropriate materials, and sense of place. The challenge is finding the balance between environmental considerations and economic constraint". In the common soul; Zeiher, L. C. (1996) reminded that in all countries, the environmentally-responsive design and its necessary roles in the quality of human life, coupled with the advanced technical capability for communication among individuals around the world, is playing a lead role in establishing a fundamental environmental-consciousness in building and community design.

Therefore, in response to the call in our country in for more holistic approach in materializing the vision, we have to invest in improving the quality of life through design process to ensure each design decision must be act of restoration and renewal to social, economical and environmental-vitality of the individual and community.

BACKGROUND

The research is aimed for the exploration of massing in the implementation of responsive architecture at design process stage in architectural teaching. The objectives of the study is to look beyond the process making of individual building, vertical and horizontal circulation, transport, energy, landscape, materials which is all interrelated. The paper will unfold on the design exploration at preliminary stage in designing building. This study will investigate the level of awareness among students on the relationship of massing towards the vision of sustainable-based design approach and categorizing the massing typology in the space organization. The research was conducted based on the given set of architectural project with a brief on the enhancement of responsive architecture in design:

Research Objectives:

- To investigate the Level of Awareness among respondents
- To classify the Massing Typology in the space-organization model
- To investigate the relationship between Level of Awareness and Massing Typology in the enhancement of responsive architecture

METHODOLOGY: RESEARCH CONDUCT IN THE ARCHITECTURE STUDIO

Sampling and Respondents

The focus group for the research was a group of sixty (60) students from in the third year program of BSc Architecture, Department of Universiti Teknologi MARA Perak. In this research conduct besides managing the project; they'd played multiple roles; as the project reviewer panel and as the observer of the research. The project duration was ten weeks and conducted between January and April 2009.

Project Brief and Tasks

The design of building is limited to a medium-scaled building comprising one unit of office building for Pertubuhan Akitek Malaysia PAM). The earlier arrangement was made between the Honorary Secretary of PAM and the lecturer for conducting the *client-architect* role-playing set. The meeting between the client and students had resulted an understanding that students required to come out with a proposal comprising operational office of Gross Floor Area (GFA) of 300 square meter area. In the brief, students were required to design PAM Office Building with enhancement on environmental-conscious design or so called *green-approach* with the following tasks:

- Task 1: Precedent Study
- Task 2: Site SWOT Analysis
- Task 3: Idea Development

Task 1: Precedent Study Analysis

In this task, the respondents were instructed to find the closest examples of existing buildings with passive-design approach from worldwide. They were to compile their secondary data collection from literature review into the A1-sized presentation board. They were to present their data collection to the whole members of the studio and lecturer. At this stage, their understanding of the responsive architecture in selecting their idol building was measured with the following criteria:

- Maximize natural resources: Sun and wind path in response to orientation
- Exterior Planning system: Provide natural lighting and ventilation
- Site Planning : Building Plinth not more than 50% the site area
- Softscape: Promote trees planting avoid trees cutting
- Indoor Planning sytem: Open-plan concept with *masrabia* type of partition
- Cooling Element: opening size and location to allow cross ventilation
- Heating Element: from the sun (photovoltaic at roof and wall system)
- Energy supply: solar energy for energize cooking and bathing
- Water supply: form rainwater collection
- Soil water: as source of biodegradable fertilizer for plants
- Vehicular free : Pedestrian friendly
- Interlocking building massing between solid and void
- Elevation: Hierarchy, rhythm in space planning to allow cross ventilation
- Green conceptual space: Sky garden, verandah, Garden café
- Centralized service core
- Intelligent building approach for safety aspects



(Plate 1: Space Planning and partitioning in responsive architecture)

Task 2: Site Analysis

The given site was an empty piece of land of cultural landscape within urban area. The chosen site was located at the Padang Merbuk, Taman Tasik Perdana, Kuala Lumpur. The site size was approximately four acres and located adjacent to the Apsara Complex, which belonged to the Ministry of Youth, Art and Culture, Malaysia. In this task, the respondents were instructed to visit the site and conduct the Site Strengths, Weaknesses, Opportunities and Constraints (SWOC) Analysis. The conduct of the research took them a week to collect data collection and then analysis was done in four groups consisting of 15 respondents in each group.

The operation of collecting data required them to access on-site observation and secondary data. The secondary data were collected from government agencies such as geographical data from the Metrological Department and Development Plan 2012 from Dewan Bandaraya Kuala Lumpur and Planning Guidelines for Commercial-Office from Jabatan Perancang Bandar dan Wilayah. Besides that, data on sustainable development data on guidelines from Department of Environmental was collected and analysed. In fulfilling this task the respondents had to find natural and cultural analysis in terms of the strengths, weaknesses, opportunities and constraints.

The evaluation by the observer and the panel of clients as the reviewer was based on the depth of study in the following criteria in the group presentation:

- Natural Strengths, Weaknesses, Opportunities and Constraints (NSWOC)
- Cultural Strengths, Weaknesses, Opportunities and Constraints (CSWOC)

Task 3: Idea Development

The conduct of Idea Development task was done after the group site NSWOC and CSWOC. In this task the findings from group site analysis was further analyzed individually. The application of knowledge from site findings was applied for individual approach in tackling the site potentials. From that stage, conceptual space planning was further developed in a site planning. In representing the respondents' idea, the space organization and layout plan presented through sets of built-form massing study model. At this stage, the massing model was used as a media for idea sharing and evaluation with project reviewer. The advantage of using hands-on model had directly-tested the individual level of understanding and awareness on environmental-conscious aspect that the respondents had in mind. The fantasy-idea in each respondents and reality of the site had to be justified in their individual proposal. Thus, the exploration on massing had provided them options of space organization within the site potentials. Once the idea versus reality justified in site planning; the proposal could be established for the following stage conceptual building development.

The building conceptual plan proposal was then tested at the face-to-face dialogues between respondents and lecturers in the crit-session. The crit-session was a routine activity in the architecture studio in which every respondent was evaluated on their individual approach in design. The following criteria of responsive-architecture were used as the base of the evaluation in the verbal and graphical presentation. In this session drawing and model presentation were made as compulsory media:

- Exterior Planning: built form massing and surrounding context
- Interlocking building massing between solid and void space
- Built form orientation
- Solid and void massing and impact to cross-ventilation
- Outdoor to indoor view and vista
- Prioritization of natural ventilation and lighting
- Interior planning: Open plan i.e minimum partition in the office interior space.
- Appropriate built form structure width not more 30 meter width
- Maximizing energy source from the Sun
- Maximizing use of water supply from rainwater
- Recycle of waste
- Promoting health and safety-prone activities among the office endusers
- Introducing green-theme interior space function: sky garden/ garden cafe
- Intelligent and interactive safety system

The following diagram Plate 4: is the built form massing model classification based four major Massing Typology:

No of Type	Massing Typology	Sample of Massing Model
Type 1	Spread-Low Rise	 <p>(Model by: Mohd Syahril Mohd Yasin)</p>
Type 2	Spread-Medium Rise	 <p>Model by: Muliamin bin Adam)</p>
Type 2	Grouped-Medium-Rise	 <p>(Model by: Mohd Akid bin Jainal)</p>
Type 4	Compacted-High Rise	 <p>Model by: Mohamad Ariff Zanudin)</p>

(Plate 3: Types of study model on massing using board, softwood and polystyrene during the crit session. Model: Studio 06,UiTM, January-April 2009)

Even though criteria of assessment was established to students during lecture session, the application of knowledge on responsive architecture in the individual proposal was varied among the respondents. The level of understanding was reflected in the crit-session, in the informal session: daily-observation and interview with respondents by the researcher.

RESULT AND DISCUSSION

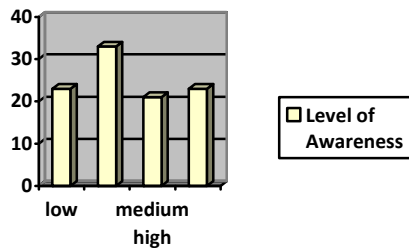
The findings of the research were analyzed in Week 11 of the Semester January-April 2009. The research which was conducted in ten week studio duration had unfolded the level of awareness among respondents.

Level of Awareness

The following Table 1 is representing the result of the research in finding the level of awareness among respondents on the issue of responsive architecture:

Level of Awareness	No of respondents	Percentage
Low	14	23 %
Medium	20	33 %
Medium High	12	21%
High	14	23 %
Total	60	100 %

(Table 1: Level of Awareness among the *respondents*)



(Chart 1: Level of Awareness among respondents in responsive architecture)

As a result of the research; is the above table that shown the majority of seventy-seven percent (77%) of respondents was categorized as *medium to high* in terms level of awareness on focusing environmental-conscious as their design approach.

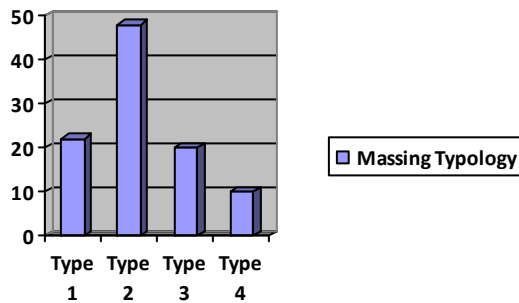
Massing Typology

The following Table 2; is a representation of the result of the research in classifying four (4) types of massing in organization of space in respect to responsive architecture:

Massing Typology	Description of Built form Massing	Built Form Height	No of respondents	Percentage
Type 1	Spread-Low Rise	0-8 meter/2 storey	13	22 %
Type 2	Spread-Medium Rise	8-16 meter/2-4 storey	29	48 %
Type 3	Grouped-Medium-Rise	16-20 meter/4-5 storey	12	20%
Type 4	Compacted-High Rise	Above five storey	6	10%
	Total		60	100 %

(Table 2: Classification of Massing Typology)

In this typology of built-form massing study, the findings shown that majority of fifty four respondents i.e.: ninety percent (90%) had chosen the low and medium rise built form in contrast to only ten percent (10%) of respondents that dare enough to have proposal with high-rise built-form. This result was highly influenced by the level of respondents' readiness in handling the building of higher levels that required them to include the design together with the services if they'd chosen built-form of more than five storey high building.



(Chart 2: Classification of Massing)

To relate between the level of awareness and massing typology, the results of Chart 2 and Chart 3 were combined to find the relationship between level of awareness and Massing Typology. As a result; it was found that *medium to high* awareness respondents had selected in the *low-rise and medium-rise* built-form massing. Even though, the massing typology had no clear relationship with the level of awareness amongst respondents towards the issue of responsive architecture; from the result it clearly shown that the high-rise built form massing were selected by low awareness respondents in the context of responsive architecture enhancement.

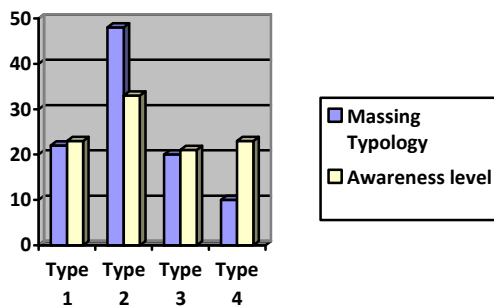


Chart 3: Relationship between Massing Typology and Awareness Level)

It is reflected from the result that *low awareness* respondents had more wisdom or more explorative in choosing any types of built form massing. In the other hand, the medium-high awareness respondents had chosen for *low and medium* built form massing. This phenomenon unfolded the real situation of design process: as an explorative research rather than pre-determined route to succeed. Any designers with well-versed in bio-climatically skills are supposed to be more opened for any type of built-form massing. The *medium-highly* awareness respondents shall be more explorative towards any kind of Massing Typology.

Yeang, Ken., (1996) stated that: "*Physically the skyscraper might be defined as a multi-storey building, generally constructed using structural frame, provided with high speed elevators, and combining extra-ordinary height with ordinary room-spaces such as would be found in low buildings*".

CONCLUSION

As future designers, it is a high responsibility for respondents to focus on what they will leave behind for the future generation. Their role in this research as respondents had created in their soul that in designing process; every action they'd made will stand out in terms economic viability, minimal environmental impact energy efficiency and aesthetics. Architecture is desperately in need of a conceptual, theoretical and philosophical unity with the nature... than a make-up artist.

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