

Development of Outdoor Bench for Recreational Park

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Abstract

Outdoor benches that are solid, durable, and have a lovely shape play an important role in public parks. As a result, benches are employed to brighten up parks. Many individuals, including the elderly and small children, rely on recreational parks to rest their feet after a stroll or other activity. The goals of this research were to determine the design criteria for outdoor benches as well as to design and develop a prototype acceptable for visitors at recreational park in Maran. A questionnaire was given using Microsoft Forms to 100 respondents in Maran, Pahang. According to the poll, the recommended design criteria for outdoor benches were wood as the main material, a backrest bench, no stagnant water problem, and high durability. Ideation, idea development, a design survey, the final design, and mock-up creation were all part of the design process. Each phase led to the improvement of outdoor bench to fulfil the design standards. The findings of this study can be used to guide future research and enhance the design of outdoor benches and achieve the objectives of Sustainable Development Goals (SDG).

1. Introduction

A recreational park or urban park is a public place with a green area and facilities for people to undertake recreational or leisure activities and socialise with others (Khalid *et al.*, 2018). Material, construction, appearance, and function are the four components of furniture. The structure serves as the foundation for the implementation of functions. These four functions are interconnected and constrain each other. In other words, the park serves as an amazing attraction that draws visitors in. Patio sets, benches, picnic tables, gazebos, and daybeds are examples of outdoor furniture. Urban public areas in Malaysia consist of numerous categories. They are city parks, district parks, civic fields, neighbourhood parks, pocket parks, plazas, and a few more. The recreational park is one of the most popular public locations among Malaysians. It is a site that city residents can frequently visit without paying an entrance fee (Danis *et al.*, 2014).

A bench is a long seat that can accommodate numerous people at the same time. Some benches are constructed of wood, but others are built of metal, stone, or synthetic materials. Some benches have arms and backrests, whereas others do not and can be sat on from any side (Zakariya *et al.*, 2014). Park benches are part of the urban landscape that facilitates activity. It creates a more comfortable and enjoyable environment for interacting with people. As a result, reshaping them will have an impact on how they sit (Mohammad Abdullah Taha Almandrawy, 2016). The creation of production plans, the purchase of raw materials, the ease of process production, the number of machine adjustments, the kind of equipment and processing accuracy, the level of quality, the cost of product manufacturing, and so on are all determined by design (Gómez Carmona *et al.*, 2022). The designs of the outdoor furniture must be able to resist wet and dry weather and may be used for a long period of time. Apart from that, this furniture should be adaptable in arrangement, use, and administration so

that it may not only add variety and interest both architecturally and functionally but also support the dynamic activities that can take place in public parks, such as sitting, socialising, and playing (Style *et al.*, 2017).

Nowadays, the majority of outdoor furniture is constructed with a classic appearance and lacks design. Outdoor furniture is typically robust and comfy while remaining beautiful. Outdoor furniture must also have a distinct personality, with an emphasis on creating a lifestyle based on clarity, innovation, and, most importantly, dependability and comfort (Style *et al.*, 2017). According to a recent study by (Shakiela *et al.*, 2023), among the known issues is the park's lack of seating. Nowadays, most outdoor furniture is designed in an uninspired and uncomfortable style. Benches and sitting are more than just items; they are also reflections of our social behaviour. People's interactions with seating can reflect their personality, sense of belonging and security in public areas, and openness to other people. Looking thoroughly at how people utilise something as simple as a bench can throw light on how we interact; the complicated nature of how humans share spaces, even when it is time to sit down for a rest (Jian & Selimin, 2023). Outdoor furniture also needs to have an identity or trend, by focusing on developing a lifestyle based on clarity, creativity, innovation, and, most importantly, reliability and comfort (Mulyono *et al.*, 2017). The single bed is proposed for single house resident who living in the area inside Batu Pahat, Johor. The general population who are in the park or any institution are the focus of the study. The size, material, and style of the outdoor furniture have all been observed. The study's scope focused on residents who are in the park, most of them just utilise outdoors furniture for sitting and are aware of what they need and wish to improve on the furniture. Furthermore, the results of this research should be shared to users of outdoor bench, especially for the enhancement of the park in Maran, Pahang. Maran has a population of 112,330 people, with 52.3% (58,711) men and 47.7% (53,619) females. This evaluation will be sent to around 100 respondents at Maran Lake Park, Pahang.

Based on the observations, this study is significant in design and has the potential to have a positive impact on users. This study, in particular, has the potential to influence local furniture designers in developing new designs for outdoor benches in parks. This is because it allows designers to think freely and can aid them with design. Furthermore, this study provides fresh knowledge about design, materials, and specifications for outdoor benches to aspiring designers. Based on the findings of this study, it is hoped that it will assist designers in developing new ideas and introduce an innovative modern bench into the outdoor furniture industry. This study finding also approaches that are in accordance with user perceptions in order to meet the goals of SDG for the benefit of the community

2. Literature Review

2.1 Outdoor Furniture

Outdoor furniture is furniture that is specifically designed for use outside. Outdoor furniture also provides seating for relaxing, sitting, eating, and socialising. Another study discovered that the availability of seats is a factor in the success of social and restorative places (Mumcu, 2016). Respondents in the same survey noted that a lack of seating is a significant deterrent and limiting factor, and a link between seating and social areas was established (Mumcu, 2016). Outdoor furniture designs must be able to withstand the rainy and dry tropical climate of Malaysia and be used for an extended amount of time. Aside from that, these pieces of furniture should be adaptable in terms of arrangement, use, and management, so that they may not only add variety and interest both architecturally and functionally but also support the dynamic activities that might occur in public parks, such as sitting, socialising, and playing. The meaning of the park in daily life has changed as the city has grown and developed (Style *et al.*, 2017). Respondents in the same study noted that a shortage of available seats is a big issue, and social spaces were discovered (Mumcu, 2016).

2.2 Bench

A bench is a piece of furniture that allows multiple people to sit at the same time. Benches are most commonly built of wood, but they can also be made of metal, stone, or synthetic materials. Some benches include arm and back supports, whereas others do not and can be sat on from any side. In American public spaces, benches are frequently donated by individuals or organisations, which are then commemorated on them, for example, with a tiny plaque. Benches are used both inside and outside (Zakariya *et al.*, 2014). Benches are available in a number of styles, depending on the available space and the purpose. There are numerous varieties of benches, including wood benches, metal benches, concrete benches, and plastic benches (Jones Hi, 2023). Outdoor parks, gardens, jungles, hiking routes, farms, landmarks, tourism, city centres, and monuments in Malaysia are frequently placed with benches that are sensitive to foreign damage from weather, birds, humans, and others (Jian *et al.*, 2023). Benches should be spaced out in areas where less able-bodied individuals are likely to sit so that wheelchairs can be put to the side or in front of the bench. Park benches should not be a hazard to walkers; if they are used along walking paths, they should be oriented to allow for simple passing.

2.2.1 Wooden Bench

Wooden benches are characterised by their resistance to various weather conditions, making it more difficult for them to sustain damage or cracking as a result of the elements, and they can be combined with other decorative and useful aspects of the area. Because each species of wood has various qualities, it is critical that they receive the proper treatment. Additionally, because wood has lesser heat conductivity than other materials, the benches never become too cold in the winter or extremely hot in the summer.

2.2.2 Metal Bench

Metal benches are the hidden jewel that may be missing from your area. The convenient piece of furniture is highly suggested for space-saving, and to create a statement in a commercial environment. Metal benches can give enough sitting, enhance the design of an area and create an enticing space to unwind and enjoy some much-needed space (Berjaya Steel Railings Sdn Bhd, 2023).

2.2.3 Concrete Bench

A concrete bench is a type of bench that is made out of concrete. It is typically used outdoors and can be used for sitting or for leaning against. Concrete bench is conventional and long-lasting outdoor site furniture guaranteed to attract notice. These strong, theft-proof concrete bench look great and last a lifetime in parks, school, retail centers, office buildings, and a variety of other commercial settings. It come in variety of styles and colors that suit with the landscape, easy to clean and durable (Construction, 2022).

2.2.4 Plastic Bench

Plastic benches have come a long way since their early days of bleaching and crumbling in the sun. A wood-plastic mixture is the most frequent plastic used in benches these days. This invention provides a more natural look on a recycled plastic and wood panel. These UV-protected and wear-resistant wood substitutes are frequently used as bench planks. The durability of plastic is determined by its type and manufacturing. Some thin-walled plastic benches may flex over time due to heat and use. Thicker plastics (often polycarbonate) have a substantially longer life cycle. Wood-plastic composites, in particular, are highly valued for their durability. High-quality versions require less maintenance and replacement than wood or low-cost plastic (David, 2023)

2.3 Recreational Park

Urban parks are outdoor, nature-based sites that primarily serve a defined urban area to conduct a variety of recreational or leisure activities ranging from passive enjoyment of the natural environment to active and participatory activities such as fishing, bird watching, jogging, children's playgrounds, and other activities specific to the parks' biophysical and landscape features (Latinopoulos *et al.*, 2016). An urban park is a place with natural beauty surrounded by an urban setting. An urban park that is also located near the housing area is less than 5 to 10 kilometres away. Moreover, it serves as an activity centre for urban people. Urban parks provide a space for recreation, meditation, tourism attractions, places to gather with family and friends, places to enjoy the beauty of nature, and many others (Ali *et al.*, 2016). The quality of parks has been found to be associated with people's life satisfaction, while the quality of health has also been linked (Rosli *et al.*, 2020). In Malaysia, like in many nations across the globe, the provision of nature-based recreational spaces via urban parks has become necessary for comprehensive, sustainable urban living. Typically, in Malaysia, the state or federal government is responsible for the development and financial provision of such parks, while the local government is tasked with managing and maintaining the parks (Bangi, 2019).

3. Research Methodology

3.1 Research Design

This study will apply quantitative methods approach to collect information of respondents at Maran Recreational Park in Pahang. The sample will be distributed to 100 Maran responders via the "WhatsApp" and "Facebook" groups. All data collected will be used strictly for this research and to determine design criteria. A standardised questionnaire will be used to collect quantitative data. The methodical collection and analysis of numerical data in order to identify trends, connections, and patterns in the environment is known as quantitative research. The advantages of the quantitative approach include helping to understand the research issue. The inquiries in the questionnaire were designed to collect criteria that aligned with the users' priorities and needs. Running a research question is critical in an inquiry approach that includes a collection of questions created in keeping with the study's objectives and delivered to a target population of users. The majority of researchers believe that surveys are the best way to collect information because they are straightforward and

time-efficient for large populations. Quantitative data will be analysed using descriptive statistics, the result will help to find what problem is the priority and any suggestion or recommendations that can be used for further occasions.

3.2 Sketches

3.2.1 Thumbnail and Ideation

One of the first steps in generating designs is to create thumbnails. Thumbnails are short, rapid design ideas sketched by a graphic designer. Thumbnailing allows designers to get their thoughts out and concentrate on specific concepts that they wish to work on further. Thumbnailing is similar to a brainstorming session with design in certain ways. In this study, thumbnail sketches of outdoor bench with various styles were created on an A3 sheet of paper. After the thumbnail drawing, the idea sketching technique is used to present the basic concept of the design. Some designs were chosen from the thumbnail sketches to be reviewed further by sketching more details. The design criteria gathered from the survey questionnaire were applied to the designs during this procedure.

3.2.2 Idea development

Idea development is a step-by-step procedure that refines a pool of ideas by discovering the specific parts of a concept that have the greatest impact. Following the thumbnail and ideation sketches, this idea development sketch is created. This is an idea development sketch that illustrates the process of idea generation. The selection of this concept development is based on the development of ideas and the merging of various idea drawings. The design development drawing also aids in clarifying the design criteria for the outside bench, as requested by respondents in the survey question circulated.

3.2.3 Design Survey

Through executing the design survey, the final design is chosen. The Microsoft Form is used to conduct the survey. The user target was then sent the form via social media, specifically Facebook, WhatsApp, and Instagram. The two sections of the inquiry are demographic in their character, providing the characteristics of the intended user. The design selection, which consists of three idea development, is provided in the second portion. The survey data will be finalised in order to determine which design will be produced as the actual product.

3.2.4 Final Design

Selecting the best solution from the design ideation stage is the last step in the design process. The best was selected based on the product's design ideation notion that was the most completed. It makes its decision using the outdoor bench's design specifications, which are influenced by the location in Maran.

3.3 Mock up

A mock up represents merely a demonstration; design evaluation includes testing different finishes, colours, and design elements that offer functionality that are not shown in the designs, if not more. The imitation has a scale size of up to 1:6 or 1:8, and detail is clearly visible. Mock-ups are static representations of the design concept that help teams visualise how a certain feature will be implemented in the final product. Prototype and wireframe are two concepts that are closely related. A mock up is a more finished version of a product, while a wireframe is its basic drawing. One of the completed iterations of a product created following the mock up is called a prototype.

3.4 Technical Drawing

A technical drawing, sometimes referred to as an engineering drawing, is a detailed and accurate plan or layout that shows how something functions or is made. Using AutoCAD software, a full-dimension technical drawing of the outdoor bench will be produced. There are both 2D and 3D drawings. Three views are included in the orthographic view of the technical drawing: the top view, front view, and side view. Furthermore, the perspective and isometric perspectives are shown. In the drawing, the millimetre unit (mm) is utilised. A3 paper was used to print the illustrations.

3.5 Cost Estimation

The method of estimating the costs and other resources required to finish a project within a specified scope is known as cost estimating in project management. Cost estimating takes into consideration every component

needed for the project before beginning to create the final product and computes an overall sum that establishes a project's budgets.

3.6 Prototype

A scale model or preliminary sample of the final design is called a prototype. In order to increase end-user satisfaction, the prototype serves as both a visual representation of the design and a tool for design evaluation. The information obtained from the questionnaire determines the materials that were utilised to build the study's prototype. Wood or any combination of materials could be the material. As a result, depending on the materials and bench components, appropriate manufacturing and finishing techniques were determined. Following the production of each and every component needed, the assembly will continue until it is finished.

4. Results and Discussion

4.1 Design Survey Analysis

A detailed survey was used in this study to collect data and information on the design criteria for outdoor benches at recreational park based on the preferences of the target customers. The survey was divided into two sections: section A contains demographic and respondent information, while section B contains questions about design criteria. The survey was given to 100 people in Maran Recreational Park, Pahang. The survey results were then assessed to determine the optimal design requirements for outdoor benches based on the needs of the respondents. The summary of the survey responses is shown in Table 1. Design survey also distributes to 100 people in Maran to collect data for which design will be used as final design for the product. The summary of design survey is shown in Table 2.

Table 1 Design criteria

Description	Criteria	Percentages %
Demographic and personal information	Female	55
	18-24 Years old	56
	Weekly	33
	15-30 min	44
	In the evening	51
Specification	Stagnant Water Problem	43
	Benches	86
	Durability	33
	Wood	41
	Anti-rust Material	21

This part was determined through the outcomes of the survey that respondents having problem with stagnant water especially when after raining and they cannot sit without getting their pant wet. These consider the design that can flow the water from the seat to the ground so there will be no stagnant water on the seat after raining or others problem involving water. Respondents also focused on durability and selected wood as main material for the outdoor furniture. Outdoor furniture type that the respondents choose is a bench. In conclusion, a significant number of (21%) respondents share their suggestions and recommendation for the outdoor furniture is using anti-rust material for long durability.

Table 2 Bed Design

Description	Criteria	Percentages %
Demographic and personal information	Male	53
	18-24 Years old	53
	Weekly	45
	Monthly	32
	Design Preferences	Functional
Durable		18
Size/ Proportion		39
Appearance		32

4.2 Sketches

4.2.1 Thumbnail and Ideation

Following the visual research, the next stage was to sketch thumbnails based on the design criteria gathered from the questionnaire results. Thumbnail sketches were created in two dimensions. Fig. 1 shows thumbnail sketches of an outdoor bench.

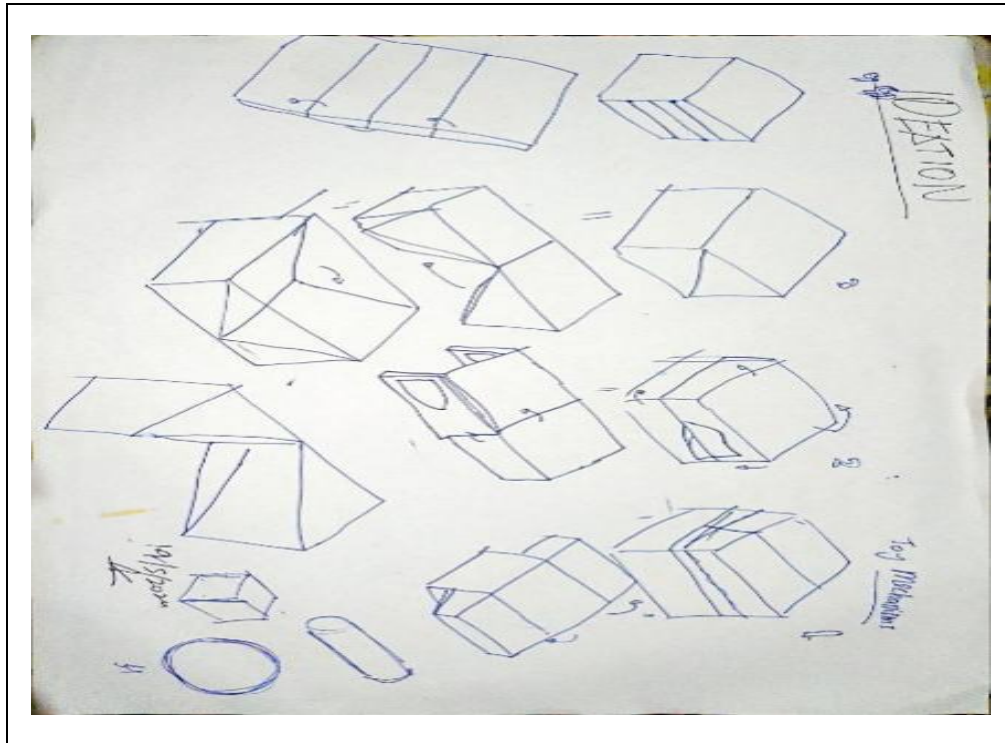


Fig. 1 Ideation

4.2.2 Idea and Design Development

The next stage was proceeding idea development based on the ideation by the selected design. Idea development can implement different ways of exploring ideas and composing solutions that best solve problem in the most effective manner. Fig. 2 shows the idea development of outdoor bench. One of the ideas was chosen as the final design based on its development. Due to the fulfilment of the design criteria, the final design was selected. In the design survey selection, the respondents selected design 2.

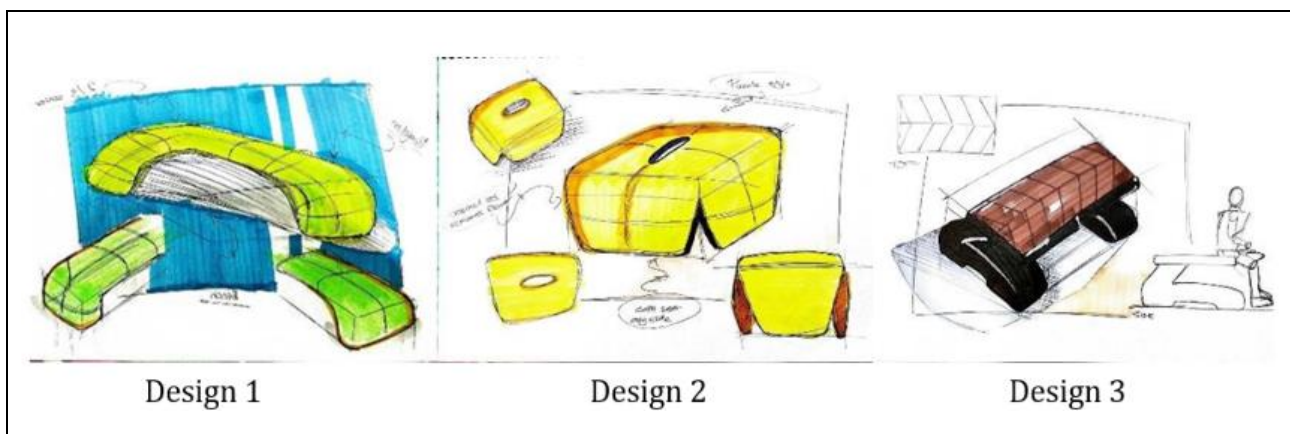


Fig. 2 Idea development

4.3 Mock Up

To 3D print an outdoor bench mock up, AutoCAD software was needed. The mock up used a 1:6 size so that the details were easily observable. By making these adjustments, the mock up will be more functional and valuable for the intended usage.

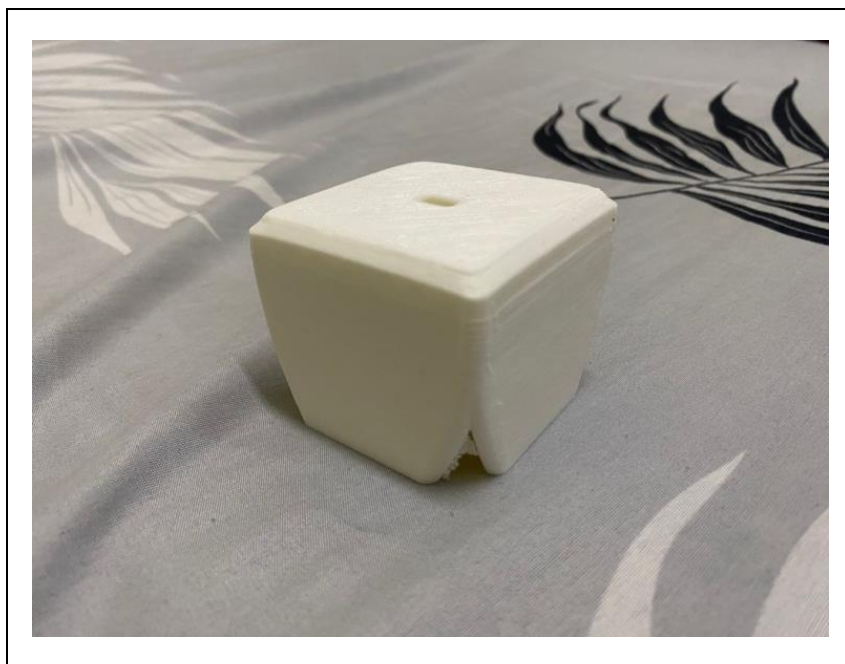


Fig. 3 Mock up final design

5. Conclusion

Conclusively, this research's findings offer advantages not only for people in the vicinity but also for non-resident visitors coming to enjoy the recreational park. By categorizing and addressing difficulties regarding product adoption, this bench aims at new design and can provide the user's need. The use of a survey questionnaire to identify design criteria for this research project, the set goals were accomplished in the end. Our goal when designing the outdoor bench was to create a durable solution that could address issues related to stagnant water, and we achieved this by utilizing wood in the construction along with a backrest for added comfort. The conclusion should summarize the main findings of the study and restate the key points inferred from trends observed and discussed regarding the data. Some suggestions should be included to encourage the continuation of the current research. Outdoor bench sketches will be based on an analysis of the survey questionnaire and chosen criteria. Ultimately, after extensive designing procedures that included ideation and surveying different designs resulted in the finalization of an outdoor bench fit for its purpose. The aim for conducting the objective research and achieving sustainable development goals can be accomplished.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Muhammad Yusman Najmi Yusri, Ahmad Anwar Safwan Sidek; **data collection:** Muhammad Yusman Najmi Yusri; **analysis and interpretation of results:** : Muhammad Yusman Najmi Yusri, Ahmad Anwar Safwan Sidek, **draft manuscript preparation:** Muhammad Yusman Najmi Yusri, Ahmad Anwar Safwan Sidek. All authors reviewed the results and approved the final version of the manuscript.*

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