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Ready-To-Assemble (RTA) Furniture: Bedroom Laptop Table

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Abstract: A laptop table is a type of furniture that can be put anywhere and will provide convenience to users when they are working. Ready-to assemble furniture would provide a great opportunity for people to construct their own furniture with the use of screws, hinges, and other readily available supplies. Most office employees and students are forced to stay at home to complete online activities due to the COVID-19 pandemic. The purpose of this research is to create a laptop table that satisfies people's needs. Long periods of time spent with a laptop on your legs might cause skin damage. The scope of this study was limited to the bedroom. The target users are university students from Universiti Tun Hussein Onn Malaysia. Research, design development, and mock-up are the three key areas of research. Solid wood, wood composites, plastic, ceramic, marble, and other materials can be used to produce furniture. A questionnaire is used to investigate each item of furniture in order to establish the design of the laptop table, including its kind, form, material, colour, and more. Thumbnails and ideation, idea development, and mock-ups are all elements in the design creation process. The survey collected data on people's perceptions of laptop table designs from 50 respondents. This study will serve as guidelines and additional value in the future, primarily to fulfill people's demands and desires for design.

Keywords: Laptop table, RTA furniture, Bedroom

1. Introduction

Ready-to-assemble furniture (RTA) is a piece of furniture that allows customers to assemble. Before assembly, instructions and hardware will be attached, so that customers will not feel confused or unable to get started when assembling. RTA furniture was first invented 2 by Swedish draftsman Gillis Lundgren. Lundgren wanted to be more convenient at the time and discuss his idea with the owner of IKEA furniture. The first self-assembled furniture was successfully launched in 1956. In the market, ready-to-assemble furniture is very popular with consumers because it reduces the cost of shipping and manual assembly of the furniture. Consumers can also experience the fun of assembling furniture. Pepke

(1988) shows that the unassembled furniture is packaged in boxes to minimize freight damage. When consumers feel that it takes up space or moves, they can disassemble that piece of furniture and reassemble it.

A laptop table is an item that is commonly used in daily life. With the continuous development of the times, modern computer desk styles have introduced various types and personalized designs to attract consumers to buy. The laptop has audio, mouse, and keyboard functions, which brings people a lot of conveniences. According to Bubric and Hedge (2016), around half of all college students use computers at their desks and on their beds.

North America participated in the world's initial laptop table market in 2019 (Future, 2021). Laptop desks are designed to provide a user-friendly experience for everyone. In some cases, placing the laptop on the lap of the bed can cause harm to the human body. According to current research, long-term exposure of thigh skin to electromagnetic radiation and heat waves from computer vents has been linked to various skin problems (Edwards, 2010). Small cases heal on their own without treatment, according to dermatologist recommendations, but in extreme cases, micro-sedimentation or laser treatment with anti-inflammatory ointments is required. Since laptop tables are profitable in the market, many competitors will appear as the economy and population rise. Laptop tables have become popular in recent years. Due to the pandemic, online learning at home has increased the demand for laptop tables during this time. This has opened new chances for furniture makers to offer their clients innovative solutions.

One major issue in this research is the arrival of the COVID19 pandemic, students have started to take online classes one after another, and students will be exposed to electronic products such as phones, computers, laptops, and tablets. Through the Rapid Upper Limb Assessment (RULA), 75% of individuals were using a laptop in a standard desk and chair design, and the remaining 25% utilized a laptop in a non-traditional structure, whether on their laps, or sitting on the bed, or in an uncomfortable position (Chang, 2008) Students like design majors need a comfortable environment and private space to study. Besides, in the study, the study room is the best online learning place (Farida *et al.*, 2021)

The demands of people in society are constantly improving and the concept of furniture has changed. Consumers are interested in disassembly furniture design concepts, mainly because of usability associations such as energy reduction, and optimization of material usage (Han, 2007). By automatically assembling furniture, consumers can experience the assembly opportunity to learn about various parts, such as screws, hinges, fasteners, fixtures, and other parts that can be supported to assemble the furniture to become a finished product. Thus, this study aims to design and fabricate a RTA bedroom laptop table.

2. Literature Review

2.1 Furniture

Furniture, often known as household equipment, is typically constructed from wood, metal, plastic, glass, marble, or other similar materials (Wormley *et al.*, 2021). Cabinets, tables, seats, stools, bookcases, bed frames, and other furniture are all available, and they may be used for a range of uses. Low furniture was the first type of furniture to develop in early ancient China. In that period, the manners of kneeling and sitting were more important, and all of the designs were made to sit on the ground.

2.2 Table

A table has a flat surface on top and support on the bottom, and it has furniture on it that may be used to put things or accomplish tasks. The variety of tables is also classified into various types, such

as dining tables, desks, computer tables, office tables, and more, as people's demands keep growing. A comfortable table design increases productivity and enables you to place personal objects on the table for convenient access.

(a) Type of Laptop Table

The bedroom is an important living area for individuals, whether they are workers or students. People might feel visually clean and refreshed by using a laptop table with a basic design. Some designs are foldable, may be opened, and closed as needed, making them convenient and space-saving. Because of the COVID19 pandemic, certain sectors have been obliged to embrace remote labor in recent years. Many jobs now involve the use of laptops and smartphones, and their use has continued to rise. The use of a laptop stand can assist people to improve their posture and work effectiveness. Based on Zheng (2020), the laptop stand raises the laptop screen to the correct position, avoiding neck and back pain. Shifting a laptop stand from a table or other surface is possible (Computer Hope, 2017).

(b) Standard Size of Laptop Table

The standard height for a standing laptop table is between 26 and 45 inches (Rachel, 2016). The normal height for a reading desk, eating table, and computer desk are 30 inches. When using a laptop, the keyboard should be 26 inches high; 30 inches is too high. The furniture standard for a home office is 26 inches, which is more suited for laptops and desktops to use for placing computers, writing, and reading. Based on Qu (2018), the standard size of a laptop table on the bed is 12 to 16 inches. A laptop with a screen size of 14 inches or less can be used on a 25cm bed laptop table. And a laptop with a screen size of 14 inches or more, suitable for a 30cm display. When utilizing a laptop table, the size of the table is necessary.

2.3 Ready-To-Assemble (RTA) Furniture

Flat-pack furniture is another term for ready-to-assemble furniture. People can have DIY time to do their own thing. Its mass manufacturing and materials are low-cost, and it reflects final furniture pricing (Heun, 2019). Furniture's lifetime and durability may be extended with proper care and maintenance. It can be simply removed and reassembled in numerous pieces.

2.4 Materials Used for Laptop Table

Material is one of the important parts in the furniture industry. The material has an impact on the functionality and durability of furniture. Wooden furniture is very popular in the market. But it is also one of the most in-demand materials (Singapore, 2018). After that, the plastic can allow the fabrication of a wide variety of shapes and is often combined with other properties such as transparency, low electrical conductivity, low density, and the like (Rodriguez, 1999).

3. Research Methodology

3.1 Questionnaire Survey

This study used a questionnaire survey. The respondents were adults and teenagers. The questionnaire consisted of two parts which are demography information and design criteria of the laptop table.

3.2 Visual Research

Visual research is an internet search using relevant keywords to examine the furniture's properties and provide new design ideas. This visual research compares design styles and forms in order to better integrate them into product designs.

3.3 Thumbnail and Ideation

Thumbnails are created by using questionnaires and visual research. Questionnaires and visual research are used to create thumbnail sketches. This is completed by hand sketching an outline and drawing using a pencil and ballpoint pens. It will make the design's initial concept and improve it.

3.4 Idea Development

Thumbnails and ideation are used for development. The idea development includes three views, which are the top view, side view, and front view, by hand drawing. In this idea, 9 pictures are extracted as idea development.

3.5 Final Design

The final design is chosen from a considerable variety of choices and developed to perfection. In the final design, the researcher decided to choose the best design from the idea development. The researcher might begin the procedure mock-up after the final project implementation.

3.6 Mock-up Development

The next step is mock-up development. Based on the final design, the mockup is created as a 1:6 scale size. This model is used to evaluate the final design's visual, physical, and functional characteristics. Modeling can provide researchers with a detailed view of the problems that the design missed. Materials of cardboard, adhesive, blades, and a steel ruler will be used to construct the model.

3.7 Technical Drawing

The technical drawing of this study was done by using AutoCAD software. An orthographic and rendered 3D drawings were developed to give exact dimension and appearance of the final product prior to fabrication process.

3.5 Prototype Fabrication

The fabrication process was done started with measuring the raw materials and cut into size using jigsaw, drill holes using hand drill machine, sanding the wood surface prior to the finishing touch by glued the wood grain stickers to the wood materials.

4. Results and Discussion

4.1 Questionnaire Analysis

In this study, 50 responses were collected from university students at Universiti Tun Hussein Onn Malaysia, who were answering 11 questions via Google Forms. The questionnaire is divided into two parts, part A is about demographic information and part B is about the design criteria of the laptop table. Consists of two parts. Table 1 shows the demographics and design criteria of the laptop table for college students, as the majority of respondents were male at 52 %, aged 21-23 accounted for 54 %, both types of houses occupy half which is hostel has 50% and terrace house has 50%, unemployed of job status at 64% and those B40 of household income for 70%. In this study, the results showed that most respondents preferred the drawer or storage, laptop table for bed, solid wood material, rectangular shape, and natural color of the laptop table.

4.2 Visual Research

The researcher searches for an image of a laptop table that is relevant. The visual study consisted of three elements, which were each inspired by the shape and style of an already available product on the market. The visual study's findings are represented in Figure 1.

Table 1: Summary of the questionnaire result

Section	Percentage (%)	Description
Demographic information	52	Male respondent
	54	21-23 years old
	52	Hostel
	64	Unemployed
	70	B40 (less than RM4850) household income
Design criteria of laptop table	80	Preferred drawer or storage
	54	Preferred laptop table for bed
	50	Preferred wood composite
	70	Preferred rectangular shape
	48	Preferred natural colour
	56	Preferred below RM200 in range of price

Figure 1: Visual research of laptop table

4.3 Thumbnail and Ideation

Figure 2 shows the thumbnail of the laptop table. Figure 3 shows the ideation of the laptop table. The findings of the questionnaire were used to create this thumbnail. The total thumbnail has 30 thumbnails of the laptop table. These thumbnails were created with a pencil and then accentuated using a ballpoint pen to make the lines seem more defined.
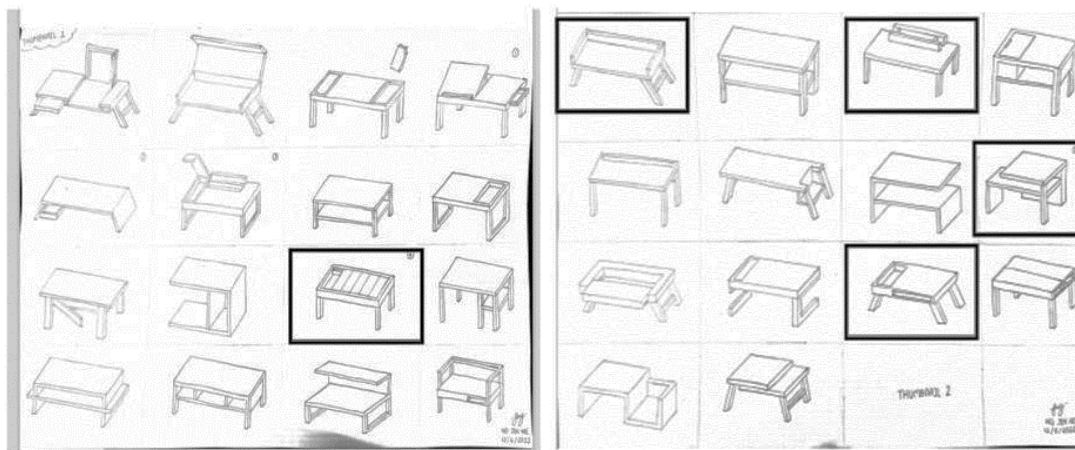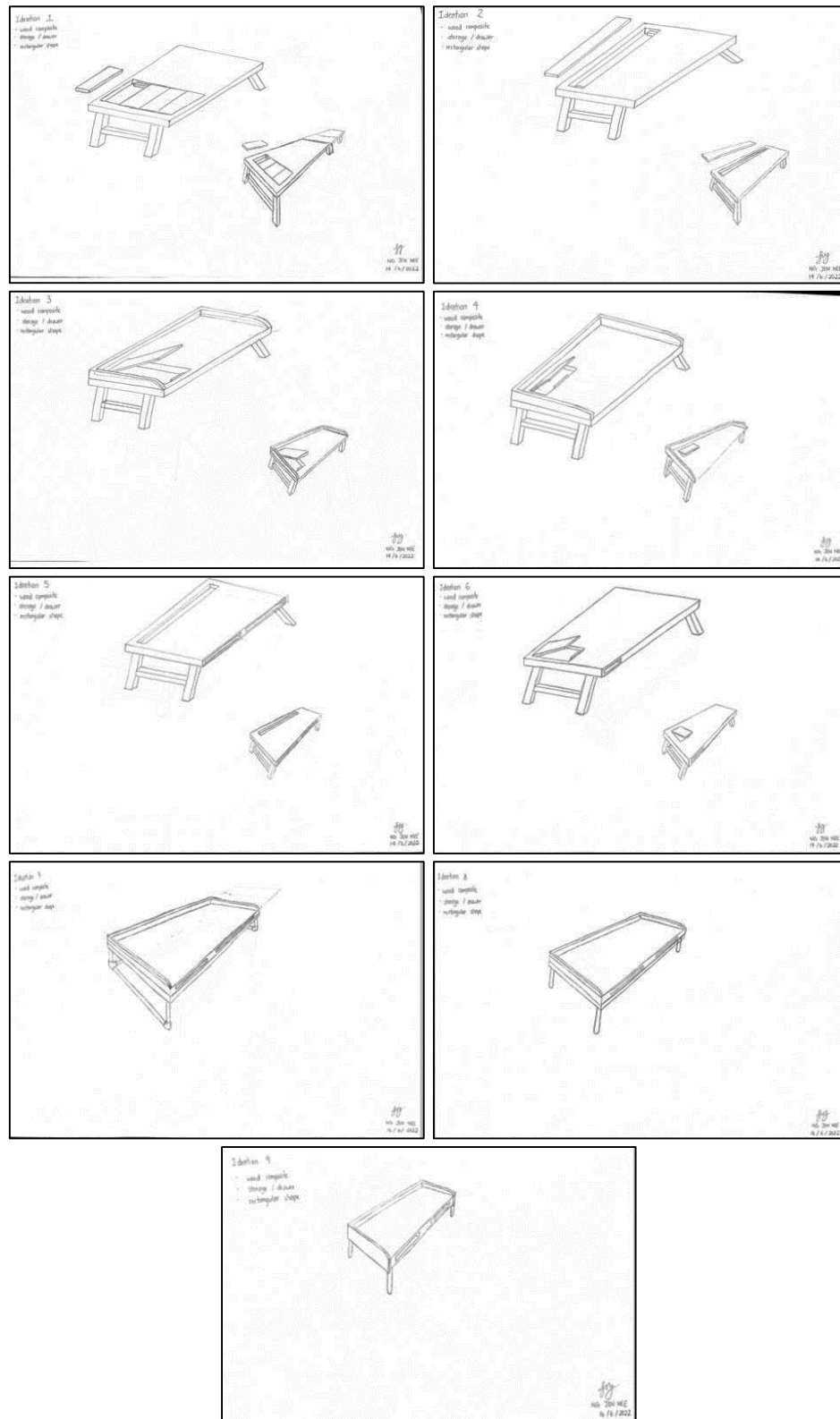

Figure 2: Thumbnails of laptop table

Figure 3: Ideations of laptop table

4.4 Idea Development

Figure 4 shows the idea development of the laptop table. There are nine designs of idea development. The isometric, front, and side design perspectives are included in every concept idea. Each concept development might have a unique design, such as size. The laptop table in my design

contains several storage places, which makes it useful for customers who want to use the laptop table on their bed.
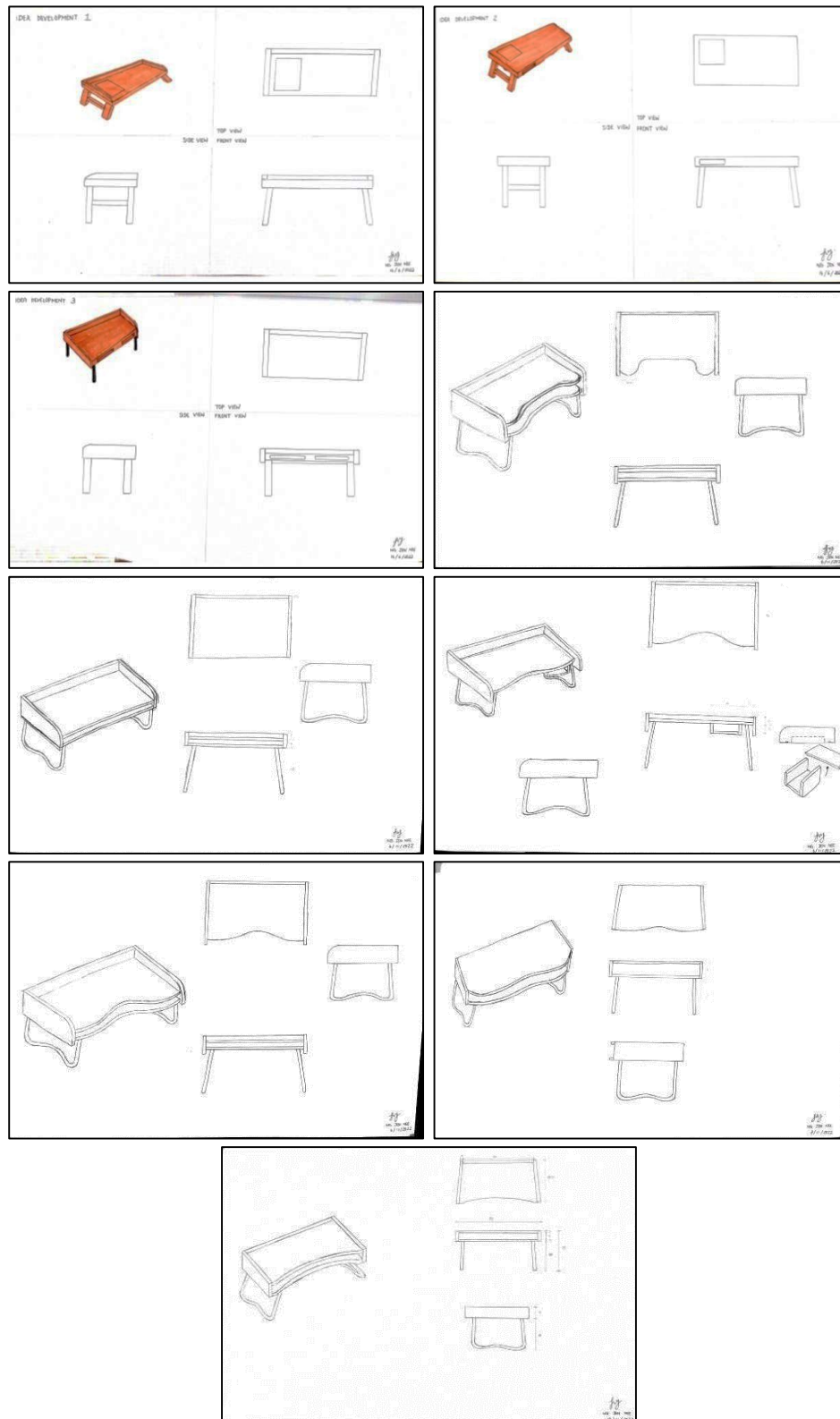

Figure 4: Idea development of laptop table

4.5 Final Design

Figure 5 shows the laptop table's final design. The laptop table is rectangular and offered in a natural colour. The decision to conduct a design inquiry before modeling is taken once more.

Figure 5: Final design of laptop table

4.6 Mock-up Development

Figure 6 shows the model of the laptop table. The materials for making models are using the glues, scissors, blades, pencils, pens, watercolor pen, brush and rulers. The ratio of mock-up is using 1:6.

Figure 6: Mock-up of RTA bedroom laptop table

4.7 Technical Drawing

Figure 7 shows that the technical drawing for RTA laptop table is sketch by using AutoCAD software. The dimension of mock-up is 11.5 cm for the length, 7.25 cm for the depth and 5.8 cm for height. Moreover, the dimension of the prototype is 69cm for the length, 43.5 cm for the depth and 35 cm for the height.
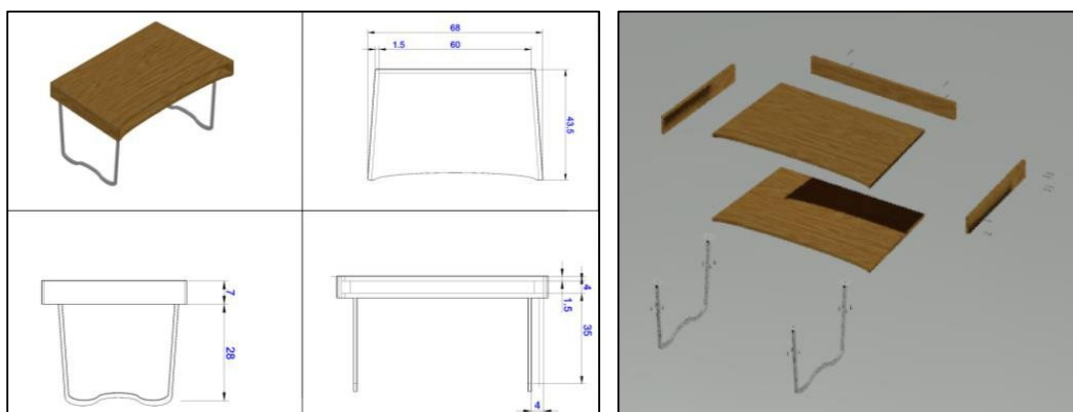

Figure 7: Technical drawings of RTA bedroom laptop table

4.8 Final Design

Figure 8 shows the prototype of bedroom laptop table. The prototype is identical with the proposed final design in this study.

Figure 8: Prototype of RTA bedroom laptop table

5. Conclusion

In conclusion, all data will be analyzed in order to obtain design criteria and model manufacturing specifications. There are still parts that need to be improved in future research. The questionnaire survey findings are simply used as a guide for the design process. A questionnaire of 50 UTHM university students was used to develop the laptop table's design requirements. It also effectively specifies the laptop table's design criteria. The data gathered comes through the survey method with male respondents aged 21 to 23, living in a hostel, unemployed, and earning a B40 household income (less than RM4850). Included in the design requirements are whether you prefer a drawer or storage, as well as the design of a laptop table. The laptop table for the bed is made of wood composite and is rectangular in shape, with a budget of less than RM200. To improve the visual appearance, the final selection of materials can be constructed of wood composites with natural color. There are 30 thumbnails, 9 ideations, and 9 concept developments that were created in this research. This design can achieve the design of ultimate convenience when researchers have more time to gather inspiration.

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