Study on Human Habitation Mode and Home Design Planning in the New Era

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Abstract. Due to the ever-increasing population and the price of houses, humans in the future may not have the opportunity to own their own land to build houses. With the change of living patterns, small-house families will become more and more popular, even mobile homes. This research uses market analysis, specification analysis, and according to the project design process, uses brainstorming and KJ method to find out design strategies and execute design projects. This research uses an expert industrial design process to design a residential space design suitable for 2040 and conforms to the following design principles: 1. For tomorrow House design will be aesthetic, smart, modern, and simple. 2. For tomorrow houses should have appropriate dimensions design and have moveable functions. 3. For tomorrow houses should include functions, space-saving and high-tech design. 4. For tomorrow house design should be able to accommodate 2-4 people. 5. In order to be multifunctional, the complexity of furniture design will increase. The expert industrial design process, analysis, and design methods described in this study will provide designers with a better grasp of the principles of future residential design, home furniture, and other related product design.

1. Introduction
Urbanization is rapidly increase and the amount of human population will be reached nearly nine trillion in 2040 which increased a 1.3 trillion amount from 2020 (Total Population of World by Decade, 2019)[1]. Human overpopulation in specific of a geographical area will causes the difficulty to sustain food, water, land and house. The adequation of this basic life’s demand will increase the immigration from one place to the others. To overcome this issue, most of the architecture and designers had proposed a futuristic house with compact important features and suitable house sizes for small family. There are a lot of moving houses with tiny size and some also with the smart home technology which cooperates with Google Home. Most of the house sizes are available in 80-180 squared feet with moveable truck function. These designs of houses are equipped with advance energy conservation and generation features such as solar panels, solar windows and smart home technology. Smart Home technologies allow the users to control and monitoring the appliances that available in the home such as fan, coffee machines, metering, music, light etc. These is the technologies available in 2020 and yet still in developing for a better product. The electricity supply in a smart home and tiny moving house is insufficient use for large appliances such as water heater, the power source is limited and required a high technology power generator to supply on it. Although it is power supply, small and tiny but moving
house required a transport to move and it seem cannot move itself. Faced with these questions, this research has the following topics, which are worth discussing.

Problem Statement:
1. In 2040, there are insufficient land for humans to have own landed house since the human population is gaining over and over;
2. The prices of landed house are much higher cost in 2040;
3. Large houses are not suitable for small family and wasted spaces.

Aims & Objectives:
1. To design and develop a space-saving futuristic house included furniture’s;
2. To design a small area of house that could fit 2–4 persons with living room, kitchen, toilet, and simple features;
3. Find out the principles of the futuristic house design.

2. Literature Review
The futuristic house falls into tons of design with different technology and different categories of house sizes. These designs had mixed different culture from different religion and country but basically the design will look modern and it is a concept of design. In 2040, the technologies are estimated to be more enhanced with combination of all similar technologies where AI (Artificial Intelligence) robots will take over the advantages to monitoring house conditions, status, security and even the health of the occupants. AI robot will be the roles of house manager to manage all the required things for owner. A future home in 2040 may not require physical entertainment system anymore such as television. Hologram technologies currently are developing successfully in most of the modern car (Mercedes) and Looking Glass Factory (Denis C, et al. 2020)[2]. This technology can apply to the house interior technologies design which realistic the movie of “Iron Man”. Most of the scientist and researcher are widely develop this feature which can convenient life of humans. It is believing that 3D hologram with sensor are available in 2040. Most of the investor are also believe that in 2040, flying house is able to achieve from 20 years now because flying car technologies already exist such as Aero mobile Company (Sheikh S A r, et al. 2020)[3] .

The housing problems of the 21st century that include continuous urbanization, overpopulation, pollution, energy deficiency, land shortage and lack of affordable housing cannot be solved by applying housing solutions of the 20th century (Vladimir L, et al. 2018)[4]. Futuristic House in 2040 is a concept and action to achieve. Even though the smart home, moving house and tiny house are adequate technologies and still can be the best existing house for referring in 2040. In this report, the researcher will focus on futuristic house design, technologies, interior design and suitable plan for projected a future house in 2040.

Based on the research, most of the existing moving house required a truck or transport to move the house from one place to another. It's an inconvenience for users to want to move to new places. While the conceptual futuristic houses are provided with a flying and ship-moving concept. Although these are conceptual ideas, they provide 2 in one concept for users who do not need to find transportation to move their homes. These flying technologies exist at the same time, but there is no production that could risk this idea in a flying house combination in 2020 and there is also a risk of staying inside an unknown future house idea. This flying house allows users to move all over the place, even landed on the sea. The cost of building this actual flying house will be much more expensive than the normal house, and it required a stable technology function to be achieved.

2.1. Analysis of Existing Products

2.1.1. Consumer intention analysis and market positioning. It is often claimed that “there is nothing more outdated than science fiction.” Indeed, history is awash with speculation on future ways of living (Niall, 2019)[5].
This study selected the following 20 future houses for market comparison. The items are listed below. Because of copyright, graphics cannot be published. If necessary, you can use the name to search on the Internet.

1. Comb House[6]; 2. Traveler XL 30[7]; 3. Minimalist Tiny House[8]; 4. Moveable Tiny House[9]; 5. Flat-Pack Tiny House; 6. Shipping Container[10]; 7. Namibia’s Skeleton Coast; 8. The YB1; 9. OPod Tube Housing; 10. The Mobile Home; 11. Futuristic Houseboat; 12. Floating Catamaran Hotel; 13. Air Ship; 14. A Multifaceted Masterpiece; 15. Ecocapsule; 16. Living Roof; 17. Drone House; 18. Mercury House One; 19. Nissan Leaf Powered Smart House; 20. Pre-Fabulous.

Based on market surveys, research, existing products and futuristic design ideas, the researcher found that every single house design has its limitations due to its design, size, technology, space management and furniture design. For a moving house, the shape is more like a cube or a rectangular one, kindly like the design of a container. This type of moving house has a long distance in length but with a small depth distance and a standard height of approximately 5.896 m × 2.385 m × 2.385 m. The space management of the design will be arranged in a rectangular way, where the sofa, the TV cabinet, the tables and even the bed are arranged parallel to the length of the sofa. However, the limitation for this rectangular size is the cramped space for people to move aside. There are many interior designs that make the container full of basic home features, but also increase the complexity of the design of the house plan. For example, the sofa and the bed combine where the bed is retracted to the wall to become a sofa, and the sofa pushes down to become a bed.

Since the rectangular container house is limited in the size of the width. 5.896 m × 2.385 m × 2.385 m rectangular house size is a massive size for a small house concept that can fit into many household features. Some of the tiny house is too small to fit tables, chairs, beds, and a small toilet. With small designs, some electronic appliances cannot be fitted into the house, such as washing machines and refrigerators. Based on a market survey of its specification, these appliances are not fitted into a small house living room area where there are tables, sofas, cupboards and kitchenware. Small size is going to be appropriate enough. The complexity of the furniture design needed to be improved in order to have a multipurpose function to control the area being wasted.

The complexity of furniture design can also be limited to a few options, such as technologies, prices, space management, and functions. The interior designer cannot design the general furniture for these tiny houses. Custom made are required to be of constant size according to its main functions, following the placement of its house. These research examples have this limitation. It is difficult to find the exact same design of furniture for different uses of function, since the size and interior design of each house is different. In contrast to the furniture that could be found in the warehouse suited to any apartment or landed house. Conceptual ideals for the design of those furniture can be seen as references, but it cannot fit exactly for Tomorrow’s House.

2.2. Specifications Analysis
The same concerns with the size and shape of the exterior design will limit inner living areas. Based on the examples researched, most modern designs have a small outer size and include some modern style designs, such as aerodynamics. The aerodynamic shape was limited in terms of interior design, furniture space management and human living areas. With a normal design, the appearance may not have a futuristic idea, but it has sufficient space for human activity. It might be a constraint to design a futuristic house with an appropriate size of living, but for Tomorrow House design will be aesthetic, smart, modern and simple. The Specifications Analysis of 20 future house designs is shown in Table 1. Due to paper limits, only part of the analysis results are listed.

3. Methods
3.1. Brainstorming & KJ Method
This research uses Brainstorming & KJ Method for initial analysis. The design team consists of 3 college students and 2 design teachers. The results of Brainstorming & KJ Method cannot present the drawing due to the limitation of the paper. The discussion results will be in text in 3.2 product define chapter.
Table 1. Specifications Analysis of 7 future house designs (Total: 20)

| Product / Specification | Comb Traveller XL 30’ | Minimalist Tiny House | Moveable Tiny House | Flat Pack Shipping Container | Namibia’s Skeleton Coast |
|--------------------------|------------------------|------------------------|---------------------|-----------------------------|-------------------------|
| Size                     | 280 (30 x 8.5)         | 184 (23 x 8)           | 160-240             | 140                         | 160                     | 350                     |
| Storey                   | 1 ½ Storey             | 1 ½ Storey             | Single storey       | Single Storey               | Single Storey           | Single Storey           |
| Bathroom                 | Yes                    | Yes (Full Size Bathtub)| Yes                 | Yes (small)                | Full Size               | Small                   |
| Balcony                  | Yes                    | No                     | No                  | No (Outside walk)           | Yes                     | No                      |
| Sofa                     | 1-2 Persons (1-3 persons) | 1-2 Persons (3-4 persons) | No       | 2-3 Persons                 | No                      |
| Bed                      | Master Bed             | Master Bed             | Master Bed          | Queen Size                  | Master Bed              | 2 Bed                   |
| Kitchen (Stove oven)     | No                     | Small                  | Medium              | Small                       | Medium                  | Small                   |
| Washing Machines         | No                     | Medium                 | Yes                 | No                          | No                      | No                      |

3.2. Product Define

It is a mobile home concept where water, food and fuel can be refuelled in a particular marketplace in 2040. When comparing to the current condominium, the design of the house is fixed at the same location with the same view and it even needs to be transported to buy a daily supplement. Tomorrow House 2040 combines transportation and housing technologies to become a "home" for future residents. Tomorrow House will also function as a boat or a flying ship offering transport and fully managed by the AI system in 2040.

The house will be built for 2-4 persons for a small family and will act as a high-tech home. Technology can combine medical, entertainment, home apps into an AI hologram system where it will communicate with us and help us handle home security, cleaning, and a daily life reminder. It's an AI robot that can be found in Google Assistant or Alexa Amazon. Even though the system was not complete at present but in the projected 20 years from now, it is feasible to become "Jarvis" home assistance for every user. Tomorrow’s House 2040 primarily concept comprises of 2 bedrooms, an entertaining area, a kitchen, a balcony, a toilet and other additional items. The concept applies to the cargo size and the scale of the house has been remodelled to maximum size of 25m² (270 square feet). The interior design concept must be compact, minimalist furniture with a broad storage capacity. Whereas the exterior design must be a potential 2040 concept, where it looks modern and is not available on current decades.

This idea was a mark-up for those small families that are affordable to spend for living, transport and high-tech facilities. The prices for current transport and house style studios will be around RM200k-RM400k with both combinations. Tomorrow’s House plans to hold the same rates in 2040 with transportation functionality and home stay capabilities. Technology purchases may be costly, but researchers believe that the volume of demand will control supply costs. It's a potential vision for
everyone where the idea of this product is high-tech, innovative, futuristic, and compact design for everyone to live with.

3.3. Design Direction
Based on the questionnaire analysis, morphological chart, and market survey, the design direction’s decision is made as shown in Table 2.

Table 2. Design Parameters and specifications

| Functions               | Exterior       | Inner            |
|-------------------------|----------------|------------------|
| Size                    | 250 mm x 140mm x 95mm Ratio 1:24 | 210mm x 125mm x 85mm Ratio 1:24 |
| Shape                   | Aerodynamic shape with flying spaceship ideas, features, and shape. |                      |
| Floor                   | Single ½ Storey |                  |
| Moving                  | Flying style House, able to levitate & move around |                  |
| Power Generation        | Self-generating electricity on solar panel |                  |
| System                  | Auto driving system & recharging on specific station | AI System, smart home, hologram graphics, Health care system |
| Furniture               | Loft bed + desk | Sofa bed/murphy bed, chair, Toilet bowl + Sink, shower, Induction cooker, cabinet, fridge, washing machines |
| Additional Features     | Balcony View | - |

4. Project Design

4.1. Concept Development & 3D rendering
Because of the limitation of the paper, only 2 conceptual designs are listed here (Total 9 conceptual designs), are described as follows (see Figure 1).

Concept 1: Aeroshielf
The Aeroshielf is designed by Brenda. This is a 1 ½ storey unit with a loft bedroom as shown in the plan. The outer shape is designed to maintain stability and reduce drag during transportation. Under the theme of 2040s, the high-tech accommodations such as Hologram, Floating Chair and Ai Home Control System is applied as shown in the sketch.

Concept 5: Space XII House
Space XII is the second design of the Space XI which used the spaceship concept to develop the idea. It has a large space and built up with master room, driver seat room and also entertainment room. The outer case has an eagle eye which is a transparent view for workspaces and room. It also have high-speed nozzles which compactible with the ventilation system.
5. Conclusion

Human populations are projected to cross 9 trillion in the world by 2040. For certain countries with a limited geographical region, the land can be confronted with inadequate human survival issues. Futuristic house is suggested to address this question where the home is anti-gravity and movable and the product name as Tomorrow’s House 2040.

The results of this research design a variety of future house designs, including furniture. The final designed house can accommodate 2-4 people, including living room, kitchen, bathroom, and simple functions that match the future human living style. And in line with the 5 principles of the future house design. These designs also consist of high technology flying style as a futuristic home.

6. Reference

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