

Next mobility design process based on MY method

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Abstract

The change of natural environment by global warming becomes various problems, and measures are pressing needs around the industrialized country. In the auto sector, a lot of development investments are done to environmental measures, and it is expected that a lot of technical problems will be overcome in the near future. However, a lot of realistic problems have been left for the spread of the environmental measures car. For example, replenishing energy, the sound, and the tax, etc...It is not only the technology problems but also adaptation to human real life. In this research, environmental measures were not the problems of the mobility unit, I propose the next generation mobility to catch up as a system.

Introduction

The change in natural environment by global warming causes various problems, and measures are pressing needs now around the advanced country. In the auto sector, a lot of development investments are done to environmental measures, and it will be necessary to overcome a lot of technical problems in the near future. However, a lot of realistic problems like the method of replenishing energy, the sound, and the tax, etc.

have been left for the spread achievement of the environmental measures car.

In this research, environmental measures were not the problems of the mobility unit, were caught as a system, and we designed the next generation mobility that had taken root in people life. Concretely, the member shared the futuristic view in 2030 on the scene of the enterprise project while using the multi space design method, and made up the concept framework of a multi aspect. We designed the next generation mobility that followed the concept framework, and sustained "Society that can trust it" for the next generation partly. (The scene in this research was an in-house project to develop the concept car exhibited to the Tokyo Motor Show that had been held at the every other year. Ordinarily, our project team was organized 20 young staffs and over, we proposed bottom-up ideas.)

Concept design

The first step is the concept design phase according to the design process expression in the multi space design model. (Figure) Ordinarily, it is usual process to make the concept that matching the image together with the discussion and the rough sketch. But, it is very early the market transformation, and will be demanded high-quality design development by diversifying of sense of values and

globalizing information in a short term on the scene though is similar it.

Then, to make up a firm concept attempting the consideration sharing at short time, we got our ideas into shape in accordance with the multispace design method. Our team used the variety of conception method for idea expansion, stake-holder interest grasp, scenario setting assumed all situations.

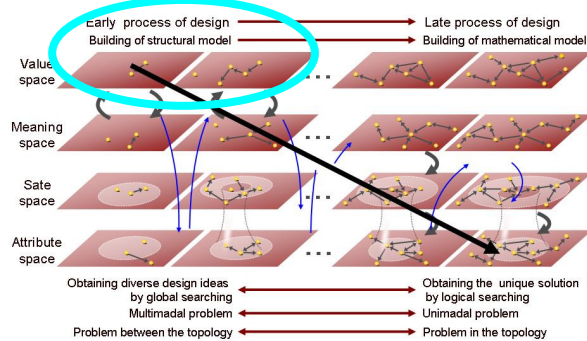


Figure 1. Multispace Design Method

Preparatory survey

First of all, We collected the investigation of an external organization to discuss among project members.

It is shared as objective knowledge.

- Innovation 25 under the leadership of Prime Minister's Office
 - Society of automotive engineers japan : The car in the future of 2030 becomes it so
 - Nikkei : Forecast report at auto sector futurity
 - The Ministry of Land, Infrastructure, Transport and Tourism : Shape in new country (investigation concerning the overall traffic system that supports sphere of large area)
 - Tokyo University, Dentsu, and Eco-design of information technology society : Lifestyle of Global warming
 - The Ministry of Economy, Trade and Industry : Technological strategy road map
- The technology road map of the Ministry of Economy, Trade and Industry with the illustration is comprehensible as the materials.

1. The telecommunication technology of which it symbolizes the Internet and the cellular phone accomplishes further development, and contributes to the use of natural energy using it.
2. The development of public traffic and personal mobility also additionally deepens diversity by the technical improvement, and the development of the transport technology linked with the infrastructure is expected.
3. The robot is widespread in the living and support the human's life by the influence of the falling birthrate. Moreover, the lifestyle of a new family appears by the development of the virtual technology.
4. The society of complete recycling achieves because the material of a natural origin spreads the world by the economy realized.

The survey materials was efficient tools for the verification and sharing consideration in a short time.



Figure 2. The Ministry of Economy, Trade Industry Technological strategy road map

Team Discussion

In this research, various techniques are applied to the Motor Show project in the enterprise, and it is a focus that the project can be led very efficiently. Then, it did not explain the technique to activate the discussion without being captured to the technique. Those idea progresses are speedily confirmed repeating the bottom-up / top-down between the value

space and the meaning space in the multispace design model.

The idea progresses of effective techniques were shown as follows.

- Mind map → The conception methods were mainly used the brainstorming and the KJ method. But we want to useful methods for create more ideas.

- Customer value chain analysis (CVCA) → It was able to understand the connection of value among stake-holder .

- Scenario graph → The behavior pattern of the user in the future is understood while comparing it at 5W1H.

Each technique gave directionality that had to be advanced of the project and the suggestion was given on each occasion.

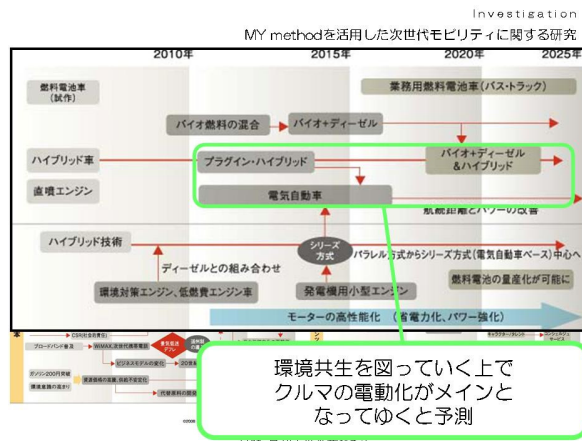


Figure 3. Nikkei : Forecast report at auto sector futurity

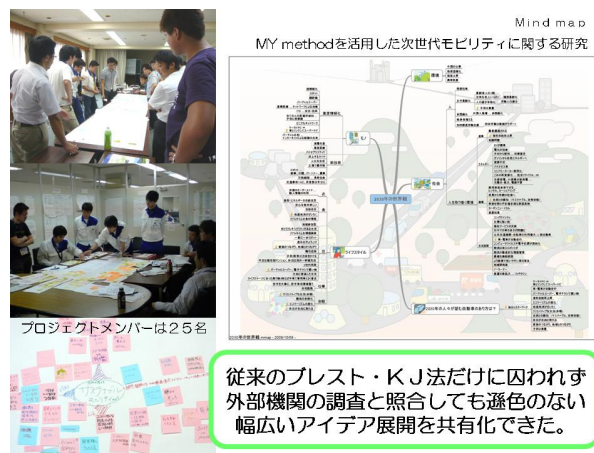


Figure 4. Mind map

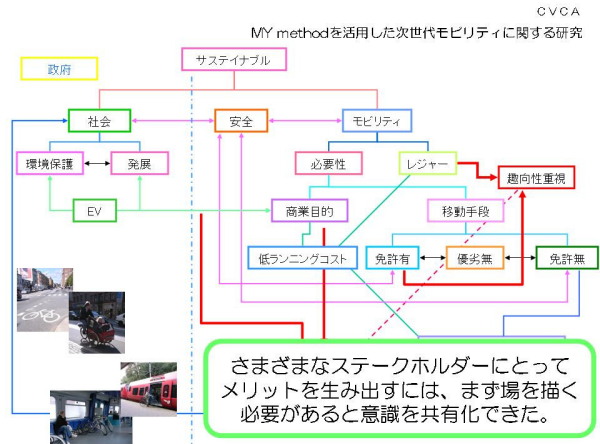


Figure 5. Customer value chain analysis (CVCA)

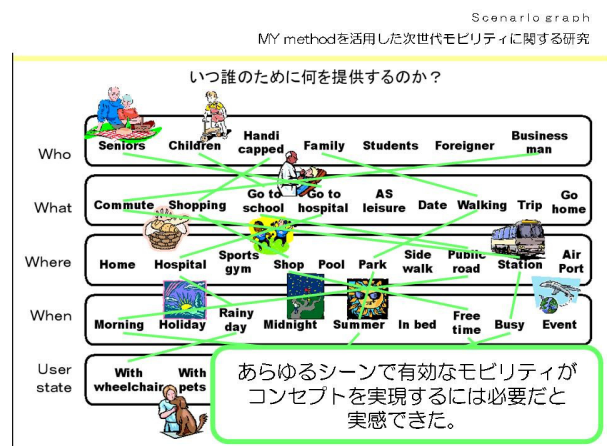


Figure 6. Scenario graph

Idea sketch development

The idea is progressed by the rough sketch for the image definition with the attribute of the material, the color and the size. It is to create the design concept from processes of value and the meaning space in the multispace design model. The design solution candidate was derived.

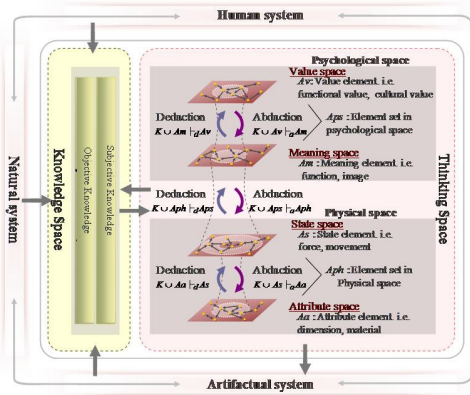


Figure 7. Idea development by Multispace Design Method

Those idea/sketch was divided into value, the meaning, the state, and the attribute respectively, and the story thought about in each space was made. However, our project team reached the conclusion of insufficiency as an extension of the future view in each ideas. We recovered the proposal including an immediate rebuilding.

When turning around it is the cause with an insufficient extension of the 2030 world is natural because the relation grasp between idea elements in the multispace design method was an insufficient and improper quotation. However, another sharing consideration that is "Connection of the car and human" was created by mistaking them. We invented the message of the show theme unexpected by this processes.

There was no extra time but it became a conclusion that it was earlier to go back the process again and to proceed to a discussion, a lot of current ideas were arranged four high spaces again separately, and the relations between elements were understood. The keyword that can be called the dream of the member "the society that trusts" is become the starting point of the concept framework from this process.

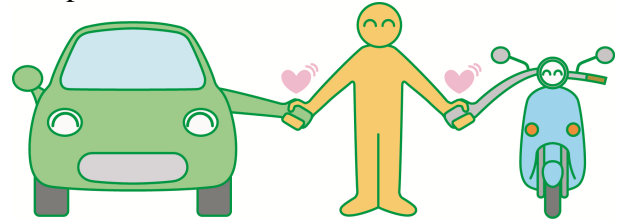


Figure 8. Connection of the car and human

Concept framework

We should propose the concept is based on the target of the project team that builds the society that can trust it.

In the multi space design model, we examined repeatedly from the idea sketch including the attribute to the psychology space process as an evaluation of the design solution candidate.

As the result, we were able to construct the concept framework that agreed with the exhibition theme. It is that promoting communications connected to "Human" and "World", environmental measures connected to "World" and "Generation", basing the culture and the education connected to "Human" and "Generation" ---"Person" that forms a community, "World" that separates the space, and "Generation" that exceeds the time axis. (figure)

In addition, we classified the new technology that obtained it from the preparation survey and expanded the concept framework. When this framework is divided into it based on MECE, environmental side centering on the human involved the new technology of the natural system, cultural side centering on the human

involved the new technology of the artificial system.

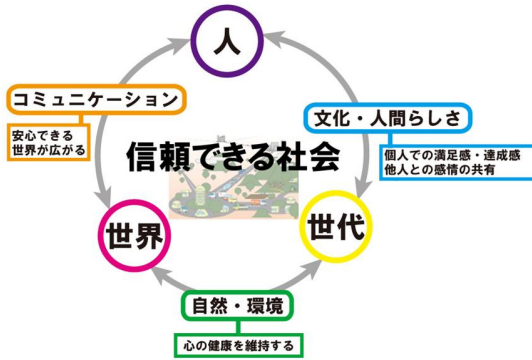


Figure 9. Concept framework



Figure 10. Concept framework 2

Concept

The concept is designed in accordance with the multi space design model based on the concept framework.

On the environmental side, the key word "Environment symbiosis → Kindness for human" corresponding to the natural system is extracted as value and meaning.

On the cultural side, the key word "Safety and safely → Everyone can get on" corresponding to the artificial system is extracted as attribute about basic design and detailed design.

"It is an easy mobility in the person whom everyone was able to get on" was able to be supported to "Construction of the society that trusted" was the target of our team as concept.

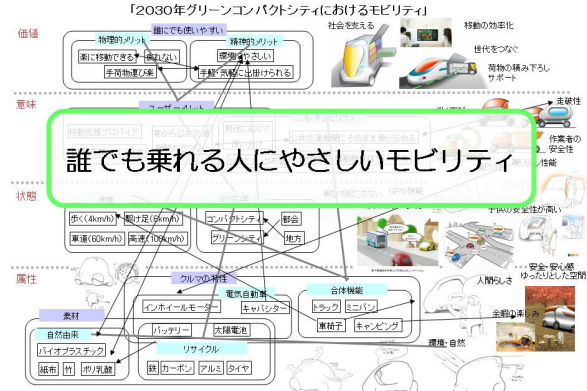


Figure 11. Concept by Multispace Design Method & Idea sketches

Basic design

The idea is progressed by the rough sketch for the image definition with the attribute of the material, the color and the size. It is to create the design concept from processes of value and the meaning space in the multispace design model. The design solution candidate was derived.

As Is

We tried to catch up the current problem of the short distance movement to share the point had to be improved in GCC by 2030. It became a discovery that there were two big problems when not only using the brainstorm and the KJ method. visualizing and classifying

As a result, There is a person who commutes the age taking a large-scale car that becomes a crowded getting on only several times alone, and people who can keep it exist in the favor of the car when the problem is classified by the result and each movement sphere classification table. It became a conclusion that there was a movement difference that man who moved by car that scattered extra exhaust gas was doing easiness by neither the pedestrian bicycled became transportation disadvantaged people compared with the car living easily on the road in daily life, and using useless energy. AsIs was assumed to be "It was not possible to finish

covering" and "There are a lot of uselessness" from the above-mentioned. It was thought that new value was able to be invented by solving it by the technology that these problems were assumed in 2030.

Problem in movement of walking range

- Carrying about the stroller is troublesome.
 - I cannot have the bought thing.
 - It fractures and crutches.
 - It walks off one's feet and the foot is a stick.
 - It is heavy labor that goes in luggage for bearing.
 - Going out by one is lonely.
 - I want to look for a good shop only at time where it goes out.
- There is the problem that scene in the movement that uses the car,
- A rear hatch can not opened.
 - When the door was opened, it threw it at the next car.
 - The bicycle has thrust it in an open door.
 - When boarding it, the head was thrown.
 - Because height was high, it was not possible to board it.
 - It collides with the thing in the blind spot when backing.
 - It has a hard time to put the stroller.
 - To the strained back when you put heavy luggage.



Figure 12. Problem in movement of walking range



Figure 13. Problem scene in the movement of using the car

ToBe

A general idea method named 5WH and 5WHY also used the problem that had risen by AsIs, essence was caught, and the improvement was understood. (figure)

- It should be able to enjoy a free movement the same as the current without giving the global environment the load.
 - It has the best size and the performance when it is necessary, and it wants the movement tool that supports people's activities.
 - People who cannot enjoy a free movement in hard respect especially up to now are made to be able to get on. On a soft side, it makes it to the thing that even a healthy person seems to be able to use without uneasiness.
 - It is possible to move easily even if sitting or standing or walking, and it is possible to go anywhere also in the vicinity, the room, and the amusement park liking it.
- ToBe assumed, "It was healthy and earth friendly", and assumed the use scene like figure from the above-mentioned.
- It is possible to move by sitting when walking off one's feet in the shopping mall amusement park.
 - It wants to feel the wind while surveying the view because it stands and to enjoy a free without any inhibitions movement.

- Sudden rain is light-hearted of going out to shopping and the park without worry that the baby gets wet.
- Redcap function that carries even if there is heavy luggage.

Headings

The technology that classified it by the concept framework was matched to the new features included to achieve ToBe and it narrowed it. The new features included of the mobility in the walking sphere region

- The first step where it goes up by one step
- As a result, it is possible to advance one step in the difference (A standard difference distance is 20cm) that exists in a general space such as pavements and escalators. Moreover, it is possible to enhance it to safety like the posture control etc. , getting on and off, and amenities by applying it.

- Interface that can be chosen

In the current state, the interface of the stick , for example, [seniaka-] etc. is a main current. However, the person with a handicapped hand doesn't use easily, and there are a lot of problems in operativeness, too. To adjust to people of all generation every situations, I want to prepare a lot of kinds as much as possible. The game generation and the child are controllers who utilize the cellular phone that makes i phone a representative to enjoy driving. The brain machine interface controlled from the brain by instructing direct is offered.

On the other hand, the mobility in local living areas :.

- Accessibility improvement of everyone on body and rotation roof where it squats down
- Neither the stroller nor the wheelchair can fold and it store it as it is.
- Uneasiness to the taking turning is solved by the function of the rotation around fixed ground with the Inn wheel motor and the four-wheel steering.
- The dissatisfaction when parking with the free parking system that controls only ultra

low-speed region automatically by the limited space such as large-scale stores is canceled.

- Crystal ball steering wheel to be able to understand movements such as pedestrians and bicycles that situation around physical road and building etc. to destination not only is understood from 3D display but also intercommunication technology is used and it includes forward

- 360° view interior that loses blind spot of car, and supports driver's safe driving

Styling decision

When bringing it together in accordance with the new features included and the concept squeezed from AsIs→ToBe

- It runs at a speed of 6 km/h to which everyone can rise even if there is no license per hour.
- partner mobility like accompaniment mate always

The initial is taken and a detailed design is developed by the tentative name named PAMO. • Electric vehicle with built-in Inn wheel motor

- PAMO is expanded and the people range of the action can be expanded in the seamless by uniting as a seat.

The partner commuter of GCC is abbreviated and PACO (tentative name).

The idea of * piece that is these frames and the current sketch is received and a basic design is developed again. It finally decided it by the member centering on sympathy with the concept.

- Body with which sense of being alive overflows

The material and the shape balance were considered as a target to which nature and easy feelings sprang up getting a hint from animal's baby. Size without overpowering feeling in which safety to surroundings is considered. And, it was and made it to ..obtaining.

- New fixed method

Everyone can easily board together with PACO, and the new union method assumed to be a healthy mobility system is adopted.

Detail design

We done detail design considering actual material, the power train, detailed size, the stress computation, and the exhibition scenario for the model production based on basic design decision.

Presentation sketch

Rough sketch actual show car make foresee detail structure material selection include refinement advance.

To merge in the town or more, PACO corrects a healthy forming the attitude.

It is necessary to decide the size and the material in detail for PAMO, and the idea development that chiefly thinks about the connection on a soft side with the person is added.

CG making

The solid that used the computer graphics was made though it was very a short term because it dropped to a solid thing. The animation confirmation will be included in two weeks, and the CG making is completed.

Work to assume targets of us who included it to the concept to be a message at the same time and for the scenario to progress also advanced it concurrently. The place where the state and the attribute were able to be expressed because the meaning and value were included in CG was considered.

Production preparation

Production up to the stage only of entering being able a great degree of to make arrangements for management in the budget with the model manufacturer because it is, and to expect fabrication specifications, the

schedule, and the number of men the same as the budget almost for eight months. It succeeded in 40 percent reduction to total time that it took 13 months until last time. It was possible to compress into about the half, and it only digestion became it for a usual production period when man-hours until approving the project were compared.

Conclusions

We applied the multi space design method to the scene of the enterprise, and developed our concept making process. It was very effective to have made efficiently those records that were able to go back the process of design development for the next project. It was very a hard project to propose the concept design while sharing the member's consideration like facilitator roles.

In this research, the prototype by which it followed the above-mentioned concept was made, and the exhibition to Tokyo Motor Show was scheduled. However, the review with a great auto sector is urged due to an unprecedented recession that originates the edge in the finance crisis, and the influence is received in no small way and this project also has run onto a reef. It is very regrettable.

We want to develop continuously a new advance technology though this proposal doesn't appear as it is as the next concept car. This research method isn't only application of the concept car development, but also application of the mass production development. And we will study to compare them for the construction of effective design development process.

References

- [1] Y.Matsuoka (2007) "*Multispace design method*" (Keio university)
- [2] S.Miyata (2008) "*The concept of the optimum design*" (Engineers japan)
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