Mobile Car Workstation

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ABSTRACT

Since Covid-19 the remote work increases day by day. The work itself becomes more and more flexible. From the point of view of the "Post-Corona Trend world" there are many megatrends developing right now. Some megatrends are remote work, co-working and autonomous driving.("Post-Corona-Trendmap")

For this reason, an investigation has been carried out using systemic models in order to analyse the problems and find a solution which improves the remote work in a car. Starting with the analysis of the user's needs and following by exploring the concepts of the product. After that the product has been defined more and more specific in functional, ergonomic and in a formal way.

At the end we developed a mobile car workstation, which can be installed fast and easily at the headrest of the front seat in a car. From the outside it looks like a normal laptop briefcase, but it contains many features like extendable workspaces to the left, right and to the front and a magnetic whiteboard on the top.

Keywords: Remote work, car, flexible, innovative, new work

1. INTRODUCTION

The world is undergoing a big change. After the covid-19 crisis we realized that many parts of daily life are completely outdated. A part of it is the art of work. Normally in the last century the work consisted of a typical 9 to 5 job. As well the worker had to be on site and couldn`t work from another location. But the art of work changed, especially during the quarantine time during the covid-19 crisis. Remote work became more and more popular.

Whether at home or in a café: remote work by definition means working from any location. All you need is a PC and online access. A recent labour market study based on millions of job advertisements shows that more and more companies are explicitly offering this option in order to be able to hire the best professionals for their company. In Europe, the share of remote work offers in job ads has more than quadrupled since 2018. ("Remote Work: Das Arbeitsmodell der Zukunft?")

To improve the remote work experience we decided to create a product which can provide a fast installable working place in any location, especially in the backseat of the car. A lot of people travel a lot during a working day and between meetings in a bigger city. Thats why we created our product "NomadSpace". It is a briefcase with extendable front and side panels which can be installed within 30 seconds and it also provides a great storage place to just continue working after a location has been changed.

2. STATE OF THE ART

The niche we develop NomadSpace in is not new, when you search Amazon for "mobile car organizer" there are hundreds of products trying to solve the same problems as we do. There is one thing a lot of these solutions have in common, there are either lacking in design and aesthetics, or are very bulky and expensive.

In the following section, we examine some examples closer. Note that we tried to choose products which represent the existing product landscape, we also applied a quantitative keyword analysis of these products.

We also applied a basic quantitative analysis of the reviews for each product by downloading all the available reviews from the european Amazon Marketplace and performing a simple keyword extraction and sentiment analysis of them. This helped us to easily identify the major problems and advantages of the individual products without having to manually review each of them.

2.1 CAR BACKSEAT ORGANIZER

The Car Backseat organizer attaches to the back of any car seat, providing organized storage and a way to hold cups and tablets.

2.1.1 Materials

The main body of the product is made from artificial leather, with some parts made from different types of fabrics.

2.1.2 Positives

One of the advantages the car backseat organizer has is the amount of storage it provides, it has many pockets. We can see a lot of reviews mention the "many [...pockets]" it has. Also, the type of artificial leather blends in well with most car interiors.

2.1.3 Negatives

Some reviews mention the cheap quality of the leather of the Car Backseat organizer and the cheap construction quality as well.

2.1.4 Keyword Sentiment Analysis (N = 209)

Keyword	Amount	Sentiment
easy	41	4
long	22	1
little	21	1
small	8	0

cheap	8	0.25
many	7	0.57
happy	6	5.33

2.2 GRIPMASTER PASSENGER SEAT TABLE

The GripMaster is a table with storage, as well as a charger and smartphone holder. It attaches to the passenger seat of the car.

2.3.1 Materials

The main body of the organizer is made of some sort of plastics. There are some decorative wood elements made from different types of wood. The top is made from a type of anti-slip surface.

2.3.2 Positives

The product seems to have good build quality, a lot of reviews mention its sturdiness. It also provides a lot of space and opportunities of organizing things.

2.3.3 Negatives

For around $500 the GripMaster is the most expensive one on our list of items. Due to its design, it is only usable while attached to the passenger seat, so you are not able to use it in any other situation.

2.3.4 Keyword Sentiment Analysis (N = 151)

Keyword	Amount	Sentiment
easy	13	3.3
little	9	0
worth	7	1
sturdy	6	2.83
mobile	5	0.8

small	5	-0.2
aware	4	2.25

2.3 MULTIFUNCTION STEERING WHEEL TABLE

The Multifunction Steering Wheel Table is a foldable and expandable table which connects to the steering wheel of a car.

2.3.1 Materials

The main body of the table is constructed from plastic, with some attachment parts using rubber and metal. The entire product is coated in black.

2.3.2 Positives

Due to its neutral black color, it integrates well with all most car interiors. Also, some reviews mention the small size when folded.

2.3.4 Negatives

The product is very cheap, and the build quality matches the price. A lot of reviews mention "flimsy".

2.3.5 Keyword Sentiment Analysis (N = 94)

Keyword	*Amount*	*Sentiment*
little	*14*	*3*
sturdy	*8*	*2*
easy	*6*	*3.66*
flimsy	*6*	*-1*
hot	*4*	*-0.25*
handy	*3*	*3*
small	*3*	*0*

3. METHODOLOGY

To create an innovative potentially successful product through the use of systemic models, we concentrate our attention on three points : the function (which is a product value), the ergonomy (which represents the product experience), and the shape (to adapt to social and market changes). During the development of our product, we used systemic models based on a human centered design. First, we will present the methodology we used for the analysis of the exterior system, then explain the conceptualization process and finally develop the way we made conceptual geometric models.

3.1 PANEL 1 : EXTERIOR SYSTEM

In this part we will develop the steps of the analysis of the exterior system. We will start with the explanation of the concept map, and we will continue presenting the way we choose our ideal consumer for this niche market.

3.1.1 Concept map : trend analysis

The concept map is the first step in the creation of an innovative product. For that reason, it is really important. We start analysing the market, social and technological trends. By researching existing products and examples, we had a clear vision about what was going on in the car market. Moreover, the development of technology in this field increases every day. Finally, the study of social trends pushes us to define our ideal consumer.

3.1.2 Ideal consumer

At the beginning, the creation of a mood board helped us to generate the global idea of our customer. Then, a persona is permitted to add a lot of details to catch the exact way of life of this person. Thanks to that new vision, we could draw a storyboard presenting a comun and bad situation which has to be solved in our customer life.

3.1.3 Brainstorming and Googlestorming

At this point of the development of the product, we had in mind the trends, the consumer we wanted to help and the situation we needed to solve. Always helped by the Concept map, which added all those datas, we started a brainstorming process. Finally, we relieved the main important points and continued with a Googlestorming. This last one permitted us to summarise in images and concepts already alives the way our product was going to take.

3.1.4 Comparative matrix and review evaluation

Now that the niche market is found and the consumer well-defined, we started to analyze the concurrents, writing the advantages and disadvantages of each product always based on the function, ergonomy and shape of the product. For that, we used the opinions we found on the shopping websites in a goal to make a review evaluation.

3.1.5 Knowledge synthesis

Centrated on the three important aspects of Funcion, Ergonomy and Shape, we summarize the precedent analysis creating three clouds of key-words. That allowed us to design the first sketch of our product.

3.2 PANEL 2

This part is totally focused on the product and its desarollment. The functional, ergonomic and formal aspects are developed at their maximum by defining the measurements, the materials or the aesthetics. First, the precedent panel helped us to define the inputs as the exterior parameters. Then, in each category, the objectives (what?) and essential variables (how?) were developed. Also, the volume of use, usable surface and contour limit helped the analisis to go further.

3.3 PANEL 3

Thanks to the details defined before, we designed each aspect of our product : from the funcion to the form. This evolution in pictures allowed us to catch each important value of the product, imagine the experience of the consumer and fix it in the actual trends.

4. RESULTS

A qualitative and quantitative research has been carried out, using the ID-Think Product Model methodology, which is based on the application of systemic models applied to the design of new products.

The ID-Think Product Model, which is based on the application of systemic models, was applied to the design of our new products. In addition, methods and techniques have been applied to help generate ideas, analyze the problem and generate possible solutions to the problems.

In total three panels have been carried out following the ID-Think methodology, which was mentioned above. The panels containing the exterior system, the system under study and the conceptual geometry, which will be explained in the following.

(B. Hernandis, M. Agustín and I. Esnal,2017, http://www.id-think.com)

4.1 PANEL 1: Exterior system

In the first panel it started with the exploring of the concepts. First we analyzed the trends of the car world and its environment. After that our target consumer was defined in detail which was followed by a brainstorming and a googlestorming. The ongoing trends in social, technology and the market has been researched with the conceptual map. In the last part of the first panel the comparative matrix has been carried out, which includes the comparison of similar products and its evaluation. At the end we defined the design variables which mainly characterize our product.

4.1.1 Briefing, Brainstorming and Googlestorming, Persona

The briefing contains the main topics which have to be solved by the product. In this case it was to find a solution for effective working while traveling, a foldable movable work space in the back of the car with limited space which is easy to install and remove. After that a brainstorming with an additional googlestorming has been carried out, which can be seen in the following figure.

To become more clear how to solve the needs of the customer, a persona was created. In short terms, he is a modern hard worker with green sensibility who lives in a town and uses all the possibilities of the transport services . He wants to work flexibly and efficiently. Further information, like his personal opinions, his life goals, his personality can be found in the following figure. As well a customer mood board was designed to become a quick impression of the customer itself.

4.1.2 Conceptual Map

After brainstorming and google-storming and the definition of the buyer persona, the concept map was created, which contains hierarchical and organized information. The conceptual map can be seen in the figure below and is divided into 2 big topics. First the trends which includes the social, market and

technology trends and second the User which contains information about his demographic situation, his needs and his behavior.

4.1.3 Comparative Matrix & Review evaluation

One of the most important techniques in the research process is the comparative matrix, because thanks to it, it is possible to know the future competition, the products created and in which aspects there are shortcomings in order to be able to intervene with the new product.

An analysis of products which provide a working space in a car has been carried out. Therefore we found in total four products which are similar to our idea. After that the product characteristics, the advantages and disadvantages from all different products were defined. Therefore we could find out which things could be improved and which things have to be kept.

To support this statement, a structural amazon review keyword analysis has been carried out. In this analysis we looked up the amazon reviews of the different products and pointed out visually which words are used when the products were excellent or awful rated.

Product	Our Product	Advantages			Disadvantages		
Image	Characteristics	Function	Ergonomic	Shape	Function	Ergonomic	Shape
	Name: GripMaster **Company:** AutoExec **Price:** 597,24€ **Brief description:** Car Desk with 200 Watt Inverter, Printer Stand and Phone Holder **Webadress** **Target Group:** Mobile Workers, Car Owners, People without Friends or Family, Rich People, People who love Accesories	**Primary functions:** • Working on the Road • Organizing Stuff **Secondary functions:** • Provide Power • Tablet/Smartphone Holder • Lot of plastic • Choosable Color/Material	• Sort of mobile • Good height for working	• Fits nicely into car seat • Fits into car design • (Non)-slip surface	• Takes up a whole car seat • Works only in the front of the car • Cheap Materials	• Heavy (11kg) • Working in uncomfortable position • Hard to carry • Hard to install • Hard to keep in place	• Super Large • Really Ugly • Cheap construction
	Name: OHMOTOR car multifunction table **Company:** OhMotor **Price:** 29,99€ **Brief description:** OHMOTOR Car Multifunction Steering Wheel Table Laptop Desk For Steering Wheel Passenger Seat Black Car Steering Wheel Desk **Webadress** **Target group:** Mobile Workers, People who have to wait for a long time in a car, busy people, efficient people, Mothers	**Primary functions:** • Create a working space in the car **Secondary functions:** • Create an extra space with a foldable construction • 10 kg carrying capacity **Material:** Plastic, prob. ABS	• Adjustable height • Adjustable angle	• Black • Flat design • Non-slip surface • Material is not really sustainable	• Construction is not really stable, Vibration of the car can have a bad effect on the working situation	• Cold perception • Angular design	• unwiedly shape • many parts
	Name: Yipa Car Backseat **Company:** Yipa **Price:** 11,56€ **Brief description:** Yipa Car Backseat Organizer with Tablet Holder,9 Storage Pockets PU Leder, Tray Car Seat Back Protectors Kick Mats Travel Accessories 1/2 Pieces **Webadress** **Target group:** children, people which travel for a long time	**Primary functions:** • Create a working space in the car **Secondary functions:** • Expand the storage volumen in the back of the car **Material:** PU Leather	• Easily reachable • Installable in a lot of cars	• More than 5 colors • Options to match material of the car	• Material looks not really strong for multi time use • Plastic not Eco-Friendly	• Not adjustable • Very large	• no easily movable between cars/stuff/things • Not foldable
	Name: Car Organiser for Front Seat **Company:** Smof Store **Price:** 38,99€ **Brief description** Car Organiser, Office Supplies, Back Seat Organiser Children with Separate Pocket for Laptop, Multiple Pockets, Drink Holder **Webadress** **Target group** Workers, People/Workers on the move	**Primary functions:** • Backpack which can be used in the car **Secondary functions:** • Organizer **Material:** Polyester	• Adjustable Height • Easy to remove / install	• Black • Clean design • Lots of pockets • Foldable	• Plastic, cheap looking Material • Cheap	• To big for a shoulder bag • Uncomfortable, because of no paddings	• Unstable design

Structural Amazon Review Keyword Analysis (n=209)
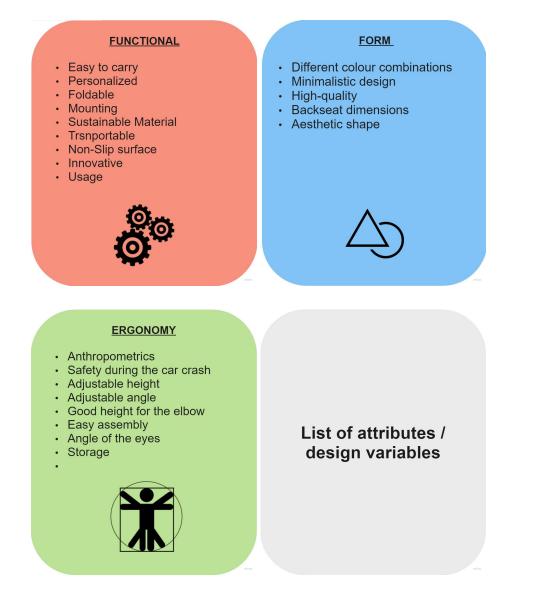

1 Star → 5 Stars

Times mentioned

4.1.4 Knowledge synthesis

In this stage, the design attributes or variables that the product should have were defined, qualifying them in terms of function, ergonomics and form.

FUNCTIONAL

- Easy to carry
- Personalized
- Foldable
- Mounting
- Sustainable Material
- Trsnportable
- Non-Slip surface
- Innovative
- Usage

FORM

- Different colour combinations
- Minimalistic design
- High-quality
- Backseat dimensions
- Aesthetic shape

ERGONOMY

- Anthropometrics
- Safety during the car crash
- Adjustable height
- Adjustable angle
- Good height for the elbow
- Easy assembly
- Angle of the eyes
- Storage
-

List of attributes / design variables

4.2 PANEL 2: System under study

In this panel we worked on the funcional, ergonomy and formal aspects of our future product.

4.2.1 Functional subsystem

First, we needed the product to be sustainable, mobile and easy to install on every type of front seat. For that, we worked on the material, the measurements and the mechanic.

The volume of use was principally defined by the form of the product closed : a briefcase. True, it didn't have to be too big but it had to possess enough space to contain all the mechanisms and ergonomic functions. In contrast, the usable surface was defined in a qualitative way because it was more linked to the ergonomy aspect. The contour limit develops the mechanisms to install and remove the workstation.

4.2.2 Ergonomic subsystem

In that part, we focused on the measurements of the expandable planes. Right, they permit the adaptation of the product to the user, but also to the environment because of the dimensions of the car. We used the normatives of a workstation but also of a car seat. The textures and colours are datas which add to the measurements given that the body of the user will rely on the workstation and his eyes will centrated on it in an environment closed and sometimes luminous.

4.2.3 Formal subsystem

The choice of the materials is the main point of this subsystem. In fact, it has to be sustainable but also aesthetic and comfortable.

4.3 PANEL 3: Conceptual geometry

It is important to see the size of the product under design in reference to real objects to understand how they relate. For this purpose we created some non-accurate reference models, these were also used to test out how different materials would look in composition.

5. CONCLUSION

Using the systemic models we have learned how to create innovative product ideas from scratch and develop it into a more concrete mockup and CAD-Model. We used several methods to create and develop product ideas in an innovative way.

In today's world, more and more efficient working is required. Our product "Nomad" provides an outstanding possibility to work flexibly everywhere. We have developed a case that is convincing in design and functionality. More specifically, it has been designed to create a mobile work surface in the back seat of a car. For this purpose, the case is simply mounted on the rear headrest with an adjustable handle. After some design ideas we figured out how to store the laptop in the case and create as well an extendable surface which improves the working experience. The design on the outside was created very simply from brown leather. Therefore, the suitcase is ideal for business purposes.

All in all the suitcase is designed very functional to set up the workspace in the car easily and fast. "Nomad" is a perfect addition for a remote worker who needs to be flexible anytime.

6. REFERENCES

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