

CS-570 INTRODUCTION TO HUMAN-COMPUTER INTERACTION
FALL 2021

PROJECT I:WEB-BASED SERVICES

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**POWERSPEED: USED CAR
WEBSITE RECREATION**

PROJECT I:WEB-BASED SERVICES

INTRODUCTION – XINYUE LIANG

In this project, we seek to improve a used car trading website. During the daily use of such websites by us and our friends, we identified that the current used car websites are usually difficult to use, lack certain important information for a successful trading process and buries certain risk into online car shopping for customers. Based on our contextual inquiry on three participants with different level of knowledge in the field of second car market, we identified the main problems come from four aspects of the current websites:

1. Single form of search method (filter based) and lack of comparison function
2. Could not provide enough information about the cars' situation by a unified standard
3. Contact method between customer, website and dealers is too formal and lacks efficiency.
4. Do not offer substitution methods to simulate actual test driving experience.

To address these four problems, we decide to add related features and functions into the current existing pattern of similar websites. Also, we noticed that among the participants, a significant number of them (usually non-car enthusiastic ones) can easily be bored by the endless comparing between different models and be annoyed by the pop up advertisements during their use. So we are aiming to provide the customers a less stressful, more playful and carefree using experience. To achieve that, in the design of our web pages, we follow the two following basic rules:

1. Minimalism: we removed all the advertisements and unnecessary buttons to keep our website as clean as possible
2. Take inspiration from game design methods: we borrowed a lot of ideas from different genres of games and incorporated playtest methods not only in utility test phase of the project but also during the development of our web pages

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INTRODUCTION – XINYUE LIANG

All the functions we added in our problem based designing process and the two basic design ideas constitute our current state-of-the-art prototype. However, there are still certain potential problems and unfulfilled opportunities existing in our current model due to the limit of our team's knowledge and the group of participants we can access:

Problems:

1. As the advertisements are removed, the income of our website is less secured. If we consider our website as a product, we might take a business pattern similar to game platforms such as steam (take part of the profit from each sale). And we might need to consult someone in marketing major about the feasibility and details such as profit and strategies of running the platform.
2. In this project, we only examined the experiences

from the customer side as we can neither register a dealer account nor find a seller who is willing to participate.

Opportunities:

1. Maybe we can team up with the car brands themselves and incorporate standards of their certified used cars to increase the credibility of our website
2. It is possible for us to improve the features we added in more economical and user friendly ways if we have enough time and budget.

PROJECT I:WEB-BASED SERVICES UNDERSTANDING – Hehuan Zhong

Contextual Inquiry

We conducted three in-depth contextual inquiries with individual potential buyers following a methodology known as master/apprentice model. The primary concentration of these inquiries is each user's searching experience – what are their goals, how do they do, how do they think, etc.



Participant 1

Participant 1 is an expert on cars who owns an RC-F. He spends a lot of time studying a wide range of auto models, features, parameters and so on. He is critical when visiting a used car website. His opinions typically reflect the highest requirements of a website user.

He used keyword search because he had already gotten desired models. This model has several facelifts and package options. Besides, he would like to search multiple

models at the same time. So he wanted to accurately locate the specific ones that he was looking for by typing in keywords explicitly. He knew where to find the information he wanted and identify which key information was missing. New functions he needed were a direct price comparison tool between different dealers, a display of factory window stickers, interior condition (especially damages) pages and a list of differences among a model's facelifts.

Though he was an experienced guy, he still maintained that if you really wanted to buy a car, you had better inspect it in person.

Participant 2

Participant 2 is an absolute green hand on cars. Just gotten his driver's license this summer, he plans to buy a used car so that he does not need to wait for buses during the freezing winter. Though his intention of buying a car is not so firm. Customers like him are disadvantaged in this market. We need to make sure our design could be accessible to them. If needed, we had better offer extra help.

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UNDERSTANDING – Hehuan Zhong

He used filters to search because he had no idea what exact models he wanted. He did not tend to make comparisons between online used-car retailers but preferred to go to local stores to buy the model that he saw online. He did not know some terms clearly so some of his answers were confusing and even contradictory.

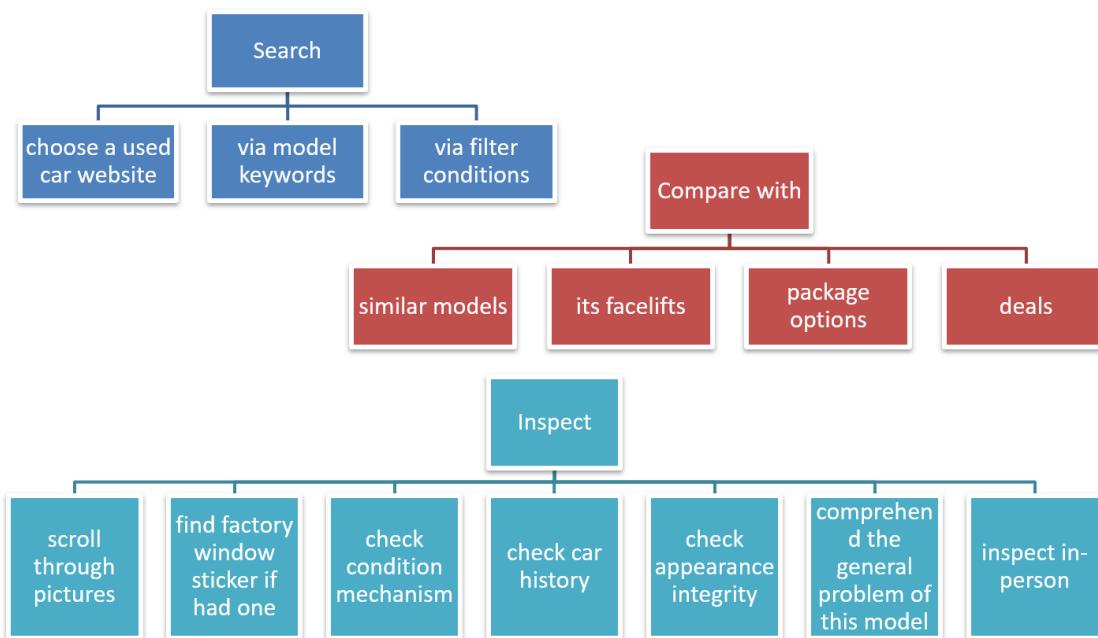
Participant 3

Participant 3 is ready to purchase a used car. He did some research but did not dig into this field. Consequently, we believe that he is representative of ordinary users. He searched by filtering specific price ranges and the odometer reading. The appearance of the car came to his primary consideration.

Price, damage/accident reports and odometer reading were also his concerns. He would like to have a message box that he could contact directly with the car owners.

Affinity Diagrams

Firstly, we extracted the movements, facial expression, and the related phase of using the website from the transcripts. All the extracted information is documented on stickers of different colors based on their type. In the next step, we inspected these stickers and then found out there are actually several movements and words that have a relatively high rate of appearance. We grouped the stickers based on the frequency of words. When we put the stickers in



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– Hehuan Zhong

sequence and reference back to the original searching process. Then we identified there are three major phases in the usage of second-hand car websites, which are search, compare and inspect. Then we generated the affinity diagram by putting the highest frequency movements/ actions and words into the related phase. The affinity diagram is especially useful for making physical, flow and sequence models. But it will slightly lack information for the artifact model (needs further interpretation and brainstorming) and cultural model (need more knowledge about the participant's background information).

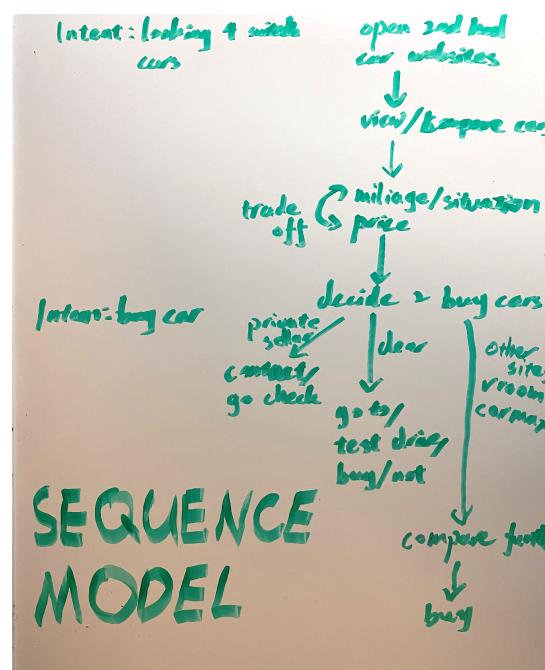
Models & Findings

We built five models to analyze each contextual inquiry respectively. A brief result comes out as follows.

1. Flow Model

For this model, we firstly identified the user categories of the used car websites, which includes dealers, private sellers, other websites (such as Carvana and Vroom) and finally customers. The next process is trying to find how these different types of users

interact with the websites. In the CI of the first participant, we found out the interaction between customers and other users are even more complicated, which include actions such as order, personal inspection and test drive.



2. Sequence Model

In this model, we examined the work sequence of buying a used car from the customer's view, as we only did CI on customer type participants and did not have a chance to interview a seller. In the sequence model, there are two main phases: the searching phase and the buying phase.

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– Hehuan Zhong

Only part of the searching phase happens on the used car website, the rest happens on dealer/ seller website, phone/ email or in person.

3. Cultural Model

There are actually 3 types of customers based on the focus of buying. Utility focused (our third participant in CI), Performance focused (1st participant) and those who only need a transportation method (2nd participant). The rules and norms in this model are: set by the website (for example, the filter based comparison is mostly used by the third type user for massive blind search), model history (for instance, performance based users would prefer certain models such as BMW M3, which have long racing history), and the location of the user (usually the utility based customer would consider passing ability and traction in Wisconsin winter time). All these rules and models would put different influences on different types of users' buying choices.

4. Physical model

In physical world, the users do search through website or app on their PC or phone

first, then used 3rd party report methods such as CARFAX to get more detailed information, in the next step they exchange information with or contact the sellers through: email/ phone/ seller websites, in the final step, they go to inspect (sometimes need a workshop to jack up the car to inspect the chassis), and test drive (mostly on public road but sometimes on personal track).



5. Artifact model

During the Cis we noticed there are two major issues in the existing site system: lack of information and incomplete experience. When it comes to the artifact model, we found that in the sketch, the two problems are all about detailed features. So, we added: information about change between models,

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UNDERSTANDING – Hehuan Zhong

3D view inspect, DLC in video game for
virtual test drive and message box for better
interaction etc.

PROJECT I:WEB-BASED SERVICES IDEATION – Kexin Tian

When we were doing the Contextual Inquiry, there were four major breakdowns we found that existed in most of the used car websites, and it gives us opportunities to improve them. Those breakdowns and the stages that we found them are:

1. Comparison Mode.

When we are interviewing people by asking them to mock a scenario of buying a used car on the website, we find out that most people could not exactly know the differences between types, especially, of the same brand. It is time-wasting for people to click the two web pages back and forth to find the differences of two, or even more, cars, and hard for them to remember the large quantities of parameters of cars. Therefore, we add a comparison mode to let them directly see the differences between cars.

2. Chat Box.

Two of our interviewers told us that they prefer to talk to the owner of the used

cars directly, so they could know the history of the used car, which is an essential factor when people are making decisions. Therefore, initially, we plan to draw the sketch with a chat box that people could directly talk with the car owner. However, when we were drawing the sketch, we realized there were problems with it. There might be not only one car owner for each car, and car owners might have already sold the car to a used car seller for convenience. After having a discussion, we came up with the idea of a professional engineer, which is explained detailedly in the third part, and we set chat boxes for the user to chat with the engineer directly.

3. Professional engineer.

When people are browsing the car, it will be convenient for users having some brief information about the car to decide whether to click into the detailed information page of the specific car or not. The information about clean title is always a prioritized factor. However, in

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some cases, even a used car that did not have any accidents before, there might be some problems that could not be reflected by the factor of “clean title”. Therefore, we set a professional rating, a score given by a professional engineer about the overall function of the car, at the browsing page.

4. 3D view

Although there are some websites that have already implemented this technology, most of the websites still do not have this function. What's more, the websites that have already implemented this function could just have a very general view. We would like to have one that could let the website user easily see both the inner and outer condition of the car, including a clear view of damage and scratch. And then, a virtual try-on would be great, to let the user experience the car through a scene in the car game with the surrounding environment of that specific car's inner look. Because damage and scratches are too broad to let people have a clear understanding of

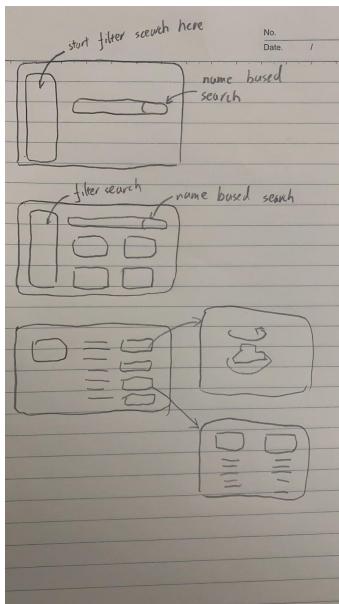
the real condition of it: Is it a big scratch? Or is it small? Is it a line? Or is it a round? Therefore, a 3D view would let the user have a relatively direct view and a closer “contact” with the car. Those are the problems we found when doing CI. When we are facing the problems, my partners and I do not only stop at the phase of dealing with them, but deeply think about the cause and the optimal solution to it.

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PROTOTYPING – XINYUE LIANG

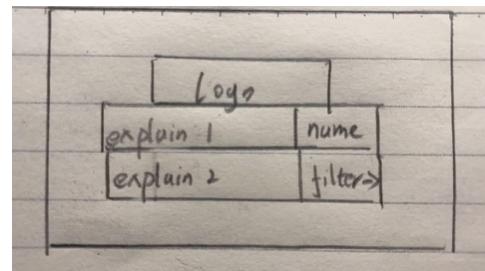
Link:<https://www.figma.com/file/Pdc8yXORyKNCa8f78P4BGC/Untitled?node-id=0%3A1>

In the first page of our prototype development, we decided that our prototype should have 5 screens for our website to include all the features we want to provide to the customers. And here is our paper prototype:

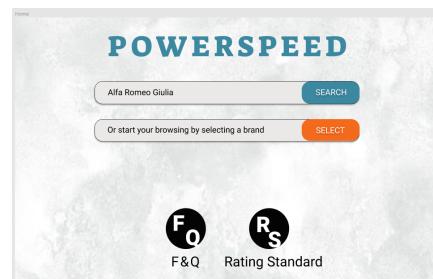


The first screen is our main screen where the users would start their search. We intend to include both the filter based search (placing all filters on the left side on the left side of the page just like the listing page.)

and name based search (placed as a search bar in the middle) in this screen. However, the feedback from testers in this stage shows that when they have not much knowledge about cars, they will tend to be overwhelmed by all these complicated filters, so we improved this a bit in wire frame by replacing the list of filters to let them start with only brand filters.



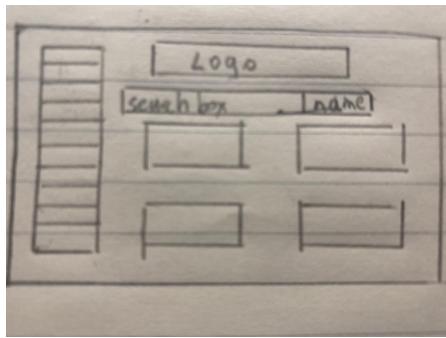
When it comes to our final prototype, we further improved it by adding a FAQ section to explain each filter that might be used and we also added an explanation about another important feature (which will be mentioned in next screen) in our website.



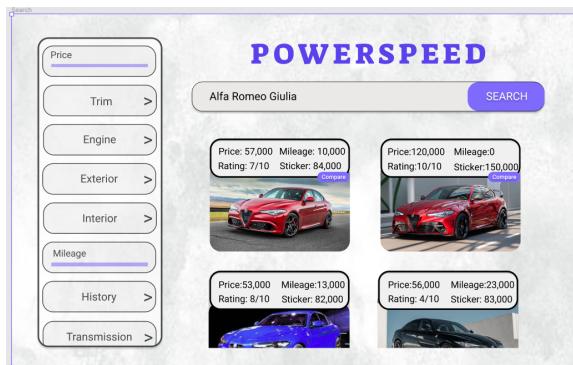
PROJECT I:WEB-BASED SERVICES

PROTOTYPING - XINYUE LIANG

The next screen is our listing screen. It seems that the layout is pretty successful based on the feedback.



Then we came up with the first figma prototype. The filters are on the left, we have part of the main screen move up to the top of the screen. The lower part shows all the listings of search results.



At first, we include four information for each listing: Price, Mileage, Rating and Sticker price. The Price and Mileage is based on the model of other current similar

websites. The rating is an important feature of our website. In ideal condition, there will be professional engineers from us to go to check each car in person and give an evaluation of the car condition based on a set of unified standards (explained in the RS black button). We got this idea from the field of Trading Card Games. There are companies such as PSA which can give a judgement of cards (such as pokemon cards) based on the print quality etc. and received huge success among card collectors. So we think we might also be able to do such grading on cars. However, in the utility test phase, some testers suggest that it would be better to add a comparison function to this screen. Others think that we should include cars' names on the listing page.

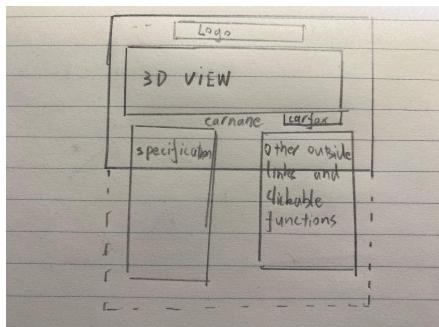
So we added a compare button on the right side and car name at the bottom for each listing.

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PROTOTYPING – XINYUE LIANG



Then the next screen is the car specification page, here we want to include all the specifications of a car and functions that could provide more information about add-ons and even offer a test drive experience replacement here. The first feature we included is the 3D view, it was initially designed as a button users can click and lead to a 3D view (our 4th page). However, the testers at this stage seemed to be annoyed by the idea of clicking into a new page when they want to see both the view and specifications. Thus we added the 3D view page directly into the specification page in our wireframe.

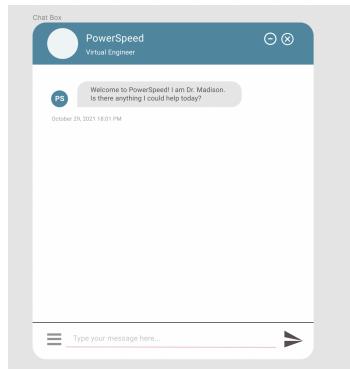


There are several features worth to talk about:

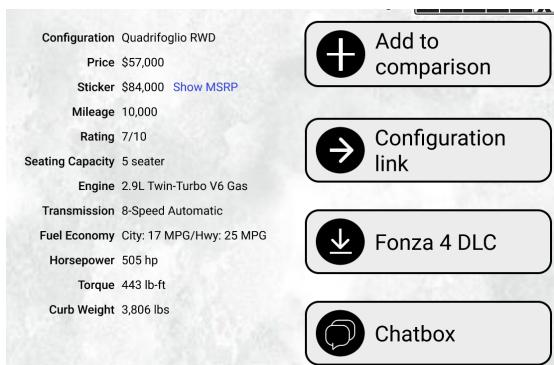
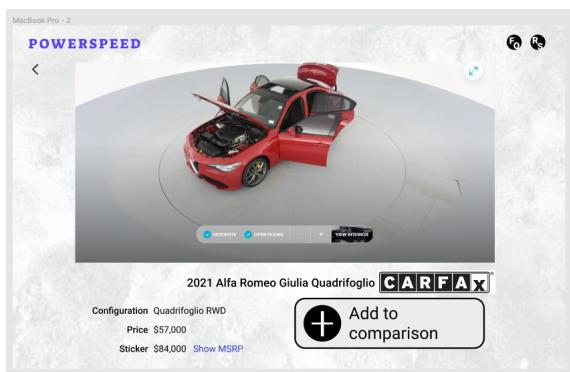
1. We initially wanted to add a stock like data curve for each car to show the price fluctuations. Then we realized that this is quite impossible to measure as the car situations and locations (which will cause transportation fees) are different, so we removed this feature in the final prototype.
2. The users can show sticker price or MSRP (which is sticker price – add on) in the specifications to get a better idea about the add ons.
3. The 3D view interface.
4. Link to the brand official website and actually build a new car to see the depreciation and whether it is a better option to buy a new one.
5. A MOD DLC in racing car game to test drive the car in simulators
6. A chatbox customers can use to negotiate with dealers and consult our experts.

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PROTOTYPING – XINYUE LIANG

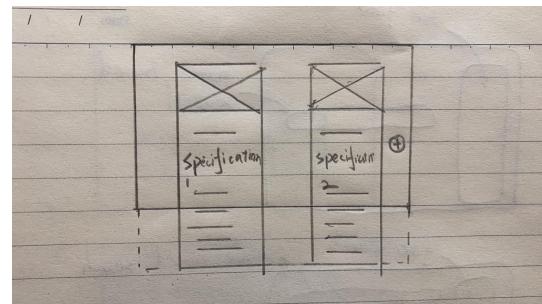


7. A Carfax link to see more car history
8. The comparison function (which lead to our final page)



The last page of our prototype is the

Comparison page. At first, it can only be used to compare two cars. In the warframe it has been improved so users can compare more models in it base on the feedbacks we get from this stage's testing.



In the next stage of our testing, we identified a big problem: in the warframes we did not include in-page back buttons cause we assume users can use the browser one. But the testers sometimes prefer to use the in-page buttons to navigate, so we added them into our figma prototype. Also, based on the utility test, we noticed that users waste a lot of time searching for the chat box (which is originally on the specification page). So we added the Chat Box button to every page of our website in our final design.

PROJECT I:WEB-BASED SERVICES PROTOTYPING – XINYUE LIANG

The screenshot shows a web application titled "POWER SPEED" with a "Compare Models" feature. It displays two Alfa Romeo Giulia models side-by-side: the 2021 Alfa Romeo Giulia Quadrifoglio and the 2021 Alfa Romeo Giulia GTA. The interface includes a back arrow, a search bar, and a "Compare Models" button. Below the cars, detailed comparison tables are provided for each model, along with a "Chit Chat With Our Engineer!" button.

Model	Configuration	Price	Mileage	Rating	Seating Capacity	Engine
2021 Alfa Romeo Giulia Quadrifoglio	Quadrifoglio RWD	\$57,000	10,000	7/10	5 seater	2.9L Twin-Turbo V6 Gas
2021 Alfa Romeo Giulia GTA	Quadrifoglio RWD	\$120,000	0	10/10	2 seater	2.9L Twin-Turbo V6 Gas

ADD MODEL

Chit Chat With Our Engineer!

PROJECT I:WEB-BASED SERVICES EVALUATION - Hehuan Zhong

Task-based Usability Tests with TAP

Evaluation is an indispensable step of website design. We need to verify that our design ideas actually ameliorate those problems we addressed before. Also, we have to make sure the website functions well in real world scenarios. After completing the prototype of a used car website, we conducted usability tests with people who have different knowledge levels about cars. Each person is assigned to perform 2 tasks with the Think Aloud Protocol. The content of these tasks is as follows:

1. Try to find the curb weight of Alfa Romeo Giulia Quadrifoglio
2. Decide which Alfa Romeo Giulia model do you prefer to buy by comparing with similar models and talking with a supporting engineer

Usability Measures

We adopted the following metrics to evaluate our prototype website thoroughly from a wide range of aspects.

1. Performance Metrics

We used levels of success instead of binary success to measure the task success. Because the tasks are not extremely hard, binary success may not tell the differences between each task's implementation situation. Besides, time-on-tasks are also a good way to measure task complexity and each test participants' performance.

2. Self-reported Metrics

System Usability Scale (SUS) was proposed by John Brooke in 1986. It is a reliable, low-cost usability scale that can be used for global assessments of systems usability. We introduce this standard tool to better understand the usability of our website prototype. The participants of the usability test are prompted to fill this questionnaire via Google Form right after they finish two tasks.

3. Behavioral Measures

Each test participants' behavior was recorded by camera. Our team members analyzed clickstream, verbal and nonverbal behaviors through video footage. In the end, we drew affinity diagrams to reflect what we

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have observed. These observations would be combined with outputs from other measurements to collectively draw a conclusion.

Findings

1. Level of success and Time-on task

Table 1. Test results of level of success

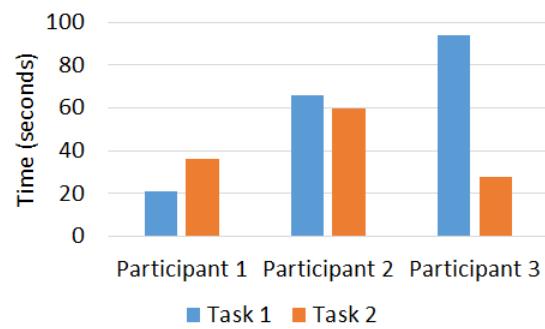
	Task 1	Task 2
Participant 1	1	1
Participant 2	1	2
Participant 3	3	1

Here we use a four-point scoring method to assign scores for each participant. Score 1 means successfully completing the task without any difficulty. Score 2 means successfully completing the task with small mistakes. Score 3 means successfully completed the task, but had major problems. Score 4 means giving the wrong

answer/giving up before completing the task.

All participants finished both tasks, but not everyone's experience was smooth sailing. We would like to further discuss the detailed situation and reasons later.

Figure 2. Test results of time-on task



It turned out that most tasks could be done within or around 60 seconds. There was an exception that Participant 2 spent a large amount of time on Task 1. By watching the participant's video footage, we found that he was scrolling around and was not sure where to click, due to the lack of the model's name on the car image.

2. System Usability Scale

After collecting all the SUS surveys we distributed, we obtained a marginal SUS

PROJECT I:WEB-BASED SERVICES **EVALUATION** - Hehuan Zhong

score, which was 63. It can be interpreted as a grade of a C. It suggested our website prototype still needs improvement to become a “real” one.

3. Affinity Diagrams

Here is the text version of the affinity diagrams, based on what we found on behavioral measures.

- Compliments:

Easy to compare;

Nice 3D view;

Engineer support;

- Lack of:

The model's name on the car image;

Clean title;

More information on search result page;

Engineer support on search page;

- Misleading:

Compare icon is too small;

Return mechanism;

To sum up, we were glad that our design ideas were comprehended by users and indeed improved the kind of used car searching experience. We also noticed that there was still a lot of work to polish this prototype. In the final design, we ameliorated most of these problems and presented a more mature version of the website.

PROJECT I:WEB-BASED SERVICES

FINAL SOLUTION – KEXIN TIAN



1. 3D View of the Car

By designing the 3D view function, we are focusing on the scenario that people are easily misled by just a few pictures of a car. A 3D view of the car could show the shape and the proportion of each part of the car more clearly and directly. What's more, the interior of a car is also a critical factor for people. However, most websites do not provide a view of the interior of the car. Through a 3D mode, people could also feel the interior part of the car, and then make their decision.



Price: 57,000 Mileage: 10,000
Rating: 7/10 Sticker: 84,000

[Compare](#)

2021 Alfa Romeo Giulia Quadrifoglio

2. Professional Rating

Decided by the features of the used car that it could not have the performance as a new car, safety is the most essential factor for all used car buyers. However, through most of the website, it is hard for the buyer to have an objective view of the safety of the car. Therefore, we set up a professional rating at the browsing page, aiming to provide a score to users that is evaluated by a professional car engineer.

PROJECT I:WEB-BASED SERVICES

FINAL SOLUTION – KEXIN TIAN

POWERSPEED

Compare Models

	2021 Alfa Romeo Giulia Quadrifoglio	2021 Alfa Romeo Giulia GTA
Configuration	Quadrifoglio RWD	Quadrifoglio RWD
Price	\$57,000	\$120,000
Sticker	\$84,000	\$150,000
Mileage	10,000	0
Rating	7/10	10/10
Seating Capacity	5 seater	2 seater
Engine	2.9L Twin-Turbo V6 Gas	2.9L Twin-Turbo V6 Gas

ADD MODEL

3. Comparing Mode

As known, cars have many complex parameters. People will have a pool of cars that they have interest in. While most buyers are not a fan of cars, they could not memorize the attributes of each model. Therefore, having a clearly comparing page for users could let them have a direct view to choose the car that satisfies their needs.

Chat Box

PowerSpeed
Virtual Engineer

Welcome to PowerSpeed! I am Dr. Madison.
Is there anything I could help today?

October 29, 2021 18:01 PM

Type your message here...

4. Chat Box

This function could fit in many scenarios. When users are choosing the car, they could talk with the professional engineer about which type, like SUV, will meet their needs; When users are looking at the specific car model they are interested in but have some queries about it, they could get a answer quickly by the professional engineer; When users are confused about some parameter they do not know, they could ask the engineer directly. Therefore, we set a chatbox to let the user have a convenient and time-saving experience.

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FINAL SOLUTION – KEXIN TIAN

5. Social Function

Meanwhile, users could have their own user home page. This is designed to have some social function among the used car buyers implemented also by the chatbox. For example, you could join the chat group of the same model buyers, and they could add friends through the group. This design is aimed to let the buyer have direct contact with those who share the same model.

6. Minimalism

As we were browsing the existing used car website, we found that many websites have some unnecessary or misleading design. For example, some websites will show other kinds of models on the listing page, but not exactly the brand/model the user is searching for. Those designs and advertisements are removed by us in our prototype to make our website as clean and clear as possible.

7. Game Design Method

We are inspired by the game design method, like playtest methods. Those methods are used throughout the development of this project, starting from the utility test, ending with the final appearance of our web page.