

Automotive Design

Vehicle Design Guide



For Step Two: Conduct Automotive Market Research

Automotive designers ask their **customers**, the people who will be buying the cars they design, what they want and need. They use **market research**, where they conduct interviews or surveys, to gather a lot of information, or **data**. They can use the data to look for **trends** and find out what groups of people want for a new vehicle.

When you design a new vehicle, you can interview your customers to find out what they want and need from a vehicle! Then, you can use their answers to make a vehicle that's just right for them.

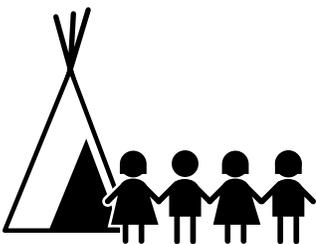
So, meet your customer! For this design challenge, design a vehicle for:



- Someone who uses a wheelchair:** I use a wheelchair to get around. I use my arms to drive my car. Most people push on gas and brake pedals with their feet to make their cars go or stop, but I have special hand controls to do that. Right now, someone has to get my wheelchair in and out of my trunk for me, so it would be nice if I were able to get it in and out easily, too.



- A school bus driver and students:** Every weekday, I drive a bus to bring kids to school. I drive two shifts. First, I take preschool and elementary-school aged kids to school. After that, I take high schoolers to school. In the afternoon, I take both groups home again. I usually have about 30 kids on my bus. Some of them play in the band or orchestra and bring their instruments back and forth. Lots of kids want to do their homework on the bus, but they need WiFi or a light to read by and we don't have that.



- A camp counselor and campers:** I'm a summer camp counselor for 10-12 year old kids. My group is usually about 8-10 kids. We go on lots of adventures, and sometimes we need to drive someplace to go hiking, camping, kayaking, canoeing, or horseback riding. I usually bring the equipment, like camping stuff or kayaks with me. We often go to the mountains and the beach, so sometimes we have a long drive. We like to listen to music, too. The kids get hungry, thirsty, and really dirty while we're out and about, but we have a lot of fun.



- Your own customer and mobility problem:** Choose your own customer and mobility problem. Identify your customer and problem by asking yourself questions like, "Who's the customer? What's their problem? Why does the customer need a specialized vehicle? Why can't a regular car meet their needs?"

For Step Two: Conduct Automotive Market Research (continued)

Market Research Questions	
Where are you going?	
Why are you going there?	
Who else needs to go? How many passengers?	
How fast do you need to get there?	
What cargo do you need to bring with you?	
What makes mobility hard for you?	
Customer Likes and Dislikes Questions	
What colors do you like or dislike and why?	
What kinds of materials do you like or dislike and why?	
What kinds of bumpers, lights, or windows do you prefer?	
What other kinds of style or flair do you want?	

For Step Three: Create Your Vehicle's Design Criteria

Creative designers get to imagine what new vehicles will look like. They have the job of deciding on the design criteria for new vehicles. **Criteria** is a list of things that a product, such as a car, needs to have. The criteria includes the parts all vehicles have, like an engine, wheels, and axles, and other parts, or **design features**, to make the new vehicle especially useful. For example, heated seats are great if you live in a cold place, and cell phone chargers are helpful features for people on the move.

Once you know what vehicle parts to include and more about what your customer wants and needs, you can use what you've learned to decide on the criteria for your specialized vehicle.

Criteria for the Interior (Inside)	
Required Parts	Special Features
<input type="checkbox"/> Steering wheel <input type="checkbox"/> Dashboard <input type="checkbox"/> Seats <input type="checkbox"/> Seatbelts <input type="checkbox"/> Gear shift	<input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____
Materials	
<input type="checkbox"/> Plastic <input type="checkbox"/> Fiberglass <input type="checkbox"/> Wood <input type="checkbox"/> Aluminum <input type="checkbox"/> Metal <input type="checkbox"/> Leather <input type="checkbox"/> Cloth <input type="checkbox"/> Carpet <input type="checkbox"/> Rubber <input type="checkbox"/> Chrome <input type="checkbox"/> Paint	

For Step Three: Create Your Vehicle's Design Criteria (continued)

Criteria for the Exterior (Outside)	
Required Parts	Special Features
<input type="checkbox"/> Body <input type="checkbox"/> Bumpers <input type="checkbox"/> Doors <input type="checkbox"/> Trunk <input type="checkbox"/> Hood <input type="checkbox"/> Wheels <input type="checkbox"/> Windows and windshield <input type="checkbox"/> Windshield wipers <input type="checkbox"/> Headlights and taillights	<input type="checkbox"/> _____ <input type="checkbox"/> _____
Materials	
<input type="checkbox"/> Steel <input type="checkbox"/> Plastic <input type="checkbox"/> Fiberglass <input type="checkbox"/> Rubber <input type="checkbox"/> Aluminum <input type="checkbox"/> Chrome <input type="checkbox"/> Glass <input type="checkbox"/> Paint	

Other Notes on the Vehicle's Design

For Step Four: Sketch a Vehicle to Meet Your Criteria

If you can imagine it, you can draw it! Creative designers draw their vehicles to share their ideas and let people see the special features they're including. They use their design criteria as a list of things to include in their drawings.

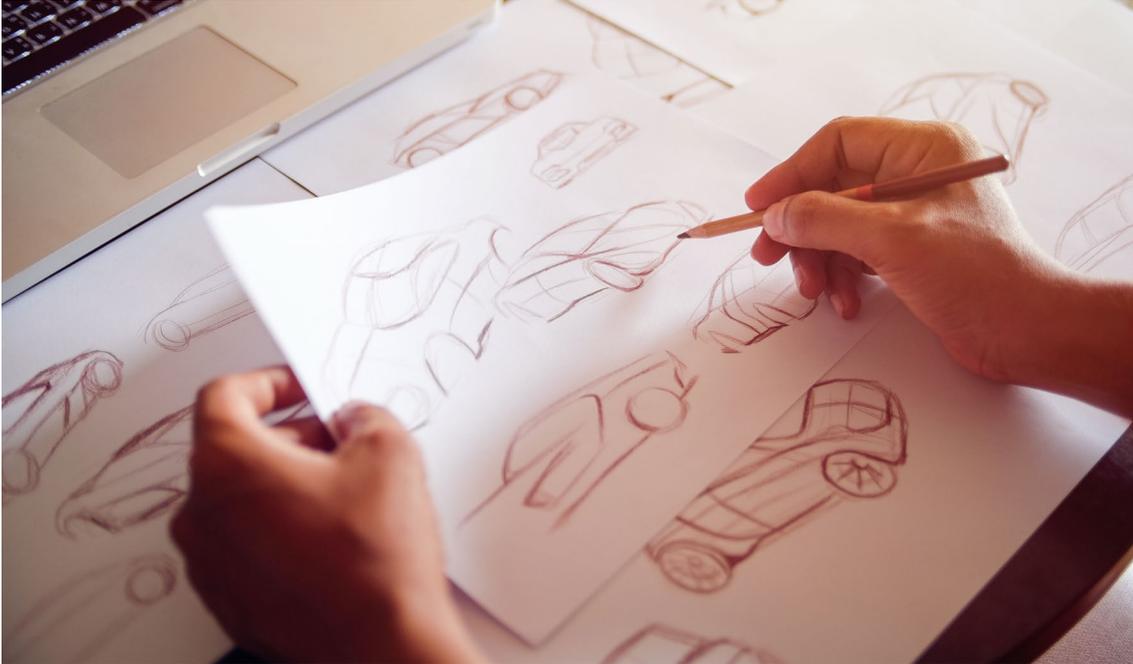
Creative designers will sketch their vehicle in several different ways. They'll draw the exterior, or outside, from different angles: the front, top, sides, and back. They'll draw the interior, or inside, too. And if there's a feature they really want people to notice, like a new kind of seat or steering wheel, they'll even draw a special picture of that.

Tips for Sketching Vehicles:

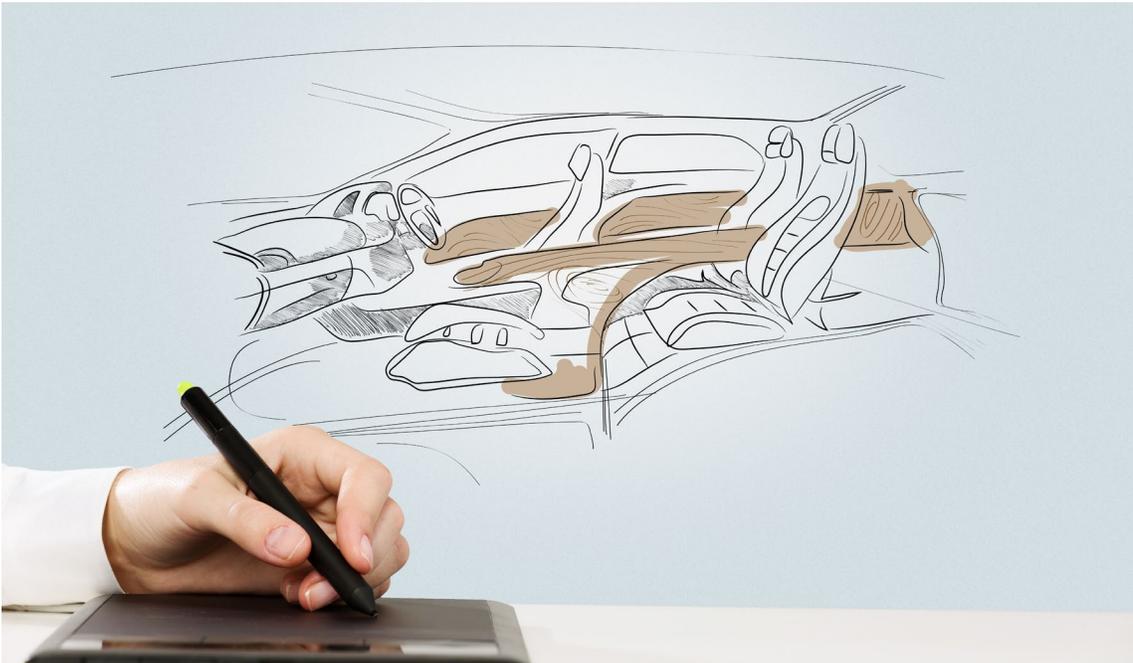
- **Imagine your vehicle.** Close your eyes and think about what your vehicle needs to do and how it will help your customer. What does it look like?
- **Use your market research.** Remember why your customer needs a special vehicle and how the vehicle will help them. Do your criteria and sketches reflect what your customer needs and wants, likes or dislikes?
- **Start simple, then add details.** First, draw the shape and size of your vehicle. Then, add in your criteria, including all the important parts and special features.
- **Use tracing paper to try out different ideas.** See what a special feature looks like before adding it to your sketch by drawing the feature on a piece of tracing paper. Then, place the tracing paper over your drawing to see if you like it as part of your final design.
- **Sketch like a professional!** Draw more than one view of your vehicle: top, side, back, or front. This helps others to understand what your vehicle looks like from every angle. Try to use long, continuous lines when you draw. For most vehicles, the distance between the front and back wheels is three wheels wide.
- **Be bold!** Use markers or colored pencils to add color to your sketches.

For Step Four: Sketch a Vehicle to Meet Your Criteria (continued)

Here's an example of how a creative designer sketches the exterior:



Here's an example of how a creative designer sketches the interior:



For Step Five: Sculpt and Share Your Vehicle

Sketches are a great way to show people your ideas, but they're flat, or two-dimensional (2-D). A 3D model, made of clay, wood, or some other material, helps the designers to show their ideas and their design's shape from all angles.

Once you have a sketch of your vehicle, you can make a 3D model of your special vehicle out of clay. Your criteria checklist can help you remember all the parts to include.

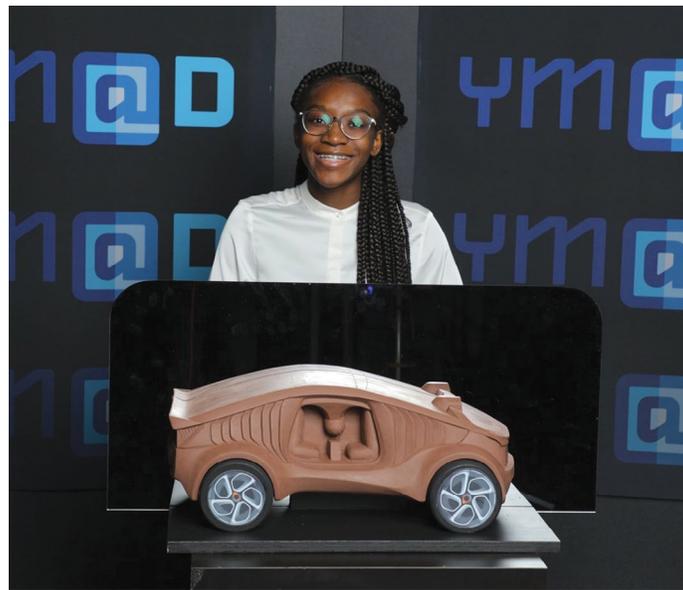
Tips for Sculpting Vehicles:

- **Learn how to use your material.** Knead the modeling foam to soften it up. Then, use the different tools to shape and add details to the foam.
- **Let your sketches be your guide.** Don't forget to look at your sketches (front, back, top, and/or side) as you sculpt. If you can, use scissors to cut around your drawings (front, back, side, and top). Then, hold them up around the foam to show the 3-D shape of their vehicle from each angle.
- **Start with the vehicle body, then add other parts and features.** First, sculpt the body of your vehicle. Then, sculpt in the parts, features, and other design criteria, like the wheels, doors, etc. into the vehicle body.
- **Use tools to add details.** Use rolling pins, cookie cutters, or any other tools to shape the foam or add patterns and details. For example, you might use the tools to form the different parts, make cut outs, or stamp impressions.
- **Show your vehicle's scale.** Once you've finished your sculpted model, make a drawing to go behind your model showing people, trees, and other items to help people understand the size of your vehicle
- **Don't worry about color.** People can see your color choices in your sketches. The sculpted model lets people see the shape and features of your design.
- **Be bold!** If your foam dries in time, use markers to add color and other details to your model.
- **Iteration is a good thing.** It's okay to make changes to your design as you sculpt the model. That's what design is all about: exploring an idea and making it better.

For Step Five: Sculpt and Share Your Vehicle (continued)

To make a vehicle that people can drive, designers first come up with an idea of what the vehicle will look like. Then, they share their designs with other people, like those who will build and test the vehicle.

Automotive designers use their design criteria, sketches, and model to share their ideas with others. They include information about the vehicle's purpose, their customer, and safety and sustainability. They make sure the other teams have everything they need to build the vehicle so people can one day drive it on the road.



Tips for Sculpting Vehicles:

- Which kind of special vehicle did you make?
- How did you meet your customer's needs?
- How is your vehicle different or innovative?
- How did you make your vehicle safe or environmentally friendly?
- What is your favorite special feature?