

Phases of Product Design

There are a few steps that product designers follow when they are creating a new product.

Concept Generation

- In this step, product designers generate an idea for a new product. They typically design new products based on where there is a need in the market or modify existing products to make them better. Product designers also decide on a target market, which are consumers in the market that best fit the demand for the product.
 - ex. An exercise drink company creates a new drink, Energizer, that is non-carbonated and sugar-free to target health-conscious individuals because there are no exercise drinks in the market that are sugar-free.

Building a Prototype

- Once the product designer decides what product they are going to create, they build a prototype. A prototype is the first version of a product. Prototypes are important not only to ensure that it actually works but also so that consumers can actually test the prototype and provide insights/feedback.
 - ex. Product designers will create the Energizer drink, testing different combinations of flavors.

Validating Prototype

- Market validation is a series of interviews of people in the product designer's target market. For example, if the target market is 18-25 year old females, the product designer will interview females from the age of 18-25 and ask them questions about whether they like the product, whether think the product is interesting, or think that they would buy or use the product. The purpose of these interviews is to investigate whether the target market will be receptive to the product concept. The outcome of the interviews will either validate the product concept or indicate a problem with the product. If the target market is unreceptive, the product designer may need to rethink the concept.
 - ex. After testing out the Energizer drink amongst 18-35 year old athletes, the feedback received is positive! However, the consumers say they wish there was a bigger variety of flavors.

Iterating Product

- Iteration refers to making changes to a product based on feedback. These tweaks are being made to ensure that the product's launch is successful. Product designers might make multiple rounds of iterations on a product.
 - ex. After receiving the feedback, Energizer's product designers will go back and create different flavors, expanding the product line to fulfill their target audience's preferences.

Production

- After iteration, product designers are happy with the product they have created, the audience that they are targeting, and the prototype that they have built. The next step is to send the product to production! In this step, the product designer chooses a production company to mass produce the product.
 - ex. The product designers decides to partner with Walmart and Costco to sell the Energizer drink, deciding that these big retailers are the best way to get their product out to the market.

Choosing a Company

Choose a company to design a new set of headphones for.

Company 1: Pulse Headphones

Type of Company: Pulse Headphones is a startup company that has currently raised \$600,000.

Location: St. Louis, Missouri

Company's Target Audience:

Professional athletes are constantly using headphones, whether it's during a warmup or before a big game. However, there were no headphones in the market that aligned with their needs: sweat-resistant, portable and comfortable devices that allowed them to move around freely while exercising. Pulse Headphones created headphones specifically designed with these aspects in mind.

Current Product Strengths:

- All headphones stay in place during heavy movement (like exercise)
- All headphones are sweat resistant
- Headphones can be customized with team logos and colors

Company's vision for future products:

- Headphones with built-in heart rate and temperature monitors to help athletes monitor their stats during a workout.
- Headphones that have built in GPS. A runner can input their running route and the headphones will give verbal directions of when and where a runner needs to turn.
- Headphones with attached lights to make athletes more visible when running, biking, or practicing outside at night.

Company 2: BeatBox USA

Type of Company: BeatBox USA was founded just a couple of months ago, with only \$1000 in seed money.

Location: Chicago, Illinois

Company's Target Audience:

BeatBox USA wanted to create headphones that were targeted towards trend-forward teens, ages 13-17. Teens care a lot about standing out amongst their peers, inspiring the need for customizable headphones. With this product, they are able to design their headphones to their liking.

Current Product Strengths:

- Headphones are customizable, people can go online and choose different colors for each piece of the headphones and order their unique pair
- Headphones have 2 modes-- bluetooth and wired (for if your battery dies)
- Headphones fold up into a small pouch so they can fit into purses or bags

Company's vision for future products:

- Headphones with interchangeable "faceplates" that go on the ear pieces. Customers can buy different faceplates to match different outfits and switch them out daily.
- Headphones with a built in camera and microphone so the wearer can tap the earpiece and begin recording everything they see and hear.
- Headphones that can be attached to different hair accessory pieces like hats and headbands

Company 3: Brotherly Sound

Type of Company: Brotherly Sound is an established, family-owned company that has been around for over 10 years. Worth 1 billion dollars, Brotherly Sound is one of the biggest competitors within the headphones market.

Location: Philadelphia, Pennsylvania

Company's Target Audience:

Brotherly Sound's headphones mainly target the medical industry, specifically surgical doctors. The product creation was inspired by doctors' need for a headphone that's portable, comfortable and can be used during a surgical procedure.

Current Product Strengths:

- Have a disposable covering that can be replaced after each surgery to stop bacteria growth.
- Very thin so they can comfortably fit under a surgical cap
- The ear pieces of the headphones don't completely block the ear canal, so surgeons can also easily talk to nurses during surgery.

Company's vision for future products:

- Headphones that will allow surgeons to communicate with other doctors during a procedure. A surgeon can perform surgery with another surgery providing live feedback.
- Headphones with attached health monitoring software to monitor patients post-surgery
- Headphones that connect to your phone to give you verbal alerts when you have a meeting or surgery scheduled.

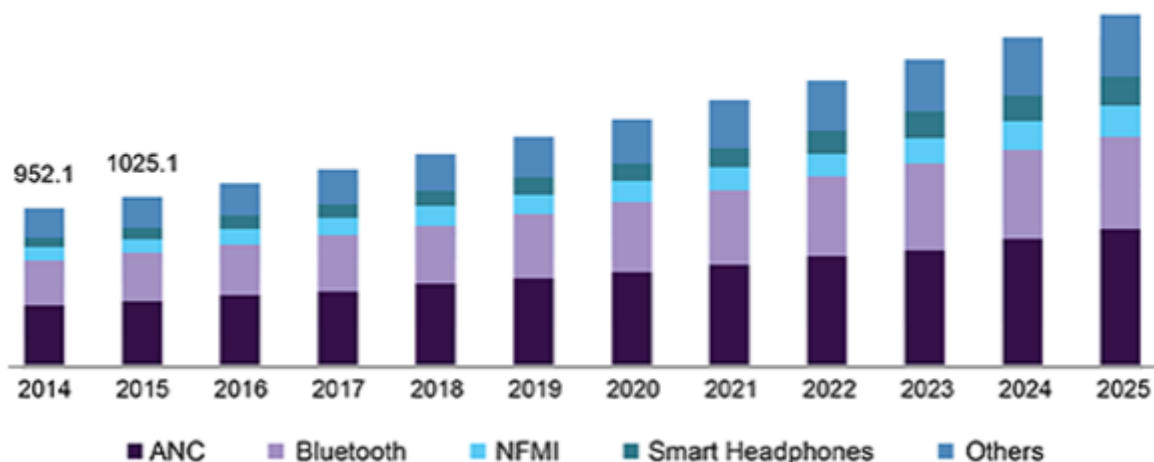
The company I choose to design a new pair of headphones is:

Market Report on Headphone Industry

The increase in usage of laptops, smartphones, tablets, and other electronic devices paired with the emergence of Virtual Reality (VR) has provoked accelerated growth within in the industry in recent times. In response to this growth, major companies such as Apple’s Beats by Dre are innovating to create products that balance comfort, portability, appearance and sound output, aspects which have driven up the quality of headphones and are used to maximize the consumer’s experience. Smart technology has guided recent innovation with an increase in demand for bluetooth and completely wireless headphones.

- **Market Insights:** In 2018, the global headphones market size was valued at \$10.52 billion and is expected to reach \$36 billion by 2024. The revenue growth is controlled mainly by a few key players in the market, namely: Sony, Bose, Beats (Apple) and Skull Candy. In the United States, 85% of households owned headphones with these brands. In the global market, although Sony and Beats (Apple) control only 29% of the market share, this translates to 47% of the revenue in the global industry. 25% of the global revenue in 2018 came from the North America region. The market to watch out for is the Asia-Pacific region, which is expected to be the fastest growing market in the years to come.
- **Pricing:** Pricing is broken down into less than \$50, between \$50-100 and over \$100. Right now, the most popular segment are headphones under \$50 paired with shorter product replacement cycles.
- **Trends:** Currently, consumers mainly use headphones for music & entertainment, fitness, gaming and VR purposes. The increase in demand for bluetooth or wireless headphones aligns with these activities and has been a crucial component for headphone innovation. Furthermore, users are more likely to purchase smart headphones - ones that not only have Bluetooth connectivity, but also feature components like noise-cancellation, water-resistance, and surround sound. These types of headphones target consumers that integrate technology in their daily lives, such as health-conscious consumers that utilize other smart products monitor their fitness and heart rate levels.

APAC earphones & headphones market size, by wireless technology, 2014 - 2025 (USD Million)



<https://www.grandviewresearch.com/industry-analysis/earphone-and-headphone-market>

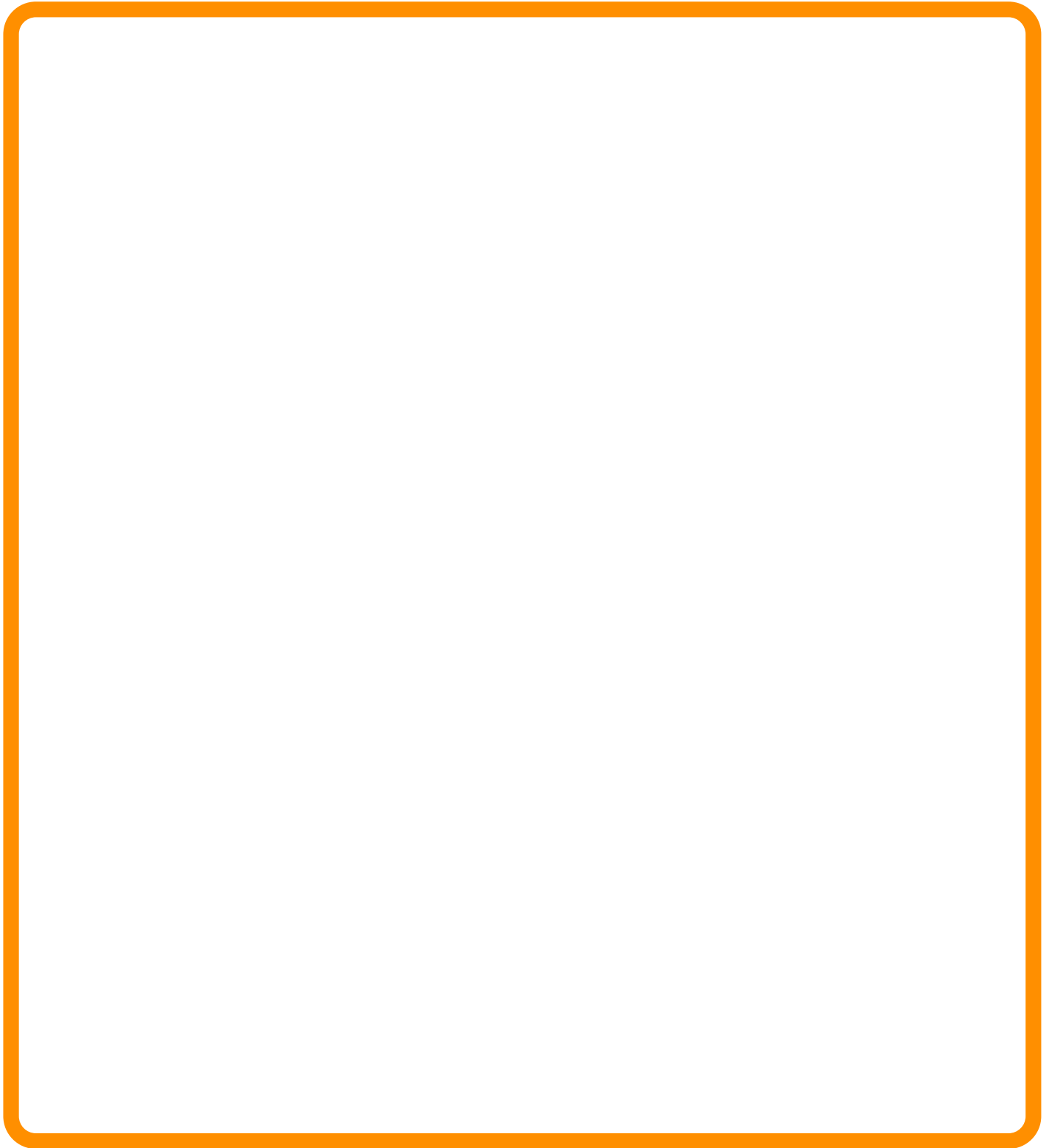
Science Behind Headphones

- Electrical impulses from a device that plays music (like a smartphone) are sent to headphones.
- The electrical impulses travel through a coil of copper wire that is next to a magnet.
- When the electricity flows through the wire, it creates a weak magnetic field.
- The interaction between this magnetic field and the magnet makes the coil vibrate.
- These vibrations happen in the same pitch, rhythm and tempo as the music being played - so these vibrations represent the music that is being played.
- These vibrations are transferred to the material next to your ears and the headphones transform the vibrations into sound.
- The sound waves travel between the headphone and your eardrum so you can hear sound!



Headphone Design

Use the space below to draw a design for your new headphones. Your design should include labels for all of the features you are including.

A large, empty rounded rectangle with a thick orange border, intended for drawing a design for new headphones. The rectangle is centered on the page and occupies most of the lower half of the document.

SWOT Analysis

A SWOT analysis is a method to analyze different factors that could affect the success of a product. Product designers perform SWOT analysis to make sure that they know these factors before they invest time and money into a designing a product. These factors help them make a plan for creating and marketing their product to ensure that they make money when they launch their product.

There are 4 components to a SWOT Analysis:

- Internal components (strengths and weaknesses originate from inside the company, meaning that they are factors of your business itself that can affect success):
 - Strengths: Strengths are the qualities that will help give the company a competitive advantage. From an internal standpoint, these can be assets such as excellent team of employees, financial support, specialized business knowledge or beneficial network relationships. From an external standpoint, strengths are any type of competitive advantages that make your company unique, in comparison to other competitors in the industry.
 - ex. Coca-Cola's strength is that it is a well-known brand name due to the company's strong marketing and advertising strategies and is a brand leader within its industry.
 - Weaknesses: Weaknesses are areas of a business or marketing that could be improved upon. Weaknesses within the business might be things that aren't being done well, but could be improved upon in the future. Product designers often consider performance gaps, or places where their productivity is stalling and can be improved. They often consider what competitors are outperforming them, and why they are being outperformed.
 - ex. Coca-Cola suffers from a lack of product diversification. Its competitors, such as PepsiCo., have a diverse portfolio of products whereas Coca-Cola only focuses on carbonated drinks.
- External components (opportunities and threats originate from outside of the company, meaning that they are factors of the market existing outside of the business):
 - Opportunities: Opportunities are areas of a business or marketplace environment that may help contribute to the success of the company. Product designers often focus on new technology that could change the way that they create a product, new government regulations that may positively affect the company, or changing market trends that may create new opportunities. Product designers will often examine if there are any unfulfilled gaps in the market.
 - ex. The growth in the wellness industry has caused an increased demand for nutritional products. Coca-Cola has the opportunity to introduce products that align with these values.
 - Threats: Threats may come from changes in the competition, technology, customer behavior or demand for a product. Before product designers create a product, they must analyze their competition to decide whether they can safely compete with the company. Product designers must also consider the weaknesses that they listed, and decide if they are actually a threat to the company's success. Product designers must analyze their financial resources, as well as human capital and the number of employees that are required to perform the jobs that they need filled now, and later.
 - ex. Coca-Cola's main threat lies in its weak portfolio of products and the pressure from so many outside competitors.

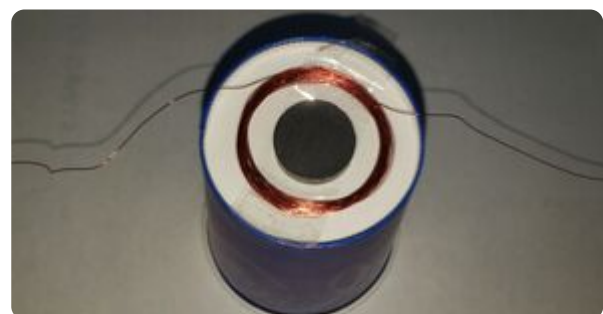
Steps to Create Headphones

Follow the steps below to create a new pair of headphones!

Step One: Create a Functional Headphone

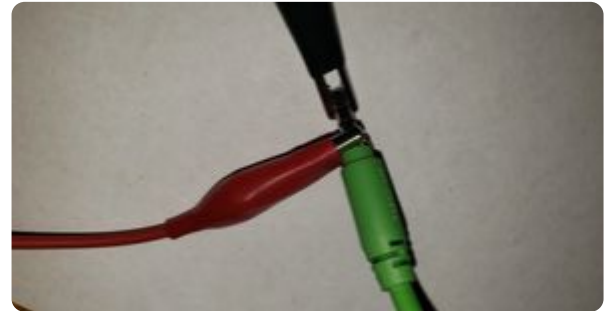
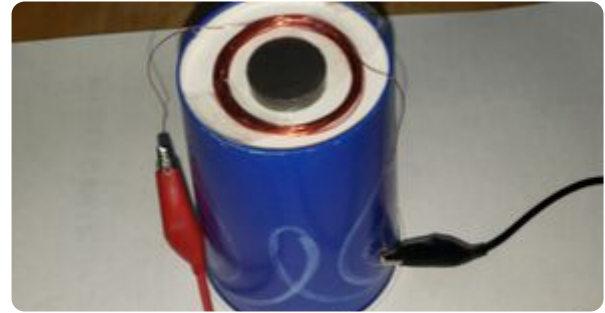
Follow the steps below to create the functional part of your headphone - the part that receives electrical pulses from the device playing music.

- Wrap 30 gauge copper wire around the battery. Leave about 3 inches of wire from each end hanging off the coil.
- Carefully slide your new copper coil off of the battery. Sandwich the copper coil between two pieces of tape to keep it from unraveling.
- Use sand paper to remove the coating from both ends of the copper wire.
- Place a test cup on top of the coiled wire.
- Place a magnet on the bottom of the inside of one of the test cups to hold everything in place.
- Place the taped copper coil on the bottom of the cup.
- Place a magnet over the tape in the center of the coil on the bottom of the cup. The magnet inside of the cup will pull on the magnet outside of the cup, which will help hold the copper coil in place.



Creating the Best Headphones

- Connect the black and red wires to the copper wire:
 - Clip the alligator clip of the red wire to one end of the copper wire.
 - Clip the alligator clip of the black wire to the other end of the copper wire.
- Clip the other alligator clip of the red wire to the end of the Aux audio cord. Clip the other alligator clip of the black wire to the barrel of the Aux cord.
- Plug the other end of the Aux cord into a device that plays music (like your cell phone or computer).
- Place the cup over one ear and play music on your device, turning the volume as high as possible. You should hear music playing through the cup. You've created a headphone!



Step Two: Add unique features

Now that your headphones work, use your headphone design page to help you add all of your special features to your headphones prototype.

- Gather art supplies and building materials to create prototypes of your special features.

Steps to Test Sound Quality

- Experiment with the cups and materials provided by your teacher. Try to determine the best and worst materials for transmitting sound.
- Here are some examples of things to try:
 - Try using different shapes and types of cups to see which materials and shapes best transmit sound.
 - Try moving the coil and magnet around on the bottom of the cup to see if some positions are better than others.
 - Try changing the strength of the magnet you are using by replacing the ceramic magnets with stronger neodymium magnets.
 - Try using other objects such as; empty chip bags, a paper bag or a piece of aluminum foil.
 - Try using larger or smaller coils. Try using more or less wire to make the coil.

