

Session 7

The Three R's of Problem Identification

Thinking Creatively

In This Session:

- A) Revisit
(45 minutes)
 - Student Handout

- B) Research and Refine
(60 Minutes)
 - Student Handout

- C) SCAMPER to Solutions
(45 Minutes)
 - Student Handout
 - Student Reading

So many problems to solve and improvements to make. How do you decide which one to tackle? In this session, students revisit and refine their broad list of problems, needs, and improvement ideas (started in Session 1, *Jump Into Design*) to identify one design opportunity as their project. They use a variety of observation and data collection strategies to consider what exactly needs fixing, developing, or improving.



In the first activity, *7A: Revisit*, students revisit their list of design opportunities started earlier in Session 2, *The Designed World*. Here, they develop the criteria for choosing a problem to pursue. In *7B: Research and Refine*, students refine their list of problems and conduct market research by gathering information about the nature of the problem. They do this by going off site to conduct a survey and collect data about the user, the user's preferences, and the realities of the user's life, environment, and behaviors. The SCAMPER brainstorm technique is used in *7C: SCAMPER to Solutions* to help students begin to think about the solutions for the design opportunity. By the end of this session, students should each have one project in mind and about five possible solutions.

Supplies

Clipboards (optional)

The 3 R's of Problem Identification

Key Concepts: Session 7

In Session 7, students use **product research** to gather information about the nature of their design problems in order to narrow their choices. Students then learn about user needs by conducting surveys and using the data to choose one design opportunity that is compelling to them. Once students know the design challenge they want to pursue, they move to Step 3 of the design process—Brainstorming Possible Solutions to the Problem.

Key Concepts

During this session students are introduced to product research methods to help refine their design problem. These methods include asking potential product users probing questions and studying user data through surveys and observations. Understanding the user of the product is critical to product design. This process, called market research, focuses on the collection and study of user preferences toward new or existing products.

Surveys allow for gathering data about a user, a user's preferences, and the context of a user's life and environment. When designers understand their users, they can design with them in mind. A survey provides a way for designers to get specific information about a user. Questions used in a survey should help gather data about the problem and the user.

Some question examples include:

- What do you find frustrating about this particular product?
- What aspects of the product do you find useful?
- What changes would you like to see made to this product?
- Would you purchase this product if (describe change)?
- How often do you use this product?

Surveys do have drawbacks because participants might give information about what they believe, not on what they do. An integrated approach to product research is often necessary to get a better understanding of the user.

An additional method for gathering information is through observations. Ethnography is a field of product research that uses observation as a method for gathering information. Ethnographic studies can be conducted by sending an observer to watch people use a specific product. By observing behavior researchers discover user needs that are not being met and possible design solutions that might meet those needs. IDEO www.ideo.com *, a product design firm, uses ethnographic studies as a method to come up with design solutions. IDEO designed a concept vacuum cleaner that follows the user during cleaning, after conducting many user observations to understand the limitations around current vacuums. The model they designed addressed numerous issues that frustrated vacuum cleaner users.

Key Concepts: Session 7 (continued)

More About Product Research

Industrial Designers Society of America (Editor) and Goodrich, Kristina (Introduction). *Design Secrets: Products: 50 Real-Life Product Design Projects*. Gloucester, MA: Rockport Publishers, 2001.

Kelley, Tom. *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm*. New York: Doubleday, 2001.

Session 7, Activity A

Revisit

Goal

Add and prioritize the list of problems and improvements that students began in Session 2, *The Designed World*.

Outcome

Identify three problems or improvements (design opportunities) to focus on.

Description

Students generate additional ideas to add to their list of design opportunities, looking for needs, problems, or improvements. They then go through a prioritization and selection process to narrow their list.

Supplies

None

Preparation

Be sure to ask students to take out their list of design opportunities from *2A Handout: Design Opportunities Are Everywhere*. (They should have been adding to this list throughout the sessions.)

Procedures

In this activity, students revisit their list of needs, problems, or improvements that they began earlier. This is Step 1 of the design process: Identify a Design Opportunity. Students should see that opportunities are everywhere and often come from a need, problem, or improvement to an existing solution.

Expanding the List

1. Provide some time for learners to add other ideas to their list that may have come up throughout the previous sessions. In doing so, their ideas should come from observations that they've made based on frustrations with particular everyday objects.
2. Give some examples here. For example, perhaps some students in the class are left-handed. They may have trouble using a computer mouse which is designed for a right-handed person. They might like to see adaptations made to a mouse so that it is suitable for a left-handed person.
3. Have students look around the room and choose something in the room. Now, ask them to consider what problems they have using this item. This might be a problem with the entire product or with one part of the item. Now, ask them to come up with a way that they would like to see it improved. Go around the room and ask students to share. You

7A: Revisit (continued)

might find, for example, that someone doesn't like the pencil sharpener in the room. She doesn't like the fact that you have to constantly take out your pencil to see if it is sharpened. She would like to see the sharpener indicate when a pencil is sharpened. Remind them to think about function as opposed to form, the way it works as opposed to the way it looks. Ultimately, the goal is for them to re-engineer a product to make a functional improvement.

4. Students can also apply the Activity Mapping technique that they learned in 2A: *Design Opportunities Are Everywhere*, to help them identify a problem. They can do Activity Mapping individually for a problem that interests them. This is a useful strategy if they have difficulty coming up with a design challenge. Suggest that they choose an activity that is routine for them and try to identify problems in that activity. For example: eating breakfast, going grocery shopping, washing their dog, taking a hike, and so forth.

Activity Mapping

- 1) Pre-activity: Describes what is done before the activity
↓
- 2) Activity: Explains what is involved in the activity
↓
- 3) Post-activity: Includes what is involved after the activity
↓
- 4) Assessment: Involves how one knows if the activity has been successful

5. Now, have students add additional design problems to their list and be as specific as they can. Remind them of the question: "What *problems* would you like to solve or what *improvements* would you like to make on a current product?" Encourage the young designers to dream!

Refining the List

1. Ask the group to come up with some questions to help each other narrow down their list of design opportunities to select a few to focus on. Working in pairs, students should ask each other probing questions to help clarify what the need, problem, or improvement is and which holds the most promise for solutions. Sample probing questions are:
 - What about this product is frustrating?
 - Do you know of any similar products that have been adapted from this product?
 - What would you like to see this product do?
 - What part of the product would need to be changed, the whole thing or one part?
 - Would other people benefit from this improvement? If so, who?

7A: Revisit (continued)

2. Another option is to have students place their lists of design opportunities on their desks and walk around to look at everyone's list. Students may read the lists and write comments next to the problems that their peers addressed. They can then use the comments to help them narrow down their list.
3. Each student should be ready to select the top three design opportunity choices.
4. Ask them to consider where they could gather the most data about other people's use and impressions of the problem or improvement that they have identified.

Wrap Up

Students share their top three design opportunities with the whole group. Then, they discuss where they could gather the most data about the problems and improvements that they identified.

Follow With

In *7B: Research and Refine*, students learn how to conduct a survey to gather more data about problems and improvements.

Revisit

Handout: Session 7, Activity A

You will now begin to think about what design project you will work on and use the design process to plan your own design. This exercise will help you sort through and prioritize your list of problems and improvements. Remember the first step of the design process:

Identify a design opportunity: Opportunities are everywhere and often come from a need, problem, or improvement to an existing solution.

Add to your list. What problems would you like to solve or what improvements would you like to make on a current product? Write down everything that comes to mind. No editing; you can do that later. Have fun dreaming! Feel free to use the Activity Mapping as part of your brainstorming process. Do this in your design notebook.

Activity Mapping

- 1) Pre-activity: Describes what is done before the activity
- ↓
- 2) Activity: Explains what is involved in the activity
- ↓
- 3) Post-activity: Includes what is involved after the activity
- ↓
- 4) Assessment: Involves how one knows if the activity has been successful

After reviewing the list with your partner, now prioritize the list and select your top three based on your discussion with your partner and your interest in pursuing this problem. Next to each, explain why you chose that one.

Where could you gather data about other people's uses and impressions of the problems and improvements that you identified?

Session 7, Activity B

Research and Refine

Goal

Students gather data about design opportunities to help them select a design project.

Outcome

Students collect data about design problems and choose one to solve with a design project.

Description

Students observe, shadow, and interview people to collect data on how people interact with products, what frustrations people have, and how products can be improved. Students then focus on one design problem. This one design opportunity may change as ideas are refined in an iterative design process.

Supplies

Clipboard for surveying (optional)

Preparation

Review students' lists and ideas for data collection.

Arrange for a walking field trip. Ideally, the location will reflect the students' feedback from the previous activity about places to collect data. This might mean a visit to the local grocery store, the mall, the hardware store, and so forth. If possible, arrange for mentors to attend this session. If mentors are available to come along, divide students into groups (with a mentor for each group) and send them to different places. If a walking field trip is not possible, ask mentors to visit your site and have students survey mentors about product use.

Students should have their lists from the previous activity, *7A: Revisit*.

Procedures

In this activity, students focus on Step 2 of the design process: Research the Design Opportunity. This is where they gather lots of information about the nature of the problem. They find out about the user, the users' preferences, and collect data about the context and realities of the users' life, environment, and behaviors. In short, market research. The idea is for students to get feedback on the design opportunity before refining their choice even further.

Explain that students can use a variety of methods to collect data on the design problem. Introduce the methods and have them prepare for the field trip. The methods may also be used as students collect data on their own time.

7B: Research and Refine (continued)

Observing

1. Encourage students to observe and record behavior within its context, without interfering with people's activities.
2. Explain that this helps to see what people actually do within real contexts, what problems people face, and how they overcome the problem. For example, the student who created the dual alarm clock needed to observe how people use alarm clocks. To do this, she might wake up early and observe how her family members use the functions on an alarm clock. Or, she might observe how people explore the functions on an alarm clock when shopping for a new clock.

Shadowing

1. Suggest that students go along with people to observe and understand their day-to-day routines, interactions, and contexts. This may help reveal design opportunities and show how a product might affect or complement users' behaviors.
2. Tell students to take notes and bring along a camera (if available) to take photos.

Narration

1. Introduce the narration method. Explain that students can ask participants to describe aloud what they are thinking while they perform a process or execute a specific task.
2. Explain that this is a useful method to understand users' motivations, concerns, perceptions, and reasoning.

Interviewing and Asking the Five Whys

1. Explain that students can gain insight into a problem by talking to people about it. Have them prepare interview questions ahead of time and identify the type of people they plan to interview.
2. Demonstrate how to use the Five Whys method, which asks "Why?" questions in response to five consecutive answers. By doing this, people are forced to examine and express the underlying reasons for their behaviors and attitudes.

Surveying

1. Encourage students to survey a variety of people to learn more about their design opportunity. Surveying can reveal trends in attitudes and behaviors.
2. Be sure that students have survey questions prepared in advance and decide how they are going to conduct the survey (by asking people the questions or by having them fill out a survey form).

7B: Research and Refine (continued)

3. Students should survey at least 10 people.

Preparing for Data Collection

1. Have students decide how they will do their data collection.
2. If students are surveying or interviewing, have them prepare questions. Questions might be about uses' frustrations with a product, changes to a product, frequency of usage of a product, and so forth.
3. If students are observing or shadowing, have them make a list of the kinds of things they will be observing, for example, how people are using a product, what kinds of things people appear to be having trouble with, and so forth.
4. Be sure that students are prepared. They can draft a script with an introduction, explaining who they are, what they are doing, and the purpose of their work.
5. Have them practice the script in pairs.

Research Etiquette

1. Remind students to respect their participants, who are often strangers who are willing to give their time and share their thoughts and feelings.
2. Here's some principles to share with students:
 - Approach people with courtesy.
 - Identify yourself and your intent.
 - Describe how the information will be used and why it's valuable.
 - Get permission to use the information and any photos that you take.
 - Keep all information anonymous and confidential.
 - Let people know that they can choose not to answer questions or stop participating at any time.
 - Keep your opinions to yourself.
 - Maintain a relaxed and nonjudgmental atmosphere.

Doing Market Research

1. Students are now ready to get out in the field and do market research.
2. Encourage students to continue this work on their own.

7B: Research and Refine (continued)

Narrowing the Design Project

1. Back in class with their market research in hand, students should spend time sorting through the data that they collected. In doing so, their goal is to narrow their list of design opportunities. They should think about which problem would be most possible for them to work on. They can begin to do this by listing the pros and cons for each possibility based on their research. Remind them that they are still focusing on problems; however, it's natural to have ideas for solutions "popping up," and this may guide them as they narrow their focus.
2. As they narrow down their choices, remind them to consider what aspect of a particular design they would like to see improved or developed. They could decide to choose the whole product or just a part of the product.
3. In small groups, students share their lists of pros and cons and get feedback from each other to help them choose one design opportunity.
4. They are now ready to make a decision. Encourage them to make a decision by selecting one or two problems that are most compelling to them. Explain that their decisions are not permanent; they may find that they change their design choice a few times throughout this process. Do not force or rush the process!

Developing the Problem Statement

1. Now that they have narrowed their list to one design opportunity, they need to formulate a "problem statement" that expresses the "heart" of the situation.
2. Discuss the features of a problem statement using the toothpaste example:
 - Begins with a clear, concise, well-supported statement of the problem to be overcome.

Teeth brushing can be a messy operation. Toothpaste often gets all over the cap and even on the sink. Sometimes the cap is dropped onto a dirty floor or into the sink drain. Includes data collected during the survey/observation in order to better illustrate the problem.

After observing my family members brushing their teeth, I noticed that they all use toothpaste with a screw cap. I observed my younger sister leaving the cap off and on the sink, my dad putting the cap down on the sink and leaving toothpaste behind after putting the cap back on, and my mom dropping the cap on the floor. When talking to people about their use of the screw cap, they reported similar problems.

7B: Research and Refine (continued)

- Establishes the importance and significance of this problem.

These problems with the screw cap seem to be widespread. With a little innovation, this problem can be solved.

- Describes the target population.

While I realized that everyone uses toothpaste, I also observed that it is primarily women who purchase the toothpaste. Therefore, my product design will need to appeal to women in particular.

3. Tell them to write the problem clearly so that it could be explained to anyone.

Wrap Up

Have students discuss how easy or difficult it was to narrow their lists and why this was the case.

Follow With

In 7C: SCAMPER to Solutions, students begin to consider solutions to their problems.

Research and Refine

Handout: Session 7, Activity B

You will now have a chance to do some market research on the three design challenges.

Choose a Method

Observing

This method involves observing and recording behavior within its context, without interfering with people's activities. Just watch people and record what you see.

Shadowing

Tag along with people to observe and understand their day-to-day routines, interactions, and contexts. Be sure to take notes and bring along a camera (if available) to take photos.

Narration

This method involves asking participants to describe aloud what they are thinking while they perform a process or execute a specific task.

Interviewing and Asking the Five Whys

Talk to people about the design problems. Be sure to prepare questions in advance. Use Five Whys method, which asks "Why?" questions in response to five consecutive answers.

Surveying

Survey a variety of people to learn more about their design opportunity. Be sure to have survey questions prepared in advance and decide how you are going to conduct the survey (by asking people the questions or by having them fill out a survey form). Survey at least 10 people.

Prepare

1. Prepare your opening script for introducing who you are and what you are doing.
2. Develop an observation, shadowing, or narration plan. Prepare questions for interviewing and surveying. Remember, you probably do not want too many questions. In a survey; you are looking for short answers.
3. Come up with a list of things that you will be looking for as you watch people interact with the products.
4. Practice with a friend.

Remember

- Approach people with courtesy.
- Identify yourself and your intent.
- Describe how the information will be used and why it's valuable.
- Get permission to use the information and any photos that you take.

7B Handout: Research and Refine (continued)

- Keep all information anonymous and confidential.
- Let people know that they can choose not to answer questions or stop participating at any time.
- Keep your opinions to yourself.
- Maintain a relaxed and nonjudgmental atmosphere.

Review the Results

5. Using your results, write the pros and cons next to each item.
6. Select one design opportunity that seems most compelling.

Develop a Problem Statement

7. Write a clear problem statement. This is intended for someone who knows nothing about this problem. The problem statement should:
 - Begin with a clear, concise, well-supported statement of the problem to be overcome.
 - Include data collected during the survey/observation in order to better illustrate the problem.
 - Establish the importance and significance of this problem.
 - Describe the target population.

Session 7, Activity C

SCAMPER To Solutions

Goal

Students brainstorm possible solutions to their design project.

Outcome

Students generate several solutions for their design project.

Description

Using the SCAMPER process, students develop a list of possible solutions to their problem or improvement.

Supplies

None

Procedures

SCAMPER

1. This activity is Step 3 of the design process: Brainstorm Possible Solutions to the Problem. Now that students have one design project in mind, they are ready to consider solutions to their problem. In doing so, they should first consider what the desired outcome is. That is, how will they know when the problem is solved? The goal of this exercise is to have them come up with five solutions to their design challenge. This is similar to what they did with the backpack in *2D Handout: SCAMPER and Backpack*. However, now they are doing SCAMPER for their own design projects.
2. Ask: What is the desired outcome of the design? What do you want the product to do?
3. From the previous activities, students should be familiar with the creative thinking processes. Revisit the SCAMPER technique for brainstorming. Have students review SCAMPER and the SCAMPER process applied to a backpack from *2D: SCAMPER and Backpack*.

Substitute (What else can be used instead? Other ingredients? Other materials?)

Combine (Combine other materials, things, or functions.)

Adapt (Can it be used for something else?)

Minimize/Magnify (Make it bigger or smaller.)

Put to other uses (New ways to use as is? Other uses if modified? Other people or places to reach?)

Eliminate/Elaborate (Remove some part or materials, or make one section more detailed or refined.)

Reverse/Rearrange (Flip-flop some section of the item or move parts around. Interchange components? Different sequence? Turn it upside-down?)

7C: SCAMPER To Solutions (continued)

4. Using SCAMPER, learners should try to come up with different solutions for their design challenge. Remind them that they do not have to use all the steps of SCAMPER during this process.
5. SCAMPER should help them generate several ideas for solutions to their design challenge.

Revisit Activity Mapping

1. Using the Activity Mapping from *7A Handout: Revisit*, students can focus on one of the cycles (pre-activity, activity, post-activity, or assessment) where they identified problems and can now brainstorm solutions.

Solution Criteria

1. Now that learners have a number of ideas that can serve as possible solutions to their problem, it's time to evaluate them systematically. Have them generate a variety of criteria and analyze their solutions with the criteria. This might include such things as:
 - It is practical.
 - It can be made easily.
 - It is safe.
 - It will not cost too much to make or use.
 - It is a new idea.
 - It is not too similar to something else.
 - It addresses the problem.
2. Have students review each solution. Using the criteria, they should identify and evaluate the relative strengths and weaknesses of possible solutions.
3. Depending on which of their solutions meet the criteria, ask students to further narrow their list of solutions to three that they will investigate in greater depth.

Wrap Up

Remind students to keep careful notes of their decision-making process in their design notebooks. Have them review their notes and ensure that they are keeping clear records of their process.

Have students read *7C Reading: Meet a Design Planner*.

Follow With

In Session 8, *A Brief Focus on Your Design Problem*, students prepare a design brief.

SCAMPER To Solutions

Handout: Session 7, Activity C

You will now begin to think of the solution for your design. In doing so, it is important to consider the outcome of the design—what do you want the product to do? Use SCAMPER to come up with some solutions. You do not have to use all the steps of SCAMPER.

Substitute (What else can be used instead? Other ingredients? Other materials?)

Combine (Combine other materials, things, or functions.)

Adapt (Can it be used for something else?)

Minimize/Magnify (Make it bigger or smaller.)

Put to other uses (New ways to use as is? Other uses if modified? Other people or places to reach?)

Eliminate/Elaborate (Remove some part or materials, or make one section more detailed or refined.)

Reverse/Rearrange (Flip-flop some section of the item or move parts around. Interchange components? Different sequence? Turn it upside-down?)

What are your design solution ideas? Write them in your design notebook.

What criteria will you use to choose a solution? Use the criteria to narrow your solution list to three solutions. Circle the three solutions above.

Meet a Design Planner

Reading: Session 7, Activity C



Bob Sweet
Senior Project Manager/Senior Design Planner
ZIBA Design

Background

I started with ZIBA Design in 1994. The new Director of Research was looking for someone with solid writing skills to crank out research reports. With a college degree in English and a fair bit of journalism experience, I soon found myself collecting data in the field, moderating focus groups, and brainstorming with designers. After a year, I left ZIBA Design for two years in Romania, where my wife had taken a job doing business development work. I returned to ZIBA Design in 1997 as a research analyst, then design planner, and project manager. Initially, I thought of myself as a creative person, let other people deal with the clients, I'll just gather information and write reports. But the more I've worked with clients, the more I've gotten to enjoy understanding their industries, how they operate and the types of problems they're trying to solve. That last bit is important; it involves much more than research or product concepts.

A Typical Day

Every day is truly different. It depends on what the workload is, who the clients are, and what stages my projects are in. In research mode, I'm out on the road interviewing an airline mechanic, spying on consumers at Target, or following a FedEx courier up and down the Sears Tower. In report mode, I'm working with a group of ZIBITES to pull together a good story for the client (report and presentation). In project management mode, I'm probably running around the office, making phone calls to vendors, generating proposals and contracts, keeping the project team together and focused on a vision, touching base with the client to exchange information, getting people the tools and materials they need to get their jobs done.

Favorite Things About the Job

I like working with very creative people who have different skills, training, and backgrounds than I do. I like working with clients from many different industries; everything from consumer goods (air fresheners, power tools, sports equipment) to services (banks and overnight package delivery). I like putting together and telling stories. That's really the heart of what we do-use research and design to tell stories about which products to make, or how they should be made.

Advice to Young People

No matter how distasteful it might seem, network like crazy. Go beyond product design and development. Learn all kinds of businesses and make good connections. All of your experiences, such as traveling, cooking, writing, biking, climbing, and fishing, will help you in product development.

7C Reading: Meet a Design Planner (continued)

About ZIBA Design

ZIBA Design is an international design firm that has designed products from many global companies, including FedEx, Microsoft, Intel, Fujitsu, Black & Decker, Sony, Pioneer North America, Dial, and Clorox. www.ziba.com*