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# Meta-Data

## Lesson Goals

* Students will understand the notion of user-centered design, especially as it contrasts with other design philosophies.
* Students will understand the fundamental principles and approaches to user-centered design.
* Students will understand the design life cycle.
* Students will understand the goal of the unit.

## Lesson Outcomes

* Students will be able to describe the phases of the design life cycle.
* Students will be able to describe the tenets of user-centered design.
* Students will be able to identify qualitative vs. quantitative data and describe the value of each.

## Assessments

* Students will reflect on the application of the lesson’s concepts to their chosen area of HCI.
* Students will engage in a short design task based on the lesson’s concepts.
* Students will complete a short answer assignment in which they critique a provided interface from the perspective of the lesson’s concepts.
* Students will complete a short answer assignment in which they select an interface to critique from the perspective of the lesson’s concepts.
* Students will complete a short answer assignment in which they design a revision of one of the critiqued interfaces from the perspective of the lesson’s concepts.

## Lesson Plan

* Students will initially be introduced to the concept of user-centered design and its emphasis on user feedback.
* User-centered design will be used to introduce the design life cycle and its focus on frequent feedback from users.
* The topics of the lesson will be previewed to set the stage for the rest of the unit.

# Script

## 3.1.1 Introduction

### 3.1.1.1 Headshot Studio

* [C] David talking
* [A] Clips of the lesson
* When you start to design a new interface, your goal is to design an interface that will meet the needs of the user better than the existing design.
* It’s very rare that we design for tasks users have never even performed before: we’re almost always developing new ways to accomplish old tasks.
* Facebook was a new way to socialize and communicate with others, but the fundamental activities of socializing and communicating weren’t new.
* Facebook just met those needs better… at least, certain needs.
* In order to design interactions that are better than existing designs, it is important to take into consideration the user’s needs at every stage of the design process.
* That’s what this unit of this course will cover.
* We don’t generally want to just build creative, novel interfaces for the sake of creativity and novelty -- we want novelty to have a purpose, and to achieve that purpose, it must be used with a strong understanding of the user’s task.
* [B] Topic; Design Life Cycle
* So, in this unit, we’ll cover the **design** life cycle, as well as methods for gathering feedback and information from users at every stage of the life cycle.
* However, before we get started on that, we need to set up some basic concepts we’ll use throughout our discussions.
* [B] Topic; User-centered design
* We’ll start by discussing **user**-centered design.
* [B] Topic; Four stages of the design life cycle
* Then, we’ll introduce the **four**-stage design life cycle.
* We’ll discuss a few different general methods for pursuing the design life cycle.
* [B] Topic; Qualitative vs. Quantitative Data
* Finally, we’ll discuss the two kinds of information or **data** we can gather, qualitative and quantitative data.

## 3.1.2 User-Centered Design

### 3.1.2.1 Headshot Studio

* [C] David talking
* [B] Definition; User-Centered Design: design that considers the needs of the user throughout the entire design process
* User-centered **design** is design that considers the needs of the user throughout the entire design process.
* As far as we’re concerned, that’s basically good design.
* Oftentimes, though, that isn’t the way design is done.
* Design is often done to meet some functional specifications of what the tool must technically be able to accomplish, instead of considering the real needs of the user.
* [B] Davidface; You are not your user!
* Or, sometimes people will go through an entire design process **believing** they understand the needs of the user, but without ever really checking.
* User-centered design is about prioritizing the user’s needs while also recognizing that we don’t know the user’s needs.
* So, we need to involve them at every stage of the process.
* Before we start, we need to examine the user’s needs in depth, both by observing them and by asking them direct questions.
* After we start designing, we need to present our design alternatives and prototypes to the user to get feedback.
* When we near a design, we need to evaluate the quality of the design with real users.
* [B] Davidface; We can’t design great interfaces just by applying guidelines and heuristics.
* Having a good working knowledge of HCI helps us go through this more quickly, but **we** can’t design great interfaces just by applying guidelines and heuristics alone.
* We have to interact with our users, understand their needs, and involve them in the evaluation.

## 3.1.3 Principles of User-Centered Design

### 3.1.3.1 Headshot Studio

* [A] Visuals of standards coming up
* ISO, the International Standards Organization, has outlined six principles to follow when pursuing user-centered design:
* [B] Principles blooping
* 1. **The** design is based upon an explicit understanding of users, tasks and environments.
* This means that we must gather information about the users, the tasks they perform, and where they perform those tasks, and leverage that knowledge throughout the design process.
* 2. **Users** are involved throughout design and development.
* Involvement can take on many forms, from regularly participating in interviews and surveys about designs and prototypes to actually working on the design team alongside the designers.
* 3. **The** design is driven and refined by user-centered evaluation.
* We absolutely must have real users evaluating the prototypes and interfaces we assemble.
* 4. **The** process is iterative.
* No tool is developed once, released, and then abandoned. Designs undergo constant iteration and improvement, even after being released.
* 5. **The** design addresses the whole user experience.
* Many designers are tempted to delineate a certain portion of the experience as their primary interest, but we must address the entire user experience.
* 6. **The** design team includes multidisciplinary skills and perspectives.
* Good teams for pursuing user-centered design include people with a number of different backgrounds, including psychologists, designers, computer scientists, domain experts, and more.

## 3.1.4 Stakeholders

### 3.1.4.1 Tablet Studio

* [V] Visual of an individual interacting with a computer
* When we talk about user-centered design, we throw around the word ‘user’ as if it’s pretty obvious what it means.
* The user is the person who uses the interface that we create.
* However, that’s not the only person in whom we are interested.
* There are multiple stakeholders in the design, and we want to explore how our designs are going to affect all of them.
* [V] ‘Primary’ appears
* The user themselves is what we call the primary stakeholder.
* They’re the person who uses our tool directly.
* [V] Secondary stakeholders appear around primary user, ‘Secondary’ appears
* Secondary stakeholders are people who do not use with our system directly, but who might interact with the output of it in some way.
* [V] Tertiary stakeholders appear around secondary stakeholders, ‘tertiary’ appears
* Tertiary stakeholders are people who never interact with the tool or its output, but who are nonetheless impacted by the tool.
* So let’s take a couple examples of this.
* Imagine we were designing a new gradebook tool that makes it easier for teachers to send progress reports to parents.
* Teachers would interact with the tool, inputting grades and feedback.
* Thus, teachers are the primary stakeholders.
* Parents receive the progress reports, so they’re the secondary stakeholders: they interact with the output of the system, but not the system itself.
* Students do not use the system or see the progress reports, but they are nonetheless affected by the system.
* So, they’re tertiary stakeholders.
* School administrators might be another stakeholder, but where they fall would depend on the setup.
* If they can use the tool to directly monitor and intervene in student progress, they might be primary stakeholders.
* If they just see the aggregated progress reports, they might be secondary stakeholders
* If they never interact with the system in any way, they’re nonetheless likely affected by it, so they’d be tertiary stakeholders.
* In designing this tool, we need to keep all three kinds of stakeholders in mind.
* For example, how does parents having more consistent access to student grade information affect students?
* It might foster increased involvement by parents, but it might also facilitate helicopter parenting, where parents are too controlling over their kids’ schoolwork and prevent them from developing necessary metacognitive skills on their own.
* User-centered design isn’t just about catering to the user in the middle, but also in looking at the impact of our design on all the affected stakeholders.

## 3.1.5 Reflections: HCI Methods

### 3.1.5.1 Headshot Studio

* [C] David talking
* You might actually come from a software engineering background.
* So while user-centered design sounds obvious to some people, you might have experienced the other side of the coin.
* In many industries and domains, software engineers are still left to design the user interfaces themselves.
* There’s a fantastic book about this topic called “The Inmate Are Running the Asylum” by Alan Cooper, where he compares technology to a dancing bear at a circus.
* He notes that people marvel at a dancing bear not because it’s good at dancing, but because it dances at all.
* The same way, people marvel at certain pieces of technology not because it works well, but because it works at all.
* The book was released in 2004, and since then the user has become more and more of a focal point of design.
* Yet, there are still places where individuals with little HCI background are designing user-facing interfaces for one reason or another.
* Since there’s a strong chance you’ve worked in software engineering, reflect on that a little bit.
* Have you seen places where software engineers, data scientists, or even non-technical people were put in charge of designing user interfaces? How did it go?

### 3.1.5.2 Exercise

* “Click to continue” exercise

### 3.1.5.3 Headshot Studio

* [C] David talking
* I encountered this in my first job, actually.
* The summer between my freshman and sophomore years at Georgia Tech, I had a job as a user interface designer for a local broadcast company.
* I designed an interface, then handed it over to a team of engineers for implementation.
* Late in the process, the requirements were changed a bit and a new configuration screen was needed.
* We got the finished tool, and it all worked beautifully and perfectly… except this configuration screen.
* It was a list of over 50 different settings, each with 3 to 5 radio buttons to the side.
* Each setting was a different length, each radio button label was a different length.
* It was illegible, it was unusable, but it was technically functional.
* It met the requirements, described in terms of what the user must be able to do -- not how usable it is.
* Fortunately, there’s a greater appreciation of the value of user-centered design now than there was then.
* So many spaces have become so crowded that the user experience is what can really set a company or a tool apart.
* I’ve been noticing a trend lately toward new user experiences around really old tasks.
* I use an app called Stash to buy and sell small amounts of mutual funds. That’s been around forever, and eTrade has been doing that online for a long time, too.
* What differentiates Stash is this new user experience: automated investing, simple tracking, simplified summaries.
* User experience design really has become a major differentiator between success and failure.

## 3.1.6 The Design Life Cycle

### 3.1.6.1 Tablet Studio

* User-centered design is about integrating the user into every phase of the design life cycle.
* So, we need to know two things: what the design life cycle is, and how to integrate the user into each phase.
* [T] Google images page of different design life cycles
* If you look up design life cycles, you’ll find a lot of different ideas.
* We’re going to discuss in terms of a four-phase design life cycle.
* [V] First slice of a four-slice cyclical diagram: the four arrows/slices are labeled ‘Needfinding’, ‘Design Alternatives’, ‘Prototyping’, and ‘Evaluation’.
* The first part is needfinding.
* In needfinding, we gather a comprehensive understanding of the task that users are trying to perform.
* That includes who the user is, what the context of the task is, why they are doing the task, and any other information related to what we’re designing.
* [V] Second slice appears.
* Second, we develop design alternatives.
* These are very early ideas on the different ways to approach the task.
* It’s important to develop multiple alternatives to avoid getting stuck in one idea too soon.
* [V] Third slice appears
* The third is prototyping.
* We take the ideas with the most potential and build them into prototypes that can actually be put in front of the user.
* Early on, we might do this in very low-fidelity ways with pencil and paper, but as we go on we refine and improve.
* [V] Fourth slice appears
* The fourth and most importantly, we perform user evaluation.
* We take our ideas and put them in front of users.
* We get their feedback, what they like and don’t like, what works and doesn’t work.
* And then, they cycle begins anew.
* The feedback we gained from the users informs and improves our understanding of the problem.
* We now know new areas of the problem we might need to explore.
* That informs our continued needfinding and requirements gathering.
* Now, we improve and consolidate our design alternatives.
* Then, we improve our prototypes.
* Then, we put them in front of users again.
* Each time we go through this cycle, our understanding improves, our designs improve, our prototypes improve.
* Eventually, our prototypes develop to the point of being designs ready for launch, but the cycle doesn’t end there.
* We keep iterating, now with live users as the evaluators.

## 3.1.7 Methods for the Design Life Cycle

### 3.1.7.1 Tablet Studio

* [V] The design life cycle
* At every stage of this design life cycle, we’re interested in gathering information from the user to better inform our designs.
* To do that, we need a number of methods to actually obtain that information.
* [V] Methods appear, as lists connected to the various phases
* Fortunately, there are a number of methods we can employ to try to gather the information we need.
* The majority of this unit, in fact, will go through these different methods.
* These will become tools in your toolbox, things you can call upon to grab the information you need when you need it.
* Note that for many of these methods, you could put together entire units or entire courses.
* We’ll spend three minutes, for example, talking about naturalistic observation, yet there are entire textbooks and courses on how to do naturalistic observation.
* The goal of this is to give you enough information to get started, and enough to know what you need to explore next.

## 3.1.8 Design Life Cycles meet Feedback Cycles

### 3.1.8.1 Tablet Studio

* [V] Feedback cycle
* When we talk about feedback cycles, we talk about how they’re ubiquitous across nearly every field.
* HCI itself isn’t any different.
* [V] Zoom out on feedback cycle, show design life cycle side-by-side.
* In a feedback cycle, the user does something in the interface to accomplish some goal, then judges based on the output of the interface whether the goal was accomplished. Then, they repeat and continue.
* In HCI, we’re designing interfaces to accomplish goals, and then based on the output of our evaluations with those interfaces, we judge whether or not the goals of the interface were accomplished. Then, we repeat and continue.
* In many ways, we’re doing the same things that our users are doing: trying to understand how to accomplish a task in an interface.
* Only, in our case, our interface is the tools to build and evaluate interfaces, and our goal is to help them accomplish *their* goals.

## 3.1.9 Qualitative vs. Quantitative Data

### 3.1.9.1 Headshot Studio

* [C] David talking
* There is one final distinction we need to understand going forward because it’s going to come up at every stage of the design life cycle: qualitative vs. quantitative data.
* At every stage of the design life cycle, we’re interested in gathering data from users.
* [B] Descriptions
* Early on, it might be **descriptions** of what they do when they’re interacting with a task
* [B] Measurements
* Or, it might be **measures** of how long certain tasks take to complete, or how many people judge a task to be difficult.
* [B] Preferences
* [B] Performance
* Later on, it might be whether users **prefer** our new interfaces, or how much better they **perform** certain tasks.
* [V] Qualitative vs. quantitative data comparison
* Data will always fall into one of two categories: qualitative and quantitative.
* Quantitative is likely easier to describe.
* [B] Definition; Quantitative Data: observations described or summarized numerically.
* Quantitative data involves anything **numeric**.
* [B] Quantitative data supports formal tests, comparisons, and conclusions.
* When data is summarized numerically, we can perform statistical tests and summaries on it, draw formal conclusions, and make objective comparisons.
* There are a lot of strengths to quantitative data.
* However, those strengths come in large part because quantitative data only captures a narrow view of what we might be interested in examining.
* [B] Quantitative data is strong for a small class of things.
* It’s **strong** for a small class of things.
* [B] Definition; Qualitative Data: observations described or summarized non-numerically.
* Qualitative data covers everything **else**.
* [B] Qualitative data supports any kind of response or observation.
* Qualitative data involves **descriptions**, accounts, observations. It’s often in natural language.
* It could be open-ended survey responses, interview transcripts, bug reports, or personal observations.
* [B] Qualitative data covers a broader picture of what we’re examining.
* Because of its flexibility, qualitative data gives us a much **broader** and more general picture of what we’re examining.
* [B] Qualitative data is more prone to biases.
* However, the cost is that it can be harder to generate formal conclusions based on qualitative data. Qualitative data may be more **prone** to biases.
* [B] Sometimes, we can convert qualitative data into quantitative data.
* In some circumstances, we can **convert** qualitative data into quantitative data.
* For example, we could count the number of survey respondents to an end-of-course survey who mentioned course difficulty in their free-response questions.
* The free response question would be qualitative data, but numerically summarizing it generates quantitative data.
* Generally speaking, though, quantitative and qualitative data serve different purposes in the design life cycle.
* [B] Quantitative data is the ‘what’.
* [B] Qualitative data is the ‘how’ or ‘why’.
* I’ve heard it described that quantitative data provides the **‘what’,** but qualitative data provides the **‘how’** or ‘why’.
* When performing needfinding or when doing some initial prototype evaluations, we’re likely interested in users’ qualitative descriptions of their tasks or their experiences with the interface.
* It’s generally only after a few iterations that we start to be interested in quantitative analysis to find numeric improvements or changes.
* We can also use these in conjunction with one another, collecting both quantitative and qualitative data from the same participants.
* [B] Definition; Mixed Method: a mixture of qualitative and quantitative data
* This is referred to as a **mixed** method approach: it’s a mix of qualitative and quantitative data to paint a more complete picture of the results.

## 3.1.10 Exercise: Quantitative vs. Qualitative

### 3.1.10.1 Tablet Studio

* [V] Quiz visual
* Let’s do a quick exercise on quantitative vs. qualitative data.
* Let’s imagine we’re doing end-of-course evaluations for some class.
* For each of the following types of data, mark whether it would be considered quantitative or qualitative.

### 3.1.10.2 Exercise

* [E] “Select the quantitative data from the items below.”
* [E] “Responses to the question, ‘On a scale of 1 to 5, rate the difficulty of this course.’” (T)
* [E] “Responses to the question, ‘How much time did you spend per week on this course?’” (T)
* [E] “Responses to a free-response question.” (F)
* [E] “Count of the number of students to mention prerequisites in their answers to the free-response question.” (T)
* [E] “Response rate to the survey.” (T)
* [E] “Responses to a forum topic requesting students post non-anonymous reviews of the course.” (F)
* [E] “The number of participants in an end-of-semester office hours session.” (T)
* [E] “The transcript of the conversation from an end-of-semester office hours session.” (F)

### 3.1.10.3 Tablet Studio

* <<run through answers>>

## 3.1.10A Types of Quantitative Data

### 3.1.10A.1 Tablet Studio

* [V] List of distinctions appearing
* Within the general category of quantitative data, there are number of sub-divisions.
* These are important because they inform what kind of conclusions we can generate and statistical tests we can perform.
* We’ll talk about statistics more when we talk about evaluation, but it’s important to understand what kind of data you’re gathering during all phases of the design life cycle.
* First, there are four major classifications of data: nominal, ordinal, ratio, and interval.
* Nominal data is also referred to as categorical data.
* It arises when we observe the number of instances of different categories.
* For example, if we were developing an app targeted at commuters, we might take a survey and count how many drive, take the subway, walk, bike, etc. Those would exach be categories.
* Ordinal data is like nominal data, but there’s an ordered scale implicit in the categories.
* For example, if you were to ask a user to rate their satisfaction with their current commute on a scale of 1 to 5, you would be gathering ordinal data.
* The key, though, is that we don’t know how big the gaps between those numbers are. If someone says 1 instead of 2, are they twice as unhappy? 10x as unhappy?
* That’s where interval data comes in. With interval data, we *do* know the exact differences between values.
* Imagine if we asked commuters what time they usually leave for work. We know the difference between 6AM and 7AM is the same as the distance between 7AM and 8AM, but 8AM isn’t twice as late as 4AM.
* With interval scales, there is no 0 points, and so we can’t compute ratios between data -- only the intervals.
* That brings us to the fourth kind of quantitative data: ratio data.
* Ratio data has a 0 point. That means we can actually use ratios. If we ask our commuters how long it takes them to get to work, then we know 30 minutes is twice as long as 15 minutes.
* So those are our four types of data.
* There are more subcategories that come up, too, though:
* For example, with nominal data, there’s multi-nominal and single-nominal.
* The question here is: can a person be in more than one category at once?
* Going back to our nominal question, we could let users select multiple methods for commuting: that’d be multi-nominal. Or, if we asked that they only chose their single most common, that’d be single-nominal.
* Nominal and ordinal data can also be binary, which means there are exclusively two categories.
* For nominal this is intuitive: we could have categories like commute vs. work from home, where there are only two categories.
* For ordinal, this simply means that the two options have an implicit order to them, like passing or failing a class.
* Finally, there’s a distinction between discrete and continuous data.
* Nominal and ordinal data are always discrete: we’re always counting how many observations fall into each bucket.
* Interval and ratio data, however, can be discrete or continuous.
* This means we could take observations that always boil down to a discrete number of possible values, or we could take measurements that could lead to a continuous scale.
* Sometimes those lines can be blurry as well. For example, if we asked people to report how long their commute is, that would probably be discrete data because we don’t anticipate anyone giving fractional minutes. However, if we actually timed their commutes, we’d get continuous data.

## 3.1.10B Types of Qualitative Data

### 3.1.10B.1 Tablet Studio

* [V] Something from the needfinding lesson?
* Just as there are different types of quantitative data, so also there are different types of qualitative data.
* In practice, however, the types of qualitative data are much more closely integrated with the way in which they were gathered.
* For example, we might have discrete ratio data that came from self-reported responses on a survey, or naturalistic observations out in the world, or logs drawn from real interfaces.
* Qualitative data, on the other hand, tends to be determined more by how it is gathered.
* Some common types of qualitative data we’ll use include transcripts from things like interviews or focus groups, raw observational notes taken during naturalistic or participant observation, plaintext survey responses, and actual artifacts generated by interfaces like spreadsheets or presentations.
* Qualitative data is strong because these types of data provide a much richer picture of whatever we’re investigating, but with that strength comes a cost: it’s also more prone to interpretation biases.
* For that reason, we often convert qualitative data into quantitative data using a process called coding.
* Coding is when distill qualitative data into categories, typically nominal, to arrive at a numeric summary of what is going on.
* This process loses some of the richness of the original data, but it provides a systematic way of controlling for biases and deriving quantitative conclusions.
* And we never lose the original data, so we get the best of both worlds.
* In HCI, we almost always want to use some mix of these two: our problem spaces are far too rich to be addressed quantitatively alone, but for that same reason we risk being dominated by biases if we still solely to qualitative analysis.

## 3.1.11 Design Challenge: Recording MOOCs

### 3.1.11.1 Headshot Studio

* [C] David talking
* As we go through the unit in this course on methods, we’re going to take a running example as a design challenge to explore the different HCI research methods.
* I’m going to choose a challenge quite close to home for me: improving the MOOC-recording process.

### 3.1.11.2 Headshot Studio (Behind Camera)

* [C] David talking
* Hi Amanda.
* [Amanda] Hi!
* I’ve mentioned before, Amanda is the video producer for this course.
* Our goal in this design challenge is going to be to help Amanda with the MOOC recording process, specifically the live recording in this room.
* We’ll talk about how we would do needfinding in a task with a rather small audience.
* We’ll talk about developing design alternatives, then building them up into prototypes.
* We’ll discuss evaluation, how we might explore the usefulness of these interfaces with real users.
* And hey, maybe along the way we’ll actually do something to make Amanda’s life easier!

## 3.1.12 Exploring HCI: HCI Methods

### 3.1.12.1 Headshot Studio

* [C] David talking
* As we go through the lessons in this unit, we’re going to talk about the design life cycle, the process of finding user needs, brainstorming design alternatives, prototyping interfaces, and evaluating them with users.
* Depending on how you’re taking this material, you might do this on your own with projects or assignments.
* Some of the most interesting applications of this material, though, are to emerging areas which might be outside the scope of the assignments you’re doing.
* So, as you’re going through the lessons in this unit, try to brainstorm a conceptual plan for how you might pursue the design life cycle in your area of interest.
* There are interesting issues that arise unique to different domains or application areas.
* In educational technology, for example, you would need to take into consideration lots of stakeholders: students, parents, teachers, administrators, and more.
* In virtual reality or wearable devices, you’ll need to think a lot more about technical constraints and finding creative ways to get around technological limitations to interaction.
* In computer-supported cooperative work, you might want to explore places where the phenomenon already exists, like Wikipedia or geographically-distributed companies.
* Throughout this unit, we’ll revisit the stages of the design life cycle and explore how it might apply to your area of interest.

## 3.1.13 Conclusion

### 3.1.13.1 Headshot Studio

* [C] David talking
* [A] Clips of the lesson
* [B] Topic; Design life cycle
* In this lesson we introduced the concept of the **design** life cycle.
* There are lots of versions of the design life cycle out there, but we’re going to discuss the most general four-step cycle.
* [B] Topic; Needfinding
* [B] Topic; Design Alternatives
* [B] Topic; Prototyping
* [B] Topic; Evaluation
* This cycle starts with **needfinding**, then goes to constructing **design** alternatives, then to **prototyping**, then to **user** evaluation.
* Then, the cycle repeats.
* [B] Topic; User-Centered Design
* The goal of this cycle is to realize **user-centered** design: design that takes into consideration the user’s needs at every step.
* In the rest of this unit, we’re going to focus on filling up your design life cycle toolbox with tools for gathering the right kind of data at the right time and using it in the right way.