



Psychology of User

Pay Attention to What Users Do,
Not What They Say.

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An Introduction

Most of us have worked with a system that is tough to navigate. Many systems are still created without proper user consideration today. Many product designers are more concerned with the technology than with the people who will use it.

You may have heard the term "human factors design" before, but what does it mean? We'll go over why it's so important, fundamental human factor design principles, and ways to assess how well you've incorporated human factors in your design in this article.

The most important aspect of any computer system is the system user, and the trip into the world of interface design and the screen design process must begin with an awareness of the system user. The user requires a system that is designed to help them. Because of the knowledge, skills, and attitudes divide between system users and those who construct the systems, understanding people and what they do is a challenging and frequently neglected process.

The designer must always perform the following to develop a fully usable system:

- Become familiar with how people interact with computers.
- Understand the important human aspects in design.
- Determine the user's knowledge and experience level.
- Determine the features of the user's needs, duties, and jobs.
- Determine the psychological qualities of the user.
- Determine the physical attributes of the user.
- Use the recommended strategies to learn about your users.

Design Thinking

If you're thinking of becoming a UI/UX Designer, You are definitely required to learn the Design Thinking Approach. This idea is essential for developing new, user-centric goods and services such as websites, applications, and even coffee machines.

Design thinking is not restricted to UX/UI design; it is applied in numerous sectors and is taught at world-class colleges. As a result, large brands such as Samsung and Google have embraced the strategy. This is a talent you must have if you want to advance as a UX/UI Designer.

So, what exactly is design thinking in the context of UX/UI design? What makes it so popular? How does it promote innovation? We'll look at what design thinking is, the five-stage method for creating great products and services, and how to get started with design thinking for UX/UI design.

Understanding Design Thinking

Design Thinking



Empathize



Define



Ideate



Prototype



Test

Design thinking is a framework that UX designers may use to handle vast, sophisticated, or even totally unknown product development challenges. Consider the design thinking approach to be a framework for people who seek to solve problems.

Also, keep in mind that design thinking is not a solitary activity. It requires cooperation among people with diverse expertise who will give original, new ideas before narrowing the ideas down to feasible solutions.

Design thinking is widely recognized as a critical topic in user-centered design. Having said that, knowing the

the technique is important for anyone trying to get started as UX/UI Designers.

To elaborate, design thinking is a problem-solving strategy that emphasizes creativity and invention. By completely understanding their users' objectives, difficulties, and end-task, UX/UI Designers use the design thinking process to find problems and come up with innovative solutions.

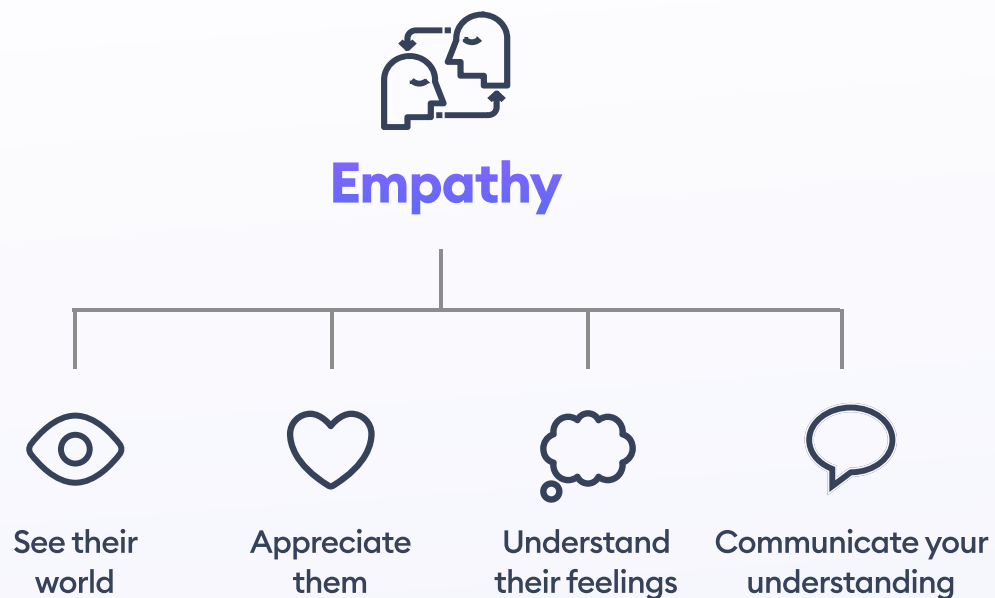
Design thinking is commonly mistaken as a "one rule fits all" technique, although it is not, and it does not always succeed. As Bill Burnett, an assistant professor and design thinking expert at Stanford University, puts it:

“Design Thinking is a method, not magic”

So, to conclude, it is a technique, a process, a skill set, and a mentality. And, certainly, it is also a set of principles.

Below are the 5 principles of Design Thinking process. Let's study them in detail and understand what exactly are they:

1. Empathize



Empathize is the first stage of the design thinking process.

Design teams do research to have a better understanding of their users' demands. They lay aside assumptions in order to get insights into the users' environment through observation and consultation with users. They can better grasp consumers' experiences, motives, and challenges this way.

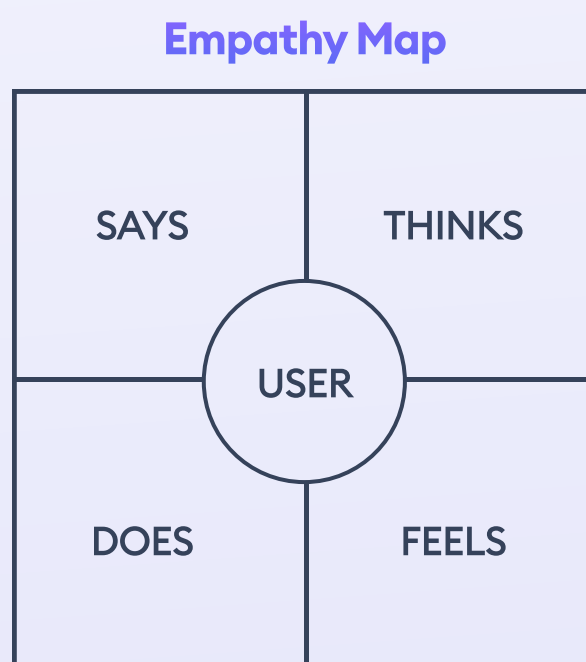
As Jack Dorsey said – “If you want to build a product that’s relevant to people, you need to put yourself in their shoes.”

As a designer working for a client, you must first grasp your customer's requirements. Then, as you begin developing, you should transport yourself inside the user's thoughts.

Who are the future users of a digital product you're developing, what distinguishes the target audience, what are their habits, what is their online activity like, where are the pain spots, and what are the consumers' wants that must be met? Answering these questions may assist you in getting a strong start.

And how may design thinking assist you as you move forward?

During the first phase of a web design project, the emphasis should be on empathizing with the demands of the consumers. Using the so-called empathy map should help with this approach.



To empathize is to conduct research. As a result, you should keep reminding yourself to examine what you see rather than rejecting it. You should also listen to others with an open mind rather than focusing on things that corroborate your prejudices. Because our biases will inevitably enter into how we interpret the world and the scenarios we investigate, we must detect and overcome these as designers—or design thinkers—before they affect our research.

Before you can begin to see through your consumers' eyes and understand their perspectives properly, you must first become completely objective. They are the authorities. Before you can work on pleasing users via design, you must first understand their dimensions of usage (e.g., tasks) and their sentiments (e.g., motives).

The question here is how to empathize in order to gain the necessary insight. So here's the solution:

The goal of the empathize stage is to understand the people

you are designing for and figure out what problem to solve. Now that we know what empathy is, we will take a look at some of the methods used for empathizing.

- ▶ Ask What-How-Why
- ▶ Ask the 5 Whys
- ▶ Conduct interviews with Empathy
- ▶ Make use of photo and video user-based studies
- ▶ Brainstorm
- ▶ Engage with the users
- ▶ Create a journey map
- ▶ Build empathy with analogies

Why Empathy is Crucial for a Business?

A human-centric design approach lies at the heart of design thinking. The success of the business will be ensured by guiding designers from a user viewpoint to gather insights about their demands. There are three metrics that may be used to assess the success of a design. The first criteria is human-centric and may be referred to as the product's

attractiveness. The second element is the product or service's viability, which lets us measure it from a business aspect. Finally, the feasibility parameter lets us comprehend the technological position of the items or services.

There is a lower possibility of success if the product or service is not appealing to the target audience. A company cannot generate a profit if its products and services are not appealing to its customers. It makes sense to use an empathic approach to design. It is one of the most important phases for a business and may aid in the resolution of issues that we were unaware of.

Conclusion

Designing with the end user in mind and taking an empathic approach provides a new viewpoint and assures higher success. Understanding the user's demands aids in the development of solutions that are realistic, desired, and viable, regardless of whether we are aware of the problem.

2. Define

After empathizing with your consumers, you may go to the second step of the Design Thinking process and outline the problem that your users require you to address. The define stage, the second phase in the Design Thinking process, is where you'll build a clear understanding of the problem you'll tackle for the consumer. This will then be shaped into a problem statement, which will serve as your north star throughout the design process.

We'll cover all you need to know about this step of the Design Thinking process, as well as how you can develop a relevant issue statement.

What is Define Stage and why is it necessary?

The define stage, the second phase in the Design Thinking process, is dedicated to identifying the problem: what user problem will you be attempting to solve? To put it another way, what is your design challenge?

The define stage is preceded by the empathize stage, in which you learnt as much as possible about your consumers through interviews and a range of immersion and observation approaches. You're ready to transform your empathy into an actionable issue statement once you've figured out who your users are and, more crucially, what their goals, needs, and pain points are.

The link between the stages of empathize and define is best stated as analysis and synthesis. During the empathize phase, we use analysis to split out what we see and uncover about our consumers into smaller, more manageable components, such as describing their actions and behaviour as "what," "why," and "how." We bring these components back together in the define step, synthesizing our results to generate a detailed overall picture.

Before we go into what constitutes a strong issue statement, it's important to understand the interplay between analysis and synthesis that many design thinkers may encounter in their projects. In his book *Change by Design*:

How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, CEO of the international design consultancy firm IDEO, writes that analysis and synthesis are "equally important, and each plays an essential role in the process of creating options and making choices."

Analysis is the process of breaking down complicated thoughts and issues into smaller, more understandable elements. We do this, for example, during the Empathize stage of the Design Thinking process, when we notice and capture information related to our users.

Synthesis, on the other hand, entails creatively fitting together the jigsaw to produce entire concepts. This occurs at the Define step, when we organize, interpret, and make meaning of the facts we obtained in order to develop a problem statement.

Although analysis occurs during the Empathize stage and synthesis occurs during the Define stage, they do not occur exclusively during these phases of Design Thinking. In fact,

across all stages of the Design Thinking process, analysis and synthesis frequently occur concurrently.

Design thinkers frequently analyze a condition before synthesizing new ideas, and then synthesize their findings again to generate more complex syntheses.

Why is Define Stage so Important?

The exact challenge you will tackle is highlighted in your problem statement. It will lead the whole design process from this point on, providing you with a definite objective to focus on and assisting you in keeping the user in mind at all times.

When you understand the description of your problem, problem statement, or design challenge, you will notice a significant improvement in your Design Thinking process and outcome. Why? A good formulation of your issue statement will guide your work and get the creative process started in the proper manner.

The design space will gain clarity and emphasize as a result. On the other, if you don't pay enough attention to identifying your problem, you'll be fumbling around in the dark. That is why, Define stage is very important.

What is a Good Problem Statement?

A problem statement is essential for a Design Thinking project because it guides you and your team and focuses on the specific demands that you have identified. It also fosters a sense of potential and hope, allowing team members to generate ideas during the Ideation stage, the third and final step of the Design Thinking process.

As a result, a good problem statement should include the following characteristics. It should be as follows:

Human-centered - This requires you to tailor your issue statement to individual people, their requirements, and the insights gathered during the Empathize phase. Instead than concentrating on technology, monetary rewards, or product specs, the issue statement should be about the people the

team is attempting to assist.

Broad enough to allow for creative flexibility - This means that the issue statement should not be too narrowly focused on a single method for implementing the solution. The issue description should also not include technical requirements, since this would limit the team's ability to explore areas that might add unexpected value and insight to the project.

Narrow enough to make it manageable - A problem statement like "improve the human condition," on the other hand, is excessively broad and will certainly make team members feel overwhelmed. Problem statements should include enough limits to keep the project manageable.

Understand With Example

Consider this design thinking definition example to emphasize the concept. Assume you're developing an app that offers seniors healthful pre-made meal delivery. Rather than expressing that you wish to boost food sales to seniors by 5%, the issue might be described as elders needing meal

delivery to have access to nutritious meal alternatives.

Finally, your goal should be to develop an actionable issue statement based on a thorough understanding of the user's individual wants, rather than a company's bottom line or needs. Those discoveries are found at the focus stage through your study and observations. As a result, be sure you have a solid foundation.

Your problem statement isn't meant to generate a specific solution or a means to meet the demands of your users in the service, experience, or product you're building. Rather, its objective is to give a broad enough scope for you to start thinking about options other than the apparent ones.

You may proceed to the next phase if you've effectively defined the problem as a problem statement, produced a POV that is inspiring, informative, and fascinating, and directs your innovation activities in an actionable, distinctive, and meaningful way.

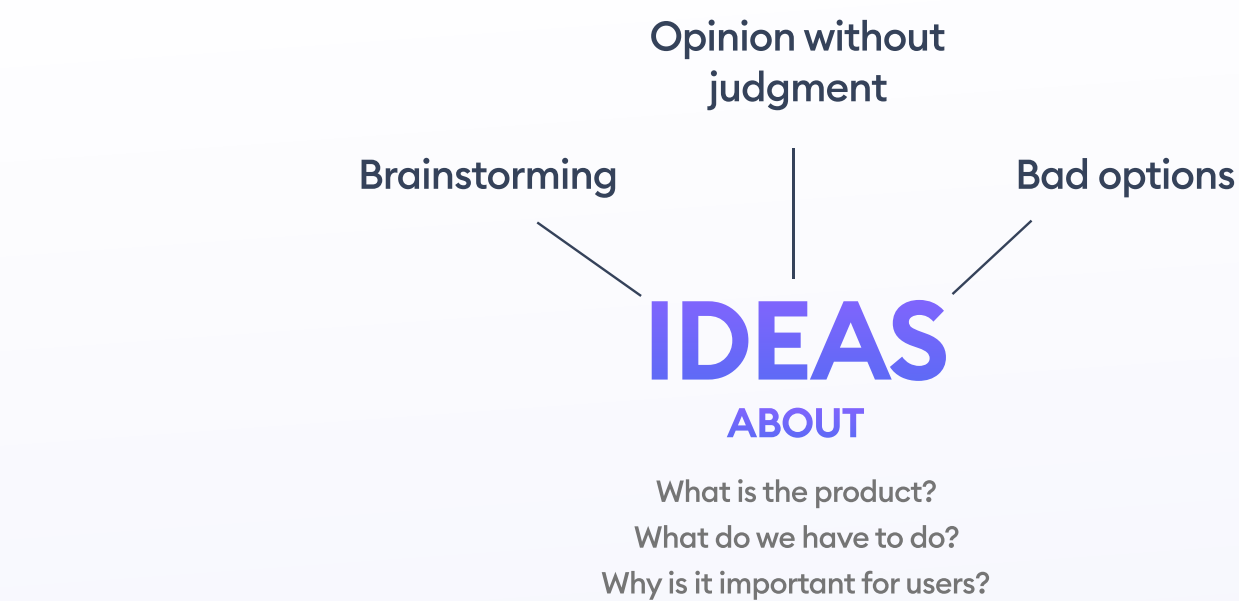
3. Ideate

Ok... First of all, let's understand Ideation in short:

With a clear problem description in mind, develop as many ideas and potential remedies as possible. The ideation phase encourages you to think beyond the box and investigate fresh possibilities. You are more likely to discover creativity if you focus on number rather than quality of ideas!

During dedicated ideation sessions, you will employ a variety of ideation approaches such as body-storming, reverse thinking, and worst possible idea.

You hold many ideation meetings with various stakeholders based on what you discovered throughout the Empathize phase. With your issue description in hand, you brainstorm as many ideas as possible for how you might make your staff happy and hence more inclined to stay with the company.



Ideate is the portion of the design thinking process that most designers enjoy: envisioning potential solutions! You've done your homework and have a good idea of who the product is for, what it's supposed to do for its customers, and why it matters to them. Now you and your team can start to imagine how your design could tick all the correct boxes.

You'll start with your problem statement and work your way up from there. There are several approaches for generating ideas; most design thinking procedures incorporate brainstorming or the worst possible concept so that individuals may be creative with their answers.

At this point, you should jot down as many thoughts as possible. It's fine if not all of those are viable or realistic; you simply want everyone on the team to express themselves freely. Later on, you'll sort the ideas based on their viability or brilliance!

When it comes to concepts that seek innovation, we frequently face the same trade-off. The more creative a product is, the higher the risk of betting on that new product. It is up to you and your team how deep you are ready to wade into the risk pool of innovation - but this quandary is worth noting while examining the ideas you gathered in this stage of the design thinking process.

Basically, in Ideate, A design thinker is expected to contribute as many ideas as possible. It is not examined whether an idea is conceivable, realistic, or viable when brainstorming. Thinkers' only duty is to generate as many ideas as feasible for them.

Design thinkers utilize boards, sticky notes, drawing, chart

sheets, thought maps, and other tools in this process. Later in this part, we'll look at mind maps. Designers also expand on the ideas of other designers. All design thinkers' solutions are brought to the table and considered. Brainstorming has its own set of rules. They are listed below.

Understand With Example

- At any given moment, just one discussion is permitted. When an idea is presented, no one else may interfere.
- The concentration must be on quantity rather than quality. The group must have a big number of ideas with them at this stage.
- Think beyond the boundaries. Wild ideas must be promoted, even if they are amusing or appear implausible.
- The group leader must refrain from passing judgement. The other philosophers must similarly defer judgement. A judgmental mindset creates an obstacle for researchers.

- Visualization is essential. Design thinkers must first build a visual image of the issue statement and then attempt to envision a visual image of their own ideas.

Among the many brainstorming ideas, here's a technique that you can learn.

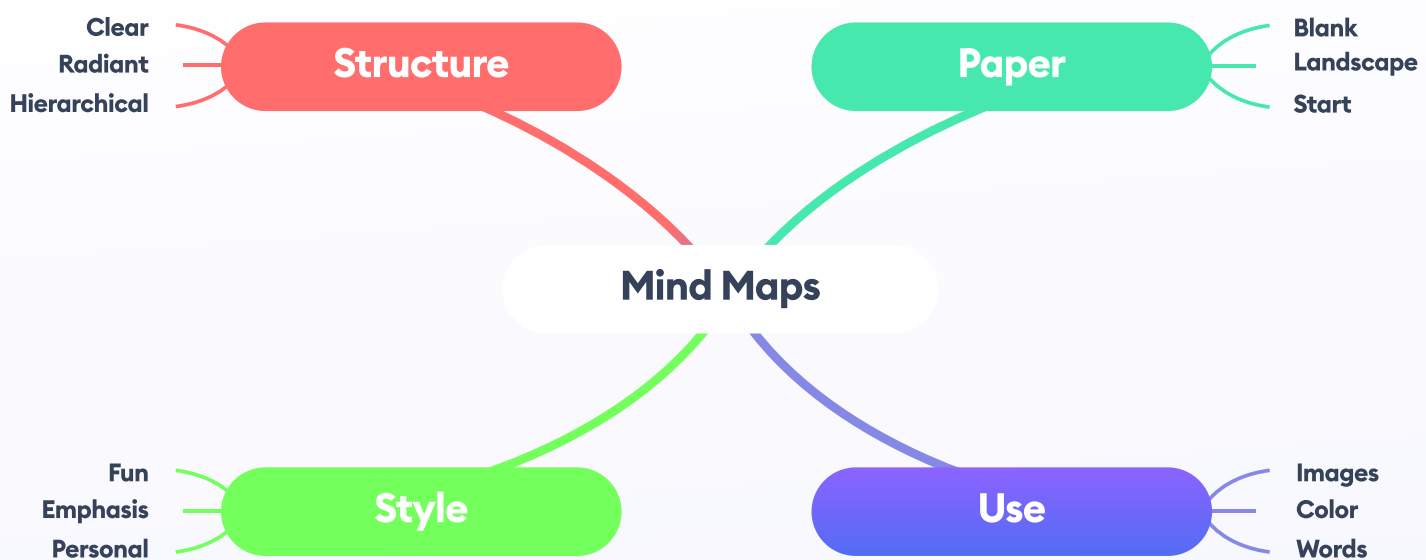
Mind Maps

A mind map is a graphic that allows you to visually examine and understand information. A mind map is built around a single problem statement and all of the solutions to that problem are written around it. The problem statement is often placed in the center of a blank page as a hub, with branches extending in all directions to indicate the answers.

Text, photos, trees, and even smaller mind maps can be used to depict the thoughts. The entire map resembles a top view of a tree, with the issue statement representing the trunk and the answers representing the branches. It is also known as the spider diagram.

However, a mind map is more than just a random layout. It is a well-structured, ordered diagram designed to enhance thinking and speed the analysis and synthesis process. The guidelines for creating a mind map are given below:

- Begin in the center of a blank white page with the issue statement.
- To represent your thoughts, use images, various colors, symbols, caricatures, acronyms, and codes. Text might be tedious, but diverse visualizations can bring a whole new dimension to your mind map.
- Long statements must be replaced with keywords. The mind map must rapidly provide a tip to the design thinker about a concept. It is a waste of time to read a lengthy statement.
- Every word put in the mind map must be linked to the center hub by some lines or collections of lines.
- For visual stimulation, use a variety of hues.
- To emphasize a point, use radial hierarchy and emphasis, italics, and underlines.

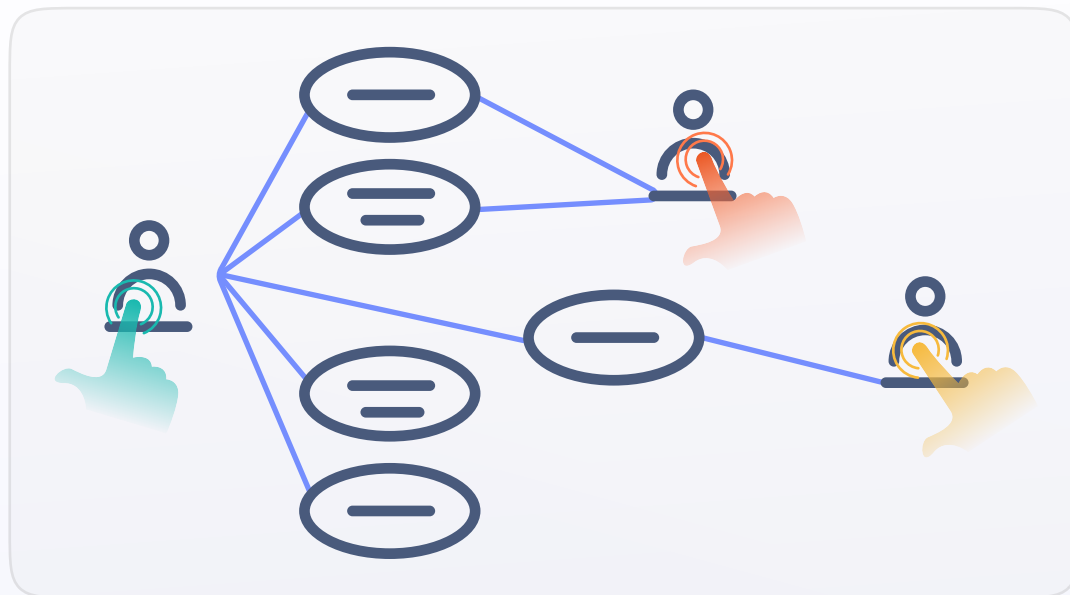


In The End

Sketches, screens, and storyboards can also be used to aid in the ideation process. Corporate enterprises have teams who use enormous whiteboards to post their thoughts on utilizing sticky notes. Different types of concepts are represented by different colored sticky notes, which aids in idea separation.

The fundamental goal behind the ideate stage in the design thinking process is to create ideas and try to categorize them. This allows for judgment-free brainstorming, bringing all ideas to the table, and moving on to the next level, 'Prototyping,' where the ideas are tested for practicality and usefulness.

4. Prototype



To study the major solutions created during the ideation phase, the design team will now create a number of low-cost, scaled-down replicas of the product (or particular aspects discovered inside the product). These prototypes can be shared and tested inside the team, across departments, or on a small group of individuals outside of the design team.

This is an experimental phase in which the goal is to find the best potential solution to each of the challenges highlighted in the previous three phases. The solutions are built into prototypes and are inspected one by one before being approved, enhanced, or rejected based on user feedback.

The design team will have a better understanding of the product's limitations and difficulties at the conclusion of the Prototype stage. They will also have a better understanding of how real users would behave, think, and feel while interacting with the final product.

Why is Prototyping Important?

Designers should build with the end user in mind. So, when it comes time to create the final product, the designer wants to ensure that they've struck the nail on the head with their knowledge so that they can start solidifying their ideas. But how can a designer validate everything they wish to do in the absence of a finished product? By developing a prototype.

A prototype allows a designer to test their idea with people and evaluate what works and what doesn't.

Prototyping is basically divided in two categories:

1. Low-fidelity prototypes often make use of rudimentary models or representations of the product being tested.

These are often paper-based accounts or representations of models constructed inexpensively or easily. Storyboarding, drawing, the Wizard of Oz, and card sorting are all examples of low-fidelity prototypes.

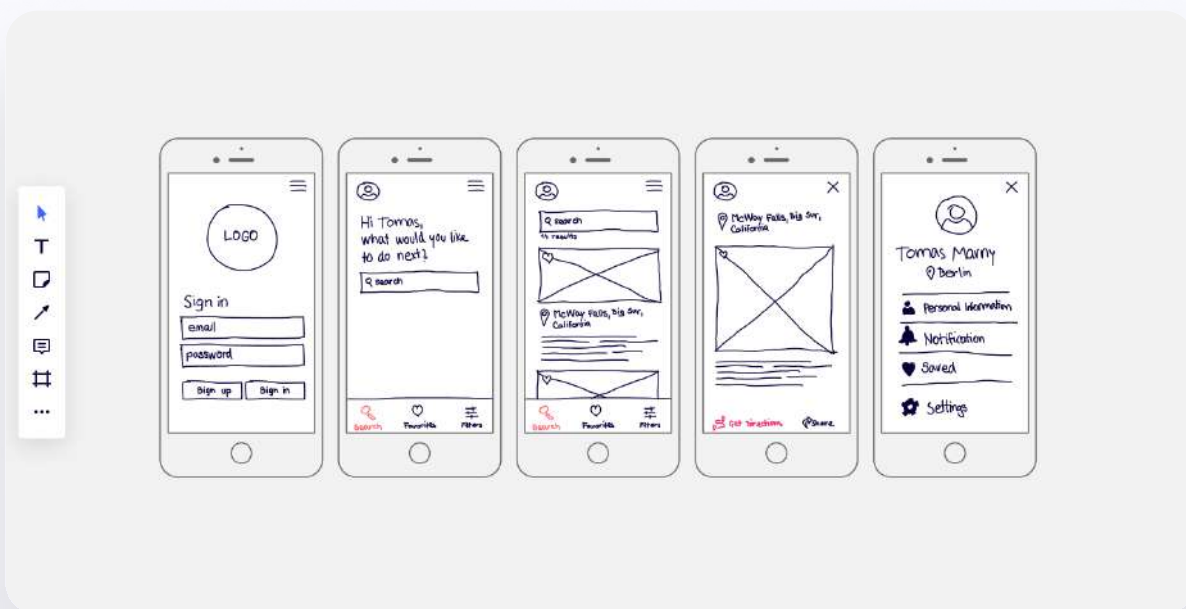


Image credit - Miro

2. When the product is nearing completion, high-fidelity prototypes are used. These prototypes, which are often computer-based, allow for realistic user interactions. High-fidelity prototypes are often thought to be more successful in gathering genuine user performance data and demonstrating actual products to stakeholders.

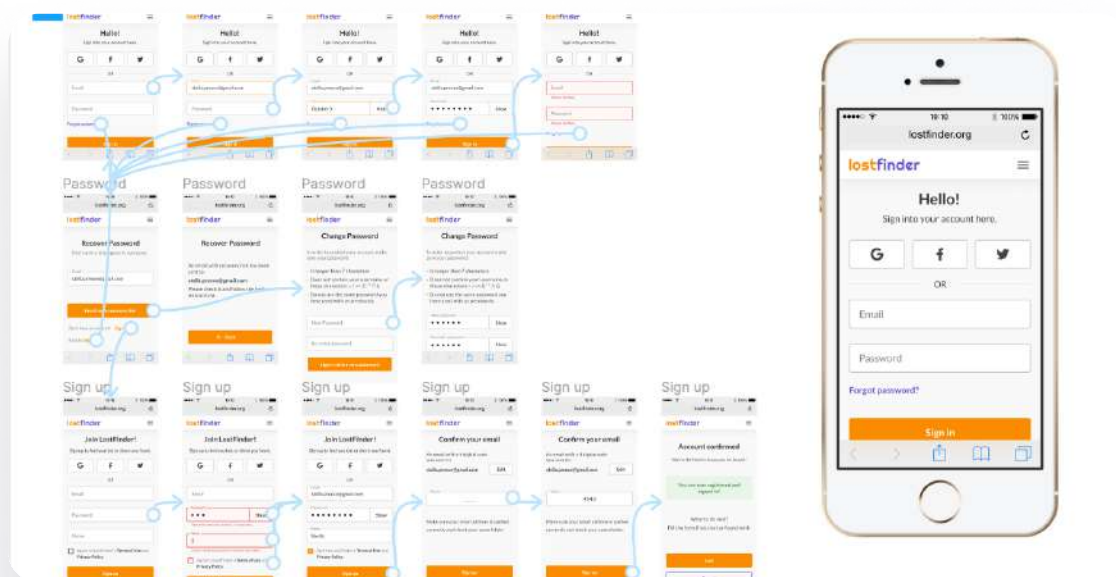


Image credit - Avrora Shuhalii

How does Prototyping help us?

Traditionally, prototyping has been considered of as a process for testing functionality. However, it is used for a number of purposes, including the (non-exclusive) categories listed below:

Empathy - Prototyping may help you acquire a deeper understanding of the design space and your user even at the pre-solution phase of your project.

Explore - Construct to think about and develop a wide range of solution-centric options.

User testing and refinement - include developing prototypes (as well as the environment) for testing and refining solutions with users.

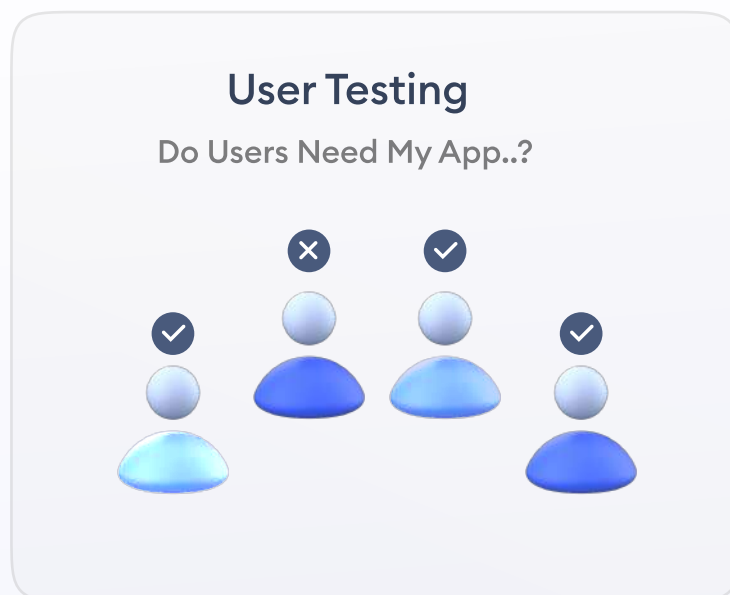
Demonstrate your vision to others (coworkers, clients, customers, and investors).

Prototyping allows us to learn and solve problems by eliminating uncertainty and misunderstanding. It aids in Ideation and allows for the testing of several concepts without the expenditure of additional money, time, or effort. Prototyping aids in the identification of a variable to explore and the division of a complicated problem into smaller, testable sections.

In The End

Most of the time, you make judgments based on assumptions and prejudices. As a consequence, despite extensive brainstorming and formulation, it fails to connect with people. This is avoided by prototyping. When utilized on a regular basis, prototyping helps you to test your assumptions by knowing the consumer and improve on existing ideas. It allows you to adopt a more human-centered approach to issue solving and work toward making your ideas a reality.

5. Test



This phase's purpose is to determine which components of your design are effective and which are not. During the testing phase, a product team provides test participants with a prototype and encourages them to execute certain typical activities with it. Testing provides a product team with a better knowledge of how real users engage with a product, what issues they encounter, and how they feel.

The testing phase is when a product's final solution is tested on a large scale. It aids in determining if a solution will or will not succeed. The prototype that is deemed the best after considering customer and end-user feedback is implemented. Depending on the success or failure of the

Prototype stage, the Testing stage can produce both good and negative effects.

If the end-user has usability issues with the solution provided, testing may result in a repeat of the Design Thinking process. It gives crucial insights that enable the designer to revise the issue description at hand and produce a new solution that is more empathic with the end-user.

Thus, testing is a recurring process in which the prototype must be tested frequently in order to update the design, confirming the UX / UI Design "test early, test often."

Why Test is Important Step in Design Thinking Process

All of the preceding stages of the Design Thinking Process are affected by the Testing Phase. The envisioned product operates on a designer's assumption prior to the Testing Stage. While this planned product may be supported by enough research and empathy, there is a risk of critical

How To Conduct a User Test?

Moderated usability testing is running a series of tests using your solution to gather input from people who reflect your target audience. Moderators can pose clarifying questions to participants and obtain more specific feedback (i.e., why exactly do test participants act the way they do).

Focus groups are often small groups of individuals (six to nine members) that meet to review and debate a specific solution. Focus groups are excellent for researching a certain issue (say, understanding how user onboarding makes users feel). This is how to hold focus groups.

Learn how to **analyze design critically**. Constructive criticism is a method of providing feedback that includes precise, practical recommendations. It is the most effective technique to offer input on design solutions. Here's how to criticize a product or a website.

In UI/UX, **prioritize reducing cognitive strain**. The amount of brainpower required by users to interact with your product

is referred to as cognitive load. The greater the cognitive load required on users, the less pleasurable a product experience becomes. Testing should assist you in identifying areas that may result in a high cognitive load.

In The End

One of the most essential steps in the Design Thinking process is testing to see if your idea(s) solves the user problem identified during the empathize stage.

It is hard to find a flawless answer right immediately, but collecting honest input from consumers will assist to steer continued development while ensuring that their needs are addressed.

Design Thinking - A Non-Linear Process

Did you know Design thinking is a non-linear process? It is crucial to note that the five design phases described above are not necessarily linear. In many circumstances, it is an iterative loop. Individual processes might occur in parallel depending on the demands of a project, or the product team can shift between phases as they create a product.

Accept that the product design process is ongoing. It is unusual to create a flawless solution from the outset. When insights gained later in the process impact judgments made earlier in the process, this is a highly typical scenario. For example, if a testing phase reveals new information about user behavior, the team may choose to hold another brainstorming session and, based on the session's findings, decide to create a new prototype.

Understand People you Design For

The purpose of design thinking is to create products with actual people in mind. Designers develop a deep grasp of the individuals who will use their product and create a solution that meets their requirements.

The success of businesses such demonstrates that when the design thinking process is incorporated into organizations' behavior, the organization begins to nurture creativity, cooperation, and innovation.

Why Study Human-Computer Interaction and User Experience?

HCI/UX/UI is an interdisciplinary study that requires an understanding of computer science as well as social sciences, humanities, business and other areas of expertise.

HCI/UX/UI students learn how to:

- ▶ Use social, cognitive and data-driven research to understand the context of use and the user experience.
- ▶ Design, prototype, engineer and test user interfaces to enhance usability.
- ▶ Understand issues related to HCI, UI and UX, including collaborative learning, social computing and the ethics of HCI, UI and UX.

But perhaps the best description of why we study HCI, UI and UX comes from Drexel alumnus Michael Dickard, PhD

and Senior User Experience Researcher at Vanguard.

According to Dickard:

“It is important to keep humans at the center of the systems and technologies we build. In the past, and even now, many companies start with solutions – they focus on building tools and systems for themselves rather than focusing on the people who will use them. At Drexel, you not only get to learn about human-centered design and research, which underpins good HCI, UI and UX, but you also learn to be critical and how to push back on dominant narratives and ways of thinking that might harm people.”

As the field continues to expand, expect students from disciplines outside of computer science or design to take an interest in HCI, UI and UX.

Understanding How People Interact with Computers

To begin, the human action cycle will be discussed, as well as how people interact with computers. Following that, several characteristics of previous and modern computer systems that have caused, and continue to cause, people problems will be examined. Finally, the impact of these issues will be examined.

The Human Action Cycle

The human action cycle is a psychological model of how people interact with computers. Norman (1988) presented it, which Stone et al. (2005) altered and used as the basis for this debate.

When taking action or performing a task, people tend to be goal-oriented, desiring to achieve a certain goal. Cognitive or bodily actions and tasks are possible.

The action cycle has three stages: setting a goal, carrying

out activities to attain the objective, and assessing the action's outcomes. The cycle goes like this:

An objective is established - A cognitive activity, appropriate objectives, or a goal is planned and defined. The objective could be to type and print a letter or to discover a good deal on an electrical device.

A strategy is developed and put into action - This phase is divided into three parts, the first two of which are cognitive and the third of which is physical.

The general approaches for achieving the required goals are chosen - A computer's word processing function is required to type a letter. Finding the greatest deal necessitates some comparison shopping on the Internet.

The action sequence has been planned - To type a letter, first open the word processor, then select a blank document and begin typing. Finding the best pricing entails conducting an Internet search to identify potential sources

of the requested equipment, visiting these sources' Web sites, and determining the equipment prices.

The actions are carried out - The scheduled tasks are carried out using the different accessible computer controls, such as the keyboard and mouse.

The outcomes of the acts are assessed - This is another cognitive stage with three stages.

The final product is perceived and comprehended - On the screen, the entered letters and symbols show. The equipment prices are listed on the website being accessed.

Expectations are used to interpret the outcome - Is the letter well formatted, with accurate and complete content? Are the costs for the correct equipment displayed?

The outcomes are compared to the set objectives - Has the letter been accurately printed? Is the price reasonable?

Failure to meet specified goals may result in the action cycle's goals being adjusted or repeated. It's possible to do multiple iterations.

Simple action cycles can take seconds to complete, while others can take hours. There may be several approaches to achieve one's aim during the execution phase. Human action cycles for activities should be completed as quickly and precisely as possible through interface design.

Why People Have Trouble with Computers

Although system design and its behavioral implications have received a lot of attention in recent years, this hasn't always been the case. Programmers, systems analysts, and system designers have traditionally designed commercial computer systems, and many of them have significant technical expertise but little behavioral training. Graphic artists have been introduced to design teams as the Web has grown in popularity, thanks to its wide graphical possibilities. Most graphic artists, like those who came before them, have significant technical expertise in their

field but little instruction in usability.

As a result, design decisions have relied heavily on the designer's intuition about the user's skills and his or her abundance of specialized expertise. As a result, poorly designed interfaces are frequently overlooked.

Designers' intuition, like anybody else's, is prone to errors, regardless of how brilliant or awful they are at what they do. It's far too shaky a foundation for making design decisions. A false sense of security is created by specialized knowledge. It helps one to analyze and deal with complex or confusing circumstances based on context clues that are not visible to users, as well as computer system knowledge that users lack. As a result, the user is unable or unwilling to confront and master a system that appears to be perfectly beneficial to its inventors.

What, in the opinion of the user, makes a system difficult to use? The following is a list of factors

Too much flexibility - When a user's demands aren't well

understood, the tendency is to cram as many functionalities as possible into a system. The interface becomes more sophisticated as more functionalities are added. Higher complexity necessitates more learning and lowers human performance efficiency. In general, as a system's versatility grows, its usability declines.

Use of Jargon - Systems frequently communicate in a peculiar language. Words like filespec,abend, segment, and boot, which are utterly unfamiliar in the office or at home and are used in a variety of circumstances, spread. Learning to operate a system frequently necessitates the acquisition of a new language.

Unexpected design - Complex or unique design features are difficult to learn since they are not evident or intuitive. Prerequisite conditions may need to be met before an operation may be completed, and effects may not necessarily be quick, obvious, or observable. The system's overarching architecture may be unseen, which has the effect that results are not necessarily linked to the acts that

produce them.

Exceptional differences - Depending on when they are performed, multiple acts may accomplish the same thing, or different things may result from the same action. These distinctions are frequently minor and difficult to notice. As evidenced by the user who claimed that difficulties were caused by pressing the Enter key "in the wrong way," critical distinctions are not made at the proper moment, or distinctions with no practical importance are made instead.

Differences in problem-solving approaches - People learn best via practice. They have difficulty following instructions and do not always read them before taking an action. Human issue solving is best described as "error-correcting" or "trial and error," in which a preliminary solution is produced and then tested based on the available evidence. Although this tentative solution has a low possibility of success, the results of the action are used to improve the chances of success on the following attempt.

Most early computer systems, on the other hand, used a "error-prevention" method, assuming that a person will not take a step unless they are confident in its success. As a result, people who take the wrong one-way path frequently end up in situations that are difficult or impossible to escape. Is this a last-ditch effort? Restart the computer after turning it off.

Inconsistency in design. "Save" and "keep," "write" and "list" are examples of various labels for the same action. Different things can happen when you issue the same command. The same conclusion might be stated in a variety of ways, such as "not legal" and "not legitimate." Alternatively, the same information could be displayed in a different order on separate screens. As a result, system learning becomes a rote memorizing exercise. Learning that is meaningful or intellectual becomes extremely challenging.

Responses to Poor Design

People remember the one thing that goes wrong, not the many things that go perfectly, therefore issues are given an

abnormally high priority. Errors are a sign that something is wrong. For commands, tasks, or transactions, the magnitude of errors in a computer-based system has been reported to be as high as 46%. Errors and other perplexing issues elicit a wide range of psychological and bodily responses from users.

Psychological

The following are typical psychological reactions to poor design:

Confusion - The perceived structure is overwhelmed by detail. The conceptual model or underlying framework cannot be grasped or established, making it difficult to find meaningful patterns.

Annoyance - Anger is caused by roadblocks that prohibit a task from being accomplished or a requirement from being met quickly and efficiently. Design inconsistencies, slow computer reaction times, difficulties accessing information fast, outdated information, and visual screen distractions

are just a few of the numerous things that can irritate users.

Frustration - Frustration might be caused by an abundance of annoyances, an inability to easily communicate one's goals to the computer, or an inability to complete a task or meet a need. Frustration rises when an unanticipated computer answer cannot be reversed or when it is impossible to determine what happened. Systems that are rigid and harsh are a primary source of annoyance.

Panic or anxiety - Panic and stress are common outcomes when a system tests a person's perceptual and cognitive capacities. Long response times while a user is working under a deadline or dealing with an unhappy customer are examples of situations that might cause worry and tension.

Boredom - When a person's perceptual and cognitive talents are underutilized, apathy and boredom are common outcomes. Boredom can be caused by a variety of factors, including poor computer pace (slow response times or long download times) and overly simplistic occupations or tasks.

A bored person is more likely to make mistakes on the job. Because these psychological responses obstruct concentration, they reduce user efficacy. Unrelated thoughts are thrust into the user's attention, making it impossible to concentrate on the work at hand. Poor performance, worry, and discontent are the results, in addition to increasing error rates.

Physical

When people do something, they want the advantages to outweigh the expense or effort involved in doing it. When effort and the aforementioned psychological responses outweigh the perceived rewards, the following bodily reactions frequently occur:

Abandonment of the system - Other sources of information are used instead of the system. Of course, these sources must be available, and the user must have the authority to reject them. This was a common reaction of managerial and professional staff in corporate systems. Almost all people can use this option thanks to the Internet.

Use of the system in part - Only a small percentage of the system's capabilities are employed, typically the tasks that are the easiest to conduct or bring the most benefits. This has traditionally been the most common user response to most computer systems. Various elements of many systems are frequently overlooked.

Indirect application of the system - Between the potential user and the computer, an intermediary is placed. This is another common response of managers or those in positions of control because it requires high status and discretion.

Modification of the task - The task is adjusted to match the system's capabilities. When the tools are stiff and the problem is unstructured, like in scientific problem solving, this is a common reaction.

Compensatory exercise - To compensate for system flaws, additional actions are taken. The manual reformatting of data to match the structure required by the computer is a

common example. This is a common attitude among professionals with little discretion, such as clerical staff. The system is being abused. To get around operational challenges, the rules are twisted. This necessitates extensive system expertise and may compromise system integrity. Programming directly. The user reprogrammes the system to fit certain requirements. This is a typical sophisticated worker answer.

These bodily reactions reduce user efficiency and effectiveness significantly. They force the user to rely on other sources of information, to ignore a system's full capabilities, or to engage in time-consuming "workaround" tasks.

People and Their Tasks

understanding of the problems that the computer can help solve, and are unaware of the resources available to suit their needs. Furthermore, the system designer, who is frequently psychologically and physically insulated from the users' problems, frequently overestimates the users' technical competence.

Unlike the users, the designer can use his or her experience and technical knowledge to solve most system difficulties and ambiguities. Often, the designer cannot think that someone will be unable to use the system they have designed.

While dealing with the daily stresses of work and home, the user is frequently unconcerned about the technological sophistication of a system or website. The user may be computer illiterate and even hostile. He or she would rather use a computer than learn how to utilise one. His or her main goal is to get some work done, a task completed, or a necessity met. Many people have come to anticipate a certain amount of design expertise these days. A system will be installed in this environment.

Important Human Characteristics in Design

People are complicated beings with a variety of characteristics that have a significant impact on interface design. Perception, memory, visual acuity, foveal and peripheral vision, sensory storage, information processing, learning, skill, and individual variances are all important in design.

Perception

Perception is the physical sensation of our many senses, such as sight, sound, and smell, that allows us to be aware of and understand the components and objects in our environment. Experience has an affect on perception.

People perceive stimuli by classifying them according to models stored in our memories. People tend to associate objects or sensations with what they already know.

A clear example of the role of experience in perception is comparing a child's gathered knowledge with that of an

adult in understanding the world.

The following are some other perceptual characteristics:

Proximity - When items are near one other in space, our eyes and minds perceive them as belonging together.

Similarity - If things share a common visual feature, such as colour, size, shape, brightness, or orientation, our eyes and minds see them as belonging together.

Pattern matching - We have identical reactions to the same shape in various sizes. The alphabet letters, for example, have the same meaning regardless of their physical size.

Succinctness - Because perfection or simplicity are simpler to remember, we regard an object as having a perfect or simple shape.

Closure - Our perception is synthetic; it creates logical wholes. We consider anything closed even if it does not fully

close itself, such as a circle, square, triangle, or word.

Unity. Closed shapes are viewed as a group of objects.

Continuity - Lines that have been shortened may be automatically expanded.

Balance - In our seeing environment, we seek stability or equilibrium. The most visually pleasing and easy to look at angles are vertical, horizontal, and right angles.

Projection in three dimensions - We see objects and patterns as three-dimensional when certain visual clues are present. Overlapping objects, the smaller of similar items, and darkened objects, for example, are viewed as being further away.

Lighting from above - Shaded or dark parts of an object are interpreted as shadows cast by a light source from above. Top-down lighting is considered natural, while other light orientations are considered unnatural.

Expectancies - Expectations influence perception as well; we sometimes perceive what we expect to see rather than what is actually there. A perceptual expectation error occurs when we miss a spelling mistake while proofreading something we've written; we see a word not as it is, but as we anticipate to see it.

Context - Individual perception is also influenced by context, environment, and surrounds. For example, depending on the angle of nearby lines or what other people have said about the size of the lines, two drawn lines of the same length may appear to be the same length or different lengths.

Noise vs. signals - Many stimuli flood our perceiving mechanisms, some of which are vital and others of which are not. Signals are the most important stimuli, while noise is the least important or undesired. Figure-ground perception is the term for this. The signal is the figure, while the ground is everything else that makes up the background. Signals, or figures, are easier to understand if they can be distinguished

from background noise in our sensory environment. Noise obstructs signal perception to the extent that they are similar to one another. Even an important signal can be obscured by noise. Consider a hidden word puzzle in which meaningful words are hidden within a big block matrix of alphabetic characters.

The signals, which are alphabetic characters that make up meaningful words, are obscured by a matrix of nonsensical letters. Depending on the user's activities and cognitive processes, the items of a screen adopt the quality of signal or noise. When a screen is first presented and must be identified as the proper one, the title of the screen may be the signal, with the other parts being noise. When the screen is in use, the data on it becomes the signal, and the title becomes noise again.

Other screen elements rise and fall in importance, taking on the roles of signals or noise, depending on the user's current needs. As the user's wants and tasks change from moment to moment, the purpose of design is to allow screen

elements to readily assume the quality of signal or noise. The purpose of design is to use our perceptual talents to layout a screen in the most meaningful and obvious way possible.

Memory

As anyone who has forgotten why they entered a place or forgotten a significant birthday will attest, memory is not the most reliable of human abilities. Memory is now divided into two categories: long-term and short-term (or working) memory. It hasn't always been this way. Most researchers in the 1950s thought there was just one memory system; the short-term component was not acknowledged or accepted.

The famous memory research (Miller, 1956) was published around this time period, demonstrating that the memory limit is 7 ± 2 "chunks" of information. Shortly after, the idea of short-term memory was recognized, and in the 1970s, the phrase "working memory" was used to describe a broader understanding of short-term memory.

Short-term memory, also known as working memory, accepts data from either the senses or long-term memory, but not both at the same time since the senses are processed separately. Only a little quantity of information is processed in short-term memory. The information it stores is thought to last anywhere from 5 to 30 seconds, with the lower figure being the most probable guess. Working memory storage capacity estimates have continuously decreased over time, from Miller's seven and a half items to three to four items now (Koyani et al., 2004). Keep in mind that people's working memory capacity decreases as they age (Laguna and Babcock, 2000).

The size and complexity of the information that can be remembered is determined by knowledge, experience, and familiarity. For example, most natural English speakers would find it considerably simpler to retain English words than a same amount of Russian terms. The opposite would be true for a Russian speaker. Short-term memory can easily become overburdened. It is extremely vulnerable to interference from actions like thinking, reciting, or listening,

which are continually erasing and overwriting it. Many people find it difficult to remember a phone number long enough to complete the dialling process.

Our knowledge is stored in long-term memory. Learning is the process through which information obtained in short-term memory is transferred to and encoded within it. It's a complicated process that will take some time and work on our part. The learning process is aided by structured, meaningful, and familiar information being transferred from short-term memory. Repetition and in-depth analysis help to increase learning. Recall of the same information improves when you think hard about it (Lidwell et al., 2003).

Long-term memory capacity is assumed to be endless, unlike short-term memory, which has definite constraints. The ability to recognize or recall words is an important memory aspect with substantial consequences for interface design. The active vocabulary of humans (words that can be remembered) is usually between 2,000 and 3,000 words. The passive vocabulary (words that can be identified) is usually

around 100,000 words. Memory cues are provided via recognition tasks, which facilitate searching through long-term memory. As a result, our ability to recognize is far larger than our ability to recall, and this phenomena should be taken advantage of in design. To do this, lists of alternatives should be presented whenever feasible to remind people of their options.

Minimize the need for a might memory

Other broad methods to lower user memory demands, lessen the requirement for mental integration, help recall, and extend working memory, and therefore improve system usability, include:

- Organizing, structuring, familiarising, and meaningfully presenting knowledge.
- Giving the user control over the presentation of information.
- Keeping all necessary information for job completion in close proximity. People can only recall a few items for 3 to 4 seconds.

- Putting information that needs to be compared close together to avoid straining memory.
- If screenreading speed is critical, don't make them do other jobs that require working memory.
- Making significant goods unique or unusual in some way, in order to maximise the likelihood of them being remembered. One approach to achieve this is to highlight crucial elements.

Sensory Storage

Sensory storage is the buffer where information collected from our senses is automatically processed. It's an unconscious process that's big, alert to the environment, quick to detect changes, and continually being replaced by fresh inputs. It works like radar in that it constantly scans the surroundings for essential information to transmit on to higher memory.

Despite appearing to be swamped by noise at times, it can occasionally detect a tree through the forest. The "cocktail

party effect," as it is known, is a good example. Have you ever been at a party and heard someone utter your name across the room, through the volume of voices? Despite the background noise, your radar was operational.

Excessive and repeated stimulation can wear down the sensory storage system, making it less alert and unable to discriminate between crucial and irrelevant information (called habituation). Avoid putting undue pressure on it. Create an interface where all aspects and elements have a clear function. By reducing interface noise, crucial details are less likely to be overlooked.

Visual Acuity

Visual acuity refers to the eye's ability to resolve fine details. It's the phenomenon in which an item becomes more clear as we move our gaze toward it and swiftly loses distinction as we move our gaze away – that is, as the visual angle from the point of fixation increases. At a distance of 2.5 degrees from the point of eye fixation, relative visual acuity is estimated to be half (Bouma, 1970).

As a result, a 5-degree diameter circle centred around an eye fixation character on a display has been recommended as the area near that character or the maximum length for a displayed word (Tullis, 1983). (Danchak, 1976).

If the average viewing distance of a display panel is 19 inches (475 mm), the optimum visual acuity area on the screen will be 1.67 inches (41.8 mm) in diameter. Assuming "typical" character sizes and character and line spacing, there are 88 characters on a screen that fall within this visual acuity circle, with 15 characters on the widest line and seven rows consumed, as shown in Figure below.

```

      3 2 1 3 1 2 3
    5 4 3 2 1 2 1 2 3 4 5
  6 5 4 3 2 1 1 1 2 3 4 5 6
7 6 5 4 3 2 1 0 1 2 3 4 5 6 7
  6 5 4 3 2 1 1 1 2 3 4 5 6
    5 4 3 2 1 2 1 2 3 4 5
      3 2 1 3 1 2 3
  
```

Size of area of optimum visual acuity
on a screen

The sensitivity of the eye rises for characters closest to the fixation point (the "0") and drops for characters near the

circle's extreme boundaries (a 50/50 chance of successfully identifying these characters). This could be a visual "chunk" of a screen, which has consequences for the screen grouping criteria that will be discussed later. (Keep in mind that the actual size of the circle, 5 degrees, is more important than the amount of characters.) The amount of readable characters will be reduced or increased depending on the character size.) These studies and suggestions were all created on early generation screens, long before the personal computer became available with a wide range of text sizes and styles.

The optimal viewing distance has been extended to roughly 24 inches with today's better screens. Because of the increased distance and the numerous font size variations, calculating the exact "chunk" size and readable amount of letters is challenging. The crucial thing to remember is that screens will have very little visual chunks, which should be taken into account when designing.

As it looks, the eye is never entirely steady; it trembles

somewhat. This tremor enhances acuity by enhancing edge recognition of items being examined. However, this tremor might occasionally cause issues. Shimmering patterns of closely spaced lines or dots can be visible. This motion can be both distracting and upsetting. To avoid this visual distraction, fill-in patterns for screens (bars, circles, and so on) must be carefully chosen.

Foveal and Peripheral Vision

Because of the limitations in visual acuity already explained, foveal vision is used to focus directly on something, while peripheral vision recognises anything in the area surrounding the site we're looking at, but what's there can't be resolved properly. At the same time, foveal and peripheral vision have a cooperative and competitive connection.

Although peripheral vision can help with visual searches, it can also be distracting. Peripheral vision is supposed to provide hints to where the eye should travel next in the visual search of a screen due to its cooperative nature.

Peripherally apparent patterns, forms, and alignments can direct the eye through a screen in a methodical way.

Peripheral vision can compete with foveal vision for attention due to its competitive character. What is detected in the periphery, as well as what is actively viewed foveally, is sent to our information-processing system. In some ways, it's visual noise.

Mori and Hayashi (1993) tested the effect of windows in both a foveal and peripheral relationship and discovered that when there are peripheral windows, performance on the foveal window deteriorates, and the performance degradation is even greater if the information in the peripheral is dynamic or moving. Design should take care to maximise the benefits of peripheral vision while minimising the drawbacks.

Information Processing

The data collected by our senses that is deemed essential enough to act on must be processed in some way.

According to recent research (Lind, Johnson, and Sandblad, 1992), we have two stages of information processing.

Consciousness and working memory are associated with one level, the highest level. It is utilised for reading and comprehension and is limited, sluggish, and sequential. You are currently reading this book at a higher level.

A lower level of information processing exists in addition to this higher level, and its capacity limit is unknown. This lower level processes familiar information quickly and without conscious effort, in tandem with the higher level. Rather than seeing, we look and perceive rather than read.

Both levels are active at the same time, with the upper level reasoning and problem solving and the lower level experiencing the physical form of information sensed.

Working with screens has most likely exposed you to this distinction. When a screen appears, you should double-check that it is the one you desire. If you're unfamiliar with a system or a screen, you rely on its concrete aspects, such as

its title, the controls and information it provides, and so on, to make that assessment. Using this higher-level processing, you intentionally look at the screen and its components. However, as you gain knowledge and familiarity with screens, you will be able to recognise a new screen with just a fast glance.

.Its shape and structure alone are sufficient in informing you that it is the ideal screen for the task at hand. Your higher-level information processing has taken over the screen identity task, so your reasoning and problem solving can continue uninterrupted. What aids this information processing at the lower levels? A screen's visual distinctiveness is a significant factor. When a screen becomes cluttered and packed with information, it loses its individuality and can only be identified through the more time-consuming and thought-interrupting act of reading.

Interference is a phenomena that can stymie higher-level processing.

Many separate mental systems are involved in perception and cognition, each processing information independently. The outcomes of this processing are sent to working memory, where they are interpreted. The higher-level memory's meaningful outputs are immediately interpreted. Interference arises when perception and cognition are confronted with opposing mental processes that must be reconciled. According to Lidwell et al. (2003), there are several types of interference:

Stop Interference - A mental process is triggered by one feature of a stimulus that is in conflict with another aspect of the stimulus. For instance, naming the colour of a written word that is printed in a different colour than the meaning of the word takes longer. A mental conflict will also be created by a green Stop sign and a red Go sign.

Proactive Interference - Learning is hampered by a person's existing memories. Interference happens when people apply their native language grammar to the new language, for example, when learning a new language. Applying the

interaction procedures for a previously learned computer system will also interfere with the learning of new interaction rules for a new system.

Retroactive Interference - Existing memories are disrupted by learning. Learning a new phone number can cause confusion with previously memorized numbers. Learning a new computer system can sometimes cause problems with a system that has already been learned.

- Avoid code combinations that cause distraction, such as colour and iconography.
- Understand and apply a person's taught mental models in the design process (see following section).

Mental Models

We form mental models of things and people we deal with as a function of our experiences and culture. Simply said, a mental model is an internal representation of a person's current understanding of something. Most people are unable to articulate this mental state and are unaware that it exists.

To understand something, explain something, make decisions, do something, or communicate with another person, mental models are gradually built. Mental models also allow a person to anticipate the actions required to complete tasks, even if the activity has been forgotten or not yet encountered.

People will bring their own expectations and prejudices to a new computer system based on mental models created while dealing with other systems and performing tasks in their daily lives. When a system fits to a person's mental models, the model is reinforced, and the system's use becomes more "intuitive." If not, there will be interference,

and learning to operate the system will be tough. This is why identifying and understanding a user's mental models is crucial in design.

A user who is already familiar with one computer system will bring a mental model with specific visual and usage expectations to another computer system. It will be much easier to understand and use the new system if it follows existing models.

When designing, then, ***Consider people's mental models when designing.***

However, there is one caveat. Never compromise your goals or design to fit into pre-existing mental frameworks. When the existing model does not fit, the best answer is to give the user with a clear and consistent new model to learn.

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Movement Control

After data has been interpreted and an acceptable course of action has been determined, a response must be taken; in many circumstances, this takes the form of a movement. Pressing keyboard keys, moving the screen pointer by pushing a mouse or turning a trackball, and clicking a mouse button are all examples of movements in computer systems.

Fitts' Law is particularly relevant in screen design (1954). The time it takes to acquire a target is a function of its distance and size, according to this law.

Simply put, the larger or closer the target is, the faster it will be attained. The following are the consequences for screen design:

- ▶ • Provide large objects for critical functions.
- Use the "pinning" motions of the screen's sides,
- ▶ top, bottom, and corners to your advantage.

Large buttons are preferable to little buttons. They give the user a broader target to access using the screen pointer. Create toolbar icons that "bleed" into the display's edges, rather than leaving a one-pixel non-clickable edge along the display's edge. The pointer will be stopped or "pinned" at a place over the toolbar by the edge of the screen, allowing significantly faster travel to the toolbar. A one-pixel edge necessitates more cautious pointer positioning across the toolbar.

Learning

As previously stated, learning is the act of encoding information from short-term memory into long-term memory. It's a complicated process that will take some time and work on our part. Our ability to learn is critical because it distinguishes humans from machines. People may enhance their performance in practically any task given enough time. Designers, on the other hand, frequently use our ability to learn as a justification to justify complex design. The fact that humans can be taught to walk a tightrope is no reason to utilize them in a design when

pathways are available.

Human performance can be considerably accelerated by a design created to reduce human learning time. People prefer to stay with what they are familiar with and jump right in. Learning time that isn't fruitful is usually avoided. Evidence from studies of people learning a computer system resembles evidence from studies of learning in other fields when it comes to the learning process. People prefer to be active, to explore, and to experiment.

There is also evidence that people are extremely sensitive to even modest changes in the user interface, and that such changes might cause problems when switching systems.

Furthermore, the prospect of needing to learn massive volumes of data is enough to deter some people from using a system. Learning can be boosted if abilities learned in one setting can be applied in a similar situation in another.

- This is achieved through design consistency.
- Provides detailed and timely feedback.
- Is phased, which means that a person must only know the information required at that point in the learning process.

The ability to anticipate the location of frequent screen or page items before they are presented is an important by-product of learning. Before the predicted target shows on the screen, experienced users frequently begin moving the mouse cursor to the location of the target.

Skill

The goal of human performance is to be able to perform well. To do so, inputs and responses must be linked into a series of activities. The essence of skill is the precise execution of actions or motions in the exact time sequence. Consistency and efficiency of effort describe it. Establishing a work speed that indicates maximum efficiency results in effort economy. It's done through improving system mastery through things like gradual learning of shortcuts, better

Many fundamental abilities can be combined to generate increasingly complicated ones because skills are hierarchical in nature. Lower-order talents tend to become automatic and may even go away. The system and screen must be designed to allow for the growth of increasingly skilled performance.

Performance Load

The greater the effort required to complete a task, the less likely it will be completed successfully, if at all. The amount of effort required is referred to as performance load, the principle of least resistance, or the principle of least effort (Lidwell et al., 2003). There are two types of performance load: cognitive and kinematic.

The quantity of mental activity necessary to complete a task or achieve an objective is referred to as cognitive load. The introduction of a graphical user interface lowered the cognitive load on computer users dramatically. One of its benefits is that it substituted commands that previously had to be remembered and formatted correctly with menu

commands that only had to be recognized.

The amount of physical activity or effort required to complete a task or achieve an objective is referred to as kinematic load. The graphical user interface also lowered user effort by replacing a textual command with a single mouse click instead of several or more letters.

- It is possible to minimise cognitive stress by doing things like.
- Screens should be free of noise and superfluous information.
- Formatting and organising information correctly.
- Providing tools that allow the user to rely on recognition rather than recollection.
- Tasks that demand a lot of memory are automated.
- Among the tools for minimising kinematic load are:
- Reducing the number of steps required to complete tasks
- Control actions and movements are minimised.
- Automating mundane jobs.

The degree of effort required to utilise a computer system or application does not have to be based on extensive knowledge with the technology. A rapid initial use of a system may lead to a quick conclusion that the projected effort required is not worth the expected rewards. Then comes rejection.

Rejection can also happen when someone believes something will take a lot of effort to use.

Human Factors in Design

Users' interactions with systems, machines, platforms, and even tasks are referred to as human factors. It has significant military roots and is frequently associated with the aviation sector.

The complexity of cockpit controls, for example, increases pilots' cognitive burden, resulting in accidents caused by human mistake (thus the term "human" factors). Similarly, product designers seek for solutions to lessen consumer cognitive strain.

Human factors design (also known as people-centered design) focuses on parts of a product or design where interaction occurs. When using a touchscreen smartphone or performing chores on a desktop computer, these are two examples.

The goal is to reduce the frequency of user errors and

provide more pleasant experiences with a product.

Understanding human capabilities and limitations, and then applying that knowledge to product design, is what human factors design is all about. It's also a synthesis of a variety of disciplines, such as psychology, sociology, engineering, and industrial design.

As previously said, human factors is concerned with enhancing human-machine interactions. To do this, consider your user's capabilities and limits, and then include them into your product or site design.

The ISO 9241 standards for ergonomics of human-computer interaction provide the basis for most of the human factors principles listed below. The principles discussed in this section are all aimed at assisting users in engaging with a product and entering a state of 'flow' while doing so.

Physical Ergonomics

Physical ergonomics relates to the human body's responses to physical job demands, such as holding a smartphone or touching a screen with your hand muscles. To develop a comfortable interaction with a product, proper ergonomic design is required. Human factors experts consider the following variables when determining if a product is good for the user:

- Specific actions performed by users with the product (for example, entering text into a web form)
- Product physical attributes (for example, the size, shape, and weight of a mobile phone)
- Users' interaction with information on this gadget in context

This data aids human factor specialists in developing a product or equipment that allows users to execute jobs quickly and efficiently. When using human factors design

in mobile app design, for example, we size touch controls to reduce the possibility of incorrect actions.

User testing will provide valuable information into proper ergonomics. You can ask people to engage with the product and measure the error rate during user testing. You might discover that your users have problems hitting certain buttons because they are too small, in which case you might increase their size.

Consistency

This principle emphasizes that a system should have the same appearance and functionality throughout. Design consistency is essential for developing pleasant encounters. A user can transfer an acquired ability to different portions of the product if the design is consistent.

Maintaining internal and external consistency is also critical:

- **Internal consistency** –Apply the same conventions across all elements of the user interface. Use the same

visual appearance of UI elements throughout a graphical user interface (GUI), for example.

- **External consistency** - Use the same design for the product on all platforms, including desktop, mobile, and so on.

Familiarity

The principle of familiarity asserts that while designing a human-computer interface, it is critical to use familiar concepts and metaphors. Designers are enticed to develop something fresh and unexpected by the design industry's passion of innovation. Users, on the other hand, like familiarity. They get accustomed with conventional design conventions and come to expect them as they use goods other than ours (Jakob's Law of Internet User Experience).

Designers that reinvent the wheel and bring novel concepts lengthen their users' learning curve. Users must spend more time learning how to engage with your product if the usage is unfamiliar. To address this, use patterns that people are already familiar with to achieve intuitiveness.

Sense of Control

The control of information by the user is at the heart of human-computer interaction design. The user, not the other way around, should be in charge of the system's interaction.

When creating a system, keep the following in mind:

- **Provide proper feedback** — Use visual and audio cues to help users comprehend a system's present state.
- **Control for System Operations** — Users should have control over system operations, such as interrupting or terminating them.
- **Personalization** — Provide content based on what you know about the user to provide the appearance that the system is responding to their requirements.

Efficiency

Users should be able to finish their jobs as quickly as feasible. It's your role as a designer to lower the user's

cognitive load—that is, interacting with the product shouldn't take a lot of brainpower.

Some pointers to remember:

Break down difficult jobs into easy steps. You can simplify decision-making and reduce complexity by doing so.

Reduce the amount of time it takes to perform the assignment. Remove all unnecessary actions and keep navigation paths to a minimum. Make sure your user can focus all of their attention (and brainpower) on the work at hand, not on the product's interface.

Assist the user. Give your user all the information they need to learn how to utilise the system up front. Anticipate areas where users may require additional assistance.

Combine information that is related. When your product has a graphical user interface, for example, you can arrange UI elements so that the most critical information is

highlighted. To organise information on screens, use the Gestalt Principles.

Offer Shortcuts. It's critical to provide shortcuts that can help seasoned users increase their productivity. Keyboard shortcuts, for example, allow users to perform particular tasks without using a mouse.

Error Management

It is human to make mistakes. However, this does not imply that your users enjoy it! The way a system handles problems has a big impact on the people who use it. This encompasses error prevention, repair, and assisting your user in regaining control when a mistake has occurred.

When designing error handling, keep the following in mind:

Whenever possible, avoid making mistakes. Create user journeys and analyse them to find areas where users may have issues.

Stop users from making deadly mistakes. Create protective layers to keep users from encountering fatal error conditions. Create system dialogues that prompt users to confirm their actions, for example (such as deleting files or their entire account).

Support 'Undo' operations. Allow for the reversal of actions.

When an error occurs, provide messages that assist users in resolving the issue.

Never hold users responsible. It's not the users' fault, according to user-centered design; rather, it's your design defects that cause users to make mistakes.

Methods to uncover human factors

Let's look at how you can use the ideas of human factors design to your design process now that you know what they are. Understanding your user and where they can get stuck is the first step, thus user testing is essential!

Here are a few approaches for determining human aspects at work:

Wizard of Oz

In this method, one person acts as the computer, replicating the program's reaction to a user who believes they're communicating with the real thing.

This may result in more natural interactions on the part of the user. During the user research phase, this technique is useful since it allows you to build a more natural user-computer interaction.

Cognitive Walkthrough

A cognitive walkthrough is a usability technique in which UI/UX experts work through a set of tasks from the user's perspective. During the prototyping phase, cognitive walkthrough works effectively because it keeps the focus simple.

Moderate usability testing

Human factor specialists use this technique to study how test participants interact with a product. When the team has a high-fidelity prototype of the product, moderated usability testing adds the most value. During your testing, ask your test participants to think aloud, which can provide you with even more vital insights into the user's experience.

Contextual inquiry

Contextual inquiry is a type of qualitative study in which people interact with a product in their natural setting, such as their job. This is good once you've launched the product and can observe how users engage with it in the real world.

Points To Remember

In the development of successful products, human elements play an important role. Human factors design is a discipline that helps you identify places in your system where you can potentially improve productivity, safety, and overall pleasure.