

HUMAN COMPUTER INTERACTION

You Will Interact With...

1. What is Human-Computer Interaction ?
2. The Meteoric Rise of HCI
3. UX Value of HCI and Its Related Realms
4. Components of HCI
5. Importance of HCI
6. Principles of HCI
7. Goals of HCI
8. Future Scope of HCI
9. Examples of HCI
10. Application of HCI in different domains
11. Use Cases of HCI

What is Human Computer Interaction (HCI)?



Human-Computer Interaction is a multidisciplinary field that focuses on designing and evaluating computer systems and technologies that people interact with. It is concerned with understanding and improving the interaction between humans and computers to make technology more user-friendly, efficient, and enjoyable.

HCI specialists consider how to develop and deploy computer systems that satisfy human users. The majority of this research focuses on enhancing human-computer interaction by enhancing how people utilise and comprehend an interface.



HCI surfaced in the 1980s with the advent of personal computing, just as machines such as the Apple Macintosh, IBM PC 5150, and Commodore 64 started turning up in homes and offices in society-changing numbers. For the first time, sophisticated electronic systems were available to general consumers for uses such as word processors, gaming units, and accounting aids. Consequently, as computers were no longer room-sized, expensive tools exclusively built for experts in specialised environments, the need to create human-computer interaction that was also easy and efficient for less experienced users became increasingly vital. From its origins, HCI would expand to incorporate multiple disciplines, such as computer science, cognitive science, and human-factor engineering.



HCI soon became the subject of intense academic investigation. Those who studied and worked in HCI saw it as a crucial instrument to popularise the idea that the interaction between a computer and the user should resemble a human-to-human, open-ended dialogue. Initially, HCI researchers focused on improving the usability of desktop computers (i.e., practitioners concentrated on how easy computers are to learn and use). However, with the rise of technologies such as the Internet and the smartphone, computer use is increasingly moving away from the desktop to embrace the mobile world. Also, HCI has steadily encompassed more fields.

UX Value Of HCI And Its Related Realms

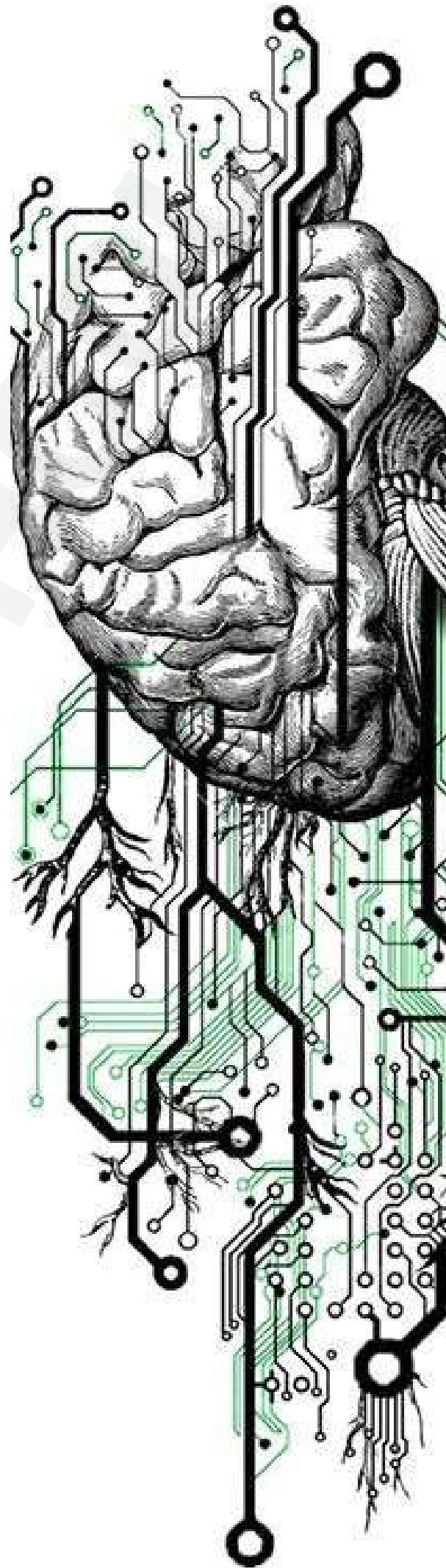


HCI is a broad field that overlaps with areas such as user-centred design (UCD), user interface (UI) design, and user experience (UX) design. In many ways, **HCI was the forerunner to UX design.**

Despite that, **some differences remain between HCI and UX design.**

Practitioners of HCI tend to be more academically focused. They're involved in scientific research and developing empirical understandings of users.

Conversely, **UX designers are almost invariably industry-focused and involved in building products or services** (e.g., smartphone apps and websites.)



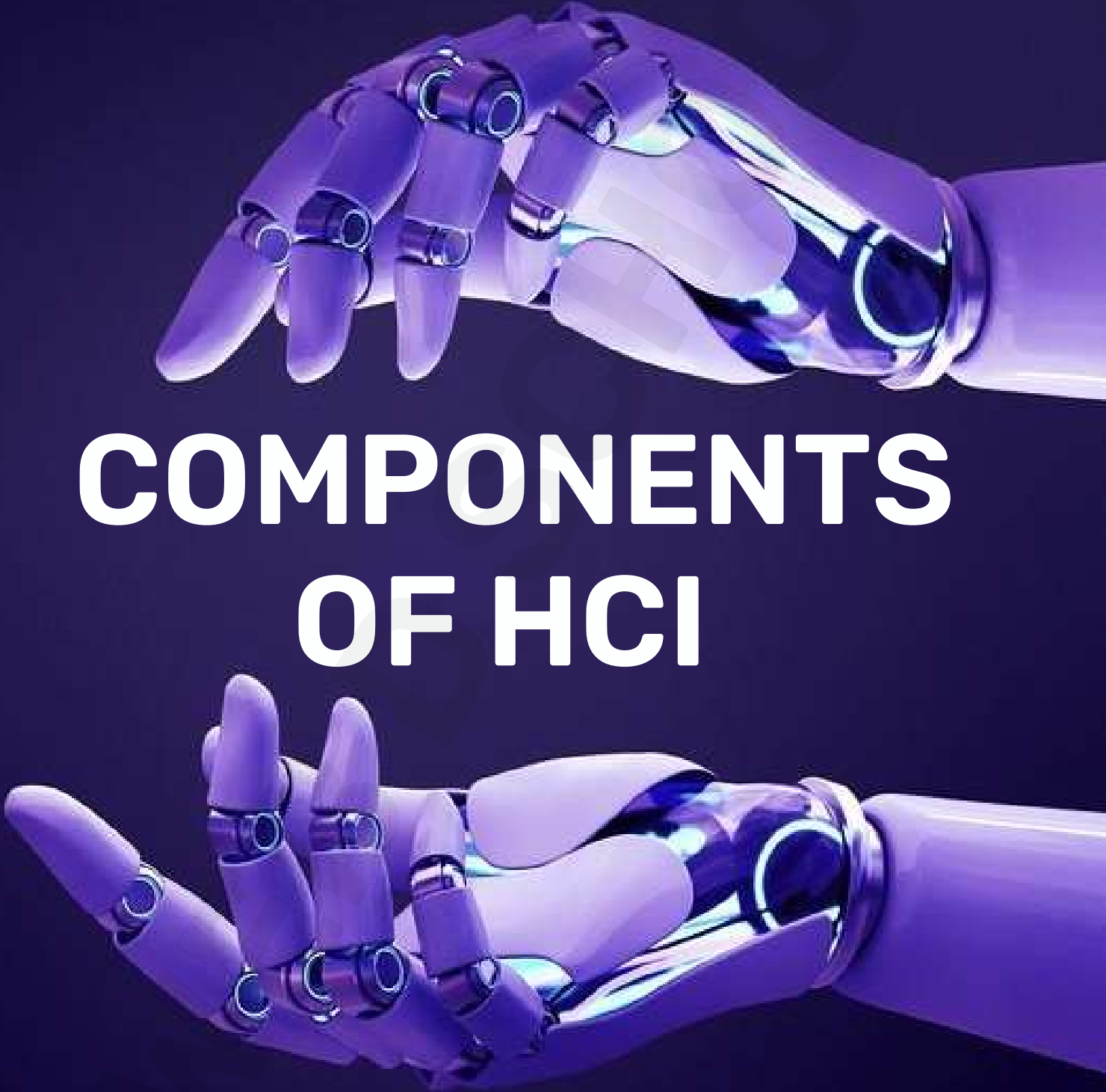


The Meteoric Rise of HCl



The practical considerations for products that we use as UX professionals concern ourselves with have direct links to the findings of HCI specialists about users' mindsets. With the broader span of topics that HCI covers, UX designers have a wealth of resources to draw from, although much research remains suited to academic audiences.

So, we must stretch beyond our industry-dictated constraints to access these more academic findings. When you do that well, you can leverage key insights into achieving the best designs for your users. By "collaborating" in this way with the HCI world, designers can drive impactful changes in the market and society.



COMPONENTS OF HCI

Fundamentally, HCI is made up of four key components



The User



The Goal



The Interface



The Context



The User

The user component **refers to an individual or a group of individuals** that participate in a common task. HCI studies users' needs, goals, and interaction patterns. It **analyses various parameters, such as users' cognitive capabilities, emotions, and experiences**, to provide them with a seamless experience while interacting with computing systems.

Goal Oriented Task

A user operates a computer system with an objective or goal in mind. The computer provides a digital representation of objects to accomplish this goal.

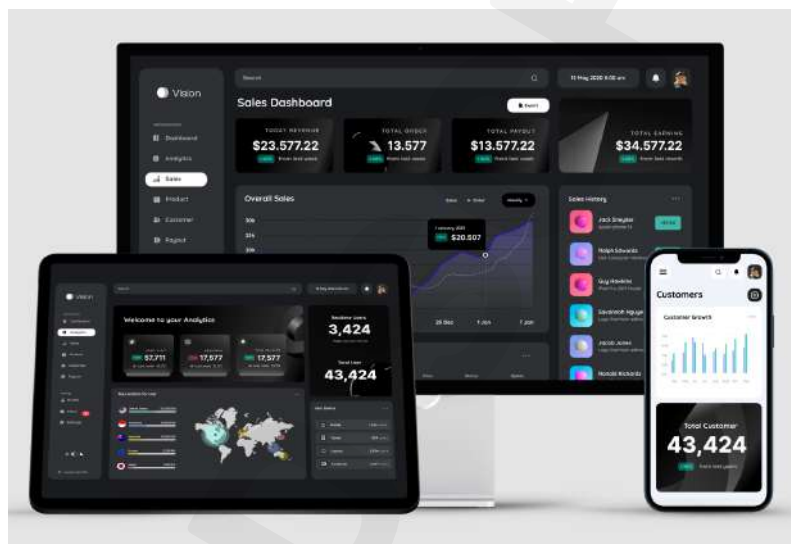
For example, booking an airline for a destination could be a task for an aviation website. In such goal-oriented scenarios, one should consider the following aspects for a better user experience.



- The complexity of the task is that the user intends to accomplish.
- Knowledge and skills necessary to interact with the digital object.
- Time required to carry out the task

The Interface

The interface is a crucial HCI component that can enhance the overall user interaction experience. Various interface-related aspects must be considered, such as interaction type (touch, click, gesture, or voice), screen resolution, display size, or even color contrast. Users can adjust these depending on the user's needs and requirements.



For example, consider a user visiting a website on a smartphone. In such a case, the mobile version of the website should only display important information that allows the user to navigate through the site easily. Moreover, the text size should be appropriately adjusted so that the user is in a position to read it on the mobile device. Such design optimization boosts user experience as it makes them feel comfortable while accessing the site on a mobile phone.

HCI is not only about providing better communication between users and computers but also about factoring in the context and environment in which the system is accessed.

For example, while designing a smartphone app, designers need to evaluate how the app will visually appear in different lighting conditions (during day or night) or how it will perform when there is a poor network connection. Such aspects can have a significant impact on the end-user experience.





Importance Of HCI



HCI is crucial in designing intuitive interfaces that people with different abilities and expertise usually access. Most importantly, human-computer interaction is helpful for communities lacking knowledge and formal training on interacting with specific computing systems.

With efficient HCI designs, users need not consider the intricacies and complexities of using the computing system. User-friendly interfaces ensure that user interactions are clear, precise, and natural.

Let's understand the importance of HCI in our day-to-day lives...

1. HCI in daily lives

Today, technology has penetrated our routine lives and has impacted our daily activities. To experience HCI technology, one does not need to own or use a smartphone or computer. When people use an ATM, food dispensing machine, or snack vending machine, they inevitably come into contact with HCI. This is because HCI plays a vital role in designing the interfaces of such systems to make them usable and efficient.



2. Industry



Industries that use computing technology for day-to-day activities tend to consider HCI a necessary business-driving force. Efficiently designed systems ensure that employees are comfortable using the systems for their everyday work. With HCI, systems are easy to handle, even for untrained staff.

HCI is critical for designing safety systems such as those used in air traffic control (ATC) or power plants. The aim of HCI in such cases is to make sure that the system is accessible to any non-expert individual who can handle safety-critical situations if the need arises.

3. Accessible to disabled

The primary objective of HCI is to design systems that are accessible, usable, efficient, and safe for everyone. This implies that people with a wide range of capabilities, expertise, and knowledge can easily use HCI-designed systems. It also encompasses people with disabilities. HCI tends to rely on user-centred techniques and methods to make systems usable for people with disabilities.



4. An integral part of software success

HCI is an integral part of software development companies that develop software for end-users. Such companies use HCI techniques to develop software products that are usable.

Since the product is finally consumed by the end-user, following HCI methods is crucial, as the product's sales depend on its usability.

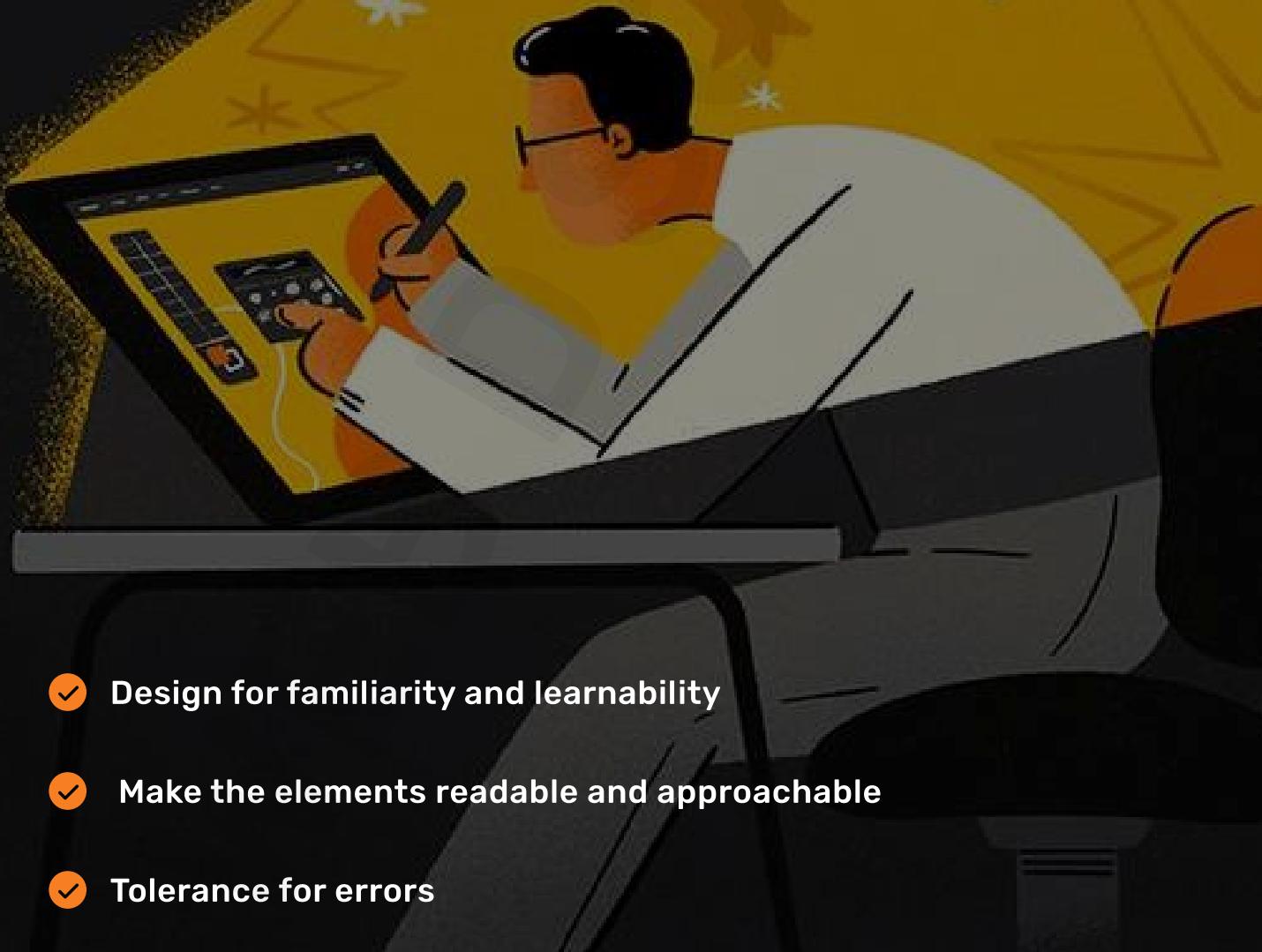
5. Useful for untrained communities

User manuals for general computer systems are a rarity. Very few advanced and complex computing systems provide user manuals. In general, users expect the systems to be user-friendly and enable them to access the system within a few minutes of interacting with them.

Here, HCI is an effective tool that designers can use to design easy-to-use interfaces. HCI principles also ensure that the systems have obvious interfaces and do not require special training to be used. Hence, HCI makes computing systems suitable for an untrained community.

Principles of HCI

Researchers and designers in the field of human-computer interaction have established numerous concepts. These regulations range from general norms and design guidelines to abstract design principles. Let's look at the most crucial HCI guidelines.

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- An illustration of a person with dark hair and glasses, wearing a white shirt, sitting at a desk and interacting with a large tablet device. The person is holding a stylus and pointing at the screen. The tablet displays a user interface with various icons and a grid. The background is a dark blue gradient with stylized white stars and a large, faint, yellow starburst shape. The overall style is modern and clean.
- ✓ Design for familiarity and learnability
 - ✓ Make the elements readable and approachable
 - ✓ Tolerance for errors
 - ✓ Flexibility

Goals of HCI

The principal **objective** of HCI is to develop functional systems that are **usable, safe, and efficient for end-users**. Always **give priority to end-users** and lay the robust foundation of HCI

To realize the above points, designers must focus on two relevant areas: **usability and user experience**.

Let's look at each category in detail



Usability

Usability is key to HCI, as it ensures that users of all types can quickly learn and use computing systems. A practical and usable HCI system has the following characteristics

Ease of Use

Systems should be intuitive and easy for both new and occasional users to learn and remember. A user-friendly interface is preferable to a complex command-line system.

Safety

Systems should prevent users from encountering harmful situations, such as accidental activation of functions. Implementing Human-Computer Interaction (HCI) practices can mitigate risks and provide recovery options for user errors.

Efficiency

A good system efficiently accomplishes tasks and supports users in completing them effectively

Effectiveness

The system should consistently deliver high-quality performance and achieve its intended goals.

Utility

Providing a range of functionalities and tools within the system enhances its usefulness. For example, an integrated development environment (IDE) with helpful suggestions for programmers adds utility.

Enjoyability

Users should find the system enjoyable to use, which can be achieved through simplicity and ease of understanding in the interface design.

User Experience

User experience is a subjective trait that focuses on how users feel about the computing system when interacting with it. Here, user feelings are studied individually so that designers and support teams can **target particular users to evoke positive feelings while using the system.**

HCI systems classify user interaction patterns into the following categories and further refine the system based on the detected patterns:



Satisfying, Enjoyable,
Motivating, Surprising

**Desirable
Traits**

**Undesirable
Traits**



Frustrating, Unpleasant,
Annoying

Future Scope Of HCI

The most recent prototypes being created by businesses around the globe employing HCI theories include the following

Dexta Haptic Gloves



Pre-touch Sensing

Paper ID





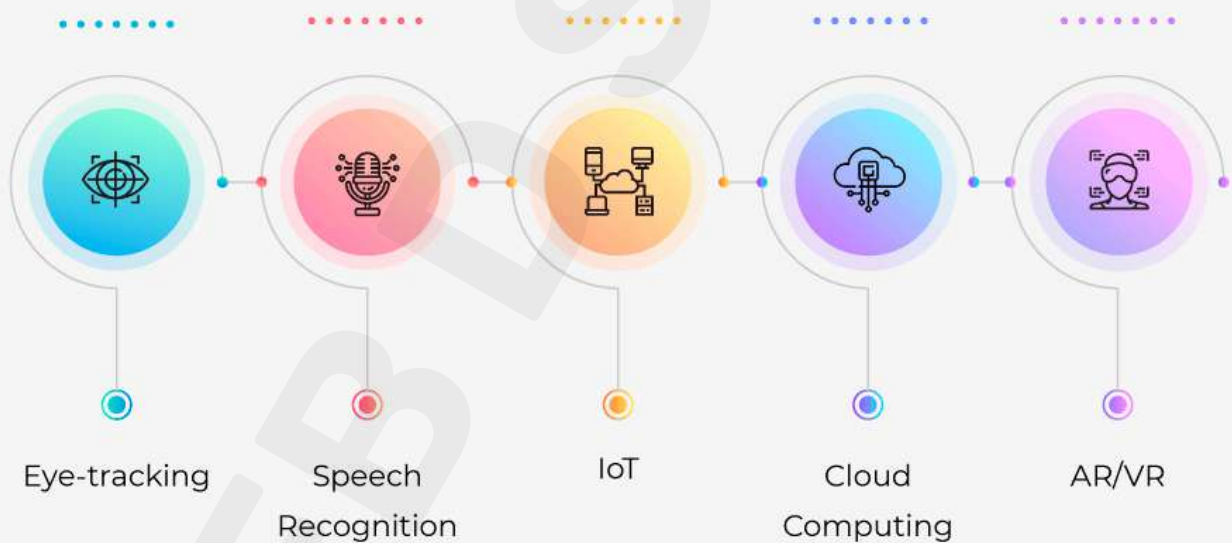
EXAMPLES OF HCI

EXAMPLES OF HCI

Technological development has brought to light several **tools, gadgets, and devices, such as wearable systems, voice assistants, health trackers, and smart TVs, that have advanced human-computer interaction technology.**

Let's look at some prominent examples of HCI that have accelerated its evolution.

Technologies that facilitate human-computer interaction



IOT Technology



The growth of IoT endpoints indicates a rising reliance on connected devices, which gather data that can inform business decisions.

The introduction of pre-touch sensing and Paper ID enhances user interaction with devices, making them more intuitive and responsive.

Eye-tracking Technology



Eye-tracking systems offer insights into user behavior and attention, benefiting industries such as marketing and automotive safety. Integrating HCI capabilities can further improve usability, allowing for novel interactions like scrolling with eye movements.

Speech Recognition Technology



Speech recognition facilitates natural language interactions with devices, powering virtual assistants and improving accessibility. HCI advancements ensure accurate interpretation and response to user commands, enhancing user experience.

AR/VR Technology



AR and VR technologies offer immersive experiences and have practical applications in training and maintenance. HCI improvements, such as Dexta Haptic Gloves, enhance sensory feedback, making interactions more realistic and engaging.

Cloud Computing



Cloud computing enables remote work and collaboration, transforming traditional office setups. SaaS services enhance flexibility and productivity, with HCI playing a crucial role in optimizing user interfaces for remote access.



Application Of HCI In Different Domains

It includes the design and development of applications. **These applications include desktop applications, websites, and mobile apps.** These applications are used in different domains, including healthcare, banking, education, networking, and many more.

Healthcare

- Patients can buy medicines online and book appointments via mobile apps.
- AR/VR transforms surgery, making it safer with 3D visualization and aiding in surgeon training.

Education

- Abundance of online resources facilitates easier understanding of concepts.
- Smart classrooms and AR/VR enhance classroom teaching and visualization of complex ideas.
- Online study options provide flexibility, especially during situations like the COVID-19 pandemic.



Banking

- Net banking and mobile banking eliminate the need for physical visits to banks.
- These platforms offer secure solutions against cybercrime, accessible from home.

Networking

- Social media and business networking platforms simplify connections and idea sharing.
- Streamlined job searches are facilitated through online networking.

UseCase Of HCI



SMART HOME

Smart homes are equipped with communication tech for automation and remote control, including managing air conditioning, heating, and lighting via voice commands or apps. Security systems alert residents of burglaries.

AUTONOMOUS VEHICLE

An autonomous vehicle is one that can drive itself. Tesla is a company that pioneered the engineering of autonomous driving vehicles. It has advanced autopilot technology, which allows real-time navigation updates.

VIRTUAL ASSISTANT

It is a software agent that can perform tasks or services for an individual based on commands or questions. These virtual assistants can interpret human speech and respond via voice.

VISUAL DISABILITIES

Voiceover is a screen reader, which basically means that your phone will talk out loud and tell you what's on the screen. The user can control it with certain touch gestures. There are some other features, too, like Magnification.

The background of the image shows a human hand in the upper half, reaching downwards, and a robotic hand in the lower half, reaching upwards. The hands are positioned as if they are about to grasp each other, creating a sense of connection and interaction. The lighting is dramatic, with the hands highlighted against a dark, blurred background.

**The
human
body is
the next
computer
interface**