# Interaction Design of Softwares: An HCI Perspective

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## Abstract:

It has been observed that the products and systems which make us feel good by their design and interface are easier to deal with and prove to be more productive and useful for us and in some or other way design plays a vital role for software application while interaction of human with computer hardware design and various systems software & Application software designs. Almost every digital interface comprises of three types of design which portray the identity of organization, i.e. ***Visual design, Content design and Interaction design.*** Visual design receives more importance from the digital teams while the interaction design is considered of little to no value. Moreover complex and difficult designs create the hindrance in understanding of the human which affects the interaction and ultimately resulting in the failure of the product. The most popular companies are focusing on graphical and user-friendly interfaces so as to make their products successful by satisfying the needs of a user. HCI emphasizes on cognitive approach of the human to understand their needs and design according to them. This is the main reason that the focus of HCI is increasing tremendously. Software application design-Interaction mood so this research is wholly focused on how a software application design affects the human while interacting with computer because in development of HCI software projects the human cognitive behavior is focused too along with physical factors.

*Keywords: HCI- Human Computer Interaction, Interaction, Human, Design, Digital Devices IOT (Internet of things), Smart devices, Real time environment, AS (Application Software) CBS Component based system.*

## I.    INTRODUCTION

HCI is a multidisciplinary field which attraction on the fields of programming designing, mental science and progressive and social sciences in order to perceive how people use and experience smart advancement. We can say that human-computer interaction HCI is simply study of relation between computer and human and also different ways through which people and computer technology impact each other. One of major participation in field of human-computer interaction HCI is make interactive designs for human and people would love to use, and also would be able to use it. With the help of field of human-computer interaction HCI we can determine that how computer technologies become more usable and more accessible to user needs so designers are necessary required to design and develop the computer systems that minimize the hurdles and hesitation between computer and human. We can say that an intelligent context isn't just decided by

Its capacity to lead tasks, yet additionally for its capacity to correctly communicate to the user.
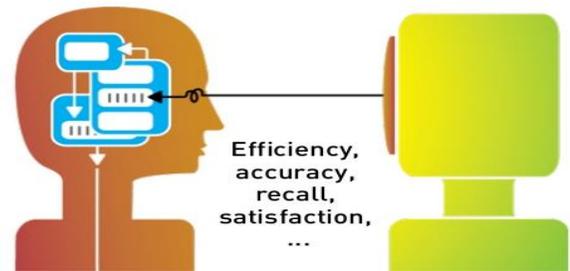


*Source: Google Images Figure 1: Foundations of Human-Computer Interaction*

## II.    INTERNET OF THINGS (IoT)

Computers used for different tasks and purposes. Computer provide a platform to user to solve the problems and to do different task. Computer have different components and icons which help to human to understand the computer. Computers are good at to do different tasks, logic, processing, Accuracy, counting, measuring, calculation, formulations, repetitive actions, and performance. Computers have also good memory. Computers are not smart than humans because computers are made by humans and they are pre-programmed by humans and they do what humans want.

Application software or App: short is the software types we use to interact with computer and perform our task it is the source to communicate and perform action on computer hardware we install applications software we can uninstall too. The application softwares includes word processor, spread sheet, games, browser email, media, etc. This is a booming era of technology where a dumb machine can interact and communicate with a person. This communicating path is developed through ICT. It creates a path between the users and appliance. Through ICT we can communicate with the devices and they can also response us. It is widely used in every field of life. Internet is the tool that is hidden source while connecting ourselves with ICT. Internet is collection of networks of network and it connects globally to utilize the ICT Gadgets effectively and ICT plays an important role to utilize things like mobile laptops and other gadgets. The application softwares includes word processor, spread sheet, games, browser email, media, etc. So after all ICT and Internet, we have IoT Internet of things. IoT has a core use in our daily lives. Many things that have been a compulsory component of our lives are based on IoT, for example wearable devices, automatic refrigerators, thermostats, washing machines, automatic door lockers, healthcare devices, trackers, coffee maker, oven, and vacuum etc. These are the things which are particularly and regularly used in our daily lives. It is a great thing of wonder that we can access and control our devices remotely.

## III.    INTERACTION

We interact with computers with the help of different components and symbols which give better understanding of designing design always give easiness in usage .if we take example of MSDOS [Product of Microsoft Company] and MAC [Product of APPLE COMPANY]. MSDOS came before the MAC but it was command line operating system and it was also hard to use .if someone wanted to check time at that time then he/she was required to type different and multiple commands to check the time but APPLE was first company who launch the  GUI [Graphical user interface ] operating system which was colorful, Graphical, simple and easy to use.it was consists on different meaningful icons and attractive graphics so due to GUI Apple company attract to unbelievable crowd. If we see now a days there are many types of  App view like digital clocks digital map, weather forecasting visualization are available in market which are simple attractive and easy to use.
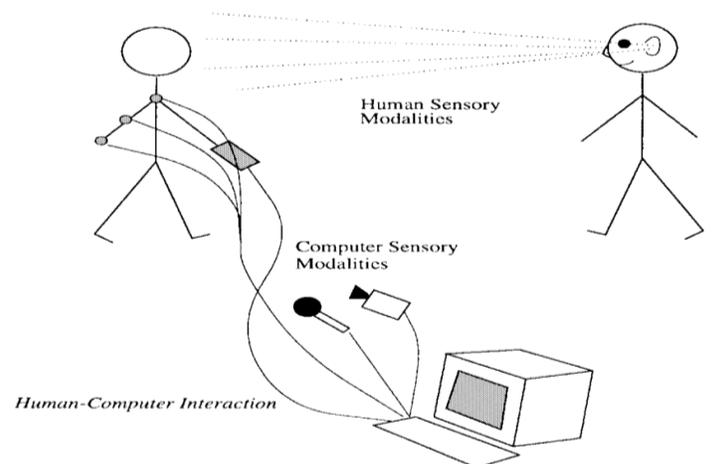


*Source: Google Images Figure 2: Interaction design of today's Software application*

If we compare past and present to different designs of computers than we can easily conclude that design of computers is affecting on human from long time and people are giving first priority to design because it creates attraction for user and it also give easiness in usage for example symbols, titles. Long time ago Egyptians were first who made hieroglyphics and they used the symbols for better communication and people stared to understand these symbols and until yet peoples on social media use many emoji's as possible as rather than text but question is that why design is affecting on humans? So I am going to define the main components of human which are responsible in upgrading of design with variation of human thinking.
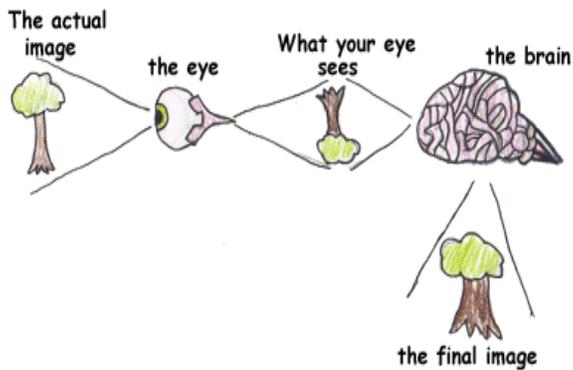
Variation in Human thinking depends on four components

- ✓ *VISUAL*
- ✓ *AUDITORY*
- ✓ *HAPTIC*
- ✓ *MOVEMENT*



*Source: [7] Figure 3 Human Computer interaction signal Processing*

## A. Visual

Visual is all about how our eyes work to capture the different types of objects in dark and light mode



*Source: Google Images Figure 4Visual Contact Transformation*

Visual Interaction alludes to the reception of UIs for intuitive frameworks which utilize visual components and visual collaboration techniques with the point of supporting perceptual derivations rather than laborious psychological examinations and calculations.

## B. Auditory

Auditory is all about how our ears work and help to listen understand and translate to things from one form to another form.
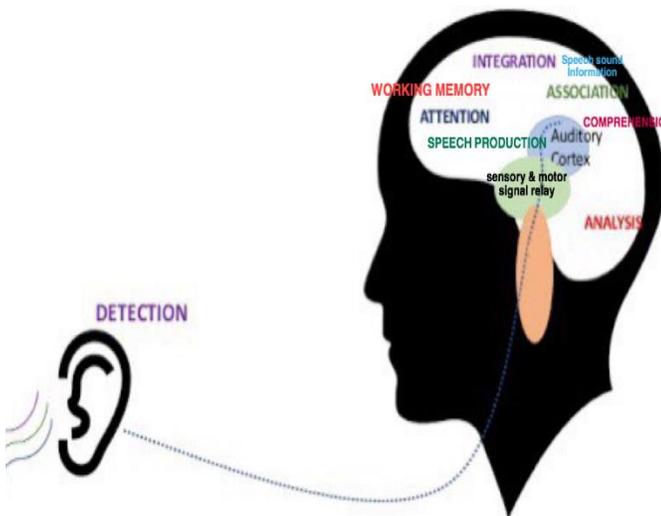


*Source: Google Images Figure5:Audio Transformation Connectivity Process*

An Auditory Icon utilizes common ordinary sounds so as to speak to articles and activities on the interface. For instance a document is hauled over the screen the commotion of paper scratching can be heard.

## C. Haptic

Haptic is all about how our skin cells tissues and sensors work. It is communication between a human PC user and the PC UI dependent on the amazing human feeling of touch. It also helps to identify the different objects. Skin
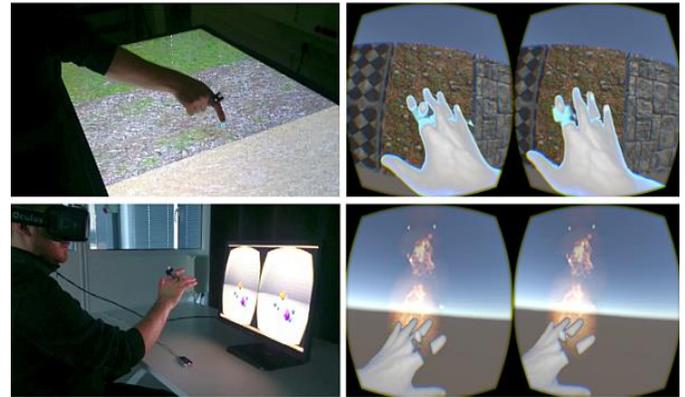


*Source: Google Images Figure 6: Touch Sensitivity movement Interaction*

is biggest organ in our body it ensures our inner organs keeps out germs and furthermore forestall extraordinary water misfortune. With the assistance of haptic we likewise feel torment in our body while we harmed. Haptic interfaces are gadgets that empower manual collaboration with

Virtual conditions [VE] or teleoperated distant frameworks. They are utilized for undertakings that are generally performed utilizing turns in this present reality, for example, manual investigation and control of articles.

## D. Movement

Movement is all about that how a human balance himself according to situation in required or specific time. Example if we talk about the cricket players some players are good at balling, some are good at batting and some are good at fielding because all of them have different logics to balance himself according to situation in specific time. Example if fielder want to catch the ball than he-she is required to stand on perfect position in specific time before ball touch on the ground.
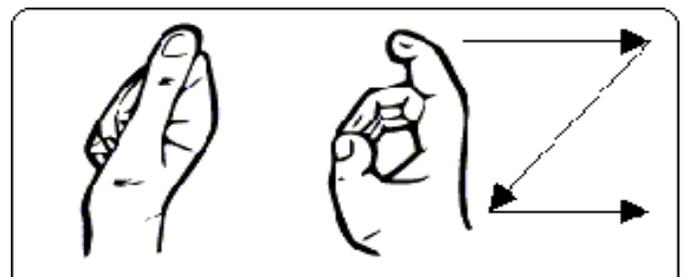


*Source: [3] Figure 7: Physical Gesture interaction movement shape for touch*

## IV. LITERATURE REVIEW

Until late in 1970 nobody could communicate with PCs aside from PC specialists. This circumstance changed altogether after individualized computing, including both individual programming and PC stages, was created, which transformed everyone into a potential PC client [1]. The improvement of the field of Human Computer Interaction HCI before long followed. With the fast development of data frameworks and correspondence innovation, data innovation has come to assume focal job in our day by day lives. Issues with respect to the cooperation among people and PCs have hence become significant and crucial [2]. The investigation of HCI has become a primary topic in scholarly and exact examinations and has pulled in much exploration consideration. These days over the globe one can discover numerous authority diaries Human Computer Interaction, International Journal of Man Machine Studies, Behavior and Information Technology, International Journal of Human Computer Interaction, Interacting with Computers.

The field of HCI was officially established in 1982 [4]. In the beginning phase of HCI in 1970-80. HCI was about how users associated with office robotization programs, for example, word preparing and information bases. The emphasis was on fundamental associations, for example, discourse boxes and mistake messages. During the late 1980. The graphical UIs began to ascend to conspicuousness and ease of use designing strategies were created. In the 1990 significant move in the field of HCI research happened as the web and the web applications turned out to be broadly utilized, for example, site pages and E-mail, texting. New sorts of interfaces and correspondence research were required. In 2005 the center moved more toward user created substance, for example, photographs, recordings, and online journals, with an accentuation on cooperation, association, feeling, and correspondence. By the 2010 and the rising ubiquity of versatile gadgets, portable and wearable registering and agreeable utilization has gotten the focal point of consideration. Due to the multidisciplinary idea of HCI, it is additionally named human machine connection [HMI], man machine association [MMI] or PC human collaboration [CHI]. This various circumstance additionally applies to the meaning of HCI and there is no perpetual flexibly of HCI from the extent of controls [3, 8]. Described HCI as request stressed over the structure, appraisal and execution of savvy figuring systems for human use and with the examination of noteworthy wonders incorporating them and Zhang, et al. [9]. HCI as being

stressed over the habits in which individuals interface with information, advances, and endeavors, especially in business, managerial, legitimate, and social settings. The center component of these definitions is the worry about people, not just identifying with the enthusiasm for human mental responses, yet in addition the human cooperations with advances for various purposes [2]. The ideas of computerization, and motorized and mechanized work have been around for a considerable length of time. As per the Britannica reference book, mechanization is the use of machines to assignments once performed by people progressively to undertakings that would somehow or another be unimaginable. In spite of the fact that the term motorization is regularly used to allude to
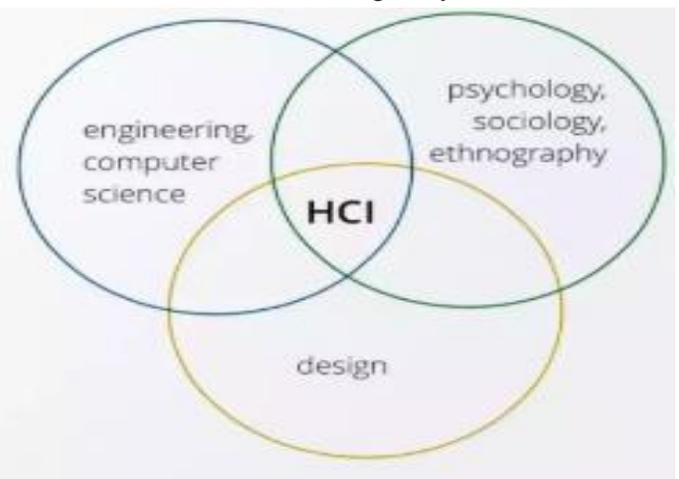


*Figure 8: HCI Paradigm*

the straightforward substitution of human work by machines, computerization for the most part suggests the mix of machines into self-administering framework. Groover, 2018.

Human augmentation is an interdisciplinary field that tends to techniques, advancements and their applications for upgrading detecting, activity and intellectual capacities of a human. [6]

Human growth can additionally be isolated into three principle classifications of augmentation:

**Augmented senses**: Enhanced senses, Improved faculties, expanded faculties are accomplished by deciphering accessible multisensory data and introducing substance to the human through chose human detects. Sub-classes incorporate increased vision, hearing, haptic sensation, smell, and taste.

**Augmented action**: Accomplished by detecting human activities and planning them to activities in neighborhood, distant or virtual situations. Sub-classes incorporate

development, discourse input, look based controls, teleoperation, distant nearness.

**Augmented cognition**: Accomplished by distinguishing human intellectual state, utilizing explanatory instruments to make a right understanding of it and adjusting PC's reaction to coordinate the current and prescient needs of the client giving put away or recorded data during common connection **[11-15]**.



*Source: Google Images Figure 6Human usage today's IoT devices sample*

HCI configuration ought to think about numerous parts of human practices and should be valuable. The unpredictability of the level of the association of a human in communication with a machine is in some cases imperceptible contrasted with the effortlessness of the collaboration strategy itself. The current interfaces contrast in the level of multifaceted nature both due to level of usefulness and ease of use and the budgetary and practical part of the machine in market. For example, an electrical pot need not to be refined in interface since its lone usefulness is to warm the water and it would not be savvy to have an interface in excess of a thermostatic on and off switch. Then again basic site that might be restricted in usefulness ought to be intricate enough in ease of use to draw in and keep users [5].
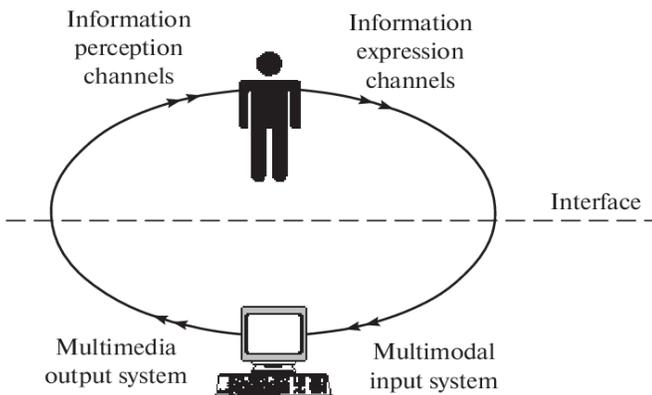


*Source [4] Fig: 7 Interaction Cycle of information*

In this way in plan of HCI the level of movement that includes a client with a machine ought to be altogether thought. The client movement has three distinct levels: physical [5] intellectual [6] and emotional [7]. The physical angle decides the mechanics of cooperation among human and PC while the intellectual viewpoint manages ways that clients can comprehend the framework and communicate with it. The full of feeling perspective is a later issue and it attempts not exclusively to make the collaboration a pleasurable encounter for the client yet additionally to influence the client such that make client keep on utilizing the machine by changing mentalities and feelings toward the client [4].

## V. METHODOLOGY

The methodology of this study were contain the given activities. Significant reviews on human-computer-interaction and Information System *IS* and Information Technologies *IT* research articles of 2018-2020.

Analysis and Interpretation of current pure HCI research & Case studies from Impact factor journals & IEEE Platform content along with the major topics that are covered in an undergraduate [HCI] course too.

Significant activities were designed to identify major factors, main trends of design interaction and characteristics of attractive interaction in HCI perspective like interface analysis & effectiveness of interaction design.

Significant activities implemented with undergrad students in Lab to interact with HCI factor design Applications and without HCI factor web portals then the appraisal of the consequences of these activities through understudy study and Instructors and Researchers evaluation on nature of the conversation of discoveries and constraints of the examination were highlighted in Results and Future Aspects.

## VI. DISCUSSION & ANALYSIS

The design plays a vital role in human life. Visual communication is one of the most effective way of sending and getting information because of the cognitive function of human brain using laptop smartphone and mobile graphical user interface communicate through

symbols and design, such as signboards indicating the directions. The Icons in websites in applications gives direction like to navigate & identify and analyze the things and we recognize and act accordingly rather to read the text rather to search even using visual contact an un-educated person can interact with the software and todays gadgets using application because application contain the HCI factors that help them to recognize and identify the applications and take action accordingly.

## A. PRINCIPLES OF HCI

Good HCI configuration is commonly troublesome predominantly in light of the fact that it is a multi-target task that includes synchronous thought of numerous things, for example, the kinds of user's qualities of the errands, capacities and cost of the gadgets, absence of goal or definite quantitative assessment gauges, and evolving advancements. An extensive information in a wide range of fields is required over the moderately youthful history of HCI, scientists and engineers in the field have gathered and set up fundamental standards for good HCI structure in order to achieve a portion of the principle destinations all in all. These HCI standards are general, essential, and commonsensical, pertinent to practically any HCI plan circumstance.

- ✓ Requirements Engineering.
- ✓ Interaction Design.
- ✓ Personas.
- ✓ Disruptive Innovation.
- ✓ Visual Aesthetics

## B. HOW DESIGN AFFECTS HUMAN WHILE INTERACTING WITH COMPUTER

Humans engage and interact with computer systems in many ways the interface between people and computers is crucial to simplify this interaction Until the mid of 1970 there was not a particular discipline for Human Computer Interaction and there were command line interfaces, whereas it was quite difficult to remember all those commands moreover the environment was not friendly with the beginners and required a great deal of time to get used to that environment. That's why the graphical user interface was established firstly by MAC and then by Windows, to simplify the things and make the environment easy to use and easy to access for the users now mostly all the desktop applications, web browsers, handheld computers, and tablet make utilize of [GUI]. Like design Considering & HCI is centered on the user how they carry on, how they associated with innovation,

Computer graphics was the true beginning of HCI which is all about usability and experience.

## C. THEN AND NOW

The symbols used in computers world, representing some functionality, are still unknown to common people. Such as 3 lines symbols used for menu displaying options, QR code on different products and applications, symbol for settings in applications, for attaching a file and many more cognitive function of the human brain. Human still communicated through symbols and designs. Such as sign boards, indicating the direction. The boards on the public areas restricting smoking. The danger boards where roads are given in picture.
Earlier in absence of GUI & HCI it was quite difficult to



*Source: Google Images Figure 9: Symbolic message Transformation*

remember all those commands moreover the environment was not friendly with the beginners and required a great deal of time to get used to that environment. That's why the graphical user interface was established, in today's world, Designs that meet only basic functionality needs are considered to be of little to no value. A good design is considered as something looking attractive and nice. Some of the companies are satisfying the needs of the highly professional regular users while fail to do so for the beginners because of their products designs. User fails to interact with computer and its functionality that causes many hazards, such as security and privacy risks, data being stolen, passwords getting hacked.



*Source: Google Images Figure 10: Iconic Design Pattern for Message delivery and precaution of understanding*

Thus, a design must work as intended and even common people can understand its function by just seeing the icons. If a person figures out how to turn camera on and off, take photos, display them, record a video, play it and also delete them, then design works consistently. If it can't perform these functions, then the design has failed. While Asian people are more attracted to android than iPhone, and because of the easy-to-access and user-friendly interface.

**As Kaaren Hanson,** formerly the head of design innovation at Facebook's design product director, has explained anytime you're trying to change people's behavior, you need to start them off with a lot of structure, so they don't have to think a lot. In order to be successful, a design must meet basic needs before it can satisfy higher-level needs before it can Wow us. It must meet some nominal need or nothing else will really matter.

### D.  FUTURE OF DESIGN

Human Computer Interaction evolved to be less focused on engineering and more design-centered. The first step to a smart HCI is having the competencies to respond and sense as it should be in accordance to user's affective feedback and detect, interpret the affective states proven by way of the user instinctually. Such as hand gestures, movement, sound and other types of gestures. Many companies are applying process of design thinking skillset and are becoming aware of the cognitive approach of users.

*IBM Design* Believing is the organization's in-house development lab that is helping associations face their difficulties by improving and making human-focused arrangements that will expand the user experience. It has 30 studio spaces designated for Design Thinking where individuals get together, set up a lot of post-it notes on whiteboards, and team up on a lot of thoughts.

The use of configuration thinking assumed a focal job in IBM's renowned (in the structure world) Blue Mix venture. In addition, Infosys has utilized structure thinking workshops to enable and change the attitude of its 170,000+ representatives. The organization has additionally been running customer workshops dependent on configuration thinking and most shockingly it has prepared 36,000 representatives, including 500 heads, on configuration thinking standards.

A meeting with Ryan Page, Capital One's head of plan for card organizations. He said planning with a human point of view is critical to building up a human system. To build up a system without a solid human need or a point of view on how genuine individuals see the world, well, that is a methodology that won't be as incredible as it may be if it's made as a team with plan.

HCI depends on "The more we comprehend about human conduct, the better we can structure PC interfaces that suit individuals' needs.

### E.  FINANCIAL PROFIT IN MARKET

Apple 1st launched the Macintosh, unremarkably called mac, in 1984. The merchandise was thought of revolutionary at the time, because it was the primary notebook computer targeting the buyer market. It absolutely was sold while not a programing language therefore thanks to they didn't succeed but after sometime they launch many products with attractive design and features and sales of Apple Company increased.

Due to the interactive design and easy to use and understand the company get revenue in profit and increase in number of unit sell.

*Table 1: Shows the Profit & Increase in Number of unit sell due to interactive and easy to use design changes in product.*

| Sr# | YEAR | UNITS SOLD | REVENUE |
|-----|------|------------|---------|
| 1 | 2010 | $ 13.6 m | $ 18.6 b |
| 2 | 2017 | $ 19.25 m | $ 26  b |
| 3 | 2018 | $ 23.5 m | $ 31.33 b |
| 4 | 2019 | $ 25.75 m | $ 33.36 b |
| 5 | 2020 | $ 31  m | $ 38.96 b |

# VII. RESULTS AND FUTURE ASPECT

*We must design for the way people behave not for how we would wish them to behave & Design is not just what it looks but feels like how it works.*

The design plays a vital role in human life. Visual communication is one of the most effective way of sending and getting information because of the cognitive function of human brain using laptop smartphone and mobile applications graphical user interface browser search engines user interface and user experience design human communicate through symbols and design, such as signboards indicating the directions. The Icons in websites in applications gives direction like to navigate & identify and analyze the things and we recognize and act accordingly rather to read the text rather to search even using visual contact an un-educational person can interact with the software and todays gadgets using application because application contain the HCI factors that help them to recognize and identify the applications and take action accordingly using cognitive natural understanding to visualize and act.

Today's modern era and ease of use with interaction and understanding advancement in the development of computer technology has led to the idea of user interact so *[HCI]* is developing sector to research and implement since 30 years it was slow research area due to the less knowledge *of [HCI]* field structure but as now it's on peek in every IT sector and Applications to facilitate the user with attractive design factors and ease of understanding with design interaction like Icons, Symbolic representation. HCI domain were identified as system capabilities along with user interface design.

The Significant importance of this study and findings were to highlight the main constraint and trademarks of human-computer-interaction. So the following factors, characteristics and main trends of HCI were identified these should be adopted in the development of software system to provide the proper interaction for use like User interface design, Task of HCI in system, Evaluation of interaction, User Acceptance, Personalized design, Interface Analysis, Performance measurement & Improvement, Development of Interaction, Human response & reaction to technology, Facial expression & Effective Interaction.

System capabilities and considering the interactive system the architecture of user interface design could be the main concern & the task of the HCI system can be like to detect the face in image & modeled navigation behavior and manage user emotions and evaluation of interaction focused on the evaluation methods of interactive technologies.
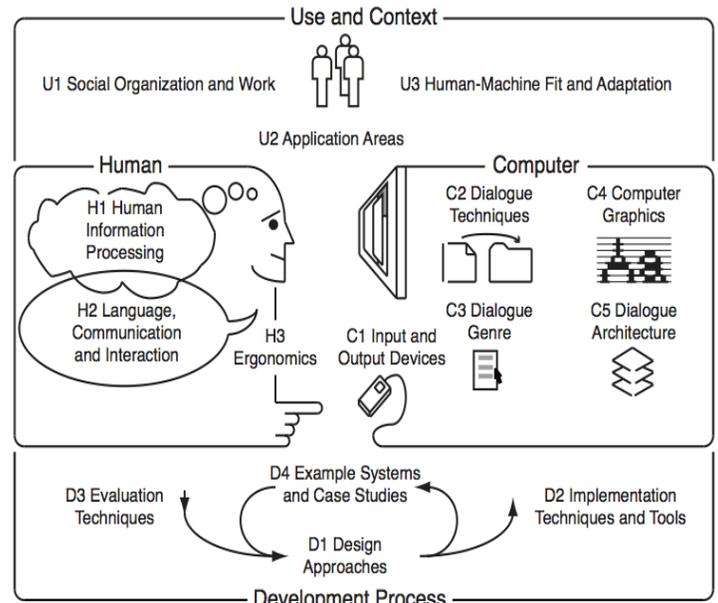


*Source: Google Images Figure 10: Foundations of Human-Computer Interaction work cycle*

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