5CS5-12 Human Computer Interaction

Reference Book: 1. Dix A., Finlay J., Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition,Pearson Education, 2005.

2. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. Human Computer Interaction, Addison-Wesley, 1994.

3. B. Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).

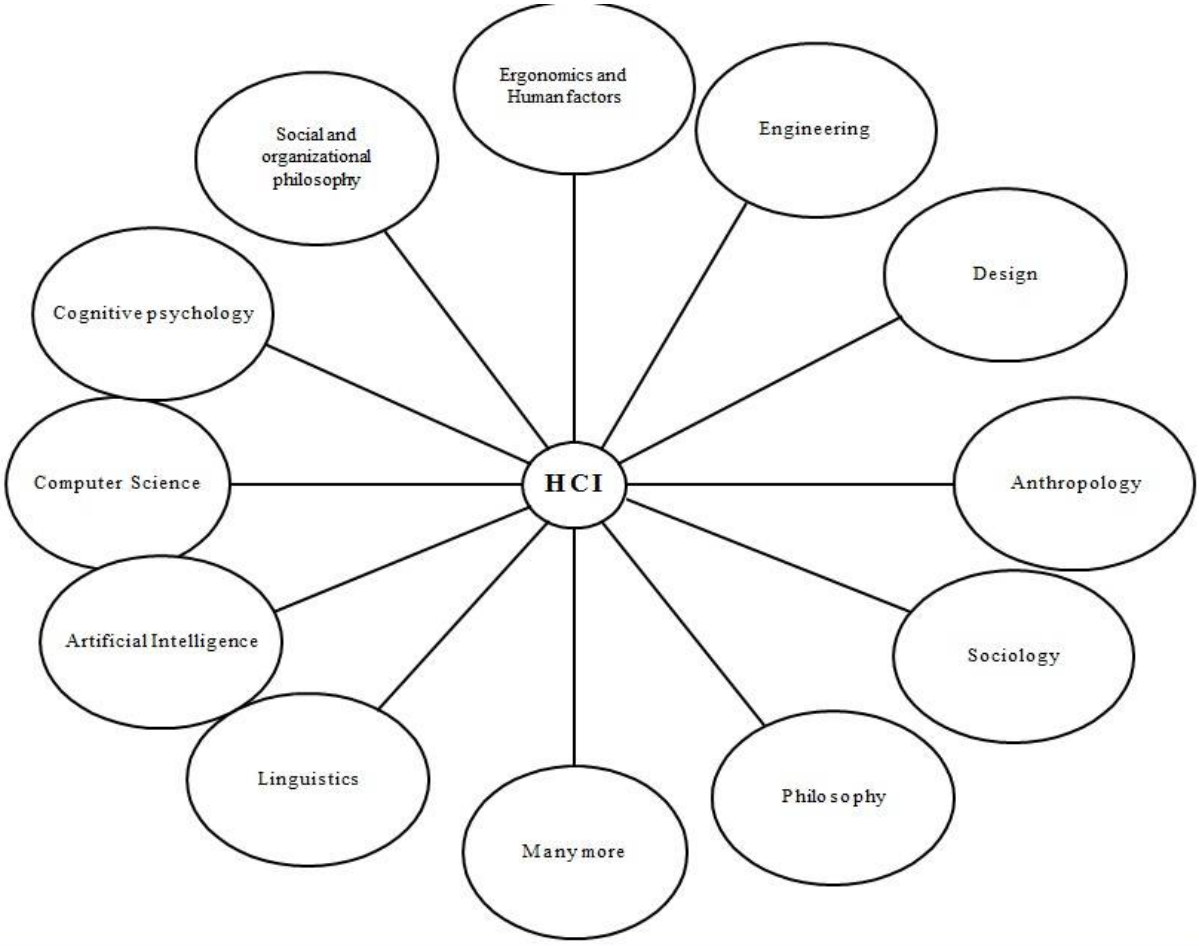
Lecture-1

HCI(Defination):-Human-computer interaction is a discipline concerned with the design, implementation and evaluation of interactive computing systems for human use and with the study of major phenomenon surrounding them.

OR

Human–computer interaction studies the design and use of computer technology, focused on the interfaces between people and computers.

HCI is interdisciplinary.various area of studies that contribute to the field.



It is emerging as a special concern within several disciplines, each with different emphasis

1.Computer Science (application design and engineering of human interfaces)

2. Psychology (application of theories of cognitive processes and the empirical analysis of user behavior)

3.Sociology and anthropology (interaction between technology, work and organization)

4.Industrial design (interactive products such as Cell phone, Washing machine, Microwave oven etc.)

Course Objective:-

learn about the ways to design "good/user-friendly" interfaces/interaction

- Issues to be considered
- User-centered design approach
- Evaluation methods

Course Overview:-

In particular, we shall learn about the following

- How interactive systems are designed and evaluated in practice .
- How to reduce design time and effort through the use of cognitive, system and task models .
- Guidelines and heuristics for interactive system design
- How to collect and analyze empirical data to take design decisions
- Some case studies and introduction to object oriented programming.

Historical evolution of the field:-

1. Early computer (e.g. ENIAC, 1946) –
   - Improvement in H/W technology (vacuum tube ->transistor -> IC) implied massive increase in computing power
   - People started to think about "how to use this power by equivalent explosion of ideas", which leads to the idea of human centered computing (J. C. R. Licklider)

2. By mid 1950's, researchers realized the need for VDU
   - Earliest application that used VDU was SAGE (semi automatic ground environment)
   - an air defense system of the USA air force.
   -
3. The development of the Sketchpad by Ivan Sutherland (1962)
   - People started to realize that computer can be used for more than data processing (computer can be made to use more human language rather than the opposite).

4. Douglas Engelbart, in his article " A conceptual framework for augmentation of man's intellect" (1963), introduced the idea of programming toolkits
   - "toolkit" concept: larger systems can be created from composition of small, well understood components.

5. Their group Augmentation Research Center at the SRI was responsible for many of the interaction techniques and devices that we now-a-days take for granted
    - Introduced concept of word processor, mouse
    - Designed NLS (oNLine System) – 1968

6. The idea of personal computer –
    - Allan Kay (1970's) thought of Dynabook influenced by Engelbart as well as Seymour Papert's LOGO
    - Developed "smalltalk" (a visually based programming environment) .

7. Windows and WIMP interfaces
    - Humans are able to think about more than one thing at a time
    - In accomplishing some tasks, they frequently interrupt their current train of thought and switch to some other piece of work.
    - Sequential interaction to complete task is not suitable for this behaviour.
    - WINDOW system and WIMP interaction developed to take care of this.

8. Direct Manipulation
    - Ben Shneiderman coined the term in 1982
    - First successful use of the idea in Apple Mac PC (1984)
    - Common GUI operations (move, drag etc)
    - Reduces the chances for syntactic errors, learning for command line interfaces
    - WYSIWYG (What You See Is What You Get)

9. Multimodality (late 1980's)
    - Relies on multiple human communication channel simultaneously for input and output.

10. • WWW
    - Tim Berners – Lee (CERN, 1989) was the inventor of the most popular application layer protocol (which we used synonymously with networks)
    - The year 1991 saw the first text based browser
    - The first graphical browser (Mosaic) came in 1993.

11. Ubiquitous computing
    - the most active research area in HCI now
    - The field originated from Mark Weiser's vision, Xerox PARC, late 1980's
    - Sensor based/context aware computing (1990's) − Also known as pervasive computing

Lect No-2

Interactive system design

Concept of usability: "UE is an approach to the development of software and systems which involves user participation from the outset and guarantees the usefulness of the product through the use of a usability specification and metrics."

Definition of usability:-Usability is the effectiveness, efficiency and satisfaction with which users achieve specific goals in particular environments; where

Effectiveness is the accuracy and completeness with which specified users can achieve specified goals in particular environments;

Efficiency is the resources expended in relation to the accuracy and completeness of goals achieved; and

Satisfaction is the comfort (experience) and acceptability of the work system to its users and other people affected by its use.

User's Definition of Usability

USABILITY : The ability of a User to Use the product/ system / environment as desired Usability Engineering: The 'affordance' offered by a product that makes it useable.

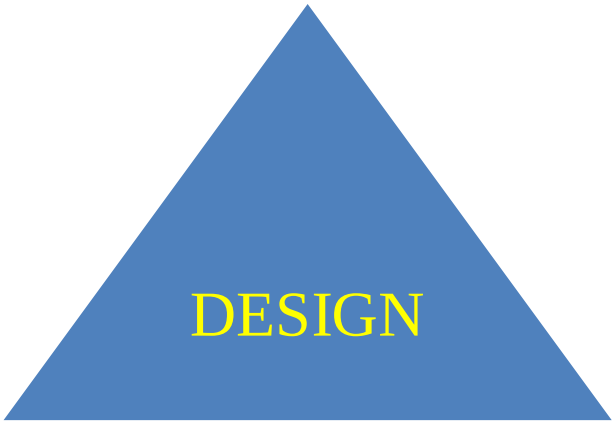
Usability does not happen by it self. It has to be "engineered" into the product.Usability is related to Human performance { Capabilities, Limits, Consequences}.

Usability is conceptualised into the product by **DESIGN**

Usability has three major components in Design

Appearance

Visual Quality



Technology

Build Quality

Interaction

Use Quality

Some definations

'Usability' is the measure of the quality of a User's experience when interacting with a product or system

'Usability Engineering' is the processes of deriving, specifying, measuring, constructing and evaluating usability features into products and systems.

Usability Study is the systematic analysis based on heuristics and/or experimental evaluation of the interaction between people and the products including the environment of use. Psychology/ Cognitive Sc/ BehavioralSc

Usability Testing is the scientific verification of the specified usability parameters with respect to the Users needs, capabilities, expectations, safety & satisfaction.

Usability as applied to Product Design

Usability as applied to Human Computer Interaction

Usability as applied to Human Environment Interaction

Usability as applied to Systems (including Engineering systems)

The goals of Usability Engineering:-5 Es

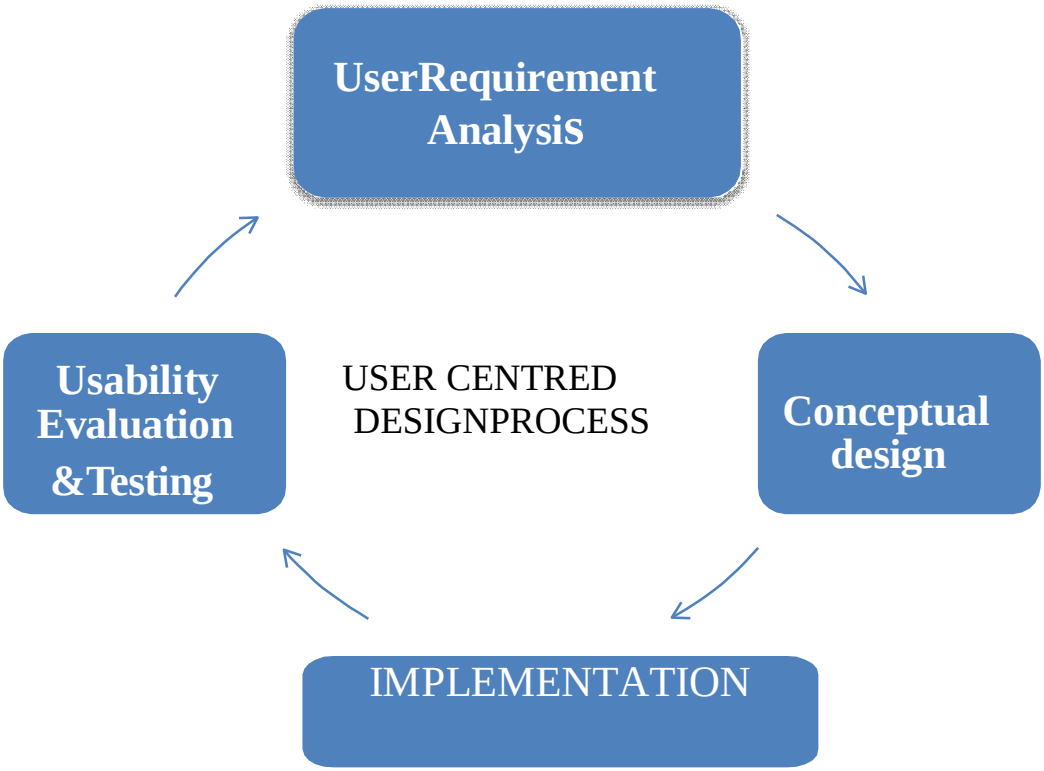
Effective to use - Functional

Efficient to use - Efficient

Error free in use - Safe

Easy to use-Friendly

Enjoyable in use - Pleasurable Experience



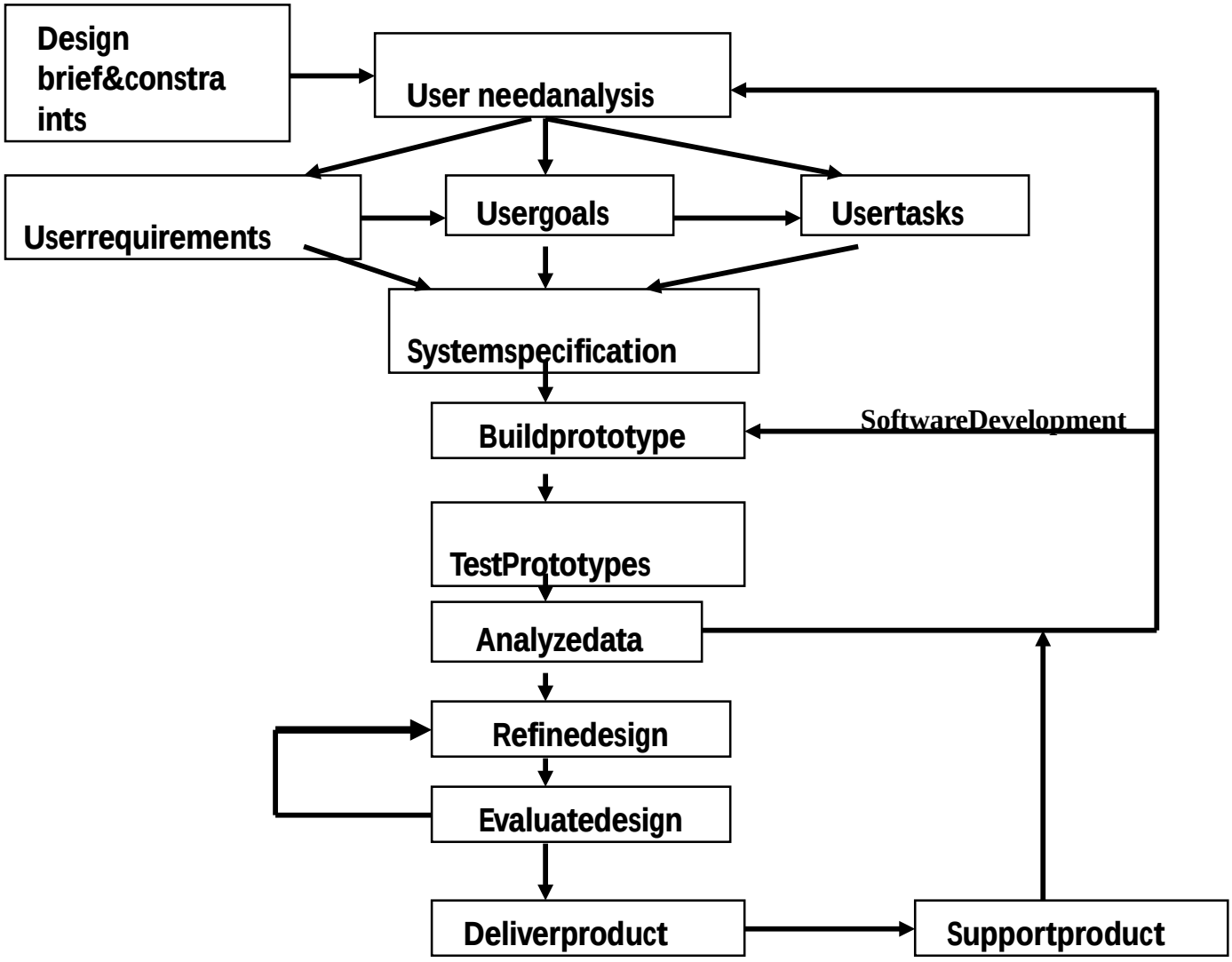
UE is based on a **User- Centered Design (UCD)**approach to analysis and design. It concentrates on those aspects of products & services that have a bearing on their effective, efficient & pleasurable USE by humans.

"Human-centered design is an approach to interactive system development that focusesspecifically on making systems usable. It is a multi-disciplinary activity."

A user may be marketer,developer,programmer,Interfacedesigner,ITEngg

The UCD Methodology.

User centered design processes : UCD



Definition of UE & other Related fields:-

HCI : Human Computer Interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

Human Factors &Ergonomics : Stress on human physical issues (physiology) and on optimising work processes

User Interface Design: Focuses on interface layer assuming all deeper functions are fixed.

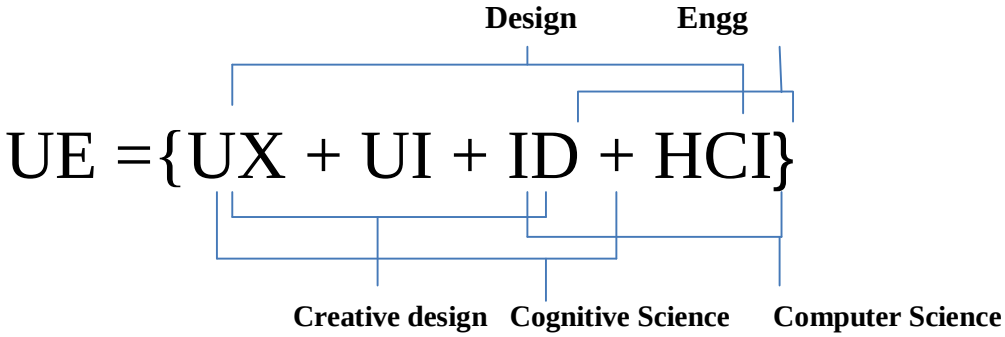
HCD- Human Centered Design: Approaches to software engineering with user focus at all stages of software design

ID – Interaction Design : wider scope in terms of devices beyond computers. More emphasis on cognitive & experiential factors.

UE- Usability engineering focuses on design &implementation processes. It is essentially research & design based activity .

There are overlaps in the above fields. Each is independent. UE has all of them.

Relationship between UE & Human Computer Interaction; Interaction Design; Experience Design; GUI Design:-



UX = User Experience

UI = User Interface

ID = Interaction design

HCI= Human Computer Interaction

UE = Usability Engineering

Usability Testing:-

- Analytical evaluation:
    - By simulating how the user's activity will be performed.
    - Heuristic evaluation measures design against a list of usability factors.

- Empirical evaluation:
    - By building and testing a prototype.
    - Formal usability testing tests a component of the design under controlled conditions - actual users.