



## L3 – UCSD Defined

– User-Centered Systems Design | Basic Values, Process and Key Principles

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User-Centered Systems Design 1MD000, Spring 2011 | Department of HCI at Information Technology

## Bengt Göransson

Consultant in **Usability & Interaction Design**

Employed at a Business and IT Consultancy, Capgemini.

Part time researcher at Uppsala University.

Been working as researcher and consultant in the IT business since 1984.

Started out as a developer. Computer science background. Moved on to user-centered design and usability.

Domains: business support (public authorities, case-handling, medicine), products (hard- and software), web-applications, e-services, etc..

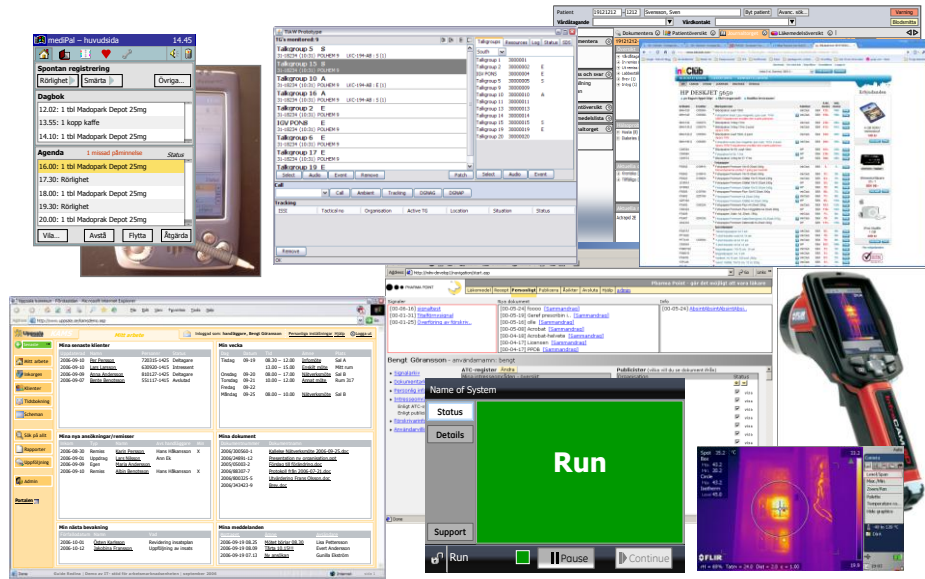
Developing methods: user-centered systems design in practice, e.g. a new discipline in the RUP. Scrum and usability.

Currently helping organizations to develop their businesses by using IT in a user-centered way.




Ph.D. from Uppsala University, Sweden, in HCI.

## Bengt Göransson

Consultant in **Usability & Interaction Design**



## My Lectures

-  **Wednesday, February 2 (L3) 10.15-12.00**
  - UCSD Defined, see Paper on Key Principles on the course web
-  **Monday, February 28 (L12) 10.15-12.00**
  - UCSD as a process
-  **Monday, February 28 (L13) 13.15-15.00**
  - UCSD in practice

## Two Parts

- The User
- and then
- The Systems Design

## Two Parts

- The User
- and then
- The Systems Design
  - Systems Design is known to all of you as you are engineers, right?
  - But who are you designing for, the users???

## **First Of All We Need To Elaborate On What's In A User...**

### **Why?**

**It's Fundamental For Everything Else  
You Do When Applying UCSD!**

**I Never Thought About What's In A User...**

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## **How Do You Define A Users?**

ISO 9241-11 Guidance on Usability

- "Person who interacts with the product"

Wikipedia on "End-User"

- "The person who uses a product"

Wikipedia on User (computer)

- "A user is an agent, either human (end-user) or software, who uses a computer or network service"

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## How Does IT Usage Influence A User's Life?

- At work?
- At home?
- In social networks?
- Integrity?

## So, What's In a User For You?

- 5 minutes.
- Discuss in pairs.
- List users in different environments.
- Why are they using IT systems? Purpose? Effects?
- Does this effect the way You look at them?

## Are Basic Human Values Applicable When Developing An IT System?!?

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### Responsibility

- I think that we as technicians (developers etc) and technology savvy IT professionals have a unique position and a particular responsibility, not just see to the effects of IT usage, but also to the consequences. Therefore it's our duty to be aware of the consequences and act thereafter.
- It's hard to for see what technology can imply and all the consequences it can lead to. Especially for our "users".

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## Moral and Dilemma Questions

- How would you act if you knew that the people you interviewed and designed for could lose their job and get fired if the system became a success?
- How would you act if you were contacted by a gaming company to develop an on-line poker game that was as usable as possible for the users, most certainly leading to maximum profit for the company?
- How would you act if the right wing party “Sverige Demokraterna” asked you to design their new website?

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## Example On Taking Responsibility And A Stand



**Nadja Haldiman, Product Design Lead, Microsoft Office**

**People spend more time with Office than the love of their life.** Since that's a big sacrifice, we want our customers to love using Office. That means we spend time listening, sharing, building relationships, generating innovative ideas, and designing with our customers. The end result is software that our customers want to wrap their arms around and kiss.

Microsoft is an Equal Opportunity Employer and supports workforce diversity.  
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## User's Bill of Rights

**IBM's Dr. Clare-Marie Karat, a researcher at its Thomas J. Watson Research Center, has challenged the industry to endorse the following Computer User's Bill of Rights.**

1. The user is always right. If there is a problem with the use of the system, the system is the problem, not the user.
2. The user has the right to easily install software and hardware systems.
3. The user has the right to a system that performs as promised.
4. The user has the right to easy to use instructions for understanding and utilizing a system to achieve desired goals.
5. The user has the right to be in control of the system and to be able to get the system to respond to a request for attention.
6. The user has the right to a system that provides clear, understandable, and accurate information regarding the task it is performing and the progress toward completion.
7. The user has the right to be clearly informed about all system requirements for successfully using software or hardware.
8. The user has the right to know the limits of the system's capabilities.
9. The user has the right to communicate with the technology provider and receive a thoughtful and helpful response when raising concerns.
10. The user should be the master of software and hardware technology, not vice versa. Products should be natural and intuitive to use.

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## Are The Users Always Right?

- Are there situations when users can be wrong???

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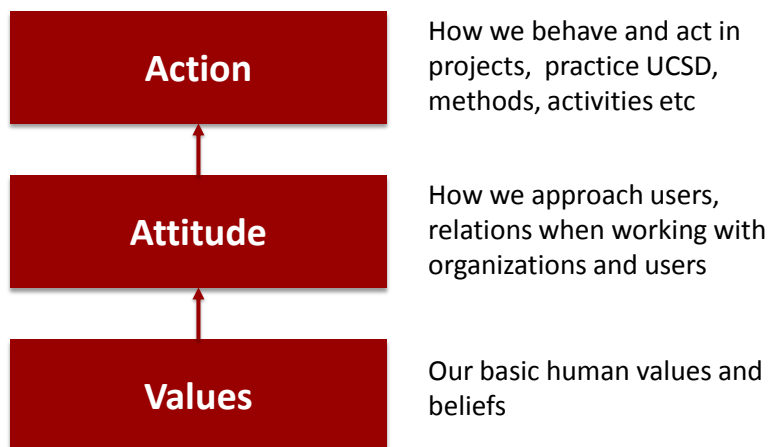
## What You As A Developer Must Do

- Take a stand!
- Realize that there is a spectrum of views and angles to work with users.
- You can't really be neutral...

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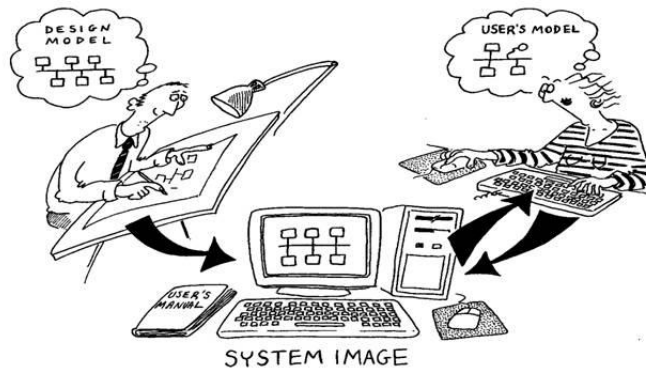
## Matrix of Values



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## When We Design



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## A Historical Odyssey

- Human Factors
- Ergonomics
- HCI
- Usability
- Usability Engineering
- User-Centered Design
- Cooperative Design
- Participatory Design
- Contextual Design
- User Experience Design

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## HCI Developed From – Human Factors / Ergonomics

- Human factors (US) / Ergonomics (Eu) is the study of all aspects of human capabilities in relation to the surrounding environment. Purpose was to increase performance capacity, increase safety etc.
- The concept developed during and the 2nd World War.
- Originates from military research, e.g. enhancing the cockpit environment for the pilots.



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## A Small Selection...

- Usability as a concept developed during the 1980s. Was subject for definition in the middle of the 1990s.
- The engineering approach – *Usability Engineering*
- Pleasure and experience – *User Experience*
- *Interaction design*; by some considered to be the next step after HCI, sometimes a part of HCI. Example of approaches Pelle Ehn & Jonas Löwgren, Erik Stolterman, Alan Cooper.
- A social and political responsibility; *Scandinavian School*.
- *Socio-technical design* (Catterall, Taylor & Galer, 1991) deep-rooted in the beliefs that human and organizational aspects can't be studied in isolation and apart from technology.
- CSCW – *Computer Supported Cooperative Work*.

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## Some Influential Perspectives

- UCSD (1986); *User Centred Systems Design*, Norman & Draper (eds.).
- Lucy Suchman (1987); *Plans and situated actions: The problem of human-machine communications*.
- Cooperative Design (1991); *Design at work: Cooperative Design of Computer Systems*, Greenbaum & Kyng (eds.).
- Participatory Design (1993); *Participatory design: Principles and practices*, Schuler & Namioka.
- Contextual Design (1998), *Contextual Design: Defining Customer-Centred Systems*, Beyer & Holtzblatt.
  - Started at Digital Equipment (DEC), during 1980s.

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## “Values” in User-Centered Systems Design

Donald Norman wrote back in 1986:

- “But user-centered design emphasizes that the purpose of the system is to **serve the user**, not to use a specific technology, not to be an elegant piece of programming. The **needs of the users** should dominate the design of the interface, and the needs of the interface should **dominate the design** of the rest of the system.”

Donald Norman, “Cognitive Engineering”, in D. A. Norman & S. W. Draper (eds.), *User Centered System Design*, 1986

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## User-Centered Design

- IBM John Gould with colleagues developed the basic principles for UCD:
  - Early – and continual – focus on users.
  - Empirical measurement.
  - Iterative design.
  - Integrated design – wherein all aspects of usability evolve together.
- The principles were "tested" when IBM developed the *1984 Olympic Message System*.
- A system for the athletes to send and receive messages.
- Information kiosks. *Remember, pre web*



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## The UTOPIA Project

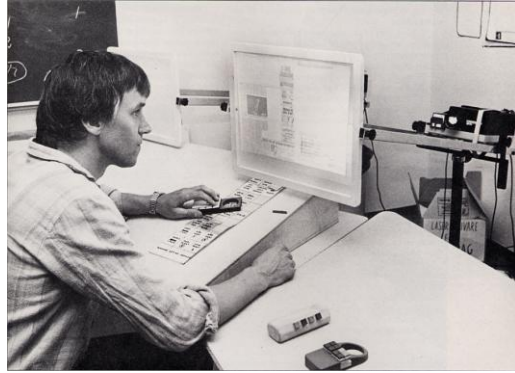
- 1981–1985; Utbildning, Teknik Och Produkt i Arbetskvalitetsperspektiv. eng. *Education, Technology and Production in A Work Quality Perspective*.
- A main objective for UTOPIA was to give the (end-) users a voice and say in the design and development of new IT-systems at their work place. The people behind the project were convinced that that would improve the end result
- Democratization of working life and with clear political implications.
- The labor unions were active in the project.
- Constituted the so called Scandinavian School.
- Lessons learned on how to actively involve users in the design and how to work with highly innovative prototypes.

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## The UTOPIA Project

- Prototypes and simulations of future work for typographers at Swedish news papers. Their work was in great transformation due to the new phenomenon of desktop publishing.



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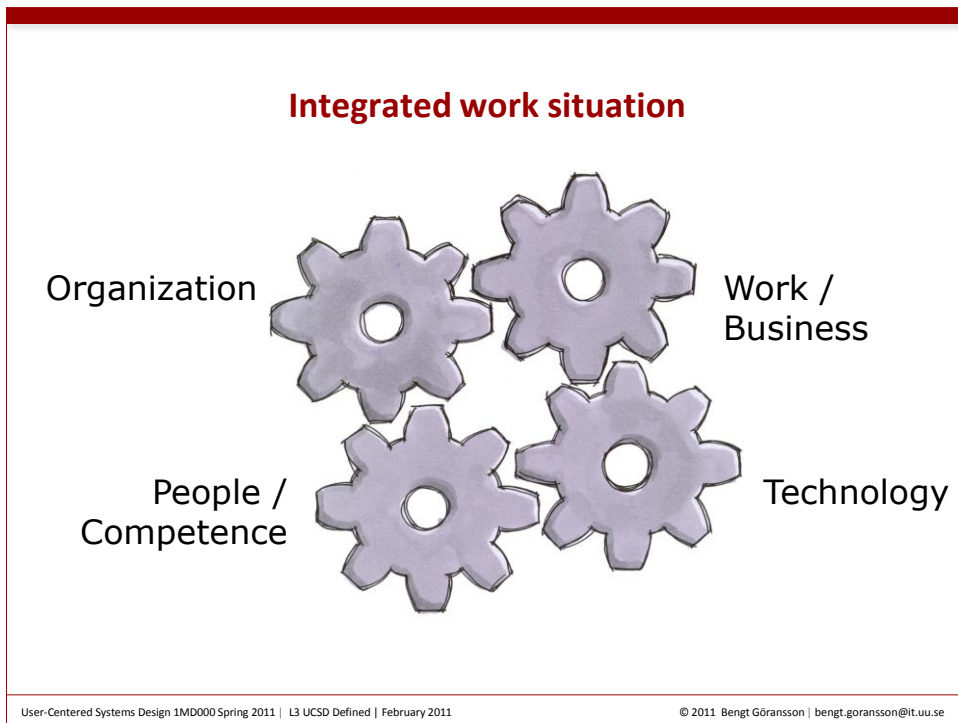
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## The Scandinavian School

- When people are forced to use IT-systems and products and don't have a choice, the design and the development must be based on their needs and be controlled by them.
- Empowering the users to take control over the "instruments of power".
- The insight that (information) technology is not isolated from "work", business, organization etc. It's an integral part and all these parts are dependent of each other.

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### Core Values From the Book "Design At Work"

*The design ideals that emerged in the Scandinavian school during the 1970s and 1980s with roots in the democratization of working life and with clear political implications:*

- Full participation of the users.
- Computer systems should enhance workplace skills.
- Computer systems are tools, and need to be designed so that they are under the control of the people using them.
- Computer systems must support both productivity and quality.
- The design process includes conflicts.
- The use situation is a fundamental starting point for the design process.

*Design at Work: Cooperative Design of Computer Systems.  
Greenbaum, J. & Kyng, M. (eds.) (1991).*

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## Views on User Involvement/Participation

- An "object" for observations.
- An active informant.
- A full member of the team.
- A decision maker.

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## Trends in Usability and The User Perspective

- From looking at Humans as objects of study, cognitive sciences.
- To social and political standpoints.
- Back to engineering and users as "just" a part of the picture.
- Now, users are seen as consumers to entertain and satisfy.
- Where do we go from here? Humans as "change agents"  
Make "desirable" changes...

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## To Motivate A Change – Persuasive Design

- The software that we design, including the user interface, has the potential to change peoples behavior. It can be a good thing or a bad thing...

Having healthcare in mind, we as Usability Professionals primarily think of usable medical devices and software and how we could improve them to make them more efficient and easier to use. But persuasive design in this area focuses on how technology could be used to motivate people to change their behavior, for instance by increasing their physical activity, by preventing them from smoking, or by changing their eating behavior.

*Silvia Zimmermann, usability.ch, 2007*

## Basic Values

### Develop for...

- Commercial use.
- People that can't choose.
- In many work situations people can't choose their working tools.
- People with various disabilities.

Context of Use



Case Handlers at a Authority

They don't have the luxury to chose!

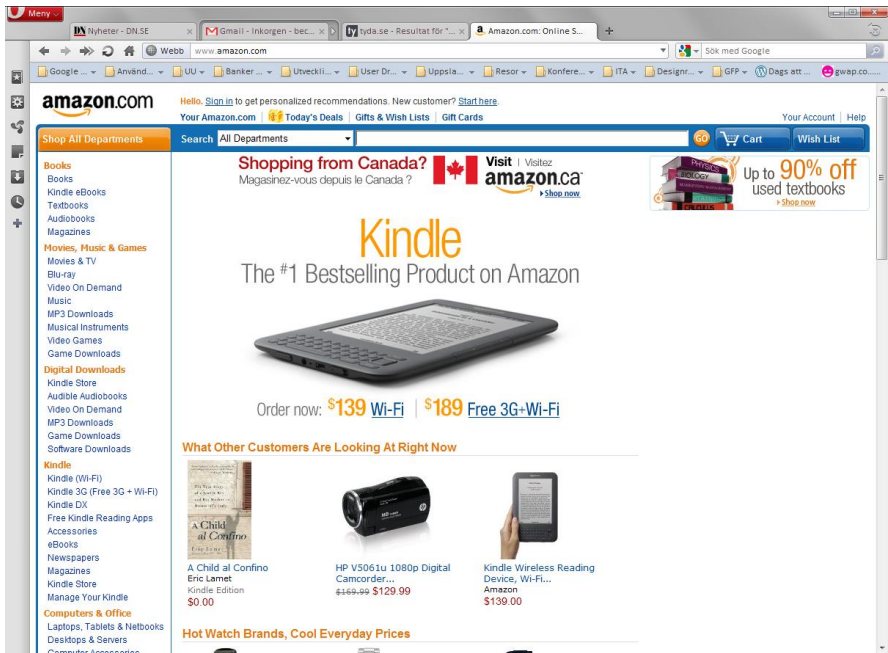


## A User and Citizen

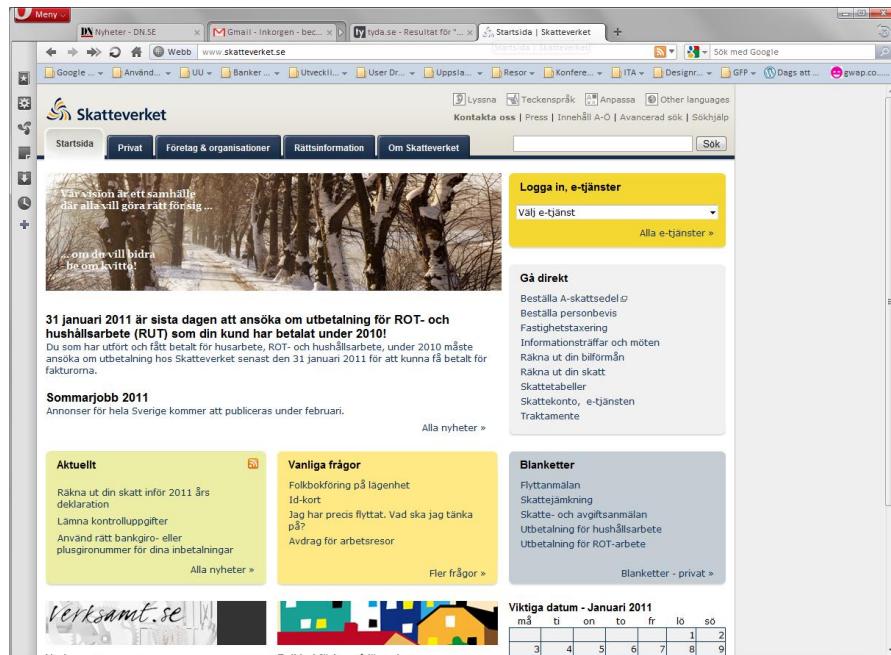


Can often chose,  
but not always!

## Commercial



## Public e-Service



## How Would You Work With Users In Different Situations?

- 5 minutes.
- Groups, 3-5 students.

## User-Centered Systems Design

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### Reasons For UCSD

- **Economic**; opportunities for decreasing costs and increasing earnings.
- **Business and organisational**; UCSD broadens the view of systems development and may facilitate the integration of the IT systems with the business.
- **Quality**; in systems and in the development process.
- **Legal**; laws and regulations, e.g. occupational health, safety legislation and “design for all”.
- **Ethics and moral**; developing systems to be used by people also involves “soft” aspects, such as, basic human values.

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## Donald Norman Coined UCSD...

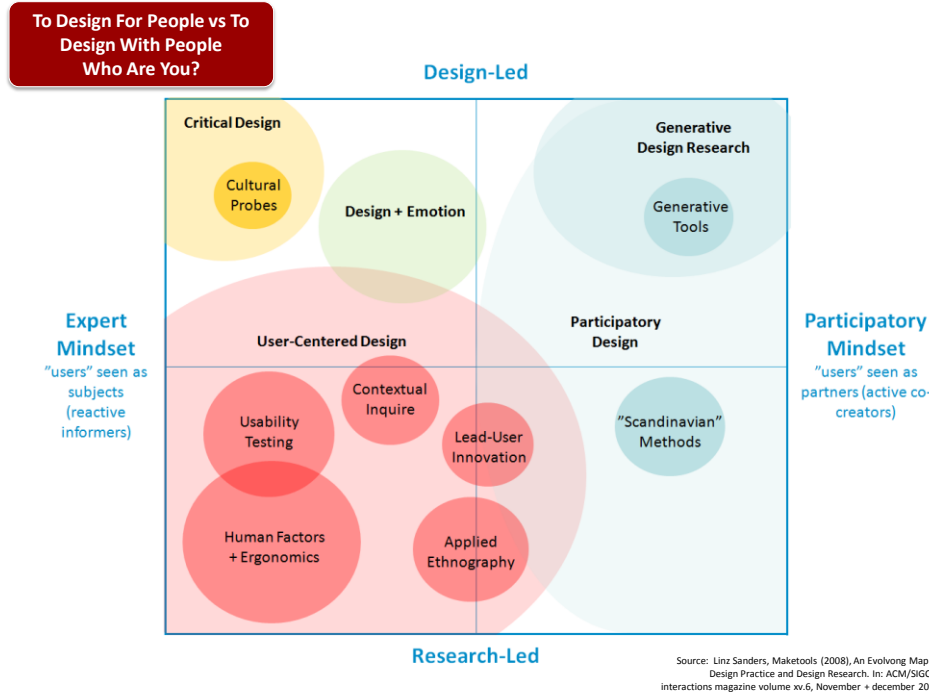
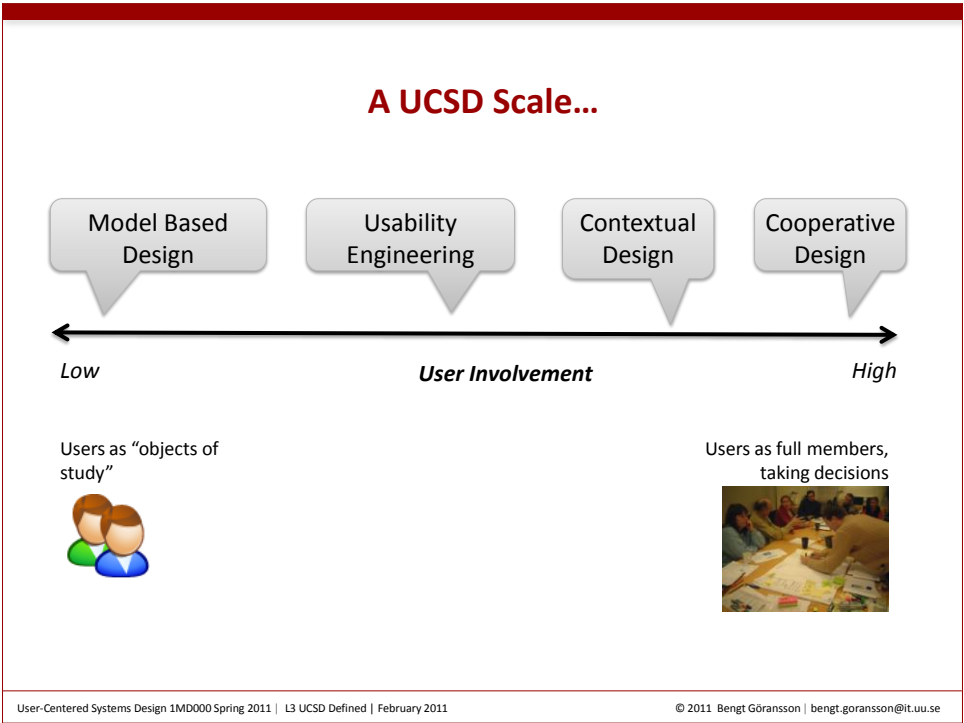
- “Do user-centred system design: Start with the needs of the user. From the point of view of the user, the interface is the system. Concern for the nature of the interaction and for the user—these are the things that should force the design. Let the requirements for the interaction drive the design of the interface, let ideas about the interface drive the technology. The final design is a collaborative effort among many different disciplines, trading off the virtues and deficits of many different design approaches.”

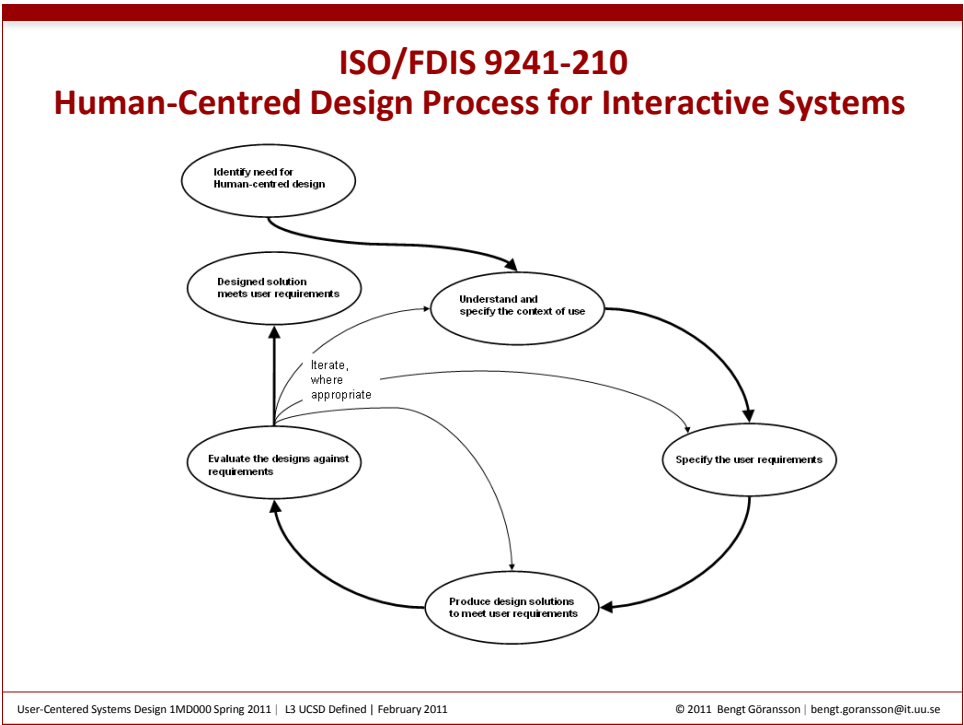
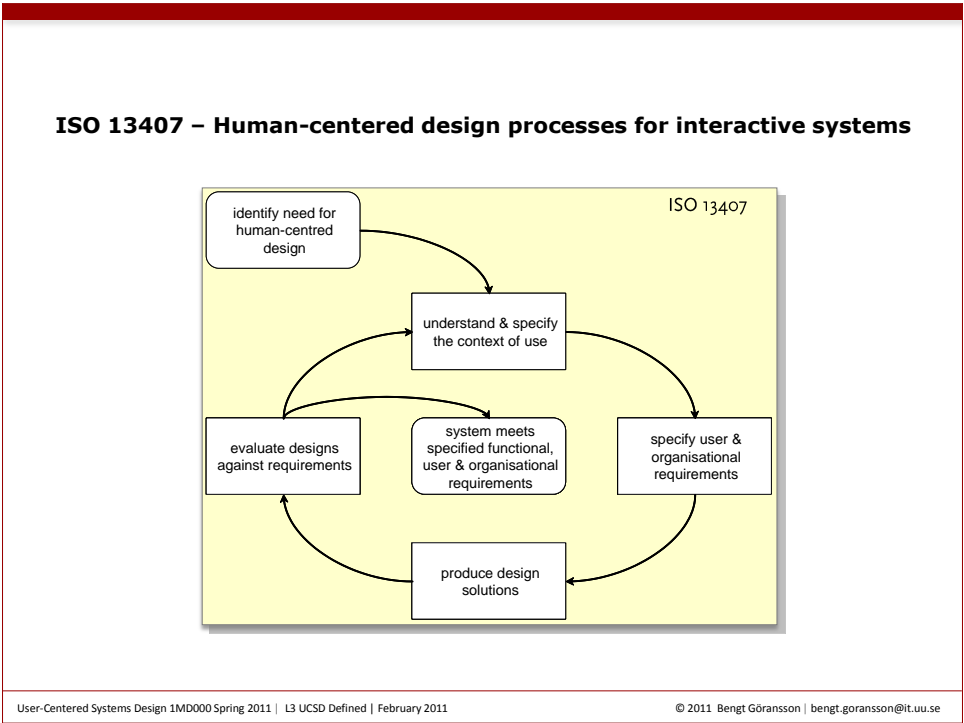
Norman, 1986, p. 61

## Lack of common definition of UCSD

- Usability engineering (Nielsen, Mayhew)
- Design for usability (IBM & Gould et al.)
- Human-centered design (ISO 13407)
- Scenario-based design (Carroll et al.)
- Goal-directed design (Cooper)
- Usage-centered design (Constantine & Lockwood)
- Contextual design – Customer-centered design (Beyer & Holtzblatt)
- Cooperative design (Scandinavian School) (Greenbaum & Kyng)
- Participatory design (Muller, Haslwanter & Dayton)









## Usability and UCSD

- *Usability* is quality in use. A metric on how well a product or system supports me as a user in doing my tasks and achieving my goals, in a certain context of use.
- *User-Centered Systems Design* is an approach (process) and attitude in the development of a product or system and focuses on the usability of the result.

## Usability

- A clear definition is important.
- The usability of a system is defined as:

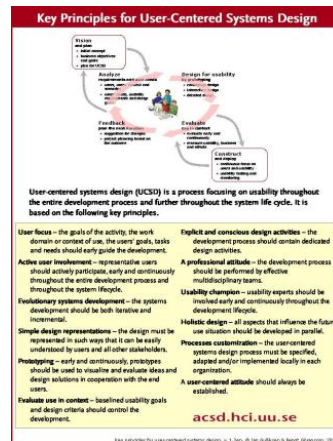
*"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."*

*ISO 9241-11 Guidance on usability*

## Definition of User-Centered Systems Design

“User-centered systems design is a process focusing on usability throughout the entire development process and further throughout the system life cycle. It is based on the following key principles.”

Gulliksen, Göransson, Boivie, Blomkvist, Persson & Cajander (2003)



### Definition and Key Principles for User-Centered Systems Design

User-centered systems design is a process focusing on usability throughout the entire development process and further throughout the system life cycle. It is based on the following key principles.

**User focus** – the goals of the activity, the work domain or context of use, the user's goals, tasks and needs should early guide the development.

**Active user involvement** – representative users should actively participate, early and continuous throughout the entire development process and throughout the system lifecycle.

**Evolutionary systems development** – the systems development should be both iterative and incremental.

**Simple design representations** – the design must be represented in such ways that they can be easily understood by users and all other stakeholders.

**Prototyping** – early and continuously, prototypes should be used to visualize and evaluate ideas and design solutions in cooperation with the end users.

**Evaluate use in context** – baselined usability goals and design criteria should control the development.

**Explicit and conscious design activities** – the development process should contain dedicated design activities.

**A professional attitude** – the development process should be performed by effective multidisciplinary teams.

**Usability champion** – usability experts should be involved early and continuously throughout the development lifecycle.

**Holistic design** – all aspects that influence the future use situation should be developed in parallel.

**Processes customization** – the user-centered systems design process must be specified, adapted and/or implemented locally in each organization.

**A user-centered attitude** should always be established.

Source:

Key Principles for User-Centred Systems Design

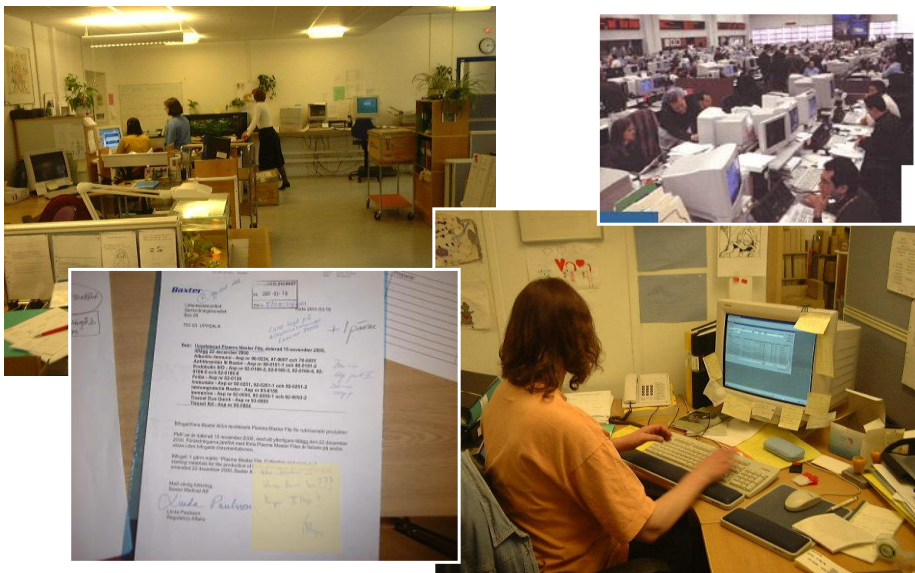
Gulliksen J., Göransson B., Boivie I., Blomkvist S., Persson J. & Cajander Å. (2003)

Published in: Special section "Designing IT for Healthy Work" in Behaviour & Information Technology, November–December 2003, Vol. 22, No. 6, pp. 397–409, Taylor & Francis, [www.tandf.co.uk](http://www.tandf.co.uk).

## User Focus

- The goals of the activity, the work domain or context of use, the users' goals, tasks and needs should early guide the development.
  - All members of a project must understand the goals of the activity, the context of use, who the users are, their situation, goals and tasks, why and how they perform their tasks, how they communicate, cooperate and interact, etc. This helps in creating and maintaining a focus on the users' needs instead of a technical focus.
  - Activities, such as identifying user profiles, contextual inquiries and task analysis, must be a natural part of the development process.
  - Make sure that all project members have met real or potential users, for instance, by visiting the workplace. Descriptions of typical users, tasks and scenarios could, for instance, be put up on the walls of the project room/area to maintain the user focus.

## Context of Use



## Active User Involvement

- Representative users should actively participate, early and continuously throughout the entire development process and throughout the system lifecycle.
  - The users should be directly involved, both in the development project and in related activities, such as, organizational development and the development of new work practices.
  - The users must be representative of the intended user groups.
  - Specify where, when and how users should participate in the development. Identify appropriate phases for user participation and specify their characteristics. Emphasize the importance of meeting the users in context, for instance, at their workplace.
  - Note the important difference between domain experts (very familiar with the activity, but not necessarily potential users) and real users. Domain experts can be members of the development team but real users should be involved on a temporary basis, in single activities during the analysis, design and evaluations of design solutions.

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## Active Users



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## Prototyping

- Early and continuously, prototypes should be used to visualize and evaluate ideas and design solutions in cooperation with the end users.
  - Use multiple paper sketches, mock-ups and prototypes to support the creative process, elicit requirements and visualize ideas and solutions. The prototypes should be evaluated with real users in context.
  - It is essential to start with low-fidelity materials, for instance, quick sketches, before implementing anything in code.
  - Work with prototypes in cooperation with the users in context (contextual prototyping).
  - Start with the conceptual design on a high level and do not move on to detail too quickly. If possible produce several prototypes in parallel.

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## Visualizing Design Solutions

The collage illustrates the process of visualizing design solutions through various media:

- Top Left:** A computer screen displaying a spreadsheet with financial data, including columns for dates and amounts.
- Top Right:** A whiteboard with a flowchart or diagram, showing a sequence of steps or processes.
- Bottom Left:** A hand-drawn sketch of a user interface, featuring a welcome message, a balance section, a performance graph, and a list of clients.
- Bottom Right:** A screenshot of a financial software interface, showing a dashboard with various charts, tables, and navigation menus.

An arrow points from the hand-drawn sketch to the software screenshot, indicating the transition from a low-fidelity prototype to a more refined digital solution.

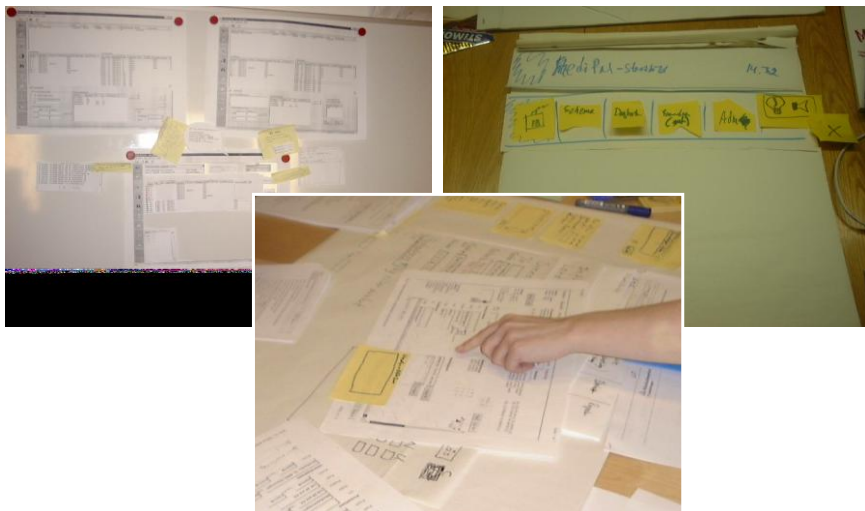
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## Simple Design Representations

- The design must be represented in such ways that it can be easily understood by users and all other stakeholders.
  - Use design representations and terminology that are easily understood by all users and stakeholders so that they can fully appreciate the consequences of the design on their future use situation. Use, for instance, prototypes (sketches and mock-ups) and simulations.
  - Abstract notations, such as use cases, UML diagrams or requirements specifications are not sufficient to give the users and stakeholders a concrete understanding of the future use situation.
  - The representations must also be usable and effective. The goal is that all parties involved share the same understanding of what is being built.

## Paper is Understandable and Inexpensive



## Explicit and Conscious Design Activities

- The development process should contain dedicated design activities.
  - The user interface design and the interaction design are of undisputed importance for the success of the system. Far too often, the UI and interaction design “happens” as a result of somebody doing a bit of coding or modeling rather than being the result of professional interaction design as a structured and prioritized activity.
  - Remember that to users the user interface is the system. The design of the SUD as regards the user interaction and usability should be the result of dedicated and conscious design activities. The construction of the SUD should adhere to that design.

## Crafting Design





## Evaluate Use in Context

- Baselined usability goals and design criteria should control the development.
  - Critical usability goals should be specified and the design should be based on specific design criteria. Evaluate the design against the goals and criteria in cooperation with the users.
  - Early in the development project, one should observe and analyze the users' reactions to paper sketches and mock-ups. Later in the project, users should perform real tasks with simulations or prototype tasks and their behavior and reactions should be observed, recorded and analyzed.
  - Be sure to specify goals for aspects that are crucial for the usability and that cover critical activities as well as the overall use situation.

## Users Evaluating Prototypes



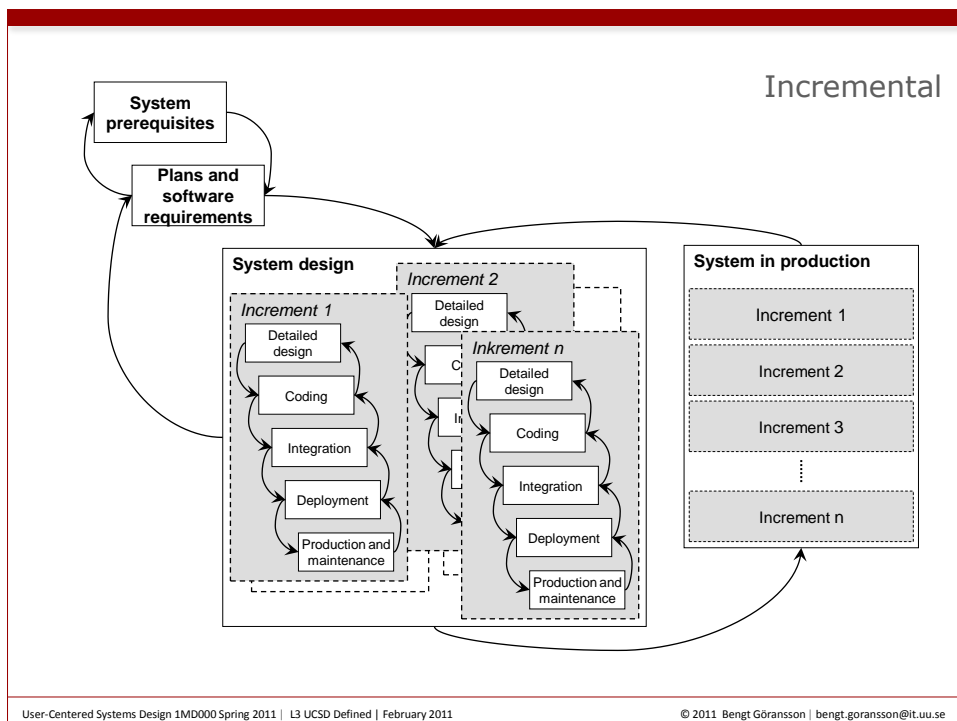


## Evolutionary Systems Development

- The systems development should be both iterative and incremental.
  - It is impossible to know exactly what to build from the outset. Hence, UCSD requires an approach which allows continuous iterations with users and incremental deliveries so that design suggestions and solutions can be evaluated by the users before they are made permanent.
  - An iteration should contain a proper analysis of the users' needs and the context of use, a design phase, a documented evaluation with concrete suggestions for modifications and a redesign in accordance with the results of the evaluation. These activities do not have to be formal. An iteration could be as short as half an hour, as long as it contains all three steps.
  - Incremental development means that, based on an overall picture of the System Under Development (SUD), priorities are set and the system is divided into parts that can be delivered for real use. Each increment is iterated until the specified goals have been met. Evaluations of the increments in real use should influence the design of the subsequent increments. Let the software grow into the final product.

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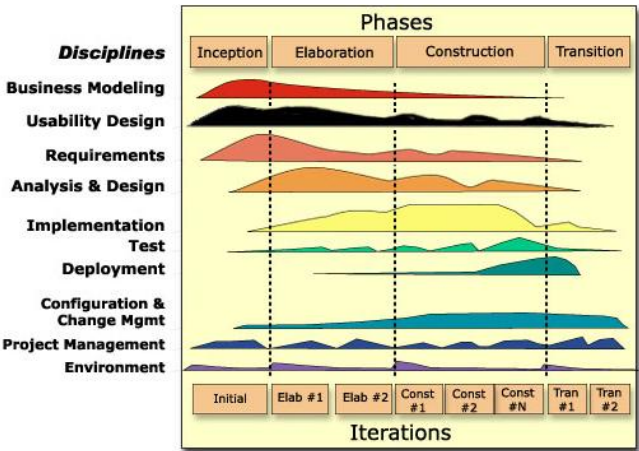
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## Processes Customization

- The UCSD process must be specified, adapted and/or implemented locally in each organization.
  - UCSD and usability cannot be achieved without a user-centered process. There is, however, no one-size-fits-all process.
  - Thus the actual contents of the UCSD process, the methods used, the order of activities, etc, must be customized and adapted to the particular organization and project based on their particular needs.
  - A UCSD process can be based on a commercial or in-house software development process, where activities are added, removed or modified. Existing methods and techniques may well be re-used, if they comply with the above factors/practices.

## Customizing Your Process



## Usability Champion

- Usability experts should be involved early and continuously throughout the development lifecycle.
  - An experienced usability expert (usability designer) or possibly a usability group, should be on the development team.
  - The usability designer should be devoted to the project as an “engine” for the UCSD process from the beginning of the project and throughout the lifecycle.
  - The usability designer must be given the authority to decide on matters affecting the usability of the system and the future use situation.

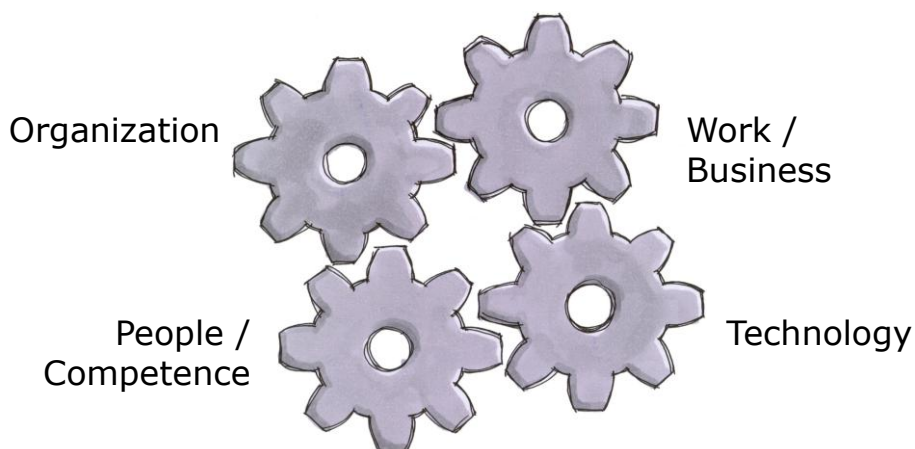
Gurus?



## Holistic Design

- All aspects that influence the future use situation should be developed in parallel.
  - Software does not exist in isolation from other parts of, for instance, a work situation. When developing software for the support of work activities, the work organization, work practices, roles, etc, must be modified.
  - All aspects should be developed in parallel. This includes work/task practices and work/task organization, user interface and interaction; on-line help; manuals; user training, work environment, health and safety, etc.
  - Other parts of the context of use such as: hardware equipment, social and physical environments, etc. must also be considered in the integrated design process. The responsibility should be placed with one person or a team.

## The Big Picture



## A Professional Attitude

- The development process should be performed by effective multidisciplinary teams.
  - Different aspects and parts of the system design and development process require different sets of skills and expertise.
  - The analysis, design and development work should be performed by empowered multi-disciplinary teams of, for instance, system architects, programmers, usability designers and interaction designers.
  - A professional attitude is required and so are tools that facilitate the cooperation and efficiency of the team.

## Multidisciplinary Teams



## A User-Centered Attitude

- A user-centered attitude should always be established.
  - UCSD requires a user-centered attitude throughout the project team, the development organization and the client organization.
  - All people involved in the project must be aware of and committed to the importance of usability, but the degree of knowledge on usability may differ depending on role and project phase. The key principles, defined here, can serve as a common ground.

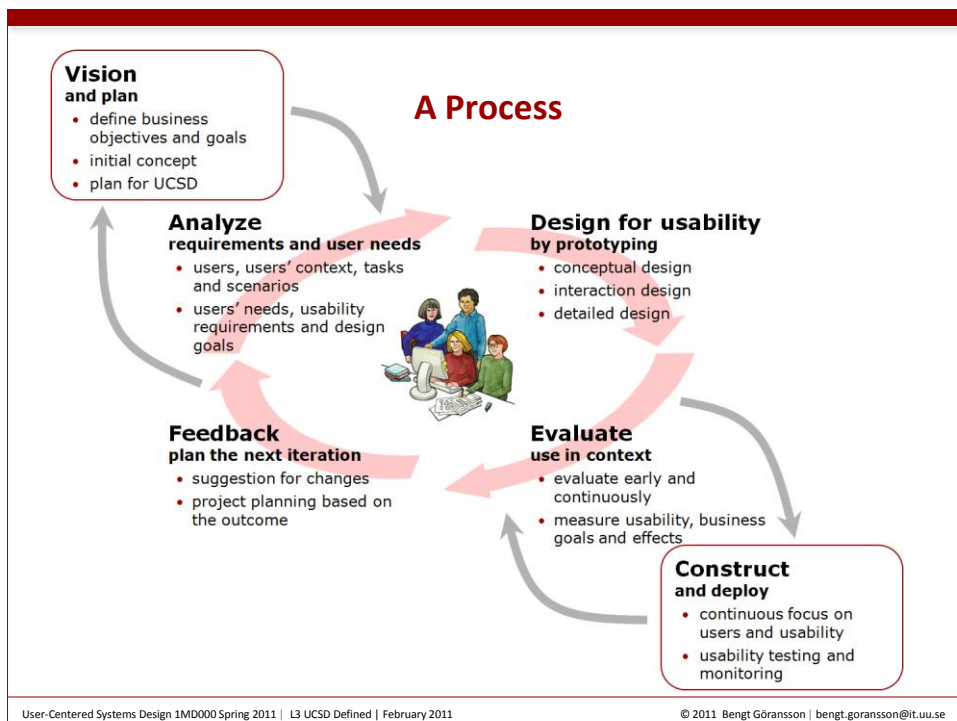
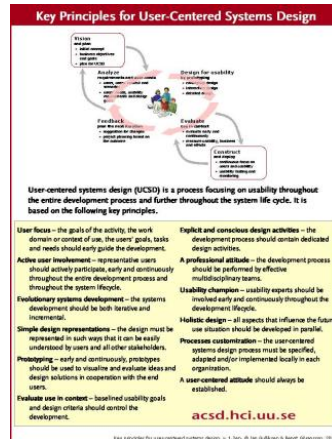
## User-Centered Attitude



## Definition of User-Centered Systems Design

“User-centered systems design is a process focusing on usability throughout the entire development process and further throughout the system life cycle. It is based on the following key principles.”

Gulliksen, Göransson, Boivie, Blomkvist, Persson & Cajander (2003)



## Application of the principles

- **Explanation model** – to analyze and communicate why organizations, projects or processes did not meet their goals as regards usability
- **Process development** – for defining a UCSD process
- **Process / organization customization** – to customize or adapt an organization, project or development process to UCSD
- **Process / organization assessment** – to assess the user-centeredness of an organization, project or process
- **Knowledge transfer** – to teach and transfer knowledge about UCSD,
- **Procurement support** – support for procurers as a basis for specifying requirements on the design process as such

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## Using the principles in practice

- These 12 principles ensure a truly user-centered approach and generate several benefits. They facilitate communicating, assessing and developing processes for the analysis, design, evaluation, construction and implementation of an interactive system. They help in maintaining the focus on the users and the usability throughout the entire development process.
- We fully appreciate that it will be more or less impossible to start applying the principles in one strategic shift. Adopting them gradually is probably more feasible and practicable. It is, however, important to comply with the principles to as large an extent as possible, at any point in time.

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## What you can do

- Decide on how important usability is.
- You specifically have to address usability aspects to achieve a usable system.
- A specific and explicit approach and philosophy is needed – user-centered.
- Include user-centered activities and foster a common understanding among all stakeholders about the importance of usability.
- Ensure active user participation.

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## I Want You To Know That...

- You are responsible for how you treat and act against users. Usability and UCSD is not just about technology. It has other values attached to it.
- Stating that you are using and working according to UCSD has certain implications and must, at least, include some basic activities.

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**Thank You For Listening!**

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