An Introduction to User-Centred Design: From Requirements to Evaluation

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This document is part of a collection of presentations with a focus on Electronic Publishing. For full details of this and the rest of the collection see the cover sheet at: http://humbox.ac.uk/3078/

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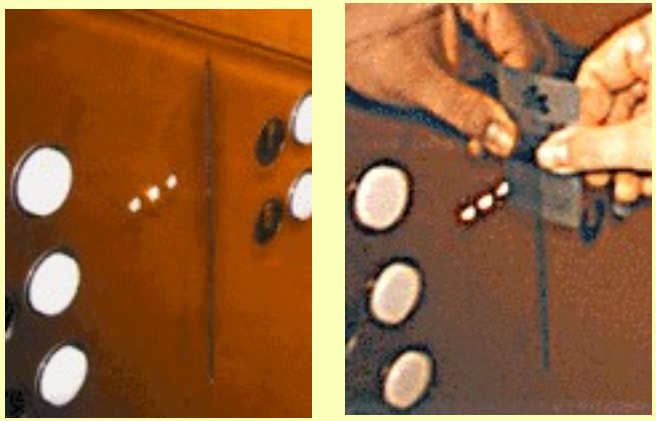
Objectives

- Emphasise the importance of users and usage in design: making technology *fit for purpose*
- Present an overview of the user-centred design model
- Briefly talk about a representative set of user-centred design and evaluation methods

Why is usability important?



(Sharp, Rogers, & Preece, 2007)

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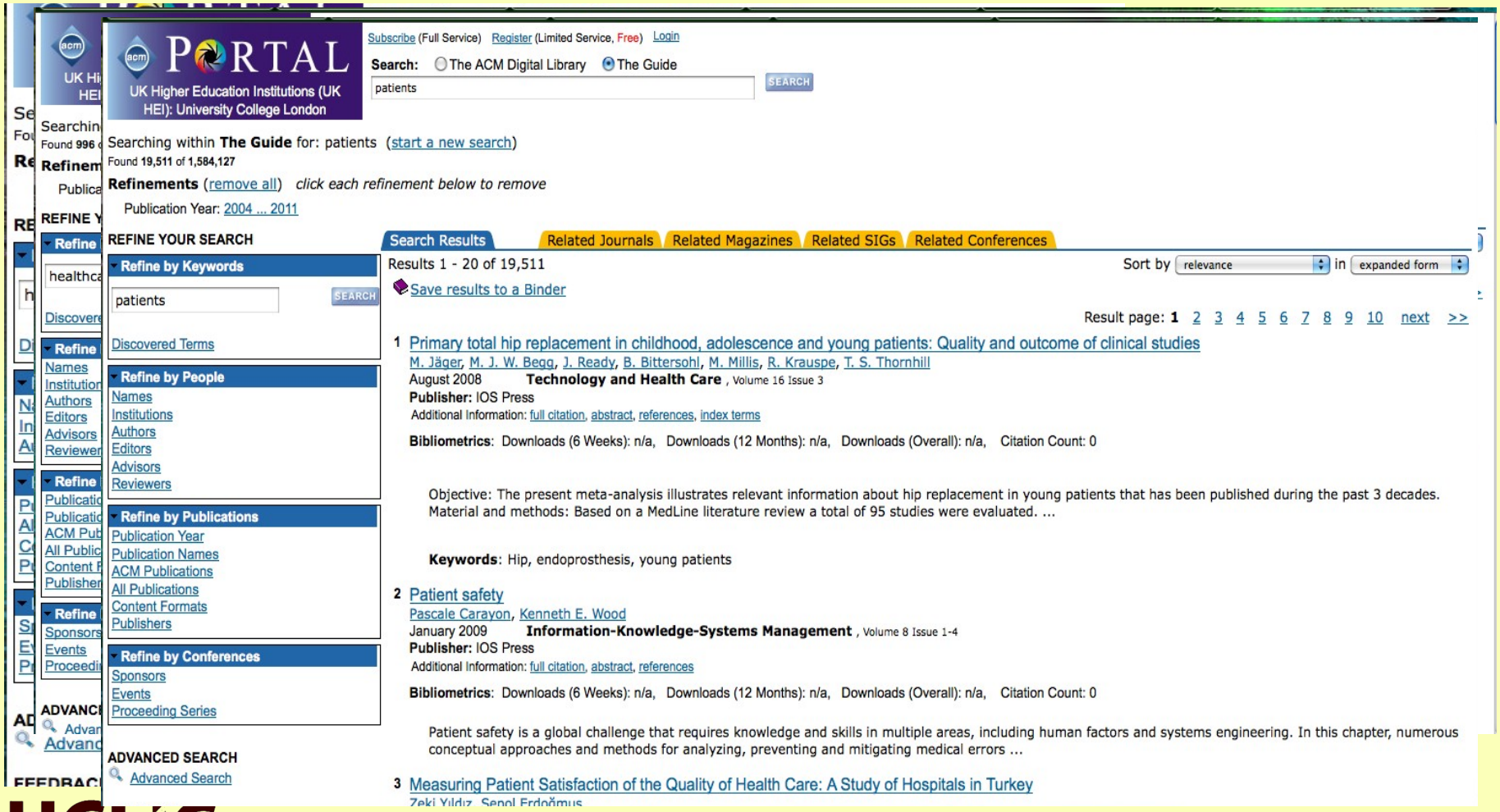
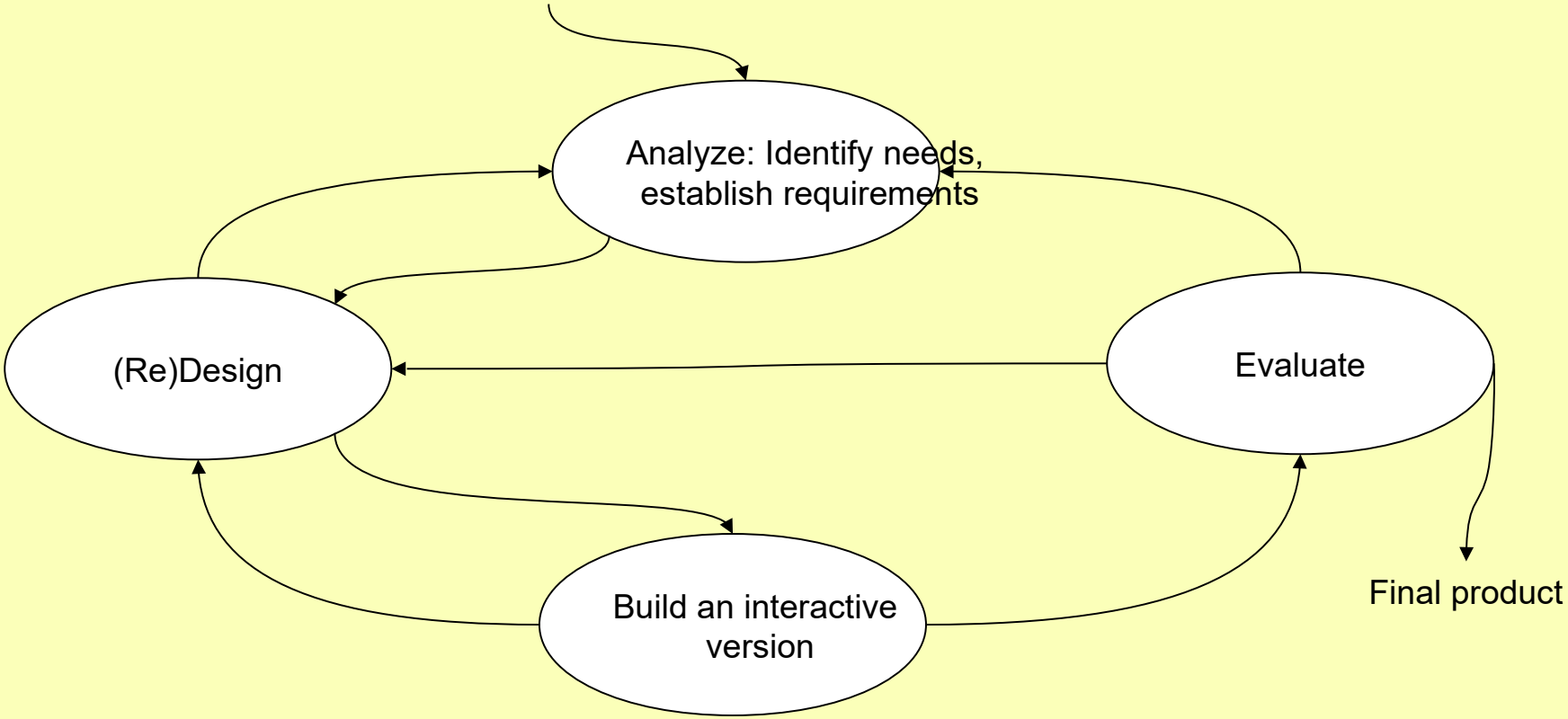
Digital Libraries



Interaction Design Model



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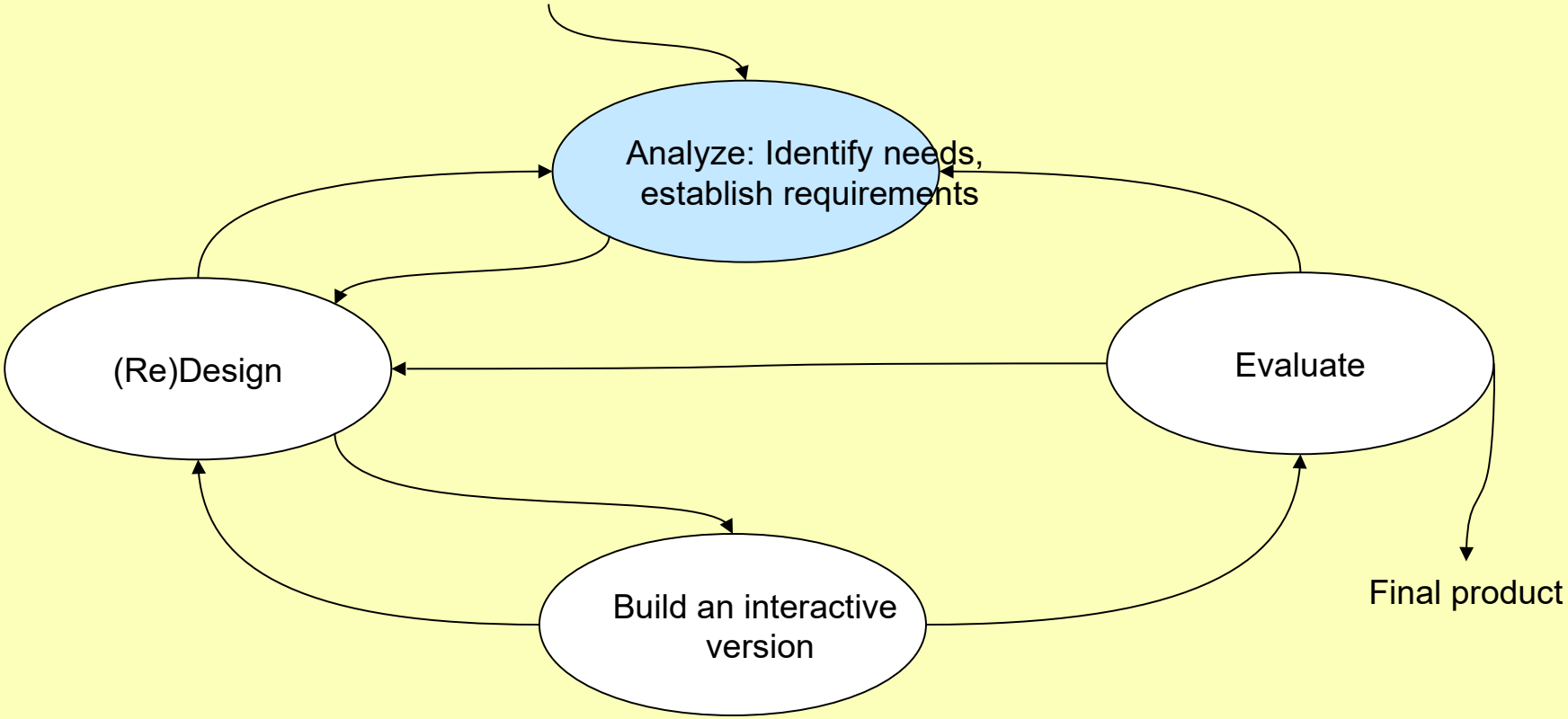

What, how and why?

- What does the requirements activity involve?
  - Understand as much as possible about users and their needs
  - Produce a stable set of requirements from this information
- How is it achieved?
  - Gather and interpret the data
  - Express the information as *requirements*

Why is this difficult?

What are ‘needs’?

- Users rarely know what is possible and often can’t tell you what they *need* to help them achieve their goals.
- Instead, look at existing tasks
  - What information do they require?
  - Who collaborates to achieve the task?
  - What is the task achieved that way?
- Needs can be discovered through data gathering methods.

Data gathering methods

- Interviews
- Questionnaires
- Observation

Key issues

- Setting goals
  - Decide how to analyze data once collected
- Relationship with participants
  - Clear and professional
  - Informed consent when appropriate
- Triangulation
  - Use more than one approach
- Pilot studies
  - Small trial of main study

Interviews

- “A conversation with a purpose” (kahn and Cannell, 1957)
- A conversation initiated by the researcher to obtain research relevant information
- Designed to elicit facts, behavior and beliefs
- Recorded for later analysis (audio or video)

Interview types

- Unstructured - are not directed by a script, they are rich but not replicable.

- Structured - are tightly scripted, often like a questionnaire, they are replicable but may lack in richness.

- Semi-structured - guided by a script but interesting issues can be explored in more depth. They provide a good balance between richness and replicability.

Running the interview

- *Introduction* – introduce yourself, explain the goals of the interview, reassure about the ethical issues, ask to record, present any informed consent form.
- *Warm-up* – make first questions easy and non-threatening.
- *Main body* – present questions in a logical order
- *A cool-off period* – include a few easy questions to defuse tension at the end
- *Closure* – thank interviewee, signal the end, e.g, switch recorder off.

Questionnaires

- Good for background information, general principles and reasons behind behavior.
- Generally used when the issues you want to address are well defined.
- Faster to carry out than observation techniques.
- Can be administered to large populations
- Paper, email and the web used for dissemination
- Sampling can be a problem when the size of a population is unknown as is common online

Observation

- Researcher observes and records the person carrying the tasks
- Helps in understanding users' context, tasks and goals
- Time consuming both to conduct and analyze
- Direct observation in the field
  - Real goals and context can be used
  - Ethnography
- Direct observation in controlled environments
  - Think aloud
- Indirect observation: tracking users' activities
  - Diaries
  - Interaction logging

Identify academics' literature sensemaking needs

"…I think I would go for **ideas**… what it means actually is **not the papers but the ideas**"

"I always need to know the **second and third authors** …"

"I also look **at people** who have cited the paper"

"I suppose when you say influential I consider it to be **influential to my own ideas**"

"I think it helps if something is from a **reputable journal**"

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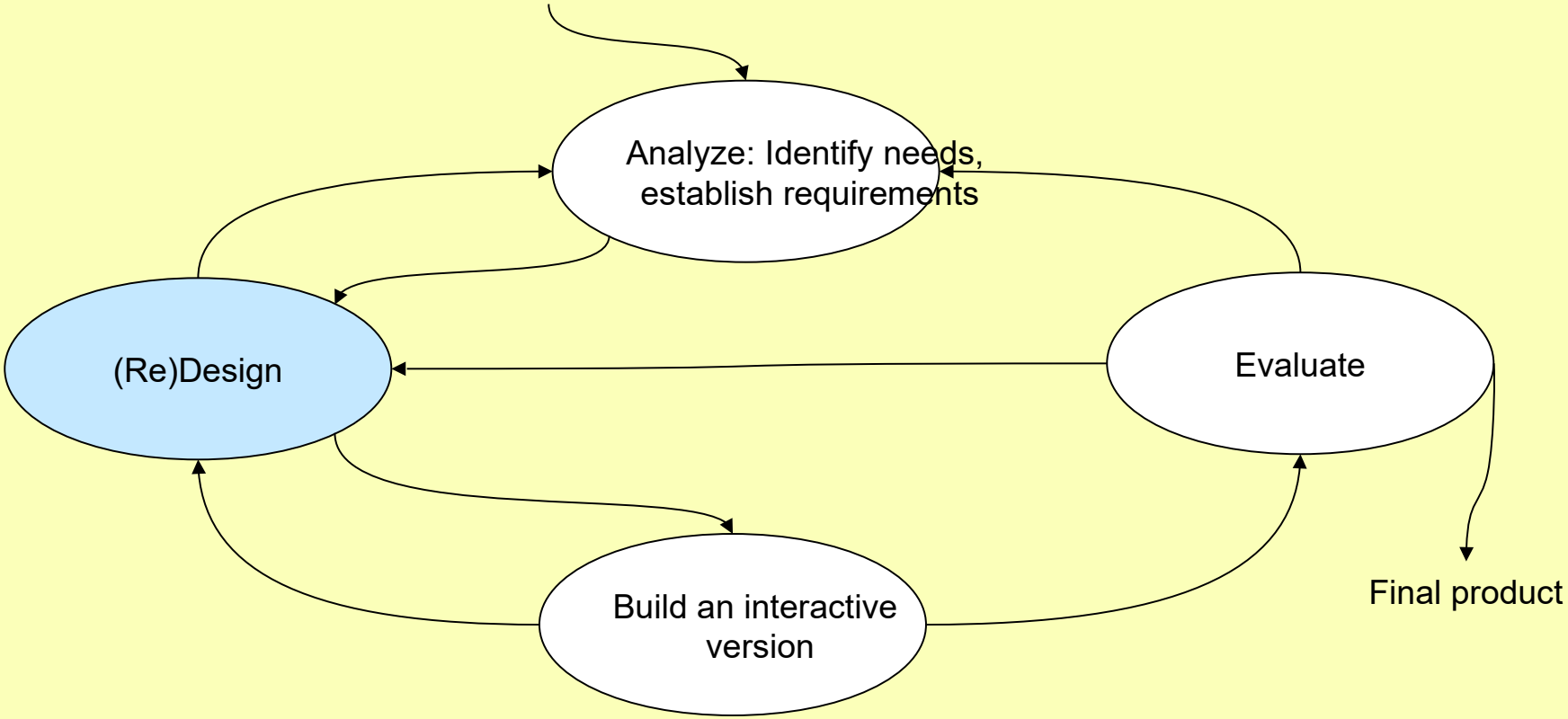


Iterative Design

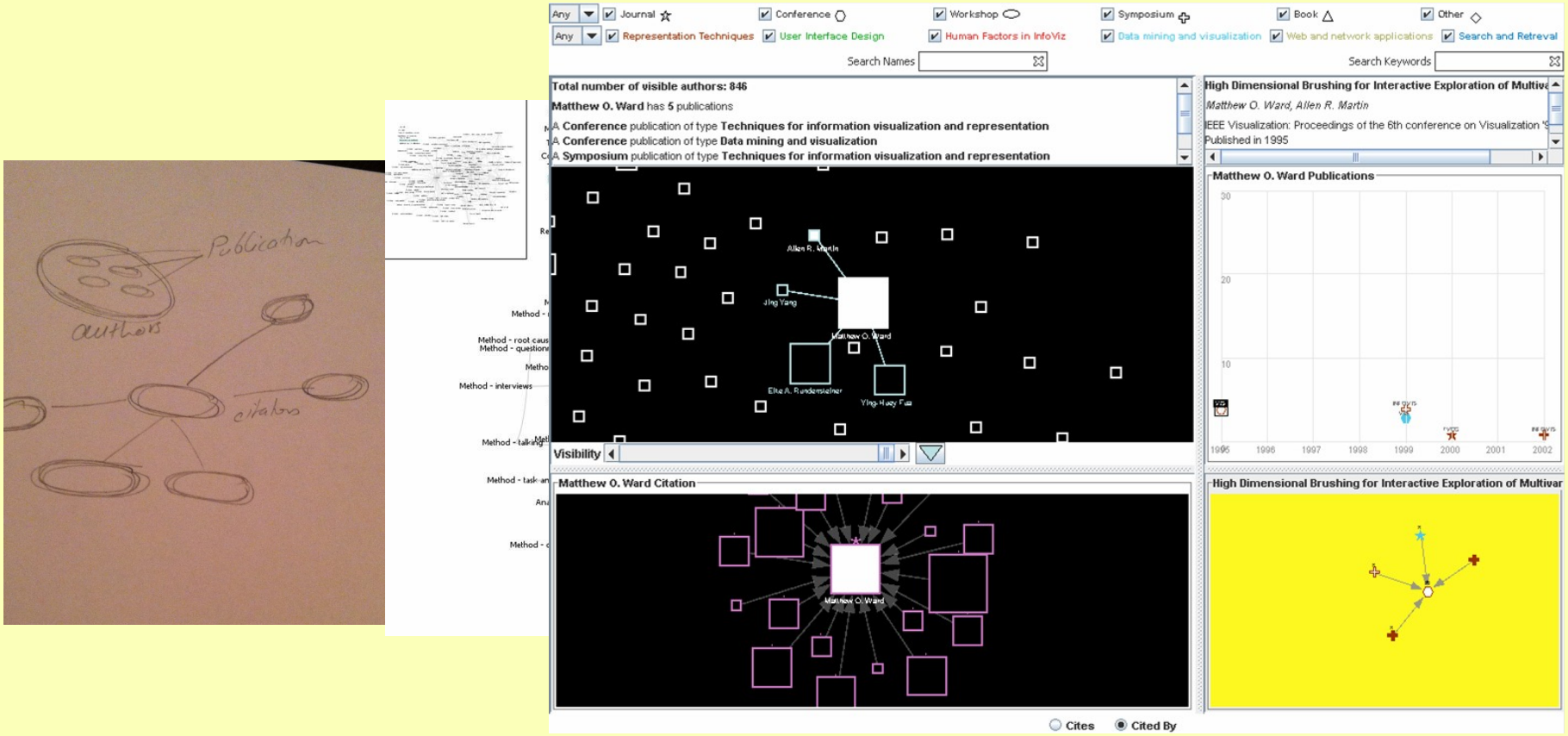
- Iterative design (through prototyping and evaluation) is necessary because of lack of adequate theory to inform design - can't reliably predict what will be a good design

- "a purposeful design process which tries to overcome the inherent problems of incomplete requirements specification by cycling through several designs, incrementally improving upon the final product with each pass" (Dix et al, 1998)

What is involved in design?

- A problem solving activity
  - Informed by intended use, target domain, materials, cost and feasibility
- A decision-making activity to balance tradeoffs
- A creative activity

Designing the academic literature information visualization tool



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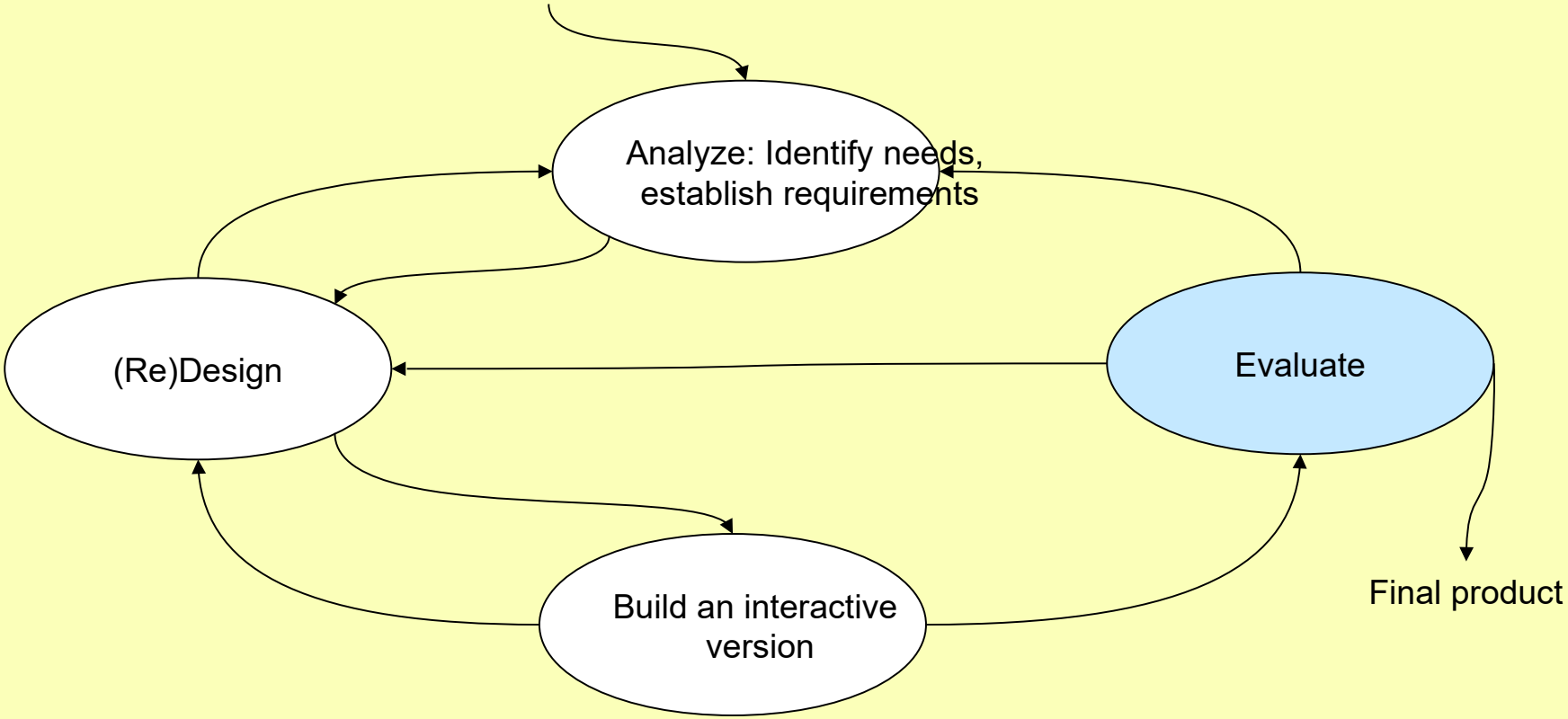
Interaction Design Model



Why, what, where and when to evaluate

- Iterative design & evaluation is a continuous process that examines:
  - Why: to check that users can use the product and that they like it.
  - What: a conceptual model, early prototypes of a new system and later, more complete prototypes.
  - Where: in natural and laboratory settings.
  - When: throughout design; finished products can be evaluated to collect information to inform new products.

- Designers need to check that they understand users' requirements.

What do you consider the features that make a well designed system?

- Efficiency
- Effectiveness
- [ISO9241 also lists Satisfaction]
- Easy *not* to make errors with it
- Easy to learn
- Easy to use
- Entertaining, engaging or exciting
- …Etc.

These might all be aspects of usability evaluation

- Any particular approach to evaluation will consider some aspects of design and the user's experience, and overlook others.
- The challenge is to choose an appropriate technique to evaluate what's of interest.
- You always need to recognize the limitations as well as the strengths of the techniques you use.

A taxonomy of approaches to evaluation

- Formative or summative
  - To in**form** further design or **summ**arise properties
- With or without the user(s)
  - Empirical or analytical
- With or without the computer
  - Running system or early prototype
- With or without the situation
  - Situated or laboratory studies

Heuristic evaluation

- Developed in the late 1980s based on experience (not theory)
- A heuristic is a “rule of thumb
- A set of heuristics provides a structure for evaluating a system – like a checklist
- When evaluating a system, you need to work systematically through the system
  - E.g. all pages on a web site
  - Or all pages needed to complete a typical task

Nielsen's Heuristics (general version)

- Visibility of system status
- Match between system and real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognise, diagnose and recover from errors
- Help and documentation

Commentary on Heuristic Evaluation

- Quick, cheap, (superficially) easy.
- Common wisdom is that you need several (5?) evaluators to catch most (~70%) of the problems.
- Focuses on interface problems, not deep issues.
- Some versions require the analyst to assign a severity rating to all problems found.

Introducing users to the system

- Most common technique is think-aloud.
- Need to consider both how to facilitate the think-aloud
  - Setting people at ease
  - Ensuring that they understand that it is the system that is being assessed, not them
- …and how to test the system
  - E.g. what tasks to give people

Think-aloud protocols

- *Usually* pre-define tasks for users (if in lab)
  - *More common to let users define their own tasks if done in naturalistic setting*
- Instruct users on what to talk about while working
- Think-aloud may interfere with task progress, so it should be used with care

Think-aloud practice

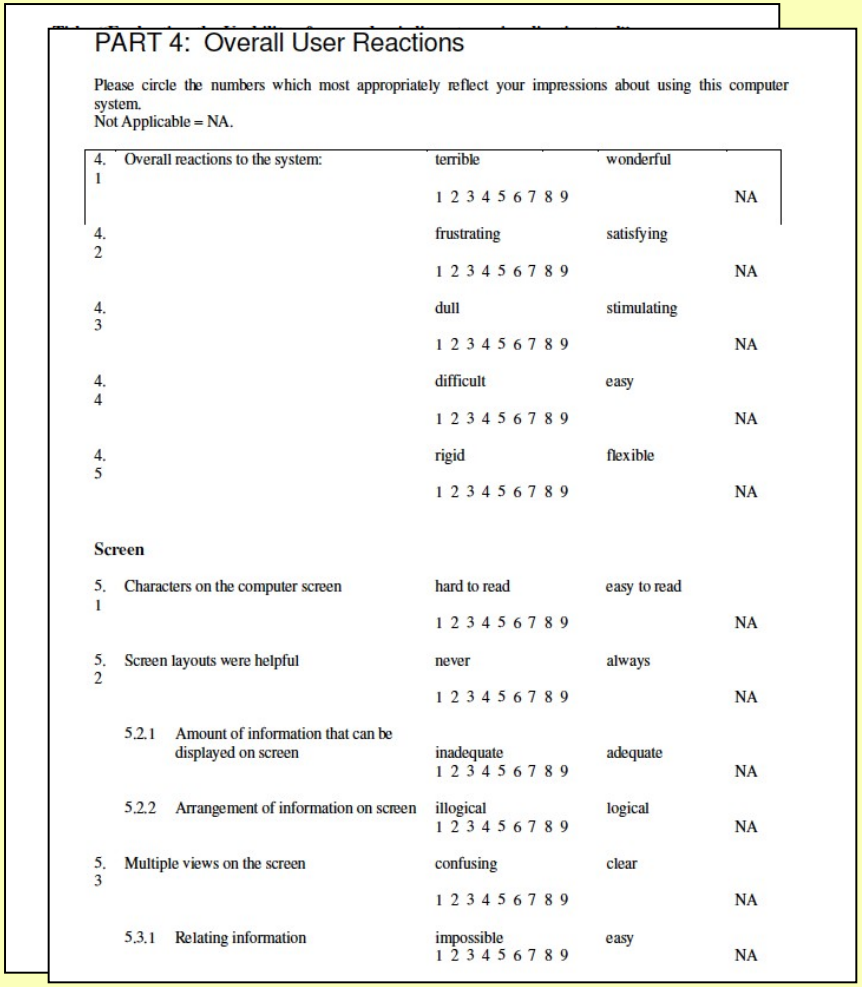
- Recording may include:
  - Screen capture & user action logging
  - Audio of speech
  - Video of screen, face, hands (with audio)
- Transcribing (for audio / video) may be complete or selective
- Analysis generally involves noting particular event types – e.g. errors, uncertainties, design suggestions

Commentary on think aloud

- It's really important to define effective tasks that will give useful data
- Think aloud in the laboratory will say a lot about basic usability but little about use in context

Evaluating the academic literature information visualization tool

- Task-based evaluation
  - Training
  - Give a set of tasks
  - Questionnaire
  - Interviews
- Redesign
- Experiential evaluation
  - Training
  - High-level task
  - Observation
  - Interviews



PART 4: Overall User Reactions

Please circle the numbers which most appropriately reflect your impressions about using this computer system.
Not Applicable = NA.

4.1	Overall reactions to the system:	terrible 1 2 3 4 5 6 7 8 9	wonderful NA
4.2		frustrating 1 2 3 4 5 6 7 8 9	satisfying NA
4.3		dull 1 2 3 4 5 6 7 8 9	stimulating NA
4.4		difficult 1 2 3 4 5 6 7 8 9	easy NA
4.5		rigid 1 2 3 4 5 6 7 8 9	flexible NA
	Screen		
5.1	Characters on the computer screen	hard to read 1 2 3 4 5 6 7 8 9	easy to read NA
5.2	Screen layouts were helpful	never 1 2 3 4 5 6 7 8 9	always NA
	5.2.1 Amount of information that can be displayed on screen	inadequate 1 2 3 4 5 6 7 8 9	adequate NA
	5.2.2 Arrangement of information on screen	illogical 1 2 3 4 5 6 7 8 9	logical NA
5.3	Multiple views on the screen	confusing 1 2 3 4 5 6 7 8 9	clear NA
	5.3.1 Relating information	impossible 1 2 3 4 5 6 7 8 9	easy NA

The tool

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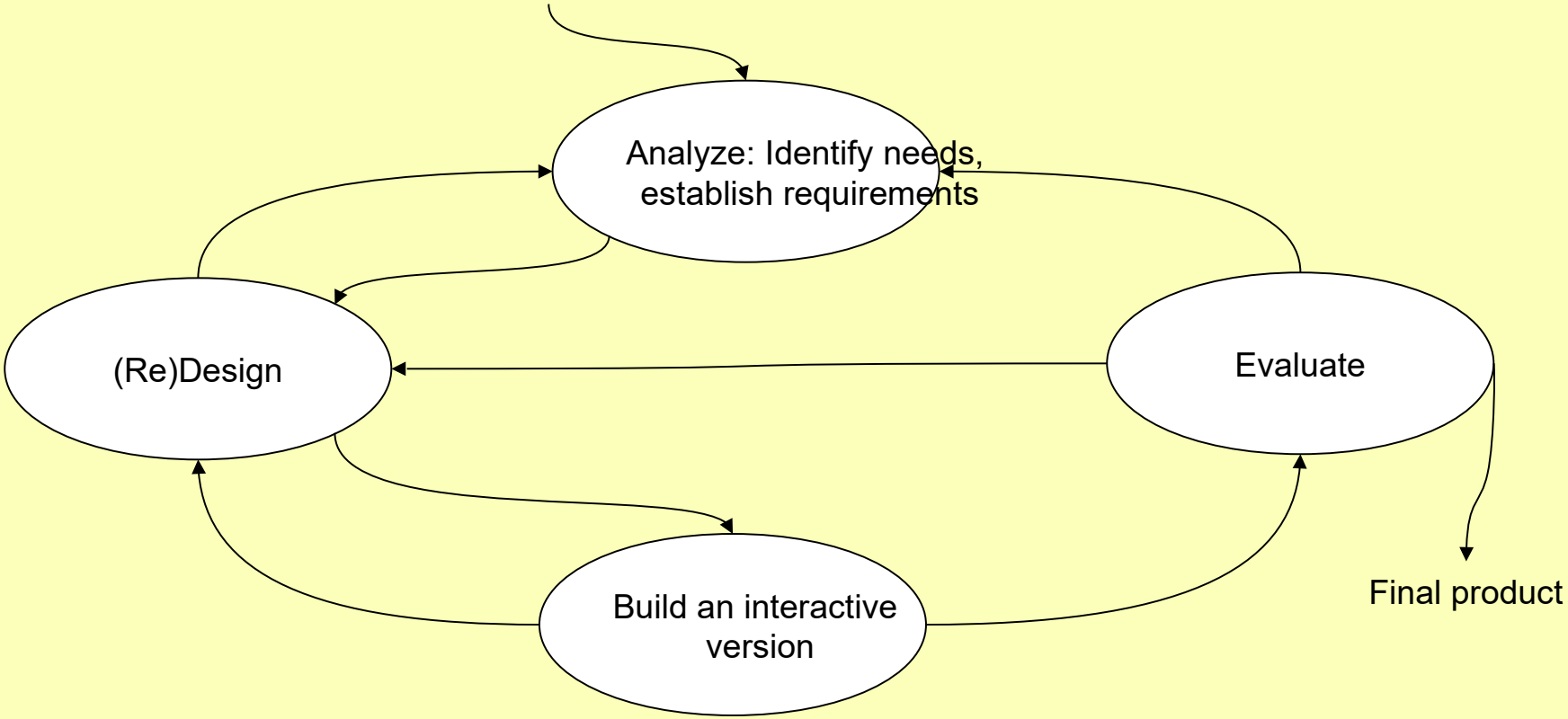

Summary

- Highlighted the importance of user-centred design
- Presented an overview of the steps involved and highlighted some of the associated methods
  - Requirements (interviews, questionnaires, observation)
  - Design
  - Evaluation (heuristic evaluation, think-aloud)
- It is a cyclic iterative process
- Listen to the users

References

- Sharp, H. Rogers, Y. & Preece, J. (2007) *Interaction Design*. 2nd Ed. Wiley, New York.

- Faisal, Craft, & Blandford, *"Building for Users not for Experts: Designing a Visualization of the Literature Domain,"* 11th International Conference Information Visualization (IV '07), pp. 707-712, Zurich, Switzerland, July, 2007.

Practical task

- Choose an electronic resource: MetaLib, ISI Web of Science, the ACM DL
- Break into groups of 3
  - One group member should be facilitator, one the ‘user’ and the third a note-taker.
  - Your goal is to evaluate the digital recourses
- Evaluation method
  - Ask the user to perform a set of tasks
  - Observe, take notes,…
  - Conduct a brief interview
- You should end up with:
  - A list of identified problems with the electronic resource to discuss (you’re not expected to know how to fix them!)
- Note down any lessons learned for conducting user tests.