

DESIGN RATIONALES AND MODELS



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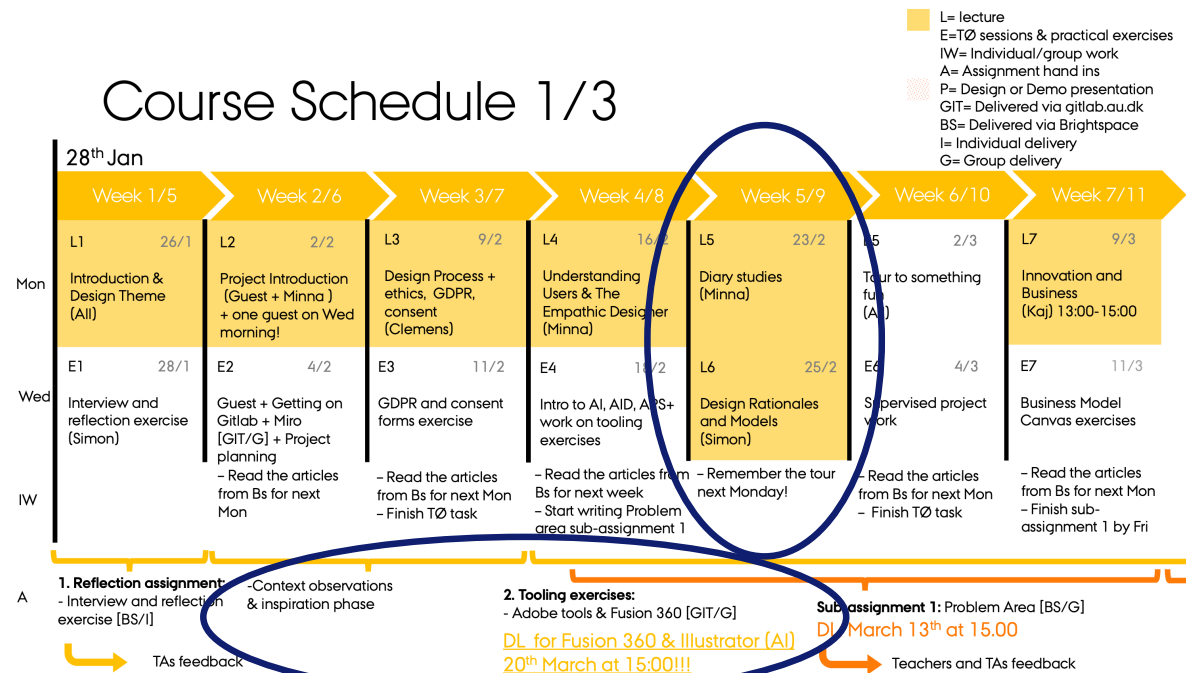
ITPDP - RATIONALE AND MODELS
25. FEBRUARY 2026

SIMON HOGGAN CHRISTENSEN
LAB COORDINATOR



WHERE ARE WE NOW?

Course Schedule 1/3



WHAT TO DO NOW (THIS WEEK)?

You should now do:

- Read literature for week 5 - and earlier weeks ;-)
- Your own inspirational work – edging closer to final Problem Area decision.
- Start planning empirical work. Requires narrowing down user group.
- Tooling exercises.



STATUS AND MESSAGES

Monday trip!

How is it going?

Context, theme, subtheme, user group?

Any observations done? Places visited?

Choosing your topic? Done? Close?

Any questions?



SUB-ASSIGNMENT 1

-
1. Motivation for choice of subtheme, context and user group.
 2. Initial positioning in relation to the theme (read some inspirational literature, introduce the field/theme and draw parallels + point out differences in approach)
 3. Tentative problem formulation (what will you actually do in this project, what are your tentative hypothesis around practice and use, and what could help/fix/better/enhance this?)
 4. Preliminary plan for your user research (who, when, what, how? Plans, contacts, emails, methods to try - this can be added as appendix if needed, but make sure to keep it concise).

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IN TODAY'S LECTURE

What is a design rationale?

Design Spaces

Contextual Design

Personas – representing users and roles

Working models



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WHAT ARE IMPORTANT ASPECTS OF A GOOD DESIGN PROCESS? (2 MINUTES)



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Result?

The users liked it?

The designer is proud of it?

Sticking to the budget?

Listening to the users?

Getting paid?

Getting promoted?

Getting recognition?

Teamwork?

Fun?

Cake every Friday?

Societal impact?

Many daily users?

A happy customer?

Spearheaded by a hotshot?

Spoken about in the media?

Using the newest technologies?

Being completely unique?

Involving the user every step?

Sales after launch?

Scalability?

Handover?

Celebrating when it's done?

Instagram Influencers loving it?

Trustpilot score?

Certifications?



WHAT IS THE MOST CRUCIAL ASPECT OF A GOOD DESIGN PROCESS?



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DOCUMENTATION!



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WHY?

Design processes are long and complex, and involves many variables and parties

You often do not nail it the first time

Iterations and Fluidity

Learning and revisitability



DESIGN RATIONALE

A survey paper of representation methods for Design Rationale

For this lecture we focus on understanding the concept (sect 1-3)



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A revised and condensed version of this report appears in the special issue of Human-Computer Interaction on design rationale, v.6(3-4), pp. 251-280

A Comparative Analysis of Design Rationale Representations

Jintae Lee and Kum-Yew Lai

*Center for Coordination Science
and MIT Artificial Intelligence Laboratory*

ABSTRACT

A few representations have been used for capturing design rationale. It is important to know in what ways they are adequate or limited so that we know how to improve them. In this paper, we develop a framework for evaluating design rationale representations based on a set of generic design tasks. We build the framework by progressively differentiating the elements of design rationale that, when made explicit, support an increasing number of the design tasks. With this framework, we evaluate the expressiveness of the existing representations. We also present a language, DRL, that we believe is the most expressive of the existing representations without being too complex for human users. We also discuss the limitations of DRL as open problems for further research.

1. INTRODUCTION

As the articles in this issue point out, an explicit representation of design rationale can bring

DESIGN RATIONALE (LEE AND LAI)

To document genealogy (tracing of lineage) of a design's final appearance and the decisions that lead to it

To link *issues* to formal design decisions (*example: global menu to reduce screen clutter*)

Document selection and de-selection *arguments*

- Supporting and counter arguments on issues for the design

May lead to generalizable patterns and reusable design-decision relations (Fischer 1991)

WHAT IS DESIGN RATIONALE?

Design rationale is write-down of arguments and decisions made during a design process, and the reasons for why those arguments were brought up, and the decisions were made. Primary goal is to support designers by providing a means to record, describe, justify and communicate the argumentation and reasoning behind the design process (MacLean 1991), including but not limited to:

- The reasons behind a design decision
- The justification for a design decision
- The other alternatives considered
- The trade-offs evaluated
- The argumentation that led to the decision (what if the argument was BS?)

WHAT IS DESIGN RATIONALE?

“Design rationale in the most general sense is an explanation of why an artifact is designed the way it is”

- LEE AND LAI, 1992



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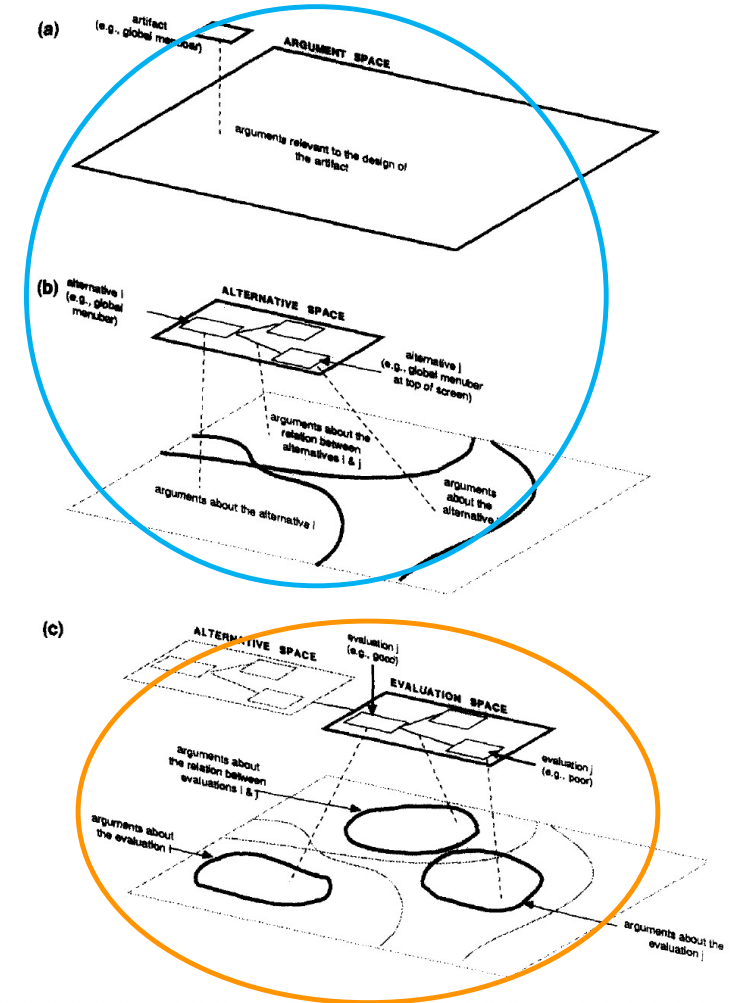


DESIGN SPACE

Design Space is a representation of alternative design options + analysis of pros/cons and relations.

From MacLean 1989:

*“The design space consists of a **decision space** (alternative options which might be appropriate), and an **evaluation space** (explicit reasons such as consistency and criteria for choosing from among the possible options).”*



DESIGN SPACE

Evaluation Space

Mapped differently in a lot of HCI literature...

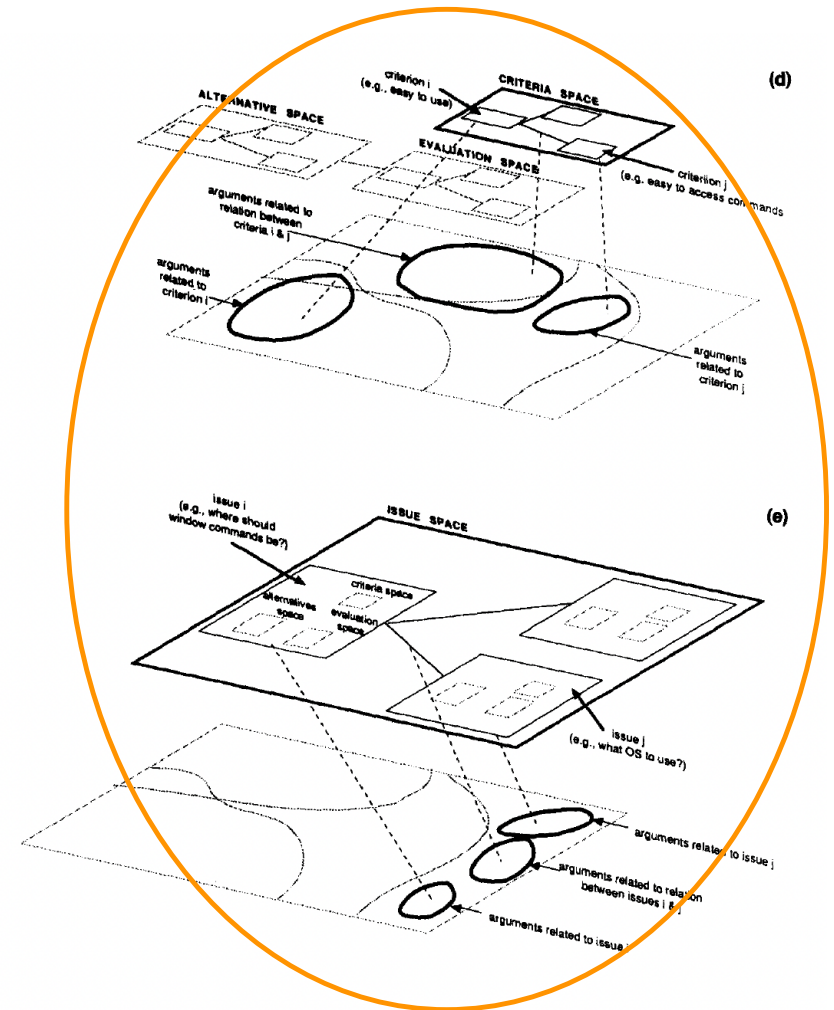
Issue (and Design Rationale) being the most impactful difference from Lee and Lai, adding potential issue handling to your argument space.

Design Rationale vs Design Space

Design Rationale describes the Design Space (MacLean).

Using for example the QOC model to represent Design Space options, generates Design Rationale.

Interesting possible exercise: Part of group specs decision space, another the beginning of evaluation space



DESIGN SPACE

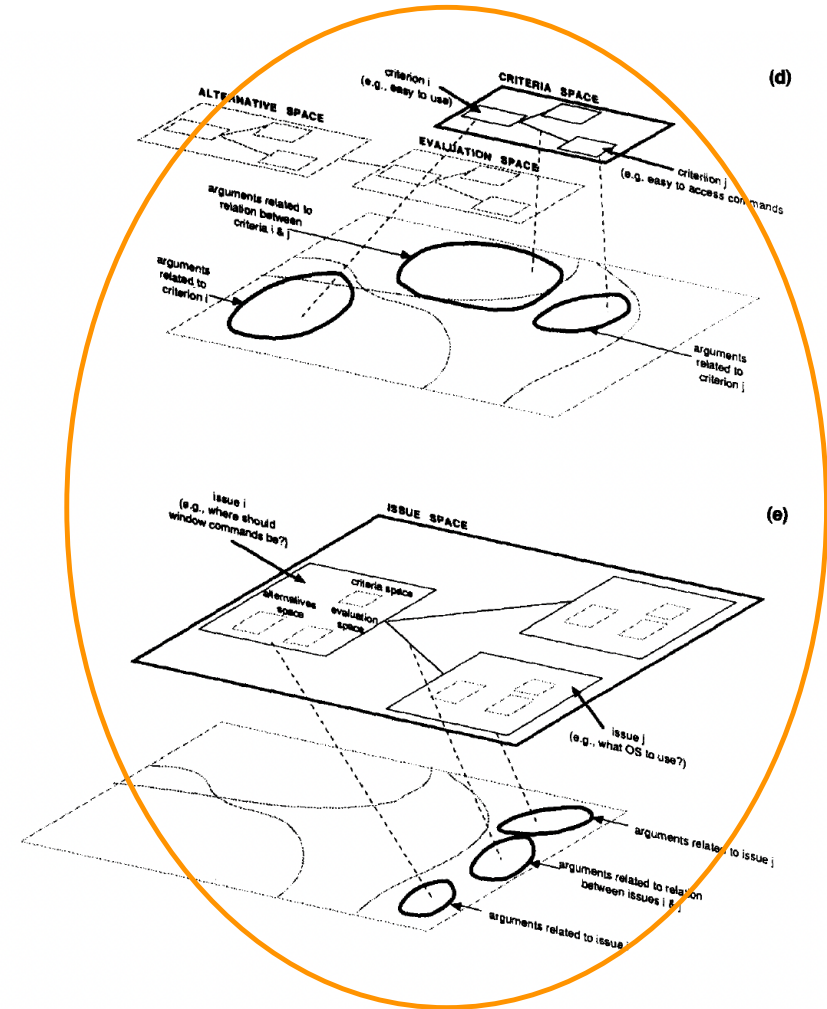
Long story short:

The map metaphor is a bit funky...

Think of products as clusters (buildings) on the map.

The Design Space is the entire map, linking (making roads) and including/excluding certain alternatives (neighbourhoods).

QOC model used extensively in this process, and sticking to just this might be simpler.



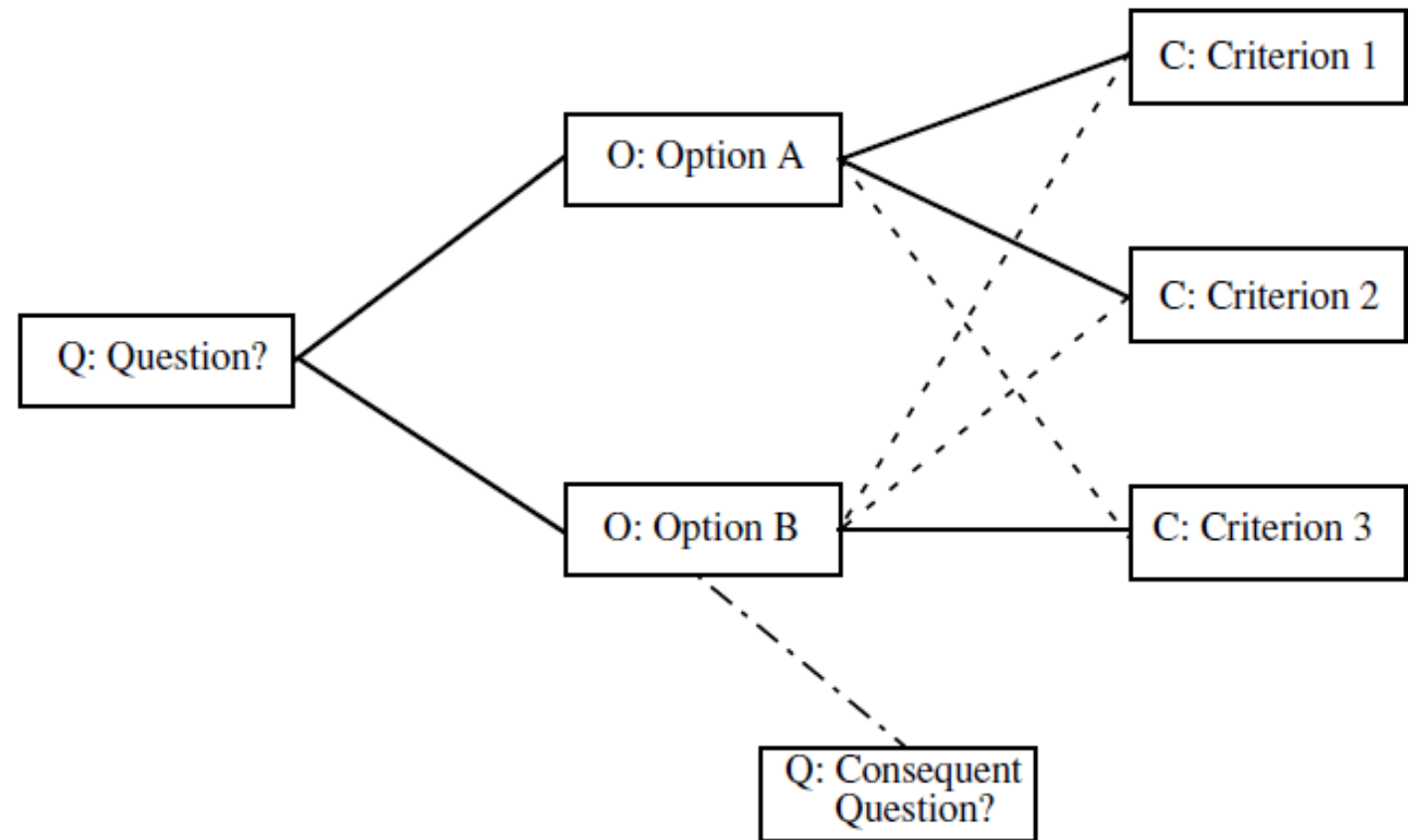
THE QOC MODEL

Developed by McLean at
Xerox PARC

A brilliant comparative tool

Helps map Design Space

Part of your Design Rationale



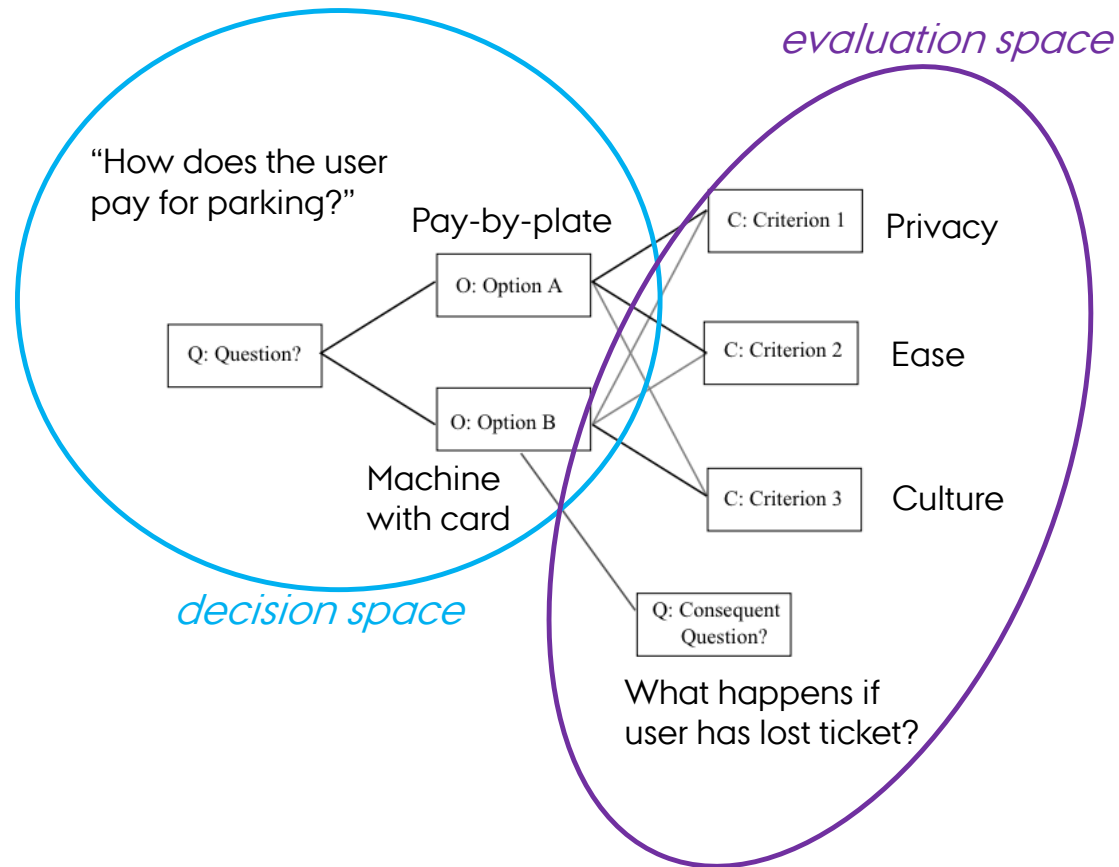
PARKING GATE: SAME CORE FUNCTIONALITY, SAME QUESTION – DIFFERENT DESIGNS



Pay-by-plate is a radical change within/of design space



DESIGN SPACE



DESIGN SPACE

Is useful for emplacing your design and the alternatives/related design
(for analysis, juxtaposition and distinctions)

Is useful for expanding horizons and taking different/novel interactions/systems into account.

It is a concrete way of making constraints visible and impactful in design

- For example through questions or criteria in QOC



THE ROLE OF A DESIGN RATIONALE

Support and capture the **design argumentation** during a design process

When iterations occur, designers can go back and avoid mistakes or decisions already tested and rejected

Argument for why the final design appear as it does and support for designing the next version of the product

- A formerly too expensive or too clunky solution has become feasible in the mean time, and the process can be started from better position

REPRESENTATIVE QUESTIONS

Made by Lee and Lai to provide a framework for assessing different representations

Since it's used to assess representations/models way of making Design Rationale;
Also a brilliant set of questions to help your design rationale and status meets

Can be used as a part of sit-down meetings to organize your team's thoughts

Not all representations and models answers all questions

REPRESENTATIVE QUESTION SET EXAMPLE

Italic: Maybe for status meets? Orange: Maybe for Ideation and Concept Dev.?

What are our user's biggest issues?

What are our biggest issues?

What is the status of the current design?

What did we discuss last week and what do we need to do today/this week?

What are alternative designs and what are their pros and cons?

What if we do not consider power/portability/user interface/GPU muscle/CPU muscle?

Which issues are inherently linked?

What would the consequence of removing this aspect/part be?

Which unresolved issues do we still have?

How do past designs or other fields deal with a similar issue?

WHY IN ITPDP?

Tools, representations, models to help keep track of design documentation

Help structure solved problems and the user-centric elements of your design

Graphical representations to use for the report, that shows field knowledge if used correctly.

Future work for your report

Preparation for your exam

Avoid having to say “... I don't know we why did that, actually...” 😊

SUMMARY

Make sure to document your design issues, positions, arguments with decision.
Use it for your internal discussions. And for feedback. And for the report. And for the demo.

When a reviewer ask "why didn't you put that button on the top instead of here?" Your design rationale will help you provide the answer.

- the answer may be feasibility of construction, or the occurrence of accidental push during an evaluation or.
- If you don't have an answer, then the design may appear coincidental and not well argued...

CONTEXTUAL DESIGN AND CONTEXTUAL INQUIRY



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CONTEXTUAL DESIGN

The Encyclopedia of Human-Computer Interaction, 2nd Ed.

8. Contextual Design

BY KAREN HOLTZBLATT AND HUGH R. BEYER

Contextual Design is a structured, well-defined user-centered design process that provides methods to collect data about users in the field, interpret and consolidate that data in a structured way, use the data to create and prototype product and service concepts, and iteratively **test** and refine those concepts with users. This is the core of the **Contextual Design** philosophy - understand users in order to find out their fundamental intents, desires, and drivers. But these are invisible to the users - so the only way to glean them is to go out in the field and talk with people

Although based on theories from several disciplines, including anthropology, psychology and design, Contextual Design was designed for practical application with commercial design teams.

Since its original development, Contextual Design has been applied in a variety of industries and also used as a vehicle to teach user-centered **design principles** in engineering and design programs.

Contextual Design has primarily been used for the design of computer information and IT systems, including hardware (Curtis et al 1999) and software (Rockwell 1999). Parts of Contextual Design have been adapted for use as a field **usability** evaluation method (McDonald et al 2006). Contextual Design has also been applied to the design of digital



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

—
User-centered design process

Focus on collecting and interpreting data of users in the field

Focus on creation of prototypes and systems as end goal

“...Understand users in order to find out their fundamental intents, desires, and drivers. But these are invisible to the users - so the only way to glean this is to go out in the field and talk with people.”



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

Step-wise method and principle-based

- Especially helpful for people who will not specialize in field study
- Fits into a software development cycle; products of field study work made visible

Guides analyst on how to understand & document what he/she sees

Not really users as co-designers



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

Principle: System design must support and extend users' work practice

Behavior, attitudes, goals, and intents of users; all part of work practice.

Work practice is part of the larger context – so is technology.

Any and all system/tech change will impact work practice.



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

Principle: People are experts at what they do – but are unable to articulate their own work practice

Field work = crucial to pick up on these practices/tendencies/events.

Tacit knowledge.

Multiple methods can help with this – participate in natural context.



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

Principle: Good design requires partnership and participation with the users

Designers = experts in design.

Users = experts in work practice.

Partnership = proper design focused on context and practice.

Step in and do your part – ask questions, offer interpretations!



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

Principle: Good design is systemic

Good design considers the system as a whole, and it's impact on it.
Methods can support generating overview of possible outcomes and implications.

Treat issues and problems to be solved as a part of the whole.



CONTEXTUAL DESIGN (BEYER & HOLTZBLATT)

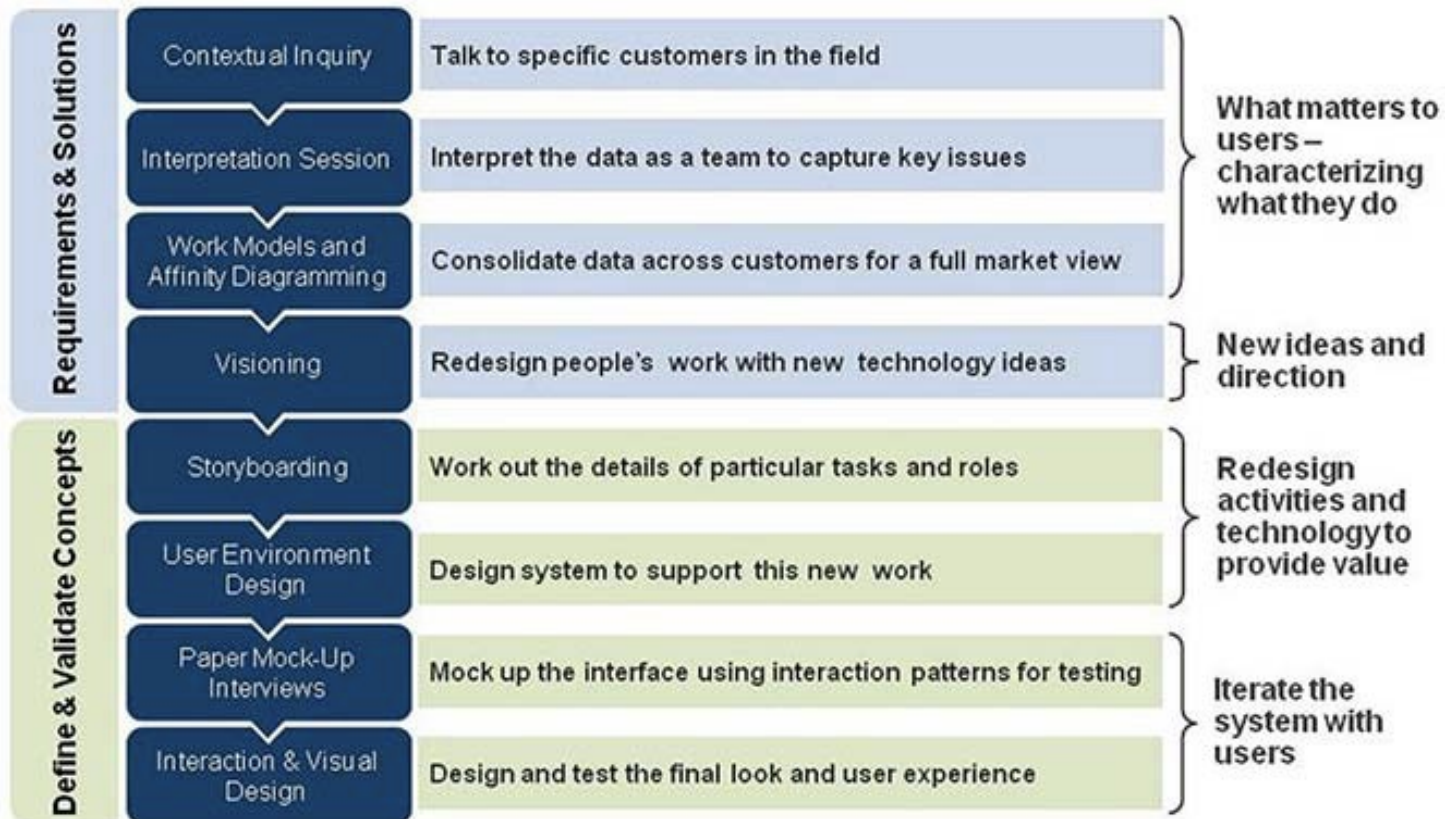
Principle: Design depends on explicit representations

Use drawings, sketches, prototypes, mock-ups, models, videos, animations etc.

Visual representation is key and makes design thoughts sharable.



CONTEXTUAL DESIGN PROCESS



CONTEXTUAL INQUIRY - FIELD STUDIES

Often two elements: [Direct Observation](#) and [Interviews \(+ Contextual Interviews \(TBA\)\)](#)

Field studies are useful to understand:

- The use context
- Challenges and potential value added by a new design
- People and their roles (end-user, indirect user, manager)
- Features of the place/space
- Understand the activity that you want to support
- Communications and patterns of interactions
- Local culture



WHAT ARE FIELD STUDIES?

It is not simply “hanging out” with users

Field studies are (and requires the analysts to be):

- Systematic and careful
- Without assumptions (as much as possible!)
- Thoughtful
- Respectful
- Productive!!



WHY FIELD STUDIES?

“Ground” designs in real activity, not assumptions

Do NOT falsify empirical data...

Helps understand “situated activity” not “rationalized accounts”

- See exceptions, exception handling, mechanics
- User behavior needs to be understood at a low-enough level to design for it



AN EXAMPLE FROM DEVELOPMENT OF “FINDING NEMO”



“Finding Nemo”-movie animators had to “ground themselves” by practicing scuba diving to become familiar with under water phenomena in order to be able to draw and animate them.



BASIC RULES & PRINCIPLES

Be an apprentice:

- Be polite -> the user is the expert in their domain
- Be humble -> assume you don't understand something

Be open-minded

- Expect to see a lot of things you didn't think you would

Check interpretations;

- Reflect back to user; debriefing

Carefully frame questions

- Do not ask leading questions
- Do not ask Yes and No questions
- Focus on getting concrete data

Don't be too narrow... Don't be too wide

- Begin by observing more WIDELY than defined problem(!)
- REDEFINE boundaries of problem
- Work within that new "unit of analysis"



INTERVIEW TECHNIQUES

In interviews – be concrete and relate to daily work examples

- Ask about examples from yesterday or last week
- **Critical Incident Technique**, Wendy Mackay (expanded upon next slide)

Page 7: <https://www.lri.fr/~mackay/VideoForDesign/print/print.pdf>

Exceptions are as important as the routine situation

- Listen to user anecdotes and workarounds
- Exceptions may reveal important requirements and conditions – or just common practice

Be aware of potential intention conflicts (culture/hierarchy)

- Different user groups (or levels) do not necessarily share the same experience/intention

EXAMPLES FOR CRITICAL INCIDENT TECHNIQUE

Ask for a concrete, critical incident

- Positive: Can you remember the last time when you were really happy with the UI?
- Negative: What happened the last time when you very disappointed by the system?

Let the user go through the entire scenario

- Positive: Identify useful features and design rationales
- Negative: Identify break down scenarios

Ask for as many details as possible

Ask why this situation was in particular memorable

Do not ask suggestive or general questions

- Why is this UI so good?
- E.g., Do you like the UI?



RECORDING YOUR DATA

Notes

Pictures (get consent, adhere to GDPR regulations)

Video (get consent, adhere to GDPR regulations)

Sound (get consent, adhere to GDPR regulations)

Sketches and drawings

Scenarios (post hoc description)

Notes on roles/personas



FIELD STUDIES - PREPARATION

You have already done some observations (right?) – but mainly inspirational!

For future field work:

Secure permission to be at the site

Plan ahead, don't expect to get into calendars quickly – it's good to have a foot in the door somehow

You want to observe the natural workflow of your users:

- Ask that users not “clean up” their desks or desktops, calendars, and so on because you will be there. Politely explain that you want to see things as they normally occur

Prepare and test all data recording equipment

On arrival, be professional, courteous and patient. Remember that you are a guest. Some might see it as additional workload.

CONTEXTUAL INTERVIEWS

—
Not your typical Q&A interview

- A mix of observation & questions

Who to interview: those doing the work, not just management

2-3 hours of observing a user work, including “shadowing” them around the workplace

- Observe the natural flow of activity and occasionally interrupt to explain and clarify what they are doing.
- You can ask users to “think aloud” to understand their thought process.
- Your questions are guided by what you see.

Recording: Notetaking, audio record, and perhaps video-record

Save the last 15 minutes with the user to review what you learned

HINTS AND ADVICE

—
Good idea to combine techniques

- **Observation** and **Interviewing** have different strengths and weaknesses
- Combination ensure quality of investigation

From pure analysis to design oriented activities

- Scenario and mock-up design may reveal useful knowledge about current state of affairs

PERSONAS



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PERSONA

Persona is personified but generalistic.

Not the same as an archetype (abstract) or a person (individual).

A persona description gives details about the user group(s) you are designing your interactive system for

It highlights the group specific requirements and context associated with persona.

More on that in lecture: Sketching User Experiences (Minna)

<https://www.interaction-design.org/literature/article/four-different-perspectives-on-user-personas>



PERSONA

Sub-assignment 2

but they must be supplemented with a textual description so that the reader can clearly see which parts of your fieldwork are being worked on and how the model is to be interpreted and used going forward.

Scenarios

You will document selected episodes from your investigations in user scenarios that capture your observations. They can consist of sketches supplemented with explanatory text. They should preferably be written in essay form so that they capture the situation in more detail than, for example, work and flow models. You can also use personas in your scenario description.

Miscellaneous

PERSONAS EXAMPLES – A TRAVEL APP



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PERSONAS FOR A TRAVEL APP...

Local Travellers

Daily Commuter



Goal

- Offers for Standard ticket on Reisekort/Flex Card
- Wi-Fi Café Facilities on board
- Rail work Intimation

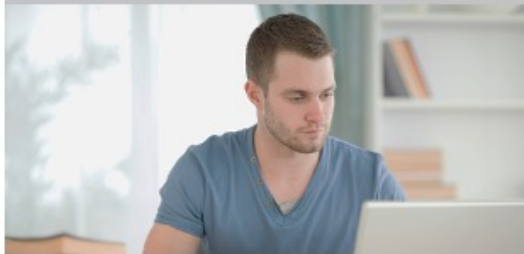
Business Traveller



Goal

- Organize & Schedules for the day
- Best Mode/Routes of travel to reach
- Avoid traffics

Student



Goal

- Best and Faster Route to destination
- Change over and Connectivity details

Senior Citizen



Goal

- Travelling to Aarhus to meet Family members
- Best offer for the commute
- Elderly Assistance facilities on-board

Foreign Travellers

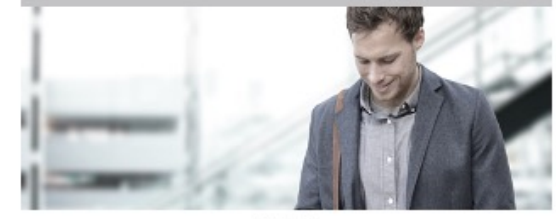
Tourist



Goal

- Explore Copenhagen and near by places
- Makes sure to visit all Denmark places to know more about culture

Business Traveller



Goal

- Reach Meeting location as planned
- Faster Service
- Wi-Fi Access to support on the pending tasks

PERSONA: REGULAR COMMUTER



“Organize my day based on Business meeting schedules”

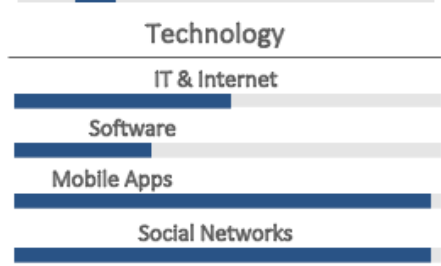
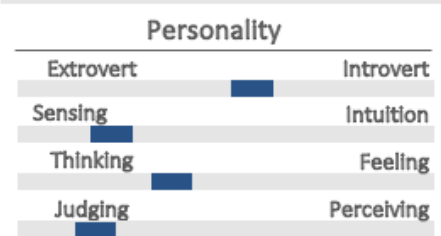
Age: 35 years old
 Language: English, Danish
 Location: Copenhagen, Denmark

Married, Tech Savvy,
 Music lover

Interest



Bio
 Resides in Copenhagen, Denmark. Married and has 3 kids. She is a Golf freak and likes to Cycle on weekends, loves to socializing.



- Goals**
- Organize & Schedules for the day
 - Best Mode/Routes of travel to reach
 - Avoid traffics

- Motivations**
- Showing Routes
 - Well organized mode of travelling

- Looking for**
- Information on Unexpected change in schedule
 - Alert or Notification on pass renewal
 - Weather information

What - does he care about / wants to know	What he wants to do
<ul style="list-style-type: none"> Schedule change notification Renewal reminder Weather forecast for daily travel 	<ul style="list-style-type: none"> Avoid traffic & choose the best route Short/Best time to reach

PERSONA: TOURIST



“I need better mobile Application to plan to Explore Denmark”

Age: 30 years old

Language: English

Location: New York, United States

Enthusiastic, Caring for details,
Likes to Socialize / Travelling

Interest



Travel



Photography

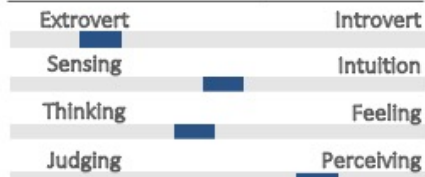


Food

Bio

Likes to explore Denmark, She is enthusiastic and loves socializing & networking with different cultural people. She lives in New York & Passionate about photography.

Personality



Technology

IT & Internet

Softwar

Low

Mobile

High

Apps

High

Social Networks

What - does he care about / wants to know

- Manage daily travel using DSB mobile app
- Finding best routes & offers
- Explore public transportation connections to reach destination
- Want to know current weather at the destination

Goals

- Explore Copenhagen and near by place
- Makes sure to visit all Denmark places to know more about culture
- Use public transport for explore

Motivations

- Use DSB Application as Virtual Travel Assistance
- Stay ahead on the latest offers on DSB

Looking For

- Option to set destination preferences
- Details about the destinations

What he wants to do

- Use app in the selected phone language
- Buy tickets for destination
- Best time
- Fare to destination

USE OF PERSONAS

Analyze and reveal requirements for system/app design from different perspectives (use scenarios, drivers, intent)

Integrate in scenario descriptions (later assignments)

Use persona description for your new design (or styling)

Utilize for prototyping and evaluation planning

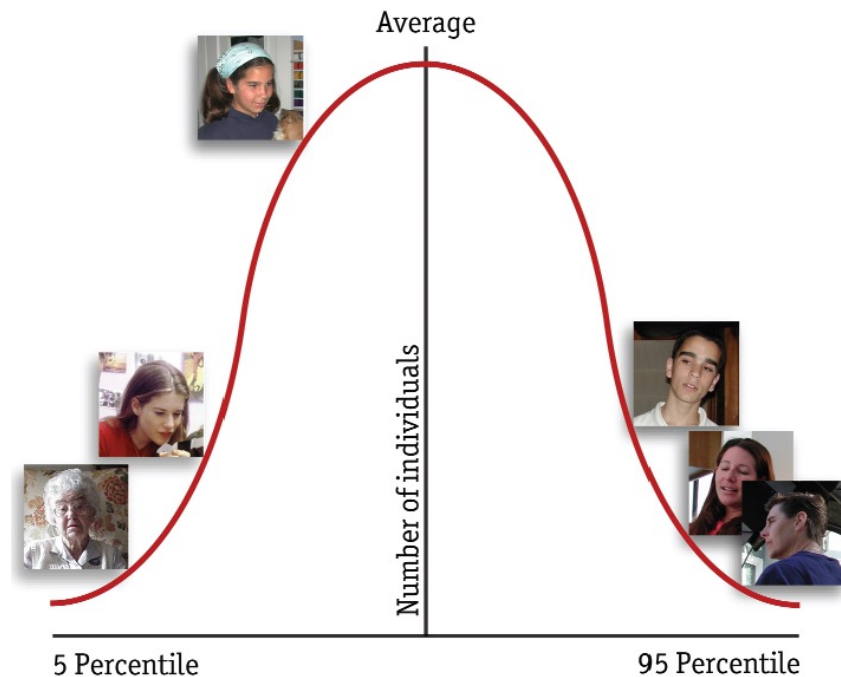


REMEMBER THE NOT-AVERAGE

—
"Extreme characters" (also used for 'Ideation' later in the course)

Extremes in travel app

- The passionate business person and car-driver that almost never use public transportation
- Elderly who do not have knowledge of smartphones



CONTEXTUAL INQUIRY – PROCESSING RESULTS



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GOT DATA? NOW WHAT?

—
Create “models” that capture the data (order different from literature)

1. Physical Model:

a map of the site with details about equipment location

2. Flow Model:

Depicts work-flow between users/personas

3. Sequence Model:

Depicts work tasks

4. Artifact Model:

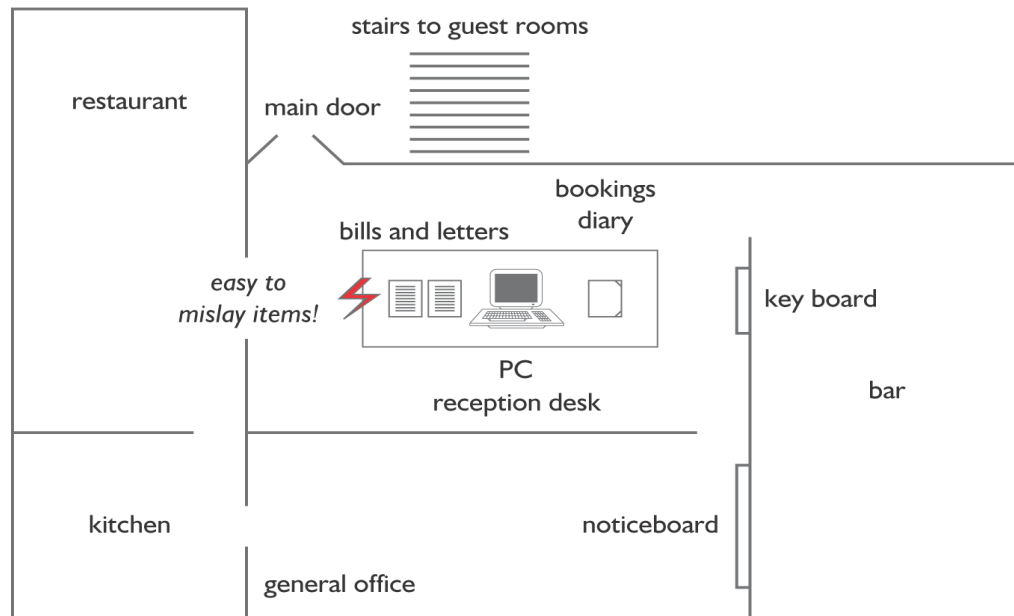
Describes the tools that people use to complete tasks

5. Cultural Model:

Captures bigger context of cultural factors that influence how things are done



PHYSICAL MODEL – HOTEL CASE



Map of site with important features

Include digital photographs to elaborate

Include traffic and potential “incident” areas or bottle-necks.

FLOW MODEL

Represents how work is divided & coordinated

Flow models for different types of workers

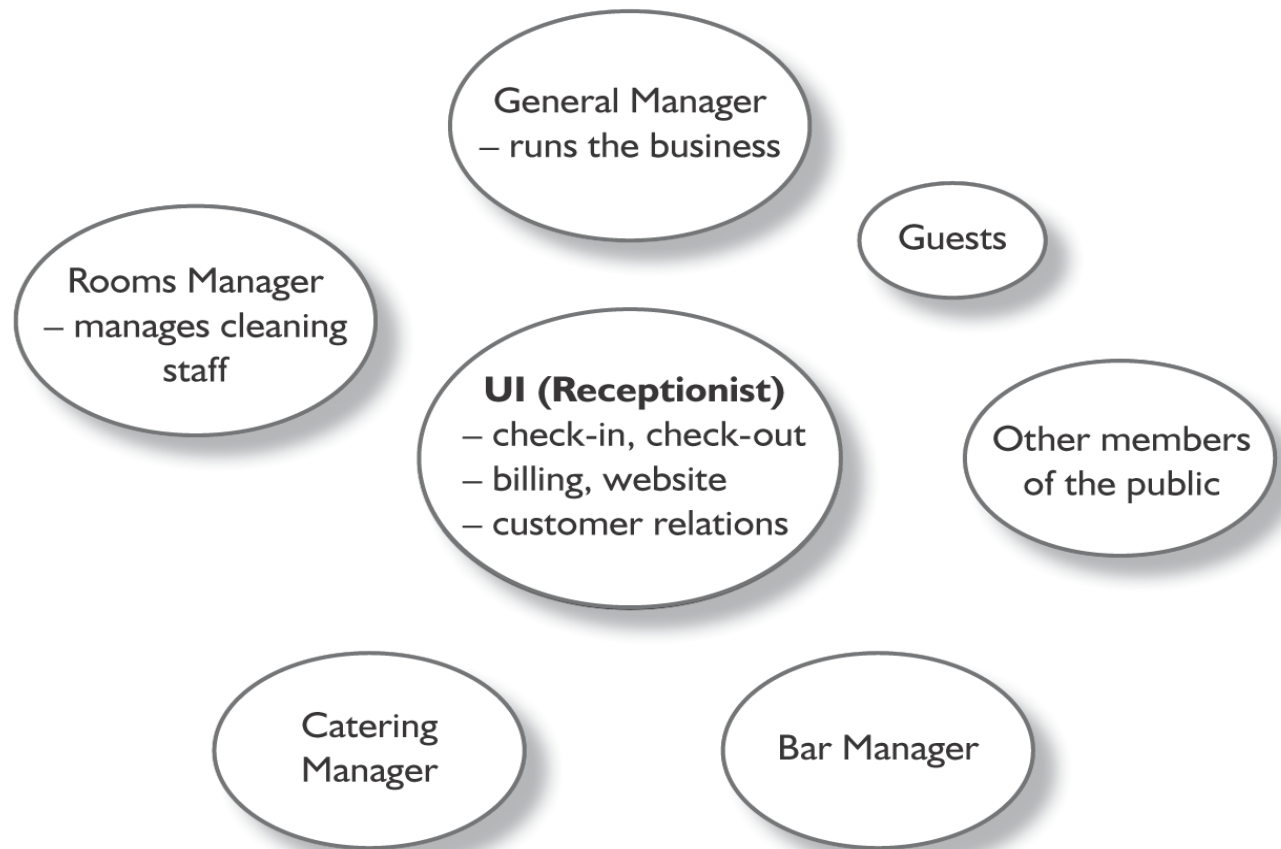
- 1. Diagram who is involved in the work
- 2. Show communication flows between people, and how those communications are achieved (through invoices, face-to-face, messages)
- 3. Mark breakdowns in communication & coordination



FLOW MODEL – HOTEL CASE – STEP 1: ROLES



- Define Personas (+tasks) in circles



FLOW MODEL

- STEP 2: FLOW

- Define Personas in circles
- Define Artifacts in squares
- Define Relational Actions with arrows



SEQUENCE MODEL

Represents work tasks by point of view (POV), shown as a sequence of steps of actions

Diagram:

1. Intent/Purpose of the action sequence
2. Trigger that causes the action to start
3. The steps that achieve the intent
4. Breakdowns/problems in getting the task done



SEQUENCE MODEL

EXAMPLE - HOTEL BOOKING

Diagram:

1. Intent/Purpose of the action sequence
2. Trigger that causes the action to start
3. The steps that achieve the intent
4. Breakdowns/problems in getting the task done

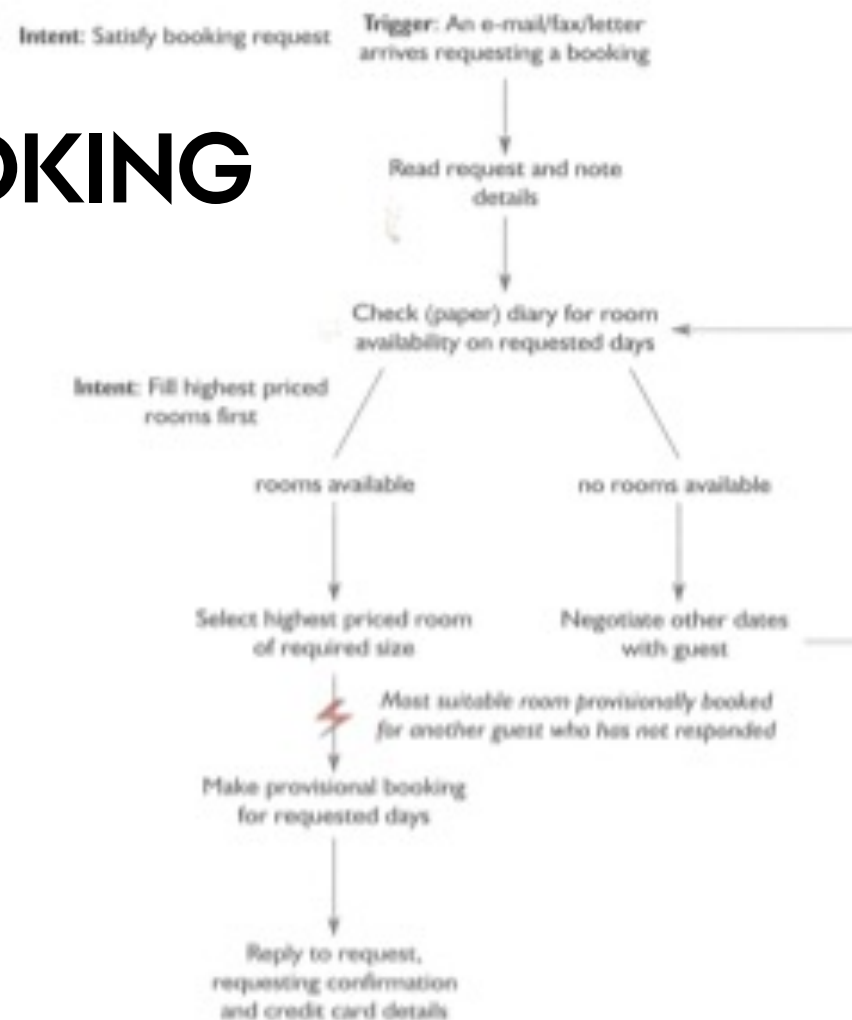


FIGURE 18-5 A branched sequence model with a loop



ARTIFACT MODEL

Artifacts are the things people use in to complete a tasks (documents, maps, notes, the web, spatial layout of items when planning something)

- 1. Collect artifacts, pictures of artifacts
- 2. Check with customers that you understand what they are for
- 3. Annotate these to identify in detail their functions



ARTIFACT EXAMPLE – HOTEL DIARY

Diary of guests due to check-in

Page from receptionist diary

Guest details

Guest ID number

Receptionist error

Booking cancelled

Made for Swan Hotel (logo)

Swan Hotel

Guest No.	Guest name	Address	Telephone No.	No. of guest	No. of nights	No. of rooms	Room number(s)	Cancel	Signature
249	Jack Mackay	Forty Bond	0131 332 4762	7	3	1	87		<i>[Signature]</i>
250	John Prescott	Windsor London	0101 642 7651	1	5	1	3	Cancelled	<i>[Signature]</i>
251	Jan Fraser	14 West Glasgow	0141 566 7813	5	2	4	1,2,3,5,6		<i>[Signature]</i>
252	James Sutherland	Franklin St Edinburgh	0131 605 4268	2	7	1	27		<i>[Signature]</i>

Special Guest need to inform the Rooms management + restaurant management

Filled in by handwriting

Tabular layout

Breakdown

Memo (Post-it)

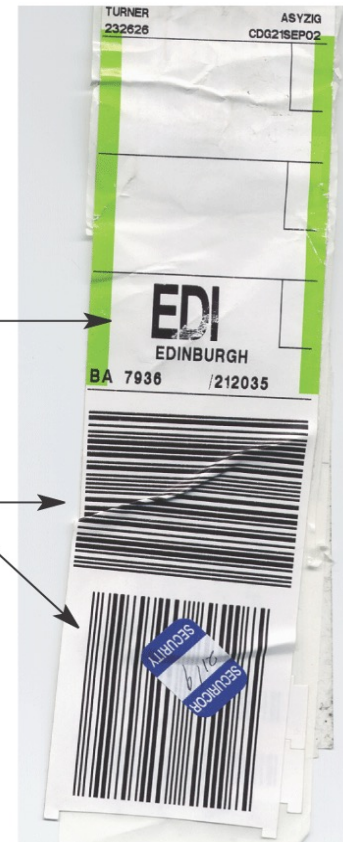
Lack of space

ARTIFACT EXAMPLE



Prominent labelling
of destination

Breakdowns – bar codes
unreadable because crumpled
or obscured by stickers



CULTURAL MODEL

Understand the local culture and the cultural assumptions. This is the broader context.

For each point of view

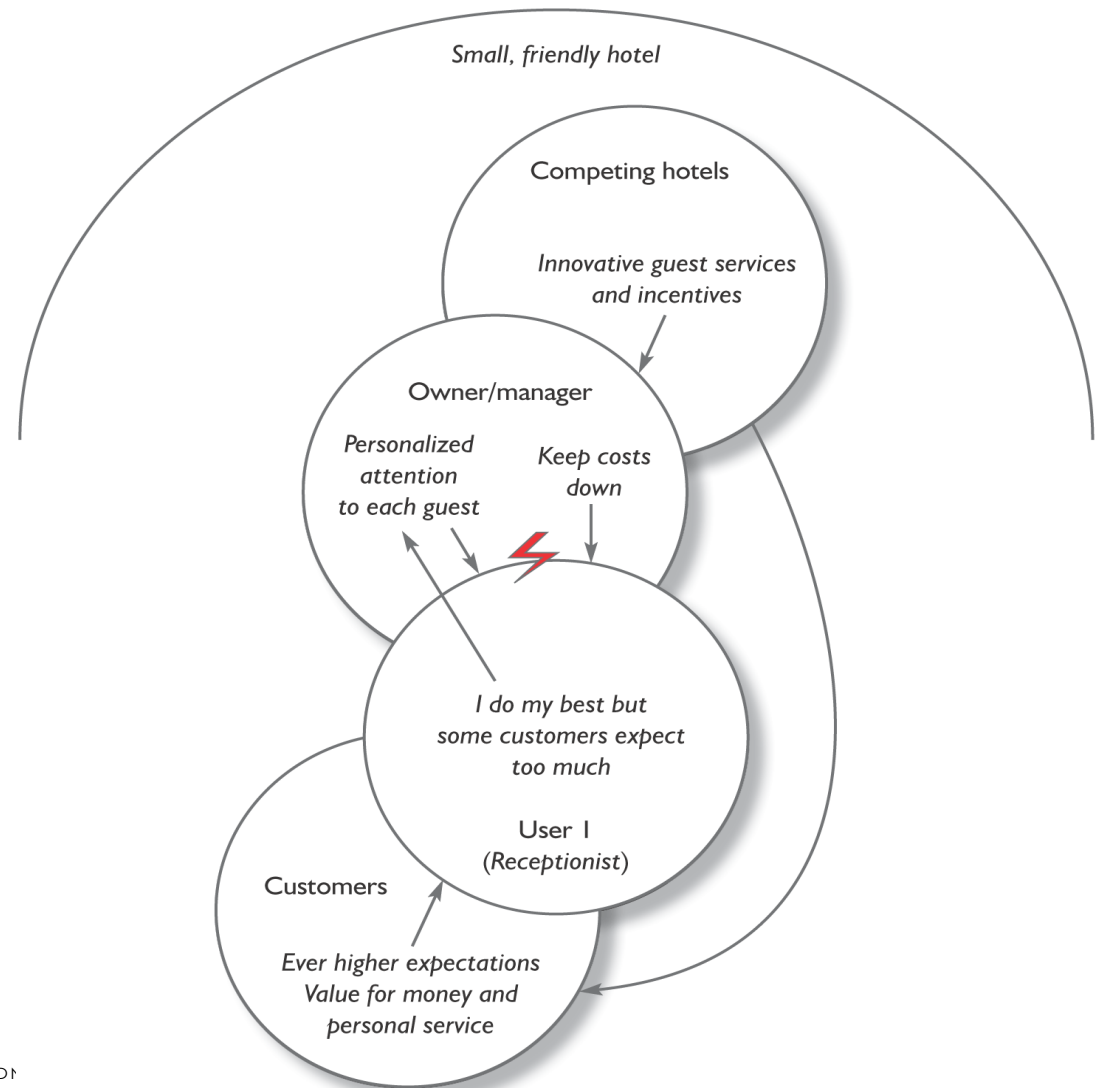
1. Start with each “influencer”—different groups of people, organizations, institutions—that affect how that person understands and does their work
2. Arrange these as bubbles or balloons that have different scope reflecting how much influence they have on the worker
3. Identify breakdowns



CULTURAL MODEL - EXAMPLE

Goals and relationships
between user groups and
organizational values

Constraint focused



MODEL EXAMPLE EXERCISE!

Group 1, 2: Physical Model example of FORMLab or PROTOLab

Group 4, 5, 6: Flow Model example from (one of) your jobs

Group 7, 8, 3: Sequence Model example from a recent novel interaction/experience

Group 12, 13, 16: Cultural Model example from a community

Group 20, 11: Artifact Model 3 x examples of tools for work activities from your life (can be pictures) or Google 😊

15 minutes, then quick presentations.



SUMMARY:

The 5 models capture:

1. How the physical environment supports the work [Physical model]
2. The people, their relationships, and their communications [Flow models]
3. How tasks are carried out [Sequence models]
4. How artefacts support the work or are processed as part of the work [Artifact models]
5. How work is constrained by organizational values [Cultural models]



SUMMARY



DEPARTMENT OF COMPUTER SCIENCE

AARHUS UNIVERSITY

ITPDP - RATIONALE AND MODELS
25. FEBRUARY 2026



SUMMARY

Document your design and design rationale!

Design needs to take the user, the context, and constraints of the problem domain into account
Thus, user involvement in design is important.

Prepare for design through contextual inquiries

- Capture your understanding in the five models, personas and scenarios
- Triangulation

Later envisionment through prototyping become essential

- Based on contextual inquiry models, personas, and scenarios

Plan your field study methods carefully - get help from TAs



