Unit 04

Discover

the process of understanding

Discover: the process of understanding

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1. Requirements

The process of understanding

- Before creative design can start, the designer needs to develop a clear and thorough understanding of the **people** who will be involved with the product, the **activities** that are the focus of the design, the **contexts** in which activities take place and the implications for the design of **technologies**: 'PACT'.

- From this understanding, designers generate the **requirements** for the system that is to be designed.

The process of understanding

- It is rarely possible to acquire a thorough understanding of requirements until some design work has been completed and evaluated.

- **Requirements work** (understanding), the design process, **representations of design** (envisionment) and **evaluation** are tightly interwoven.

The focus of understanding

- The focus of the understanding process is on **what people do**, or **might want to do**, **how and why they want to do things** and on any problems they are having with any system currently in use.

- It is also about understanding how the domain of investigation fits in with **other things that people are doing**.

The focus of understanding

- UX designers need to do research, also called **user research**, in order to inform their understanding of the sphere of activity (the domain) that is the focus of investigation.

- In software engineering or information systems projects, this is a formal step which is usually termed '**requirements analysis**'.

Requirements: a creative leap

- A requirement is **'something the product must do (functional requirements)** or **a quality that the product must have (no-functional requirements)'** (Robertson and Robertson, 2012).

- Designers will study current activities and gather stories of use and generate a great deal of information about the current situation and about people's goals and aspirations.

- The task is to turn this into requirements for a new product, system or service, often it will need a **creative leap** (through a process called **ideation**).

Requirements terminology

There has been a debate on the terminology for requirements :

- **Requirements gathering**, suggests that requirements are waiting to be picked up with little interaction between designer and stakeholders

- **Requirements generation**, which suggests a more creative activity that tends to de-emphasize links to current practice

- **Requirements elicitation**, which suggests some interaction between stakeholders and designers

- **Requirements engineering** – often used in software engineering projects, usually a very formal approach.

Requirements templates

- The use of a **standard template**, is useful for specifying requirements. At minimum it should include for each requirement the following:

  - A unique reference number, coding whether the requirement is functional or non-functional

  - A one-sentence summary

  - The source(s) of the requirement

  - The rationale for it.

- Additional elements :

  - The criteria for measuring whether the requirement has been satisfied

  - A grade of importance of the requirement, for example, on a scale of 1–5

  - Dependencies and conflicts with other requirements

  - Change history.

Robertson and Robertson (2012)

Example: Volere specification

Requirement #: 75   Requirement Type: 9   Event/BUC/PUC #: 7.9

Description: The product shall record all the roads that have been treated

Rationale: To be able to schedule untreated roads and highlight potential danger

Originator: XXXX – Chief Engineer
Fit Criterion: The recorded treated roads shall agree with the drivers' road treatment logs and shall be up to date within 30 minutes of the completion of the road's treatment

Customer Satisfaction: 3.   Customer Dissatisfaction: 5

Priority: Dependencies: all requirements using road and scheduling data   Conflicts:

Supporting Materials:

History:

Requirements types

- **Functional requirements** are what the system must do.

- **Non-functional requirements** are the qualities that the system must have.

- These qualities may be crucial factors in the acceptability, sales or usage of a product.

Requirements types/1 (Volere)

9. Functional Requirements

10. Look and Feel Requirements

 – 10a. Appearance Requirements 10b. Style Requirements

11. Usability and Humanity Requirements

 – 11a usability, 11b personalization and internationalization,
   11c learning, 11d understandability, 11e accessibility,

12. Performance Requirements

 – 12a. Speed and Latency Requirements, 12b. Safety-Critical
   Requirements, 12c. Precision or Accuracy Requirements, 12d. Reliability
   and Availability Requirements, 12e. Robustness or Fault-Tolerance
   Requirements, 12f. Capacity Requirements, 12g. Scalability or
   Extensibility Requirements, 12h. Longevity Requirements

13. Operational and Environmental Requirements

 – 13a. Expected Physical Environment 13.b. Wider Environment
   Requirements 13c. Requirements for Interfacing with Adjacent Systems
   13d. Productization Requirements 13e. Release Requirements

Requirements types/2 (Volere)

14. Maintainability and Support Requirements

– 14a. Maintenance Requirements 14b. Supportability Requirements 14c. Adaptability Requirements

15. Security Requirements

– 15a. Access Requirements 15b. Integrity Requirements 15c. Privacy Requirements 15d. Audit Requirements 15e. Immunity Requirements

16. Cultural Requirements

17. Compliance Requirements

– 17a. Legal Compliance Requirements. 17b. Standards Compliance Requirements

https://www.volere.org/templates/volere-requirements-specification-template/#1545133611721-03925e08-5ffb

example of usability requirements

- *The product shall be easy for 11-year-old children to use.*
- *The product shall help the user to avoid making mistakes.*
- *The product shall make the users want to use it.*
- *The product shall be used by people with no training, and possibly no understanding of English.*

Non-functional requirements

- Non-functional requirements cover a number of aspects of design, including image and aesthetics, usability, UX, performance, maintainability, security, cultural acceptability and legal restrictions.

- Also important are the data, or media requirements of any system – the type of content that it has to deal with and the various media that will be used.

Requirements and technology

- For both types of requirements, it is not specified how the technology will meet the requirement.

- This is a later part of the design.

Supporting evidence

- It is best to supplement the list of requirements with some **supporting evidence** – interview or observation reports, photographs of artefacts and video snippets if practicable.

- This helps readers of the requirements specification to understand the reason behind items in the list.

Prioritizing requirements

Requirements should be reviewed with customers and clients and modified as necessary. Decisions will almost always be made about the relative priority of the requirements since few design projects have unlimited resources. One way of doing this is by using the 'MoSCoW rules' that classify requirements into the following:

- **Must have** – fundamental requirements without which the system will be unworkable and useless, effectively the minimum usable subset - minimum viable product (MVP)

- **Should have** – would be essential if more time were available but the system will be useful and usable without them

- **Could have** – of lesser importance, therefore can more easily be left out of the current development

- **Want to have** but Won't have this time round – can wait till a later development.

Challenge 1

We design a new device for home, the Home Information Centre (HIC). Which of these requirements of the HIC are functional and which non-functional? Discuss issues of prioritizing the requirements:

- Unobtrusive in the home environment
- Option to print out details
- Fast download of information
- Direct 'panic' link to the emergency services
- Volume control/mute features
- Customizable to support choice of languages, including those with different character sets
- Provides email
- Security for each individual user.

2. Participative Design

Participative design

- Research work involves using a variety of techniques to understand and analyse others' needs, goals and aspirations.

- The key thing for designers to remember is that **they are not the people who will be using** the final system.

- Designers need to understand the requirements of other people.

Participative design

Through user research (by talking to people, interviewing, observing people and recording their activities on video, organizing focus groups and having workshops) the designer will understand both the **requirements** for the new design (**the 'gain'** a new system will deliver) and the **problems** people are having with existing situation (**the 'pain'** of the current situation).

Engaging with people

- By engaging with people using various techniques that encourage the participation of people in the design process, designers will acquire a large number of **stories** that form the basis for the analysis work.

- Recasting several similar stories into more structured conceptual **scenarios** will also help the designer to understand and generate **requirements**.

Human-centred design

- Throughout, we emphasize the need to take a **human-centred approach** to design.

- First, it is important that **human characteristics and activities are taken into account**.

- But beyond this, wherever possible, it is right that the people who will use new interactive technologies or services **have an input to the design process itself**.

Human-centred design for custom-made systems

- In **general design projects** only a small proportion of those who will use the eventual system will be involved.

- In **custom-made systems** or services for a small group of people, it is feasible for the people concerned to act as **co-designers** and so acquire ownership of the technology to be introduced.

The socio-technical tradition

- This design philosophy of involving people in the design of their systems is usually attributed to the **Scandinavian tradition** of worker participation in the management of the workplace.

- There are also links to the **British socio-technical design movement** and to the social informatics movement in the United States of America (Davenport, 2008).

- This started with an emphasis on human considerations in the design of systems to support manual work, such as coal mining, but later evolved methods for user involvement in the design of computer-based systems.

The socio-technical tradition

- Methods embodying the socio-technical philosophy included **ETHICS** (Mumford, 1983, 1993), the **HUFIT** toolkit (Taylor, 1990), which provided a comprehensive, practical set of techniques for working with users, and **ORDIT** (Eason *et al.*, 1996), which aimed to incorporate organizational considerations into systems design.

- The work of E. Mumford at Manchester, and K. Eason, L. Damodoran, S. Harker et al. at Loughborough University, is central to the development of the socio-technical approach.

Scandinavian participatory design

- The Scandinavian participatory design movement of the early 1980s was also important.

- The most influential was the work of Pelle Ehn and colleagues in the **UTOPIA** project (Bødker *et al.*, 1987; Ehn and Kyng, 1987).

- This was very much a politically informed initiative, with the emphasis on workplace democracy and empowering workers as co-designers of work practice and the tools supporting it. Techniques such as **paper prototyping** were invented so that workers were not disadvantaged in working with technologists.

Scandinavian participatory design

- Pekkola et al. (2006) have reviewed these earlier approaches and suggested how the demands of information systems development and participative design can be brought together. Using an iterative approach to design, bringing in participative methods and prototyping Stakeholders were able to evaluate prototypes as a normal part of their work.

- Deborah Mayhew's **Usability Engineering** is a well documented and structured human-centred approach (Mayhew, 2008)

- Another similar approach is **Rapid contextual design** (Holtzblatt and Beyer, 2014).

Challenge 2

- Incorporating input from those who will be affected by a changed system into the requirements process helps ensure that the eventual technologies have a good fit with the people, activities and contexts they are designed to support.

- There is also a strong ethical argument for user involvement.

- Can you think of another reason for doing this?

3. Interviews

Interviews

- One of the most effective ways of finding out what people want and what problems they have at the moment is to talk to them!

- Interviews with all the various stakeholders in the domain are a vital way of gathering stories.

- Designers employ a range of different styles of interview from a **completely structured survey** through to a general **conversation**.

Structured interviews

- The structured interview uses questions that are developed beforehand. So the interview follows the wording exactly.

- Public opinion polls, before elections, are normally based on structured interviews.

- Structured interviews are reasonably easy to carry out simply because of the degree of pre-structuring.

- However, people are limited to very restricted replies, and it is difficult for the interviewer to follow up the unexpected response.

Extract from a structured interview

Thinking about the department's website, about how often would you say that you have used the following during the last week?

Timetable information	not at all ☐	most days ☐	every day ☐	more than once a day ☐
Staff home pages	not at all ☐	most days ☐	every day ☐	more than once a day ☐
Module information	not at all ☐	most days ☐	every day ☐	more than once a day ☐

Semi-structured interviews

- Designers very frequently use semi-structured interviews: the interviewer uses pre-prepared questions but can reword these as appropriate and **explore new topics as they arise**.

- Often, the interviewer simply prepares a **checklist**, with suitable prompts such as 'Tell me about the first things you do when you get into the office in the morning'.

- Clearly, this free-form approach is more demanding for the interviewer, but the data obtained is more rich.

Semi-structured interview example

Example: comments

- Interviewee reflected back on what was said

- Follow up questions: the interview is designed to start at a high level then to probe at a greater level of detail.

- The analyst's checklist of topics to cover for this example included the type of information needed, current sources (paper or on-line) and specific examples of information needs.

Unstructured interviews

- Completely unstructured interviews are sometimes used where it is particularly important **to minimize designers' preconceptions**, or where very little background information is available beforehand.

- There are no preset questions or topics beyond the general subject of the project in question.

Contextual inquiry

Contextual inquiry is a first-stage design method by Beyer & Holtzblatt, (1998); Holtzblatt, (2012).

Principles:

– Go where the customer works, observe the customer as he/she works and talk to them about the work.

– Contextual Inquiry includes artefact collection and observation under one unifying theme or philosophy.

Four principles of contextual inquiry

- **Context** –the interview must take place in the context of use. Typically this has been in a workplace or home environment but today it can be in a wider range of settings. The researcher observes the use of the product and talks to the user about what has happened in the observed session or previous interactions.

- **Partnership** –the user and researcher need to form a collaborative partnership to understand what the user is doing and why. A contextual interview will shift from observing to discussing what happened in rapid shifts during the interview.

- **Mutual interpretation** – the researcher will explain their conclusions and interpretations. The user is free to correct or expand on the researchers interpretations.

- **Focus** – the researcher must keep the interview focused on the topics which need to be explored to provide useful data for the improvement project's scope.

Contextual inquiry

- The aim of contextual inquiry is for designers to get design data by immersing themselves in the lives of their users.

- In-depth **interviews** are followed by an **interpretation session** typically involving 2–5 designers.

- From this interpretation of the data, they generate **notes** each of which captures one key point from the interview and is self-contained, example: key practical issues, identity and cultural observations, activity issues, device usage, design ideas, etc.

- These notes will be used later in the process of design when they generate **activity diagrams**.

Use of Stories, Scenarios and Early prototyping in interviewing

stories

scenarios…

early prototypes

Stories, scenarios and early prototyping in interviewing (1 of 2)

- **Scenarios** and **stories** are helpful aids to understanding activities and help avoid having people imagine (or reconstruct) situations in the abstract.

- For example, people can be asked to recall a typical 'day in the life' or incidents when the current technology does not support what they need to do. This will identify circumstances that the new design must take into account.

- Once there is a rough idea of what the new technology might do, discussing a **scenario** will highlight many issues, from the naming of individual functions to the impact of changes in work practice.

- **Prototypes** – (paper sketches to semi-functioning products) are very often used to embody scenarios in possible technology. For example, in the later stages of analysis for a shared notebook for engineers, we used **simple prototypes coupled with small usage scenarios**. These were projected on a screen and discussed in a small group meeting, prompting discussion about the match between our design ideas and the way the engineers currently disseminated information.

Stories, scenarios and early prototyping in interviewing

- The analyst and the interviewee 'walk through' the scenario, while the analyst probes for comments, problems, possible alternatives and suggestions in general.

- Depending on the outcome of the scenario/prototype walkthrough, modifications and further iterations may be desirable.

- Where many new issues emerge, it may be the case that the early concepts underlying the scenario or prototype are misconceived and should be radically rethought.

Think-aloud commentaries

- When it is necessary to know details about current technology, users can be asked to talk through the operations concerned – including their internal cognitive processes (i.e. what they are thinking about) – as they use the technology in question.

- This data, properly termed a **'think aloud protocol'** (Ericsson and Simon, 1985), can provide helpful indications of current problems.

- It is important to remember, however, that by imposing the requirement to generate a commentary, we are interfering with the very process we are attempting to study.

- Further, not all cognitive processes can be accessed by the conscious mind.

Guidelines for interviewing

1. Decide who to interview and what you hope to get from the interview that will contribute to your understanding.

2. Determine how to access to the people you want to talk to.

3. Consider bringing along some stimuli for the interview to help people envision what you are trying to understand.

4. Prepare a research brief.

5. Get to know the background to the project and any organizations involved.

6. Be clear about what you want to find out and whether a **structured**, **semi-structured** or **unstructured interview** will be most effective.

7. Decide whether to interview people **individually** or **in groups**.

8. Get to know the context for the interview.

9. For work activities, background research might include studying company reports, brochures, websites and organization charts or scanning through software manuals and promotional materials.

10. For other activities, general research on the internet will help understand the characteristics of the domain and the activities that people are involved in.

Keeping track of the interview

11. Interviewing can be more effective if carried out by a pair of interviewers. One person can take the lead while the other takes notes.

12. The note-taking burden is relieved if the interview is audio- or video-recorded.

13. If use audio/video, make sure you check the equipment before each session and periodically during the interview.

14. Even when the interview is recorded, notes are still useful and will help find key points.

15. Interviews can be transcribed and used as the basis of a **grounded theory analysis**

16. Since this is a time-consuming form of analysis, often just watching a video or listening to the audio of an interview is sufficient.

17. Keep the interview on time.

18. Know what you want to understand and ensure that you cover all that you need to.

Structuring the interview

19. Many interviews use a mixture of open and closed questions (unless completely structured interviews such as surveys).

20. Begin with some general questions to help settle the interviewee down.

21. Beware of using too much jargon and ask your interviewee to explain any jargon or acronyms that they use. People should be willing to explain the detail to you.

22. Ask the interviewee to tell stories about their activities.

23. As listeners, designers are looking for any problems that people are currently experiencing (the pain) and scope for improvements or endorsements of early design ideas (the gain).

24. As storytellers, people will provide details that may seem irrelevant but will often contain valuable context that designers need to understand.

25. Make sure that you round off the interview by asking if you have missed anything important and close the session leaving the way open for further discussions and clarifications.

Reflection and exploration

26. Reflecting back during the interview helps confirm that you have understood what has been said.

27. It is often a good idea to have the interviewee review a summary of the interview that you can email after you have written it up.

28. You should also look over the notes of the interview yourself to identify any points that need clarification.

General-purpose exploratory questions

These help the interview along, especially in the early stages. Some useful ones are as follows:

- – 'Tell me about your typical day'.
- – 'Tell me three good things about . . .'
- – '… and three bad things'.
- – 'What if you had three wishes to make the service better' ?
- – 'What has gone wrong with the service recently? How did you cope' ?
- – 'What else should we have asked about' ?

When to stop

- Deciding when you have conducted enough interviews means balancing practical constraints against the comprehensiveness of the data you need for your research.

- Certainly, all significant stakeholder groups must be covered, two or three interviewees per type of stakeholder should be enough.

- There may be a need to look at different types of organization or contexts of use.

- In many cases, client resources limit the process.

- With unlimited resources, the general rule is to stop once no new insights are being obtained.

Framework of user research: Step 1

Step 1   Project background

This step is about providing a **contextual background** to the research activities you want to carry out in terms of the scale and type of project the design activity you are researching for sits within.

What project does your research activity relate to?

Give a brief summary of the project, including its aims, objectives and the teams involved. Provide links (or titles) to related design briefs if they are available.

What research or other design activities have already taken place within this project?

This helps give context to the work that has been done before and where the design activity you want to inform with research sits within the larger project roadmap.

Step 2. Design Objectives

Step 2   Design objectives

This step is about articulating the **motivation** behind the design work you want to inform with research.

What is the design activity trying to achieve?
Be explicit and try to avoid non-specific expressions like 'to make X better'.

Example:
The design activity is focused on updating the web UI with the aim of reducing confusion and cognitive load for first-time buyers during the online mortgage application process.

How does this align to current business objectives?
Explain whether this design activity is part of a larger collection of related design work or if it stands alone. Are there specific business KPIs that the design activity is intended to achieve?

Step 3. Research rationale

Step 3   Research rationale

This step is about determining **why** research needs to be undertaken in order to aid the design activity. How will it help you and why are you doing it?

What do we NOT know that is preventing us from making firm design decisions?
State the problems that are preventing you from making informed design choices.

Example:
We need to understand what UI components and/or language are causing confusion or uncertainty for first-time mortgage applicants when using our online service.

How will undertaking research move the design process forward?
Explain your rationale for carrying out research. Is it required to explore and/or validate ideas with current customers, to test design ideas for their ability to produce a desired or intended result, or something else?

Step 4. Insight objectives

Step 4   Insight objectives

This step is about specifying the **insights** required from the data gathered to resolve uncertainties in design decisions that are stopping the design activities from progressing. What do you hope to know **after** the research that you don't know now?

What information do you need to move the design forward?
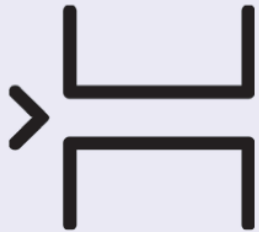List the required insights this piece of research needs to deliver to help fulfil the design objective. Be explicit.

Example:
Deliver a ranking of how to visually represent monthly payments in order of user cognitive load from high to low.

Step 5. Confirm knowledge gap

Step 5   Confirm the insight knowledge gap

This step is about confirming that information to support the insight objectives identified in Step 4 are currently unknown and that you are certain the information to fill the knowledge gap is **not** obtainable via desktop research methods (such as searching internal repositories or previous research studies).

Has relevant research been carried out before?

Include a reference to any previous related research (brief summary of author, date, project, output, findings) that is relevant or may help but does not close the knowledge gap. This research could have been carried out internally or externally. Also, include the resources you have searched but found no relevant prior work.

Step 6. Research questions

Step 6   Research questions

This step is about determining what high-level questions when answered will bridge the knowledge gap and therefore support the insight objectives outlined in Step 4.

What questions do we need to answer to bridge the knowledge gap and fulfil the insight objectives?

Be explicit and consider the format of data that answers the questions. These questions will lead to a list of sub-questions, which you will put to your research participants during the actual study (you don't need to list those sub-questions here).

Examples:

- What factors in the current mortgage application process are different for first-time applicants than for those who have been through the process before?
- What is the impact of different graphical representations of monthly payment on cognitive load?

Step 7. Participants

Step 7   Participants

This step is about determining **who** may be able to help you gather the data required to bridge your knowledge gap. Often, this will be existing customers or competitor customers, but remember, there are other people who can help, such as subject experts.

Who needs to be recruited to take part in the research?

Don't worry at this point about how many participants you will need. Instead focus on describing what demographic variables are important and also which are unimportant (for example, age, occupation, experience, income).

What needs to be included in a participant screener?

A participant screener is used to define who should **not** participate in the study and why. It screens the study for participants who may not be appropriate for reasons like their background, job or experience.

Include specifics about any demographic variables that may bias the data gathered and skew the analysis, like 'works in finance' or 'expert user of mobile technologies'. Explain why you think this will impact the data.

Step 8. Research materials

This step is about determining what research materials need to be given to your participants to help them provide the data that will answer your research questions.

What materials need to be provided to be able to gather the appropriate data?

Specify what materials you need to give the participant to help them answer the research questions and generate the required data (for example, a slide deck introducing the project work, visual representations of design ideas, an interactive prototype).

What fidelity of research material is required and why?

Think along the lines of high, medium or low fidelity and provide your rationale. Do you need a fully realized design or will more simple representations be enough to get the data you need?

Example:

We need a high-fidelity, clickable prototype with considered copy in place, to determine how the language used influences which sections the users click on at specific points in the journey.

Do we need to show something complete or can we show parts of a design?

Is it critical that a prototype shows representations of every page to validate specifics of a user journey or can they be shown components separately?

How much of this is currently available, how much needs to be created and who will provide it?

Specify what is currently available to the project team, what needs to be generated and who will do this.

Step 9. Research data

Step 9 Research data

This step is about specifying the anticipated **data output** that will be generated by the research activities.

What type of data is expected or needed?

Be clear about the format of the data you need to answer your research questions successfully. Is it qualitative, quantitative or a combination of both? For example, quotes from users (qualitative), time to complete tasks (quantitative).

What is your rationale for this type of data?

Briefly assess the benefits of why you require this type of data to best inform your research questions and therefore support your insight objectives.

Step 10 Research Deliverables and Outputs

This step is about making sure the agency or research team are clear about:

- What data is needed
- Why it is needed and how it is relevant to the design
- How the data and analysis should be shared and curated
- Who should receive the data, analysis and insights.

How should the data generated and the analysis carried out be reported?
Define the formats you will be sharing the information in. This helps manage and align expectations about what will be delivered and by whom.

Example:
An analysis document plus a spreadsheet of raw data.

What is the research project timeline?
Establish and articulate a timeline for the research activity that includes the following milestones and anticipated durations:

- Participant recruitment (if needed)
- Data collection
- Data analysis
- Analysis reporting
- Analysis and insight distribution.

4. Questionnaires

Questionnaires /1

- Most of the methods we discuss so far, involve working with people face-to-face.

- However, there are ways of obtaining requirements information at a distance.

- The most common of these is the questionnaire but there are more ingenious, novel techniques as well.

Questionnaires /2

- Questionnaires are one way of streamlining the understanding process if a large number of people are to be surveyed and resources are not available to interview them individually.

- Constructing a workable questionnaire is difficult and time-consuming. Questionnaires need to be designed, prototyped and evaluated as any other form of interaction design.

- It is a hard to devise questions when there are no opportunities to detect and clear up misunderstandings as they happen.

- For small numbers of people – up to 10– an interview will obtain the same information, and more, if the time required to construct a questionnaire is taken into account.

Questionnaires /3

- Questionnaires are ideally suited to gathering a large amount of quantifiable data or to capture responses from people who cannot be involved more directly.

- With the proliferation of on-line questionnaire services such as Survey Monkey, quite complex questionnaires can be constructed and made available on the web.

- Another technique for gathering data is 'crowd sourcing'.

- Here, small specific tasks are put on the web and volunteers sign up to take the tasks in return for a small payment.

- Amazon's 'Mechanical Turk' is the best-known example but needs careful design of the task if it is to be effective.

Questionnaires /4

- A good questionnaire should contain questions that:

  - Are understandable.

  - Are unambiguous.

  - Collect data which actually answers evaluation questions.

  - Can be analysed easily.

- Response rates to questionnaires can be very low indeed – return rates of under 10 per cent are common if the intended respondents have no particular stake in the design of the technology or **incentive** (being entered into a prize draw, for example) to participate.

- Where questionnaires are administered as part of a face-to-face evaluation session, most people will complete them but people who take them away to finish in their own time, or who do the questionnaire on the web, very often don't.

Analysing the data

- Analysing the data requires thought and time.

- If most respondents have awarded feature 'A' 5 out of 7 for usefulness but feature 'B' 6 out of 7, does this really mean that feature B is better?

- Or is it enough that both features score above the mid-point?

- Maybe feature A was misunderstood – without a follow-up question the data is difficult to interpret.

- This is easy to do in an interview but would add significantly to the length of a questionnaire.

- Where respondents have been given the opportunity to express opinions as unstructured answers, you will need to devise a scheme for classifying this material so that it is usable.

Likert scales

- Perceptions of system design are often collected through rating scales, known as Likert scales (Likert, 1932).

- The Likert scale is the most common of a number of methods for eliciting opinion. People are asked to indicate their agreement with a statement using a **five-point scale: Strongly agree, Agree, Neutral, Disagree and Strongly disagree** or a seven-point,. The scale is attached to each of a number of statements such as:

Icons were easily understandable (Tick one box):

- Strongly agree ☐
- Agree ☐
- Neutral ☐
- Disagree ☐
- Strongly disagree ☐

Likert scales

- Getting the wording right and choosing appropriate statements to elicit information relevant to the enquiry is difficult and much trial and revision of statements will be required.

- The items on a questionnaire should be as specific as possible.

- A probe statement such as 'The system was easy to use' does provide a general impression but gives very little information for redesign if you do not supplement it.

Semantic differentials

- Another approach is to devise **'bipolar' rating scales**', often called **semantic differentials**.

- These derive from the work of Osgood *et al.*, (1957) and have evolved into a very powerful way of uncovering the feelings people have towards ideas, products, services and brands.

- For example, Brian Lawson (2001) used semantic differential to find out what people liked about pubs.

- The 'place probe' (Benyon *et al.*, 2006; Smyth *et al.*, 2015) was designed to obtain people's responses to a photo-realistic virtual environment of different places, the probe contained semantic differentials about the quality of the images, the sense of freedom people had to move around and their overall visual perception and subjective feelings of the place.

Semantic differential: example

Key features of the place

On the tables provided in each question below, please mark a cross in the box that best describes your experience in relation to the adjectives provided at either side. Below is an example for an experience that was 'quite bad' and 'very light'.

Example

	Very	Quite	Neither	Quite	Very	
Good				x		Bad
Light	x					Dark

Did the images that were displayed seem?

	Very	Quite	Neither	Quite	Very	
Grainy						Clear
Realistic						Unrealistic
Unbelievable						Believable
Distorted						Accurate

Semantic differential: example

Did the movement of the images seem?

	Very	*Quite*	*Neither*	*Quite*	*Very*	
Smooth						Jerky
Broken						Unbroken
Slow						Fast
Consistent						Erratic

Did you feel that you were?

	Very	*Quite*	*Neither*	*Quite*	*Very*	
Passive						Active
Free						Restricted
Disorientated						Oriented
Inside						Outside
Mobile						static

semantic differential example

Did you feel that the environment was?

	Very	*Quite*	*Neither*	*Quite*	*Very*	
Small						Big
Empty						Full
Light						Dark
Enclosed						Open
Permanent						Temporary
Colourless						Colourful
Static						Moving
Responsive						Inert
Far						Near
Untouchable						Touchable

Did you feel that the environment was?

	Very	*Quite*	*Neither*	*Quite*	*Very*	
Ugly						Beautiful
Pleasant						Unpleasant
Stressful						Relaxing
Harmful						Harmless
Exciting						Boring
Interesting						Uninteresting
Memorable						Forgettable
Meaningful						Meaningless
Confusing						Understandable
Significant						Insignificant

standard questionnaires

- To gather requirements and opinions about system features, several ready-made and validated usability questionnaires are available, for example, QUIS (Questionnaire for User Interface Satisfaction) from the University of Maryland and SUMI (Software Usability Measurement Inventory) from the University of Cork.

- These are 'industrial strength' instruments and there is normally a fee for their use.

- Others may be found in textbooks and on the web, but in the latter case, be sure that their source is a reliable one.

- The user experience questionnaire uses semantic differentials to assess the quality of a product or service (http://www.ueq-online.org/).

- The System Usability Score (SUS) is a short questionnaire to assess usability (see http://www.usability.gov/).

SUMI (Software Usability Measurement Inventory) from the University of Cork

1 This software responds too slowly to inputs.

2 I would recommend this software to my colleagues.

3 The instructions and prompts are helpful.

4 The software has at some time stopped unexpectedly.

5 Learning to operate this software initially is full of problems.

6 I sometimes don't know what to do next with this software.

7 I enjoy my sessions with this software.

8 I find that the help information given by this software is not very useful.

9 If this software stops, it is not easy to restart it.

10 It takes too long to learn the software commands.

- 11 I sometimes wonder if I'm using the right command.

- 12 Working with this software is satisfying.

- 13 The way that system information is presented is clear and understandable.

- 14 I feel safer if I use only a few familiar commands or operations.

- 15 The software documentation is very informative.

- 16 This software seems to disrupt the way I normally like to arrange my work.

- 17 Working with this software is mentally stimulating.

- 18 There is never enough information on the screen when it's needed.

- 19 I feel in command of this software when I am using it.

- 20 I prefer to stick to the facilities that I know best.

- 21 I think this software is inconsistent.

- 22 I would not like to use this software every day.

- 23 I can understand and act on the information provided by this software.

- 24 This software is awkward when I want to do something which is not standard.

- 25 There is too much to read before you can use the software.

- 26 Tasks can be performed in a straightforward manner using this software.

- 27 Using this software is frustrating.

- 28 The software has helped me overcome any problems I have had in using it.

- 29 The speed of this software is fast enough.

- 30 I keep having to go back to look at the guides.

SUMI 4/5

- 31 It is obvious that user needs have been fully taken into consideration.

- 32 There have been times in using this software when I have felt quite tense.

- 33 The organization of the menus or information lists seems quite logical.

- 34 The software allows the user to be economic of keystrokes.

- 35 Learning how to use new functions is difficult.

- 36 There are too many steps required to get something to work.

- 37 I think this software has made me have a headache on occasion.

- 38 Error prevention messages are not adequate.

- 39 It is easy to make the software do exactly what you want.

- 40 I will never learn to use all that is offered in this software.

- 41 The software hasn't always done what I was expecting.

- 42 The software has a very attractive presentation.

- 43 Either the amount or quality of the help information varies across the system.

- 44 It is relatively easy to move from one part of a task to another.

- 45 It is easy to forget how to do things with this software.

- 46 This software occasionally behaves in a way which can't be understood.

- 47 This software is really very awkward.

- 48 It is easy to see at a glance what the options are at each stage.

- 49 Getting data files in and out of the system is not easy.

- 50 I have to look for assistance most times when I use this software.

System Usability Scale (SUS) (Brooke, 1996)

SUS score [0-100]
Score1: questions 1,3,5,7,9
=> [response– 1]
Score 2: questions
2,4,6,8,10 => [5 – response]
Final = (Score1 + Score2) x
2.5

Bangor et al, 2009
SUS = 51 => OK
SUS = 72 => Good
SUS = 85 => Excellent

	Strongly disagree				Strongly agree	
	1	2	3	4	5	
1. I think that I would like to use this system frquently.					√	4
2. I found the system unnecessarily complex.				√		1
3. I thought the system was easy to use.		√				1
4. I think I would need the support of a technical person to be able to use this system.	√					4
5. I found the various functions in this system were well integrated.		√				1
6. I thought this system was too inconsistent.			√			2
7. I would imagine that most people would learn to use this system very quickly.		√				1
8. I found the system very cumbersome to use.				√		1
9. I felt very confident using the system.					√	4
10. I needed to learn a lot of things before I could get going with this system.		√				3

Total = 22

SUS Score = 22 × 2.5 = 55

hints for designing questionnaires

Hints and tips for design of questionnaires

Specific questions are better than general ones

General questions (a) tend to produce a wider variety of interpretation by respondents, (b) are more likely to be influenced by other questions and (c) are poorer predictors of actual behaviour.

General: List the software packages you have used.

Specific: Which of these software packages have you used?

Visual Basic ❏   Word ❏   Excel ❏   PowerPoint ❏

Closed questions are usually preferable to open questions

Closed questions help to avoid differences in interpretation. Open questions are more difficult to analyze but can be useful, for instance, when seeking comments in the respondent's own words, when not enough is known to construct closed questions, and for potentially sensitive items.

Open: People look for different things in a job; what sort of things are important to you in your job?

Closed: People look for different things in a job; which one of the following five things is most important to you?

Good pay   ❏
A feeling of achievement   ❏
Ability to make your own decisions   ❏
Good people to work with   ❏
Job security   ❏

Consider a 'no-opinion' option

If there is no such option people may manufacture an opinion for the questionnaire.

Mobile communications technology has made life easier. Do you agree, disagree or not have an opinion?

Agree ❏   Disagree ❏   No opinion ❏

However, a middle choice may encourage a non-committal response. One strategy is to omit the middle choice and follow up with an 'intensity item' which separates out strong from mild feelings.

hints on questionnaires

Do you think mobile communications technology has made life easier or more difficult? Please tick the number which reflects your opinion.

Easier　　1　2　3　4　　More difficult

How strongly do you feel about this?

Extremely strongly　　1　2　3　4　5　　Not at all strongly

Vary the orientation of rating scales or intersperse with other questions
If a questionnaire contains a lot of similar scales, all of which have, say, the 'good' end at the left and the 'bad' end at the right, people may go down the page ticking each scale in the same place. Either reverse some scales or put some other types of question in between.

Appearance, order and instructions are vital
The questionnaire should look easy to fill in, with plenty of space for questions and answers. Initial questions should be easy and interesting. Middle questions should cover the more difficult areas. Make the last questions interesting to encourage the respondent to complete and return the questionnaire. Keep the design simple and give clear instructions, repeating them if there is the possibility of confusion. Ticking boxes is less confusing than circling answers.

Add introductory and concluding notes
The introduction should explain the purpose of the survey, assure confidentiality and encourage reply. The concluding note can ask respondents to check they have answered all questions, encourage an early return of the questionnaire with the deadline date (and return details, if not using a pre-addressed envelope), offer to send a summary of the findings, if appropriate, and thank them for their help.

Make return easy
Many questionnaires will be delivered on the web, of course, but sometimes paper is appropriate, in which case make it easy to return the completed questionnaire. For web-based questionnaires, include a progress bar so people can see how much of the questionnaire they still have to complete.

5. Probes

Probes

- Probes are **collections of artefacts** designed to elicit requirements, ideas or opinions in specific contexts.

- 'Cultural probes' were developed by Gaver *et al.*, (1999) in working with elderly people located in three European cities.

- The overall aim was to design technologies that would foster greater participation in the community by older people.

Cultural Probes

- The designers first met the groups in person, then introduced them to the cultural probes packages.

- Each person received a **collection of maps, postcards, a disposable camera and booklets** – each item being carefully designed to stimulate interest and curiosity and suggesting ways in which people could use it to send ideas back to the designers.

- They were **'designed to provoke inspirational responses'**

Cultural probes (Gaver et al. 1999)

- **Postcards**, for example, asked people to list their favourite devices.

- The **disposable cameras** had customized covers which suggested scenes to be captured, such as 'the first person you will see today' or 'something boring'.

- Over a period of weeks, many of the probe materials were sent back to the designers, carrying rich data about the lives of the elderly people.

- Not all items worked out as planned – the authors do not specify which – and the materials were selectively redesigned before being distributed to subsequent participants.

Cultural probes

- In conlcusion, the exercise was highly successful in capturing the general sense of what it meant to be elderly in the communities involved, although it is noted that the results did not have a direct impact on design.

- The philosophy behind cultural probes was rather different than trying to gather requirements and illustrates well the difference between requirements elicitation and requirements generation.

- Gaver (1999) argues that probes are meant to confront, they are intended **to provide inspiration for designers** rather than elicit specific requirements.

Technology probes

- **Technology probes** are another form of probe that were used to gather requirements for home technologies (Hulkko *et al.*, 2004). Probes inspire and provoke designers to engage with the lives of others.

- Another analysis of probes (**cultural, mobile, domestic and urban**) by Graham *et al.* (2007) concludes that probes represent the 'turn to the personal' in a direct reference to the 'turn to the social' that happened in HCI at the beginning of the 1990s.

- Probes are an amalgam of social science methods for understanding (such as photography, diaries, life documents and so on) that enable designers to focus upon the individual's everyday life, going beyond the general.

Probes

- People find it very difficult to express abstract ideas. So probes are a way of provoking them to think about things in a different way.

- They are one form of stimulus needed to help designers get the data they need.

- As with other techniques for helping designers in the understanding process, probes will need thoughtful design, prototyping and evaluation before they are used in the real investigation.

6. Card sorting

Card sorting

- Card sorting is concerned with understanding **how people classify and categorize information**.

- Card sorting is particularly relevant in **information architecture** design as the structure of the content is critical.

- Trying to find things on a website is like looking for the scissors in someone else's kitchen. You know there are some but finding them can be hard, as how people organize things is a very personal matter.

Card sorting technique

- Card sorting involves writing concepts onto cards and then grouping them in different ways.

- A group of people work with a facilitator to structure data, concepts, objects or other artefacts, finding categories to group them together.

Card sorting technique

- This results in a **taxonomy** (a classification) and a set of high-level concepts known as an **ontology**.

- Where the results from a large number of people are available, various **mathematical grouping** techniques can be used.

- Card sorting can be conducted **face to face** or using an **on-line tool**.

Information categorization

- Hudson (2012) gives the example of a supermarket checkout vegetable pricing machine. If a customer has bought some onions, which category should they select? How about if they have some courgettes, broccoli or aubergines?

- If customers have to spend a long time searching for the right category (and any casual observation of supermarket checkouts suggests they do), queues will build up and people will get dissatisfied.

Open-closed card sorting

- There are two types of card sort:
    - An **open card sort** starts with blank cards and participants are asked to write down the objects or actions they think are important in some domain. These are then gathered together into categories.
    - A **closed card sort** starts with predefined categories and asks participants to place objects into the categories.
- As with most methods for understanding, it is likely that the analyst will move between these different types, depending on the problem.

Results of card sorting exercise
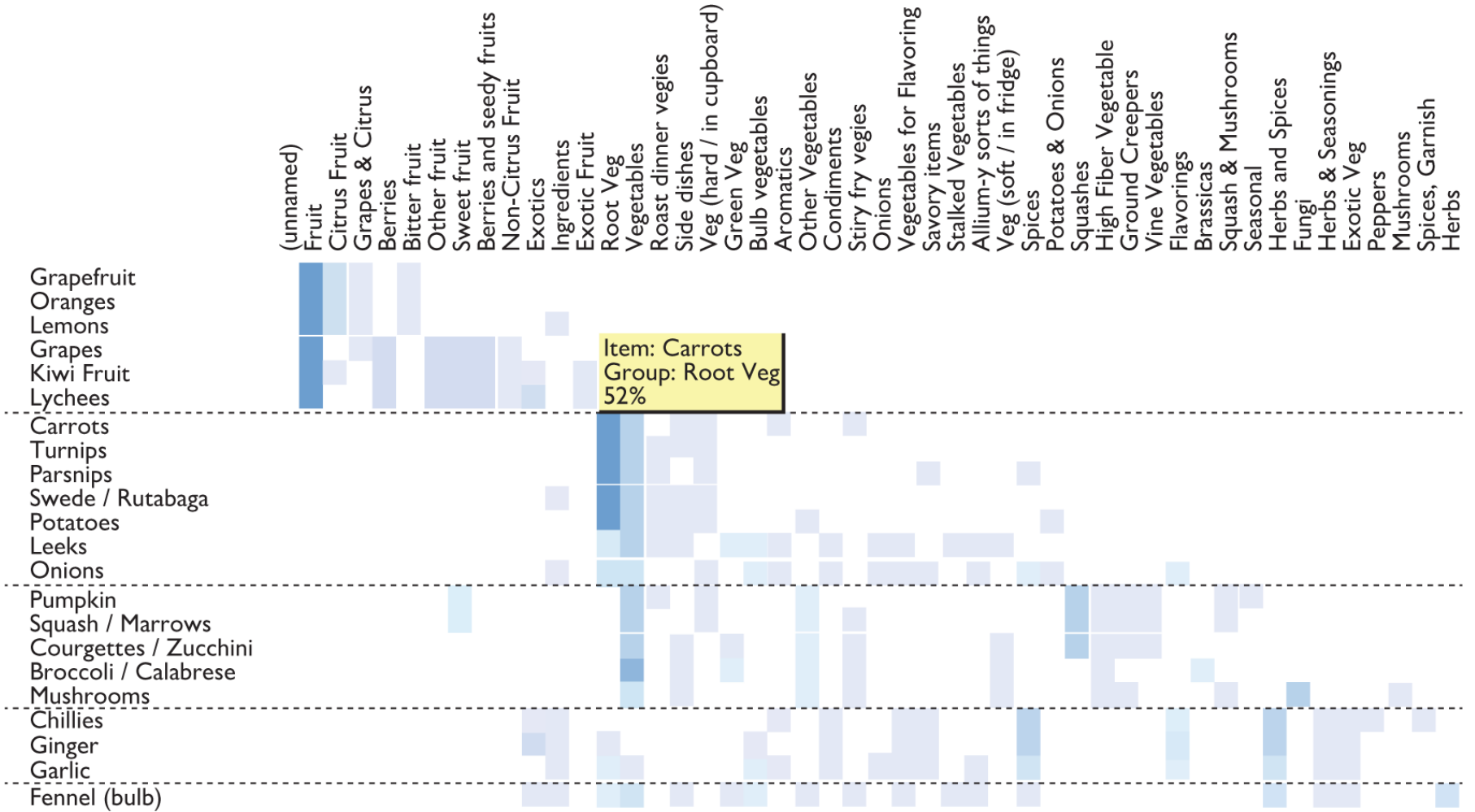
Source: www.interaction-design.org/images/encyclopedia/cardsorting/groups chart 26 participants.jpg
Hudson did this with 26 participants and got the results shown here

Card sorting technique

- One can also look at all the pairs of items that different people put in the same category and once again look for agreement or disagreement across different people.

- Different classifications may suggest that there are distinct types of user who may need different classifications.

- A cluster analysis such as this can be used to produce a dendrogram which shows the hierarchical clustering of objects (or actions).

- Representations such as these can then be used in a reverse card sorting (or tree sorting) method to see how the hierarchy is traversed for different tasks.

Dendrogram
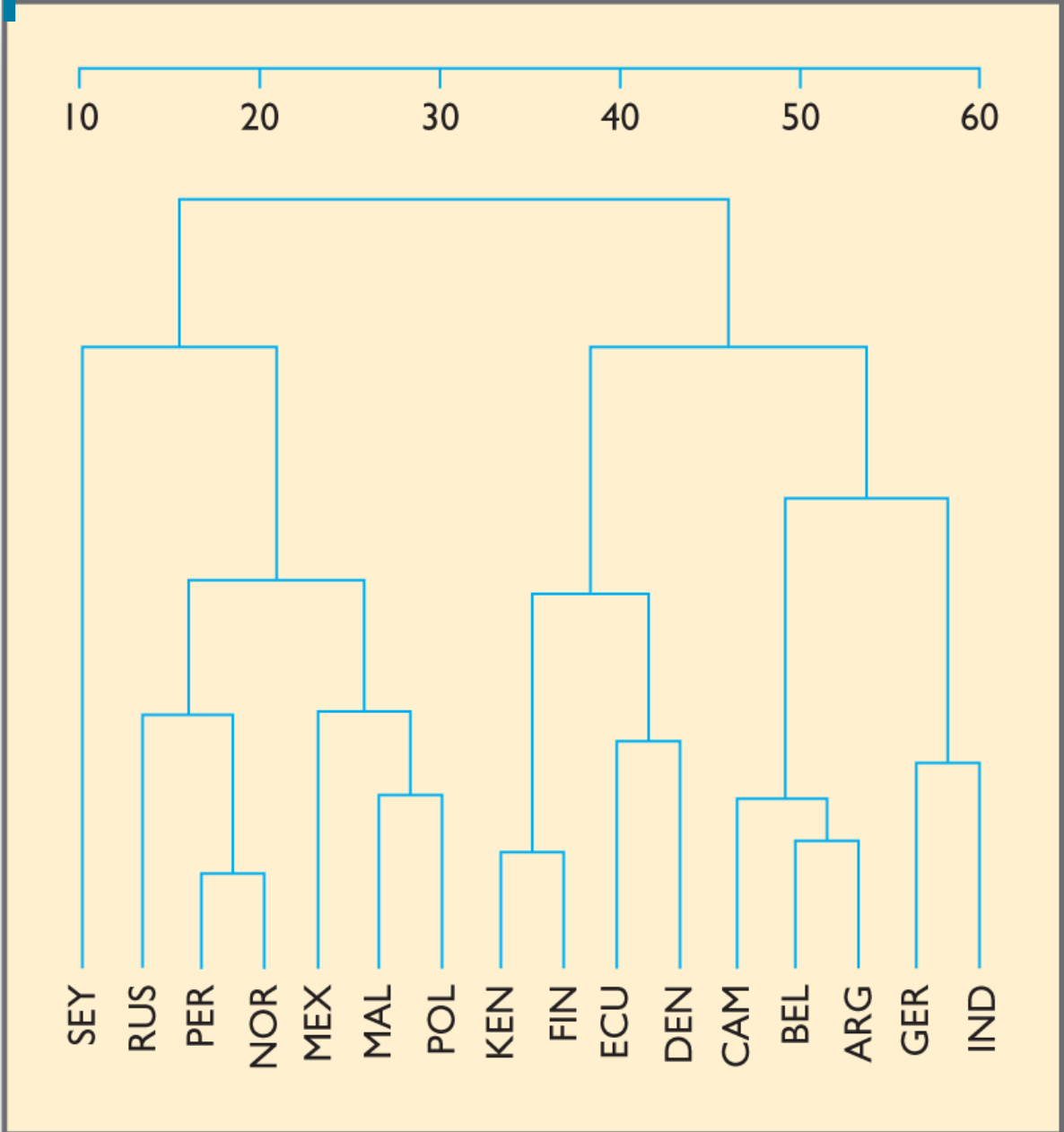
Affinity diagrams

- The affinity diagram, an important part of the contextual design approach (Holzblatt and Beyer, 2015), is essentially a card sorting technique used to bridge the immersive process of contextual inquiry and the creative process of ideation.

- In this technique, short statements derived from the stories that users told when being interviewed are written on sticky notes.

- The design team then spend considerable time (Holzblatt and Byer 2015 suggest 2 or 3 days) grouping the notes together, looking to have 4–5 notes grouped into single issues.

- Each group represents an issue.

Affinity diagrams

- The groups emerge from the data and they are not pre-defined. The issue is then labeled and issues are grouped into bigger issues that in their turn are grouped into themes.

- Holzblatt and Beyer (2015) suggest that if the process is done right, then a designer can read through the structure as if it were a story, reading down the themes to the detail of the actions that were obtained through the interviews.

- Actual user stories that support what are essentially conceptual scenarios are included at the bottom level of the affinity diagram.

Affinity diagram example:
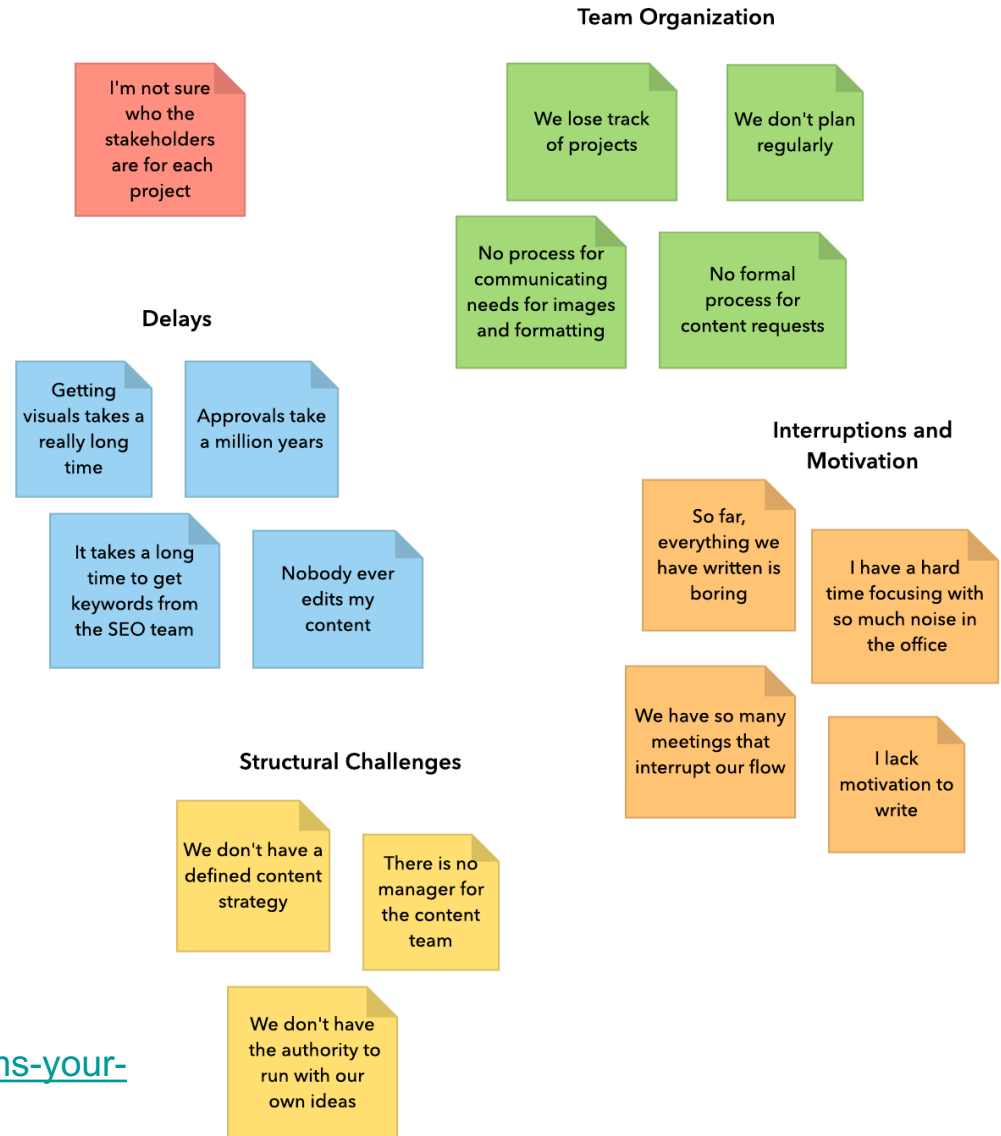
problems in the content- creation process

Our content writing team is not producing as much content as we think they should be. We can use an affinity diagram to uncover any problems and come up with solutions to resolve them.

To start, we create a document with the title "What are the problems in our content creation process?" After sharing the document with all of the relevant stakeholders, we give them time to record ideas at their leisure. The result looks something like this:

No formal process for content requests

We lose track of projects

It takes a long time to get keywords from the SEO team

We don't plan regularly

Getting visuals takes a really long time

We have so many meetings that interrupt our flow

Nobody ever edits my content

I'm not sure who the stakeholders are for each project

There is no manager for the content team

No process for communicating needs for images and formatting

Approvals take a million years

We don't have the authority to run with our own ideas

I have a hard time focusing with so much noise in the office

So far, everything we have written is boring

We don't have a defined content strategy

I lack motivation to write

Affinity diagram example

problems in the content- creation process

Team Organization

I'm not sure who the stakeholders are for each project

We lose track of projects

We don't plan regularly

No process for communicating needs for images and formatting

No formal process for content requests

Delays

Getting visuals takes a really long time

Approvals take a million years

It takes a long time to get keywords from the SEO team

Nobody ever edits my content

Interruptions and Motivation

So far, everything we have written is boring

I have a hard time focusing with so much noise in the office

We have so many meetings that interrupt our flow

I lack motivation to write

Structural Challenges

We don't have a defined content strategy

There is no manager for the content team

We don't have the authority to run with our own ideas

Semantic understanding: RepGrid

- The repertory grid technique (RepGrid), is based on the work of psychologist George Kelly (Kelly, 1955).

- In this method, participants are asked to describe the concepts that they think characterize some topic.

- For example, you might be investigating the qualities of personal devices and ask people to give adjectives (the constructs) that describe what they like about their mobile phone and other personal items (the elements).

- These descriptive qualities are then used to provide ratings of the constructs.

- For example, a mobile phone could be rated as heavy versus light, slim versus fat, comfortable versus uncomfortable and so on.

- This type of analysis is also related to the semantic differential and to other techniques that focus on the measurement of meaning (Osgood *et al.*, 1957).

Challenge- practical

- You are in the process of designing a new tourist information web site. You have collected the main categories of content you would like to include and you want to design the menu structure for navigating your visitors in the web site.

- Run an **open card sorting** exercise and report back your results

TRAVEL PLANNER

Plan your travel, cities to visit, activities, accommodation, tra...

HISTORY

Local history, early inhabitants

LOCAL INHABITANTS

First inhabitants of the country, and their habits

7. working with groups

Working with groups

- An alternative to asking individuals or stimulating individuals to provide information (questionnaires, probes) is to work with groups of people.

- The most common example of this is the **focus group**: a group of people are posed questions by facilitators and encouraged to react to each other's comments.

- If they are part of a group, people can be asked to describe how they cooperate to manage activities.

- Members of the group can stimulate each other's memories and discussion may flow more naturally than in the single-person interview.

Focus groups

- Focus groups can be enhanced by the use of **scenarios**, **prototypes** and other stimuli.

- Examples, use a robotic pet as a stimulus for talking about companionship with groups of older people.

- Use printed scenarios and screenshots of a mock-up automatic teller machine (ATM) to generate requirements for personalized ATM services

- Use maps and visitor guides to generate requirements for a mobile guide application.

Focus groups techniques

- A technique used to support focus groups is CARD (Collaborative Analysis of Requirements and Design, Tudor *et al.*, 1993; Muller, 2001).

- It involves physical playing cards with which a group can lay out, modify and discuss the flow of an activity.

- In the analysis phase, each pre-formatted card contains people's accounts of what is done and why for an individual component of the activity.

- Requirements on innovations in human practices or technologies can then be discussed around the cards. CARD is also intended to support design and evaluation.

Inspiration Card Workshop
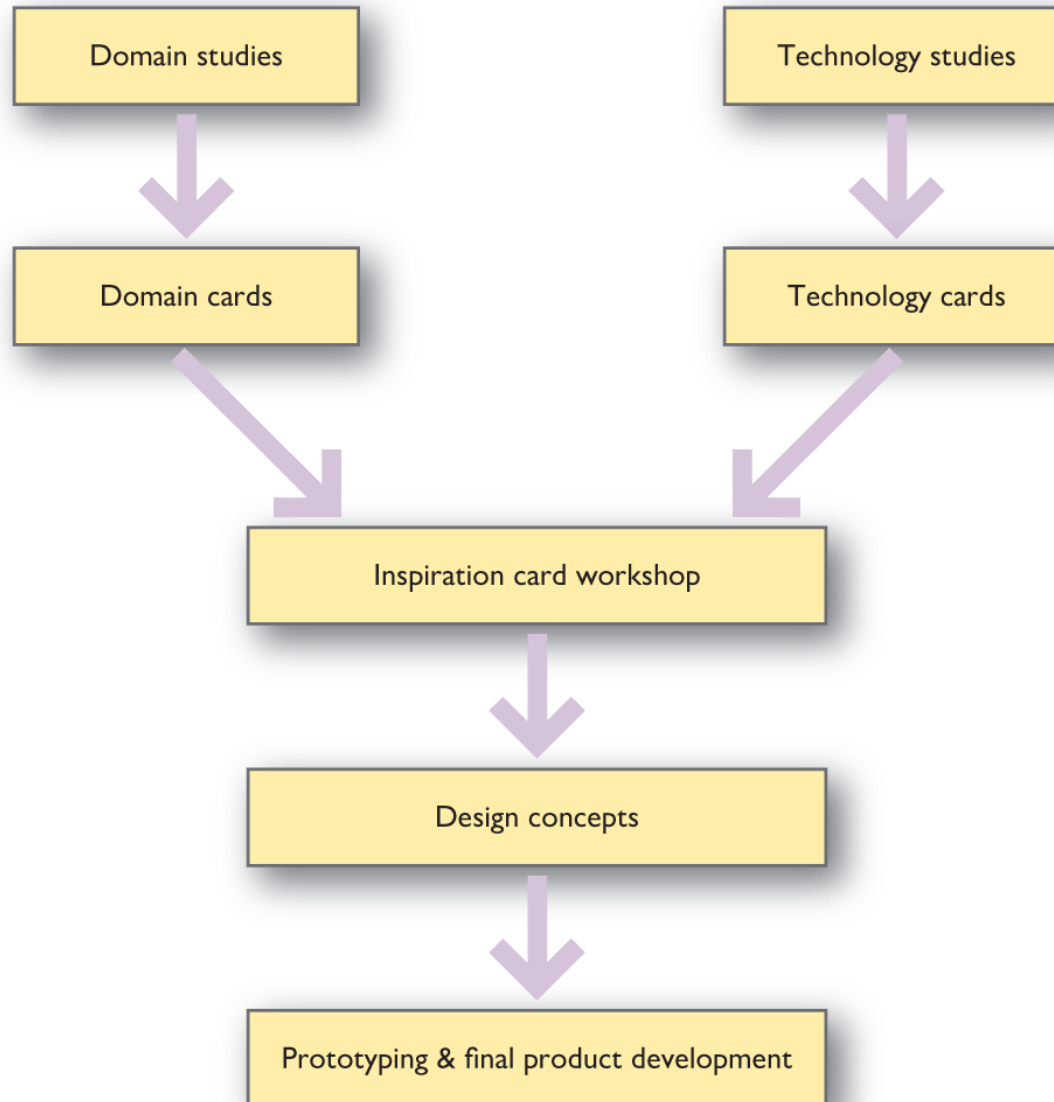
Inspiration card workshops

- Halskov and Dalsgaard (2006) use a method called Inspiration card workshop.

- Here physical cards (postcard sized) are used to stimulate group discussions about requirements and design.

- There are cards to focus on domain issues and cards that focus on technology issues.

- The cards are combined onto posters that can then be viewed by other groups (Figure).

- In this way, key issues are raised and made available for discussion.

- The authors argue that this is an important part of co-design, or co-creation, where designers and domain experts (future users) work together to generate requirements, rather than a designer trying to elicit requirements.

- Other methods for group working include the Future Workshop (Jungk and Mullert, 1987) and a number of methods by Edward de Bono (De Bono, 1993).

IDEO method cards

- This is a collection of 51 cards representing different ways that design teams can understand the people they are designing for.

- The cards can be used by researchers, designers, engineers and mixed groups to think about design issues and generate debate.

- The cards are classified as four suits that describe various types of activity.
  - Ask
  - Watch
  - Learn
  - Try

Brainstorming

- Brainstorming is a group creativity technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its members.

- Brainstorming sessions also require some stimuli, whether as pictures, text or video, to get the ideas flowing.

- Participants will need some way of recording their thoughts and ideas; a whiteboard, flip chart, paper and coloured pens.

- Post-it Notes in different colours can be used to capture ideas.

- This can be useful if the brainstorming session is followed by an affinity analysis where ideas are grouped together using different criteria.

Brainstorming

- An important point about brainstorming is not to dismiss ideas too soon.

- The sessions should begin with an 'anything goes' approach.

- Generate plenty of ideas.

- These can then be filtered in a part of the session that tries to look at the feasibility of the ideas and their practical impact.

- A good technique for helping brainstorming sessions is to get different members of the group to adopt different roles – the ideas generator, the critic, the sceptic, the pragmatic, the documenter and so on.

- Robertson and Roberton (2012) provide plenty of good advice on organizing and structuring brainstorming sessions.

KJ (Jiro Kawakita) method

5-Step method for idea evaluation, clustering and development:

- **Card making**: writing down relevant, verifiable and important ideas. One per card.

- **Grouping and naming**: Cards that appear to belong together are grouped, the groups provided with an appropriate name. The idea-groups are reviewed and – if possible – *clustered* in larger, appropriately named higher-level groups.

- **Redistribution**: The cards are collected and redistributed among the participants, akin distributing playing-cards. A card is read out and each person reviews their "hand" to find any card that fits with the one read out.

- **Chart making**: The total number of idea-groups must by now have been reduced to less than 10, which may contain one or more sub-groups. The cards are arranged on a sheet of paper in such a way that a spacial pattern is formed.

- **Explanation**: The participants try to express what the chart means to them, being careful to differentiate personal interpretations from facts.

https://articles.uie.com/kj_technique/

8. fieldwork

Fieldwork: Observing activities in situ (ethongraphy)

- Fieldwork (Ethnography) is a research method based on observing people in their natural environment rather than in a formal research setting.

- When ethnography is applied to design, it helps designers create more compelling solutions.

Reasons for doing fieldwork

- Interviews and questionnaires provide one side of the story, but it is difficult for people to describe all the details of the relevant aspect of everyday life or work.

- Ethnography is needed because sometimes the activity is intrinsically difficult to describe in words – many manual procedures fall into this category (e.g. try describing how to ride a bicycle) – or because it requires complex and subtle cooperation with other people or events.

- In other cases, an interviewee may describe the 'official' procedure rather than how something is actually done in practice.

- People might be embarrassed to admit to some difficulty they are having or may just tell the designer something to get rid of them.

ed

Discover meaning

People have a need for meaning in their lives. Ethnography provides rich insights into how people make sense of their world. For example, people incorporate rituals into their lives—but some rituals are large and public while others are small and private.

Understand norms

Cultural norms influence design decisions. Ethnography reveals the ways in which cultural norms shape people's perceptions. For example, some cultures emphasize the shape of the body and seek ways to accentuate it, while others try to minimize it. The role and use of color can also vary greatly from place to place.

http://www.aiga.org/content.cfm/ethnography-primer

Make communications powrful

Things need to be understood. Ethnography helps us learn how to communicate more effectively with target audiences, in a language and way they really understand. For example, a poorly designed communications piece can create confusion or anxiety.

http://www.aiga.org/content.cfm/ethnography-primer

Create for a global market

Ethnography helps us learn how products, technologies, and communications flow in the global world. Branding, experience design and point of purchase elements all tell a story. Compare how experiences work around the world, even for the same products and services.

http://www.aiga.org/content.cfm/ethnography-primer

Observe reality

What people say is not what they do. Ethnography highlights differences between what people perceive they do and what they actually do. For example, while people say they eat in a healthy way, they sometimes make less-than healthy food choices.

http://www.aiga.org/content.cfm/ethnography-primer

Identify barriers

Behaviors provide clues to where problems exist. Ethnography vividly identifies people's "pain points" and guides the way towards solutions. For example, the obvious solution to improve the morning commute is a cup holder.

http://www.aiga.org/content.cfm/ethnography-primer

Observation

- In its simplest form, the designer can simply ask **'Can you show me how you do tha**t' ? during the study.

- More complex or larger activities will require someone to spend some time on site observing as unobtrusively as possible.

- This is best done after some initial interviewing, so that the researcher have some idea what it is we are looking at.

- In many settings, everyone at the scene must be informed of what is happening and grant their permission in advance, even though they may not be the main focus.

- In more public settings (e.g. building foyers, streets and railway stations), observations may be undertaken without the permission of those being observed but the researcher should normally get the permission of the owners of the setting.

Observation

- Ideally, the observer needs to see a range of variations on the normal activity and situations where things go wrong but this may not be possible in many situations.

- Here the important point is to identify what the observers have not observed so they do not over-generalize from their data.

- As in interviews, notes should be taken and video recording is very useful, particularly for sharing the observation with other design team members.

Difficulties with ethnography

- Being unobtrusive is a skill of its own and the observers' very presence will naturally tend to make people self-conscious and may alter their behavior (something known as the **Hawthorne Effect**). With time, this effect is expected to decrease.

- It is much less of a problem where the activity observed absorbs all the participants' attention.

- It is also hard to observe effectively where the activity is simply one of the people processing data at computers with little or no interaction with other people or artefacts. Here it would be more productive to ask people to demonstrate aspects of interest rather than waiting for them to occur in real time.

- There are also ethical issues associated with observing people; permissions need to be obtained and anonymity of who said and did what should be ensured.

Ethical issues

- Most universities and research institutes will have a guide to the ethical issues involved when undertaking any form of study involving humans and this should be consulted before any studies are undertaken.

Example (The Research Councils of Canada)….

1. 'The welfare of a person is the quality of that person's experience of life in all its aspects. Welfare consists of the impact on individuals of factors such as their physical, mental and spiritual health, as well as their physical, economic and social circumstances. Thus, determinants of welfare can include housing, employment, security, family life, community membership and social participation, amongst other aspects of life. Other contributing factors to welfare are privacy and the control of information about the person and the treatment of human biological materials according to the free, informed and ongoing consent of the person who was the source of the information or materials' (p. 9).

2. 'Justice refers to the obligation to treat people fairly and equitably. Fairness entails treating all people with equal respect and concern. Equity requires distributing the benefits and burdens of research participation in such a way that no segment of the population is unduly burdened by the harms of research or denied the benefits of the knowledge generated from it. Treating people fairly and equitably does not always mean treating people in the same way. Differences in treatment or distribution are justified when failures to take differences into account may result in the creation or reinforcement of inequities. One important difference that must be considered for fairness and equity is vulnerability. Vulnerability is often caused by limited capacity, or limited access to social goods, such as rights, opportunities and power' (p. 10).

Design ethnography

- In the early twentieth century, pioneering **ethnographic anthropologists** endeavoured to understand an unfamiliar way of life through what has become known as 'participant observation' – learning about language, activities and culture through spending months or years living in the community under study.

- The anthropologists talked to people, observed day-to-day life in detail and collected not just physical artefacts but stories, myths and so on.

- Eventually, the resulting personal experience and field data were analysed and recorded as an ethnography.

- Sociologists, notably those from the University of Chicago in the 1930s, employed similar techniques in the study of societies and groups closer to home.

- In both domains, the basic approach continues to be used, including the core principle that the ethnographer should not interpose his or her own theoretical or cultural frameworks or expectations between the field data and the resulting ethnography.

Ethnomethodology

- Following the work of Suchman (1987), most ethnography for technology design adopts a particular flavour of sociology termed 'ethnomethodology'.

- In short, ethnomethodologists hold that social rules and norms, and practices are not imposed externally on everyday life but that social order is continuously and dynamically constructed from the interactions of individuals.

- As a corollary of this, it is philosophically unsound to generalize beyond the setting where the ethnomethodological ethnography has been undertaken, or to analyse the findings from a theoretical standpoint.

Design ethnography /2

- Ethnographic work in human-centred design projects is not always the preserve of specialist 'ethnographers'.

- As the approach has gained popularity, technologists and HCI practitioners frequently 'do some ethnography' for themselves.

- Their sometimes casual adoption of the techniques has attracted some adverse comment from those trained in the field (Forsythe, 1999), and more cautious practitioners often refer to their work as 'ethnographically informed'.

Design ethnography /3

- **Design ethnography** is a growing area of research and activity in UX design.

- It recognizes the difference between undertaking ethnographies from an anthropologist's perspective (where natural understanding is central) and the ethnographies practised by designers (where the aim is to inform design).

- The objectives for the design ethnographer are very much determined by those of the design project in hand.

- They often focus on elucidating the role and high-level requirements for a proposed new technology through a deep understanding of work in practice.

Design ethnography /4

- Dourish and Bell (2014) provide a good description of ethnographic and cultural anthropology in the context of the development of ubiquitous computing environments.

- In other projects, the ethnographer's added value to the process of understanding is in the definition of usage stories and scenarios, the identification of practical issues for implementation and as a focus for a higher degree of stakeholder involvement.

- The discussion in the final chapter of Heath and Luff (2000) is a particularly clear account of moving from ethnography to requirements using video-based studies of medical consultations.

Design ethnography /5

- Design ethnography requires a sensitivity on the part of the designer and a willingness to open up to the issues that people in a particular setting are concerned about.

- Design ethnographers focus on **activities**, **rules** and **procedures**, the **physical layout** of place where the activities take place and the use of **artifacts** in the work or leisure activities.

- Of course, the **internet** and **mobile devices** will often be a fundamental part of any activity and design ethnographers need to be particularly sensitive to the way these artifacts and **the social networks** that they enable contribute to peoples' activities.

- A set of guiding questions can be useful.

Rogers and Bellotti's 'reflective framework' for ethnographic studies

- Why is an observation about a work practice or other activity striking?

- What are the pros and cons of the existing ways technologies are used in the setting?

- How have 'workarounds' evolved and how effective are they?

- Why do certain old-fashioned practices, using seemingly antiquated technologies, persist, despite there being available more advanced technologies in the setting?

- Envisioning future settings what would be gained and lost through changing current ways of working or carrying out an activity by introducing new kinds of technological support?

- What might be the knock-on effects (contingencies arising) for other practices and activities through introducing new technologies?

- How might other settings be enhanced and disrupted through deploying the same kinds of future technologies?

Other ethnographies

- Design ethnography can also be undertaken on-line as opposed to just face-to-face.

- Here researchers may monitor social networks, join on-line communities, follow discussion groups, watch relevant YouTube videos and search out other on-line contributions to the domain of study.

- The term 'netography' has been used to describe on-line ethnographic research (Kozinets, 2010) where the advice is to follow good ethical and anthropological practice of being involved in the community rather than being a distant observer.

- Autoethnography (Ellis, Adams and Bochner, 2011) is an approach to understanding based on ethnographic study of one's self.

- The key to (relatively) economical ethnographic work is to recognize when enough data has been collected.

- One indication of 'enough' may be that no new details are emerging.

- Another is being able to identify what has not been observed but will not happen within the span of the current work.

Analysing ethongraphic data

- Of course, time is required not just to acquire the data but to analyse it.

- Video is intensely time-consuming to analyse – at least three times the length of the raw sequence and frequently more, depending on the level of detail required.

- The process can be streamlined by having an observer take notes of significant points in the 'live' action; these notes then act as pointers into the video recording.

- Software tools such as **Atlas.ti** and **Nvivo** help in analysing pages of text notes (not just of observations but also transcripts of interviews and group sessions) and, in some cases, audio and video data.

- For large projects, material can be organized into a multimedia database or web-based repository.

atlas.ti video analysis example: https://youtu.be/5Oxnh0C3W_s?t=264

Communicating ethnographic results

- Communicating ethnographic results can be challenging.
- One approach is to encapsulate the findings in 'vignettes' – short descriptions of typical scenes.
- A **vignette** is very similar to a scenario but less structured than the format we have proposed – perhaps more like the text of a scene in a play script, complete with stage directions.
- The vignettes are usually accompanied by a transcript of the accompanying dialogue.
- Vignettes are often supplemented by video extracts and sample artefacts.
- Another possibility is for the ethnographer to act as an evaluator of early concepts or prototype designs, before the requirements are finalized and while the design is too immature to benefit from user feedback.

Use of ethnographic results

- A close link between ethongraphic studies and system design has been attempted (Viller and Sommerville, 2000). This takes the output from the study and expresses its findings in the UML notation (UML is the Unified Modeling Language).

- By contrast, Heath and Luff (2000) and Dourish (2001) and Dourish and Bell (2011) argue that the purpose of workplace ethnography is to construct a reservoir of experience that allows designers to uncover how people make sense of technology in use and so to design tools which support the improvised, situated and continually reconstructed nature of real-world activity.

9. artefact collection

Artefacts collected and desk work

a photograph which might be taken and annotated to capture the range of information artefacts used in everyday work in an academic's office. These include the following:

- Laptop used for file archiving, calendar, document production, e-mail and internet
- Paper notebook – notes of *ad hoc* meetings also holds currently important papers
- Printouts of journal articles
- CD – current backup
- (Under mug) miscellaneous documents
- Sticky notes with 'to do' items, important phone numbers and IP address of laptop
- Telephone – internal and external calls
- Desktop PC – older file archive and connection to network backup used for email/internet if laptop connection fails.

Artefacts may be collected such as documents, forms or spreadsheets in office settings or to video or photograph items that cannot be removed

Other desk work

- Understanding activities does not just involve working directly with the people who are doing the activity now or who will be in the future.

- The designer will need to do 'desk work' as well.

- This may include records of **requests for help** or **user support** and records of **bugs reported** and **change requests** often reveal gaps in functionality or presentation.

- Other desk work involves reading **procedure manuals** and other material about the organization.

- It involves studying **existing software systems** to see how they work and what data is kept.

- Desk work involves collecting and **analysing** any documents that exist and documenting the **movement of documents** and the **structure of objects such as filing cabi**nets etc.

Looking at similar systems

- Looking at similar products, services or apps is another way of getting ideas.

- A **market analysis** looks at similar products that have been produced or services that are provided.

- This can be useful because the designer can see the product or service being used *in situ* and can consider the design solutions that others have proposed.

- This might highlight good and poor solutions for particular design problems.

- Looking at **similar activities** complements such an analysis.

- An activity might be in quite a **different setting** from the one under scrutiny but might have a similar structure.

- For example, looking at an automatic coffee machine might help in understanding an ATM activity.

Challenge

- What artefacts might you collect or photograph relating to people's use of communications technologies in the home? (Hint: think about non-electronic media as well.)

10. data analysis

Data analysis

- The data gathered needs to be analysed, digested, synthesized and presented in a way that other designers and all the stakeholders can understand.

- This involves designers immersing themselves in the data and taking time to explore the relationships between the data.

- A key distinction in methods of data analysis is between **quantitative** analysis and **qualitative** analysis.

Quantitative analysis

- Quantitative analysis involves gathering countable measures of some criteria.

- For example, a quantitative analysis of a questionnaire would focus on the number of people who answered the different questions in particular ways, or the percentage of the people who responded to the different questions.

- A quantitative analysis might include looking at the average number of people in different categories, the mean or mode of a data set and the size of the standard deviation of the population from the mean.

- Various statistical tests of the significance of the data that has been gathered can be performed in order to inform the analysis.

Qualitative analysis

- A qualitative analysis of data relies on the designer building an argument to support a view, making use of the data in a sensitive, user-focused way.

- For example, following the process of interviewing a number of users, the designer will read over the transcripts and look for recurring themes or issues that people are talking about.

- This might be backed up by observations that show for people having particular problems and following some desk work looking at similar products or services, the designer might point to some key issue that is currently badly covered by existing designs.

- Data analysis is all about understanding themes and categories that are more abstract than the raw data.

Data analysis

- In UNIT 02, we discussed a design method that used **stories** as the raw data and collected these together into conceptual **scenarios**.

- This process of abstraction led to a better understanding of the domain.

- Earlier in this unit, we discussed gaining a semantic understanding by using semantic differentials to gather data about the key descriptors of some domain.

- The scores on the detailed adjectives will be grouped together into larger concepts and themes to inform design.

- Different methods will be used in different ways to collect different types of data at different stages in design, so it is likely that the designer will use a range of qualitative and quantitative methods during the understanding process.

Triangulation

- Triangulation refers to the investigation of some phenomenon or some domain from at least two complementary positions.

- In order to be sure about the robustness of some data analysis, the UX designer should use some form of triangulation to verify findings.

- This could be getting two different researchers to analyse some data aiming to ensure inter-rater reliability of results.

- Data drawn from two or three different sources can be used to triangulate results.

- They are stronger results if they can be found in different data sets, or using different data gathering processes.

Grounded theoretic approach

- **Grounded theory** (Glaser and Strauss, 1967, Corbin and Strauss, 2014) is a qualitative method suitable for the analysis of the results of an ethnographic study, or an analysis of in-depth interviews.

- Transcripts of video or audio are marked up with **tags** – metadata that puts the word or phrase into a **category**.

- In the open coding approach, the researcher tags statements from the bottom up, grounded in the text, without concern (initially) as to where these concepts have come from.

- Axial or thematic coding is concerned with developing themes from the data.

- A common way of approaching this is to start off with a large number of low-level themes (maybe 30, or 50 in some domain) and then have a second pass through the data to see if any of the themes can be collected together into larger themes. These larger themes then create the axes within which to undertake further analysis.

- There is much discussion about grounded theory and the philosophical issues that surround it and ethnomethodological approaches to gathering and understanding data.

Other theoretical approaches

- **Distributed cognition** is an approach to understanding systems that recognize the importance of various artifacts and people coming together as a complex system necessary to achieve goals in some domain.

- Models of the information flows and structures (such as ERMIA) can be developed to represent the whole system.

- Another view of human cognition focuses on how activities are decomposed into actions that in turn are broken down into operations.

- **Activity theory** is on how the system as a whole can achieve the objective of the system and on the use of artefacts to mediate actions.

Humanistic UX

- More recently, Jeffrey and Shaowen Bardzell have suggested an approach to understanding and design that comes from a humanistic tradition (Bardzell and Bardzell, 2014).

- They use critical theory and other methods from literature and cultural studies to inform the data gathering and analysis for UX design.

- Their focus is on critical analysis of the discourse uncovered through qualitative methods of interviews, observations and so on and on the intertextuality of different methods (similar to the ideas of triangulation).

- Their design approach focuses on aesthetics of UX, on the poetics of UX and on the pragmatics of UX.

Summary of Unit04

- In this Unit, we have focused on some widely used techniques for understanding people and activities in context, so we can identify requirements on the design of new technologies.

- However, there is no firm distinction between requirements, envisionment, design and evaluation, so many of the techniques described here could be used at various stages of the design process.

- Design starts with researching and understanding the situation at hand, but in the course of achieving that understanding, designers iterate between the exploration of new concepts, envisioning ideas and the understanding and evaluation of ideas, designs and opinions.

- Using the techniques described here should ensure that designers undertake a human-centred process.

Key points

- Techniques for understanding people's activities in context include interviews, observation and collecting samples of artefacts, complemented by background research away from the domain of interest.

- Using more than one technique helps compensate for their individual limitations.

- Requirements work must be documented for communication and use in design; one way of doing this is a requirements specification supported by illustrative materials, another is in developing a scenario corpus.

- Understanding includes the analysis of data and this can be approached from a number of different perspectives, whether informed by one or more theories of cognition and action or whether the research takes an approach based on bricolage.

MAIN PARTS OF A STORYBOARD

- [ ] MAIN CHARACTER: PERSONA

- [ ] USER GOAL (TASK TO COMPLETE), MOTIVATION

- [ ] VILLAINS (PAIN POINTS, PROBLEMS, FRUSTRATIONS)

- [ ] LOCATION, SETTING (CONTEXT OF USE)

- [ ] SOLUTION (PROVIDED BY THE PRODUCT OR SERVICE)

- [ ] OTHER RELEVANT OBJECTS, CHARACTERS, RELATIONSHIPS

- [ ] SCRIPT