CHAPTER

Usage Research Data Analysis

8

Highlights

- Distill the essence from your usage research by synthesizing work activity notes from raw data notes.
- Make your work activity notes:
  - Elemental (about just one idea).
  - Brief and concise.
  - Complete.
  - Modular.
- Extract work activity notes that are inputs to user stories and requirements.
- Extract work activity notes that are inputs to usage research models.
- Organize the remaining work activity notes:
  - Simple methods for organizing small amounts of data.
  - Building WAADs for larger amounts of data.
- Large example.
- Synthesize the "elephant" that is user work practice, work domain, and user needs.

8.1 INTRODUCTION

8.1.1 You Are Here

We begin each process chapter with a "you are here" picture of the chapter topic in the context of The Wheel, the overall UX design lifecycle template (Fig. 8-1). Within the Understand Needs UX design lifecycle activity, this chapter is about the data analysis subactivity in which you analyze the usage research data you elicited in Chapter 7, furthering your goal of understanding the work context for the new system you will design.

8.1.2 Overview of Usage Research Analysis Subactivities

The overall goal of usage research analysis is to understand the user's work practice in the broader work domain of the product or system to be designed.

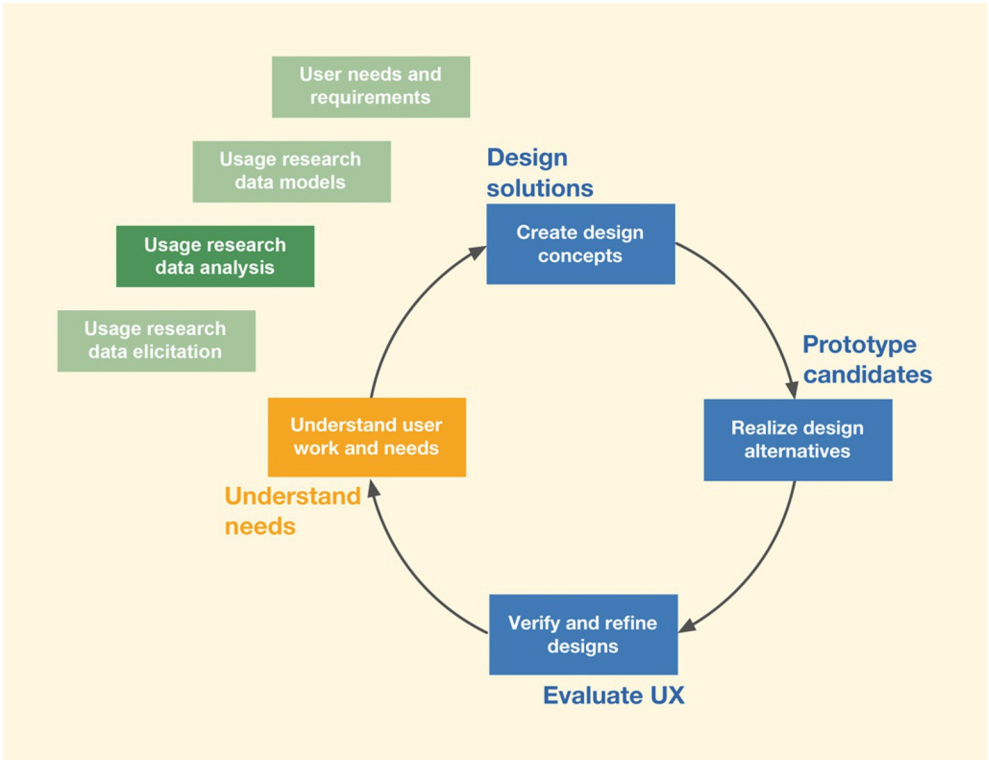

Fig. 8-1

You are here in the usage research data analysis chapter within the Understand Needs lifecycle activity, in the context of the Wheel, the overall lifecycle process.

If the system or product you are working on is large, unfamiliar, and/or domain complex, you can come away from usage research data elicitation feeling overwhelmed. This is when you can use the power of the UX process to distill and organize the usage research data.

A work activity note is brief, clear, concise, and elemental (relating to exactly one concept, idea, fact, or topic) statement used to document a single point about the work practice as synthesized from raw usage research data.

The subgoals of the main subactivities of usage research analysis (as illustrated in Fig. 8-2) are:

- Goal: *Distill the essence of what you discovered in usage research:*
  - Synthesize work activity notes from the raw data.

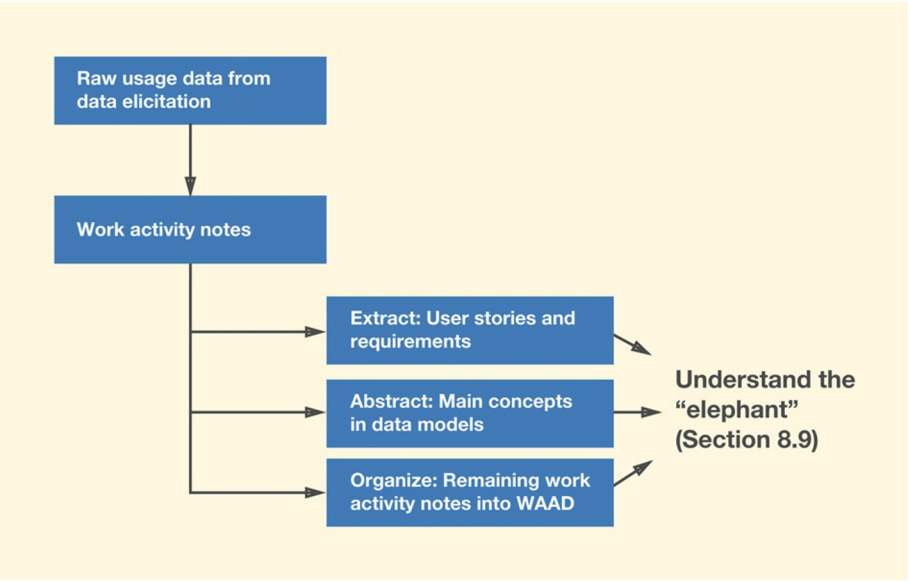

Fig. 8-2

A flow diagram of the usage research data analysis.

- Goal: *Enumerate features and capabilities users will need in the system or product:*
  - Extract work activity notes that are inputs to user stories and requirements (Section 8.3).
- Goal: *Capture and explain different aspects of work practice as sharable representations:*
  - Extract work activity notes that are inputs to data models (or integrate the notes directly into the data models) (Section 8.4).
- Goal: *Capture other details of the work practice, lessons, or insights in discrete microsummaries:*
  - Put aside the remaining work activity notes as inputs to the work activity affinity diagram (Section 8.5).
- Goal: *Create a representation of the overall understanding of the work practice, excluding things that are already in the models:*
  - Organize the remaining work activity notes into categories (Section 8.6), possibly within a work activity affinity diagram, or WAAD (Section 8.7).
- Goal: *Understand the whole domain and work practice picture* (Sections 8.8 and 8.9):
  - Synthesize all the usage research data.

8.2 DISTILL THE ESSENCE FROM YOUR USAGE RESEARCH BY SYNTHESIZING WORK ACTIVITY NOTES

Break each raw data note into its work activity notes. Make each work activity note brief but complete, self-standing, and modular. With your team in your UX studio, collaborate on making sense of the raw data you have gathered:

Domain complexity

The degree of intricacy and the technical, or possibly esoteric, nature of the corresponding field of work. Domain-complex systems are often characterized by convoluted and elaborate mechanisms for how parts of the system work and communicate, having complicated work flow containing multiple dependencies and communication channels. Examples include an air traffic control system and a system for analyzing seismic data for oil exploration (Section 3.2.2.3).

Synthesis

The process of integrating diverse inputs, facts, insights, and observations of parts of a concept to make conclusions that characterize and aid understanding of the whole concept (Section 8.9).

1. Start with the set of raw usage research data notes that came from data elicitation in Chapter 7.
2. Look at each raw data note in turn.
3. For each raw data note, synthesize each work activity note in turn.

8.2.1 Work Activity Notes can be Handwritten or Typed into a Laptop

While the process can work if you write the work activity notes on scraps of paper or Post-it notes, you might also want to consider capturing the notes in computer-readable form, whether in a word processor, a spreadsheet, or directly into a database system. This facilitates sharing, manipulating, and printing as needed.

8.2.2 Make Each Work Activity Note Elemental

A work activity note is a data note that refers to or relates to exactly one concept, idea, fact, or topic. Elemental means that the note is a simple constituent, uncompounded, basic note. Make each note brief, clear, and concise.

Example: Synthesizing Work Activity Notes for the TKS

Consider this raw data note:

> *It is too difficult to get enough information about events from a ticket seller at the ticket window. I would like to be able to find my own events and not depend on the ticket seller to do all the browsing and searching.*

There are at least two elemental work activity notes that can be synthesized simply by breaking apart the two sentences:

> *It is too difficult to get enough information about events from a ticket seller at the ticket window.*
> *I would like to be able to find my own events and not depend on the ticket seller to do all the browsing and searching.*

The latter of which can perhaps be shortened to:

> *I want to be able to browse and search for my own tickets to events.*

Example: Synthesizing Work Activity Notes for the TKS

As another example of synthesizing elemental notes for the TKS, consider this raw data note:

> *I like to keep up to date with what is going on regarding entertainment in the community. I especially want to know about current and popular events.*

Again, there are at least two work activity notes that can be synthesized simply by breaking apart the two sentences:

I like to keep up to date with what is going on regarding entertainment in the community.
I especially want to know about current and popular events.

Example: Synthesizing Work Activity Notes

For this example, let's start with this user comment in the raw data:

It is difficult to get enough information about events from a ticket seller at the ticket window. I always get the feeling that there are other good events that I can choose from but I just do not know which ones are available. But the ticket seller usually is not willing or able to help much, especially when the ticket window is busy.

A concise synthesized note:

I would like to be able to find my own events and not depend on the ticket seller to do all the browsing and searching.

8.2.3 Make Each Work Activity Note Brief and Concise

- Filter out all noise, fluff, and irrelevant verbiage.
- Rephrase, condense, and distill—boil it down to the essence.
- Make each work activity note easily read and understood at a glance.
- Make a clear, specific, and focused point, conveying the substance of the issue in question.
- Retain the original meaning and remain true to the user's intentions.

Example: Brief and Concise Data Notes

Consider, again, this raw data note:

There are often long lines and the ticket sellers are usually too busy to give you much help in choosing events. And, when they do pay attention, it is usually difficult to get enough information about events from a ticket seller at the ticket window.

It can be paraphrased and condensed into the following concise notes:

I don't like buying tickets at the central ticket office.
The ticket office usually has long lines.
The ticket sellers are usually too busy to help.
I can't get enough information about events from ticket sellers.

Example: Brief and Concise Data Notes

Consider this rather long raw data note:

> *I'd like to see a ticket kiosk in town here. I'd try it out and maybe I would use a kiosk to buy tickets for events around town. I'd also use it just to find information on what's going on. It would have to be close to where I live or work or shop.*

The first two sentences are mostly noise, just comments without much to say about design. They do not become work activity notes.

The third sentence can be interpreted as a general statement about using the kiosk as a community information source, a concise version of which is:

> *Use kiosks as a community information source.*

The last sentence can be synthesized and generalized as a note about kiosk location:

> *Locate kiosks near where people live, work, and shop.*

8.2.4 Make Each Work Activity Note Complete

Be specific; avoid vague terms. Resolve ambiguities and missing information as you synthesize the work activity notes (more on completeness in the next section).

8.2.5 Make Each Work Activity Note Modular by Retaining Context

Modular in this context means that each note is complete enough to stand on its own, a note that everyone can understand independently of all the others. Each note should be a single-topic piece that can be rearranged, replaced, combined, or moved around independently of the others. If notes are split to be elemental, this means preserving any context that each split-off piece gets from its companions.

8.2.5.1 Don't use an indefinite pronoun, such as "this," "it," "they," or "them" unless its referent has already been identified in the same note

As a corollary, make sure each work activity note does not contain unresolved indefinite references. State the work role that a person represents rather than using "he" or "she." Add words to disambiguate and explain references to pronouns or other context dependencies.

Example: Don't Lose Context When Splitting

> *Important to potential customer: A method such as the one just above is absolutely essential for getting to the needed information the fastest way, especially if you already know the name of the event.*

This is an example of how NOT to do elemental notes. Note how the reference to *A method such as the one just above* became unresolved after this note was split off from the preceding part.

Example: Retaining Context When Splitting

> *But it (the ticket printer failing) could happen, no matter how careful you are, given the amount of traffic and usage. What then? Need a customer service phone (e.g., hardwired to the company representative).*

Notice how the reference to "it" is resolved by adding a parenthetical explanation of the indefinite pronoun.

Example: Avoiding an Unresolved Indefinite Pronoun in a Data Note

Suppose when another note was split to make it more modular, one of the resulting notes is:

> *He didn't ask me if I wanted to see a movie.*

At the time the original note was split, this part should be disambiguated to read:

> *The ticket seller didn't ask me if I wanted to see a movie.*

Example: Not Using an Unresolved Indefinite Pronoun in a Data Note

> *From a system viewpoint, we can see that not printing tickets at the kiosk would be easier, but no one would want the tickets sent to their home. It's a big confidence issue about getting the tickets immediately.*

If these two sentences get separated for modularity, you need to explain what "It's" means in the second one:

> *Printing tickets in the kiosk is a big confidence issue about getting the tickets immediately.*

8.2.6 Additional Information to Accompany Work Activity Notes

If rationale information (why a user feels a certain way or does a certain thing) exists in the raw data, it should be considered to go along with the corresponding work activity note.

An example of a note that includes rationale is:

> *I do not ask for a printed confirmation of my ticket transaction because I am afraid someone else might find it and use my credit card number.*

This could be made more general to be a rationale for security about credit card information:

> *Extremely high priority requirement:*
>
> (1) *Must protect user credit card information.*
> (2) *Provide option of not printing confirmation of a transaction.*
> (3) *Obfuscate sensitive payment information (e.g., credit card) on a transaction conformation.*

If there are two reasons in the rationale for the idea or concept in the note, split it into two notes (repeating the context), as those two notes might eventually end up in different places.

8.2.7 For High Rigor, Maintain Connections to Data Sources

In cases requiring high rigor and traceability of usage research data and model components to original sources, you can tag work activity notes with "data source IDs," which are IDs of the people from whom the related raw data note was elicited. The source ID tag is passed along to the work activity note from the tag on the related raw data note.

Source IDs will allow you to go back to the original sources of the raw data if questions, disagreements, or interpretations of the data become an issue later in the process. Most projects do not require this kind of rigor.

Example: Tagging a Work Activity Note with Source ID

In the example at the end of Section 7.5.6, we had a raw data note that described a barrier in the workflow model of the ticket buyer, tagged with a source ID of "8." This is the unique identifier of the individual we interviewed. The best practice is to maintain confidentiality by excluding real names and maintaining the name-ID mapping somewhere else. The corresponding work activity note, synthesized in analysis, will also retain that tag:

It is usually difficult to get enough information about events from a ticket seller at the ticket window. [8]

8.2.8 Preview of Sorting Work Activity Notes into Categories

The simplest way to describe this process and to practice it is to use each work activity note in just one "category" (used here as a convenient term for different representations of work and needs (e.g., models vs. user stories vs. the WAAD)). However, while we describe it this way for expediency, there might be times when a given work activity note is useful in more than one place to form different perspectives on the data. So, we urge you to use the usage research data in whatever way possible to create a full understanding of the "elephant" (a reference to the parable of the blind men who each "see" an elephant differently, Section 8.9) that is the work practice and work domain.

In this sorting of work activity notes, you are just sorting them out as *inputs* to the categories. You are not yet writing user stories or requirements or making models from these notes (the one exception is merging a note into an existing model if that is just as easy as sorting it into the modeling category).

In sum, you start with the full set of work activity notes you just extracted from the raw usage research data.

1. Extract work activity notes that are inputs to user stories or requirements and put them in a user stories and requirements pile.
2. Extract work activity notes that are inputs to data models and put them in a data models pile (or experienced UX professionals may find it convenient to merge them directly into existing models).
3. Treat the remaining work activity notes as inputs to the work activity affinity diagram (WAAD) and put them in their own pile.

8.3 EXTRACT WORK ACTIVITY NOTES THAT ARE INPUTS TO USER STORIES OR REQUIREMENTS

8.3.1 User Stories and Requirements

A requirement is a small-scope or large-scope statement, formal or informal, of a necessity that is essential to be included in a design. A user story is a small-scope requirement, written in a particular format.

A requirement, generally used in nonagile environments, is written as a statement within a requirements document (Section 10.3.5). A user story, the essence of agile requirements, is written as a short narrative description about a

Scope (of delivery)

Describes how the target system or product is "chunked" (broken into what size pieces) in each iteration or sprint for delivery to the client and users for feedback and to the software engineering team for agile implementation (Section 3.3).

Waterfall lifecycle process

One of the earliest formal software engineering lifecycle processes; an ordered linear sequence of lifecycle activities, each of which flowed into the next like a set of cascading tiers of a waterfall (Section 4.2).

capability, function, or feature that is wanted or needed in the product or system (Section 10.2.2).

During a time when the Waterfall process was prevalent, we used requirements to codify what was needed in the system in formal statements. Those requirements were targeted as features the system should support. There was a flavor of system-centeredness. In the agile world, the focus is on delivering meaningful capabilities to the user. So these days there is more emphasis on stating the needs using that perspective and user stories are one popular way of doing that.

8.3.2 Extracting Inputs to User Stories or Requirements

It is useful to keep related information with notes extracted as inputs to user stories or requirements. For example, keep information from these notes about related user work role(s) and the reason why the feature is desired.

Because we want this set of inputs to user stories or requirements to be as complete as possible, data analysis is the time to interpret any note mentioning a want or need for a feature, functionality, or design as a user story or requirements note, regardless of whether those wants or needs were actually expressed by a user.

See Chapter 10 for more about user stories and requirements.

Example: Extracting Inputs to User Stories for the TKS

Consider these work activity notes coming out of the example in Section 8.2.2:

> *I like to keep up to date with what is going on regarding entertainment in the community.*
> *I especially want to know about current and popular events.*

Both sentences can be interpreted as inputs to user stories representing slightly different perspectives.

Example: Extracting Inputs to User Stories for the TKS

Consider these two related work activity notes:

> *I want to see reviews and other feedback from people who have already seen the show.*
> *[Design idea] Consider including capability for people to add reviews and to rate reviews.*

The first is an obvious candidate as an input to a user story. The second is a design idea that might well be transformed into the form of a user story.

A larger example appears right after Section 8.7.

8.4 EXTRACT NOTES THAT ARE INPUTS TO USAGE RESEARCH MODELS

After dealing with raw data notes relating to user stories and requirements, the next kind of data to look for is the work activity notes relating to usage research data models. You can either extract them to use them as inputs to data modeling (making simplified data representations by abstracting out unimportant details, Chapter 9) or, if it is easy to do, integrate them directly into the corresponding models right now.

8.4.1 Modeling Started Back at the Project Beginning

Much of what goes into the models starts at the beginning before you ever go into the field for usage research. This is especially true for models such as user work roles and the task structure as well as the basics of the flow model.

Some information for the models might come from early project commission documents (e.g., business proposal, design briefs) and early discussions with the client while setting up the project. By the time you get to usage research, you should already know a bit of what is in some of the models.

In many projects, much of the modeling done after data elicitation will be to verify and refine the models and to fill gaps. This chapter is about extracting the model-related notes as inputs to modeling (or, in some cases, putting them directly into the models). The next chapter, Chapter 9, is where we tell you more about how to continue the modeling.

Example: Extracting Model-Related Data

Consider this work activity note from the end of Sections 8.2.3 and 8.2.7:

> *It is usually difficult to get enough information about events from a ticket seller at the ticket window.*

This can be represented as a barrier in the workflow model of the ticket buyer.

8.5 THE REMAINING WORK ACTIVITY NOTES BECOME INPUTS TO YOUR METHOD FOR ORGANIZING THE NOTES BY CATEGORY

You should have all the remaining work activity notes after notes that can be used as inputs to user stories or requirements and the models have been extracted. These "leftover" work activity notes are now treated as inputs for organizing the notes by category.

8.5.1 Print Work Activity Notes

Although you can use handwritten work activity notes, some prefer to print the notes. If you have captured your work activity notes in computer-readable form, it might now be convenient to print them out for use in making the work activity affinity diagram. You can print the notes on yellow Post-it note stock, such as the kind that has six peel-off Post-it labels per page.

Affinity diagram

A bottom-up hierarchical technique for organizing and grouping large amounts of disparate qualitative data, such as the work activity notes from usage research data, to highlight the issues and insights in a visual display (Section 8.7.1).

Notes printed or handwritten on colored bond printer paper formatted, say, six to a page, also work fine. If your work activity notes come from a database, you can use the "mail-merge" feature of your word processor to format each note into the table cells for either plain paper or Post-it printing.

Exercise 8-1: Work Activity Notes for Your Product or System

Goal: Get practice in synthesizing work activity notes from your usage research data.

Activities: If you are working alone, it is time for another pizza-and-beer-and-usage-research-analysis party with your friends.

- However you form your team, appoint a team leader and a person to act as note recorder.
- The team leader leads the group through raw data, synthesizing work activity notes on the fly.
- Be sure to filter out all unnecessary verbiage, fluff, and noise.
- As the work activity notes are called out, the recorder types them into a laptop.
- Everyone on the team should work together to make sure that the individual work activity notes are disambiguated from context dependencies (usually by adding explanatory text in italics).

Deliverables: At least a few dozen work activity notes synthesized from your raw usage research data. Highlight a few of your most interesting synthesized work activity notes for sharing.

Schedule: Based on our experience with these activities, we expect this to take you an hour or two.

8.6 ORGANIZE THE WORK ACTIVITY NOTES

Goal: *Organize your work activity notes to identify unifying and underlying themes about the work domain.*

In a small-to-medium size project, the size of your set of work activity notes will be tractable and can be organized with a modicum of time and effort. A large,

complex project or a project with a high need for rigor can require more effort because you may have a large number of work activity notes to go into the work activity affinity diagram. Here is how to do it for almost any project:

- If the set of work activity notes is small and the project is simple, organize the work activity notes into a hierarchical bullet list.
- If the set of work activity notes is medium-size and not too complex, organize the work activity notes with the card sorting technique (next section).
- If the set of work activity notes is large, your project is complex, and/or there is a need for high rigor, organize the work activity notes in a work activity affinity diagram, or WAAD.

Work activity affinity diagram (WAAD)

A hierarchical bottom-up technique for organizing disparate pieces of data, used to sort and organize work activity notes in usage research analysis, pulling together work activity notes with similarities and common themes to highlight common work patterns and shared strategies across all users (Section 8.7).

8.6.1 Card Sorting Is a Simple Technique for Data Organization

Card sorting is a participatory affinity identification technique used to organize sets of data items (e.g., ideas, concepts, features) into a hierarchy of categories, each grouped by a common theme (Martin & Hanington, 2012, p. 26). It is an easy, inexpensive, and effective method of organizing data into categories.

Ideas that need to be organized are printed or written one per card. Give a small group a stack of these cards. Ask the participants to group the cards into piles that seem to be about similar or closely related concepts, using any criteria they choose. Listening to the group discussion that occurs is helpful in understanding their mental processes that led to the categories. Each pile is given a representative category label. According to Kane (2003), "The approach can be used to identify the major content categories of a website or to organize system functions into a useful collection of menus." In some ways, card sorting is like a one- or two-level affinity diagram. If you need a bit more organizing power than this, you can create a WAAD (see next section).

8.7 FOR HIGHER RIGOR IN COMPLEX PROJECTS, CONSTRUCT A WAAD

8.7.1 Affinity Diagrams

Affinity diagrams are a bottom-up technique for organizing lots of disparate pieces of data, such as the work activity notes from your usage research data. Affinity diagramming came from Kawakita Jiro, a Japanese anthropologist, as a means to synthesize large amounts of data from the field (Kawakita, 1982). An affinity diagram is a hierarchical structure in which notes about similar ideas are grouped together (by affinities). We adapt affinity diagramming as a technique for building a work activity affinity diagram (WAAD) to organize and group the

issues and insights across your usage research data and show it in a large visual display.

A WAAD is an affinity diagram, a hierarchical bottom-up technique for organizing disparate pieces of data, used to sort and organize work activity notes in usage research analysis, pulling together work activity notes with similarities and common themes to highlight common work patterns and shared strategies across all users.

An affinity diagram is used to:

- Organize the work activity notes you synthesized in the previous section.
- Provide a structure that yields sense.
- Afford visualization of the user's work.
- Suggest ideas for designs.
- Helps generalize from instances of individual user work activities to broader work themes.

Our description of WAAD building here is at a medium level of rigor. You should choose an approach that fits your needs for a tradeoff between rigor and efficiency. WAAD building in most real projects tends to be very informal.

8.7.2 Prepare Your Work Space and Your Team

- ***Set up your work space.*** Prepare a large posting and working space on the walls of your design studio or on the tops of work tables.
- ***Work together.*** This is highly collaborative work.
- ***Democratic process.*** None of the data is "owned" by any team member.

8.7.3 Compartmentalize the WAAD, Separating it by User Work Roles

Often, the set of tasks performed by one user work role is separate from those performed by others. For example, consider the Middleburg University Ticket Transaction Service (MUTTS) ticket seller and the MUTTS database administrator. Each performs different work with different concerns and needs.

This allows us to divide the task structure into separate structures at the highest level, one for each user work role. This separation is how we can use work roles to divide and conquer to control complexity. It becomes easier to do analysis and design for one work role at a time.

Following this approach in analysis, we divide the WAAD into multiple separate WAADs to simplify the WAAD-building process. Many (most) of your work activity notes will be associated with, or apply to, just one given user work role.

MUTTS

MUTTS is the acronym for Middleburg University Ticket Transaction Service, our running example for most of the process chapters (Section 5.5).

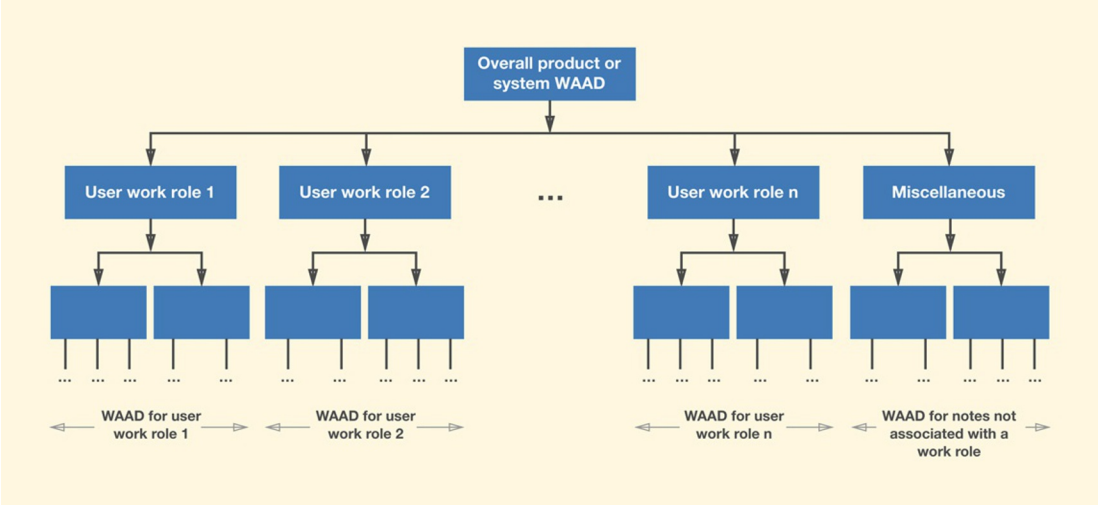

Fig. 8-3
Work activity affinity diagram compartmentalized by user work roles.

- Put sticky notes up along the top of your posting space with labels (we suggest a different color from that of the work activity notes) labeled by user work role, as in Fig. 8-3.

Of course, you will still have some work activity notes that aren't tied to a specific work role, which go into a WAAD for miscellaneous notes (also in Fig. 8-3). You may still also have to deal with an occasional work activity note that involves more than one work role, probably by splitting or duplicating the note.

8.7.4 The Bottom-Up Process of WAAD Building

8.7.4.1 Posting work activity notes

- Consider each work activity note in turn.
- Decide which user work role (or "Miscellaneous") sub-WAAD is the best fit.
- If there is no note yet posted in this sub-WAAD or if the note to be posted doesn't fit the theme of any existing group in the most appropriate sub-WAAD:
  - Start a new group by posting the work activity note somewhere under the sub-WAAD (this is how the WAAD grows in breadth).
  - Add a topic label to identify the theme of this new group (see next section on labeling).
- If the current work activity note fits the topic of an existing group already under this sub-WAAD:

- Add it to that group.
- Adjust the label as necessary to encompass the new note, adjusting the "meaning" of the group or expanding its scope.

- Continue in this fashion, growing and evolving groups of work activity notes.

8.7.4.2 Labels for groups of notes

- Decide on an initial label for the affinity theme of this group and write it (usually on a Post-it or note paper of a color different from that of the work activity notes):
  - A precise group label is important for capturing the essence, gestalt, or meaning of the group.
  - A group label denotes the exact scope of the group.
  - Avoid wordings with low descriptive power, such as "general."
  - A highly descriptive group label makes it so you don't have to look at the notes anymore to know what the group is about.
- Post the label above the work activity note, as the heading of the group.

As an example of the importance of precision in labels, a team in one of our sessions used the label "How we validate information" when they really needed the more precise label "How we validate input data forms." A subtle difference, but important to the intended affinity for that group.

8.7.4.3 Growing labels with growing groups

As a group grows by the addition of new work activity notes, the theme represented by the set of notes taken as a whole can expand and the label should be expanded accordingly.

Example: Growing Labels with Growing Groups

Look at the purple label in the middle of Fig. 8-4. This shows a label that has had terms added to it in the course of evolution within a group of work activity notes for the Ticket Kiosk System (TKS).

Note that we will be using real data from MUTTS from which the notes in this example are drawn. You may wish to see what these data look like in raw and work activity note form. See the book website (http://www.theuxbook.com/) for a representative listing of the MUTTS/TKS usage research data.

That group label started out as just "My concerns about security." Notes about privacy and trust got added to this group because those concepts have an affinity with security. The group label was expanded to track this expanding theme so it can be clearly understood without having to look at the notes in the group. Fig. 8-5 is a closeup of that topical label, showing how extra descriptive terms were added at different times to enlarge its scope during the process of building

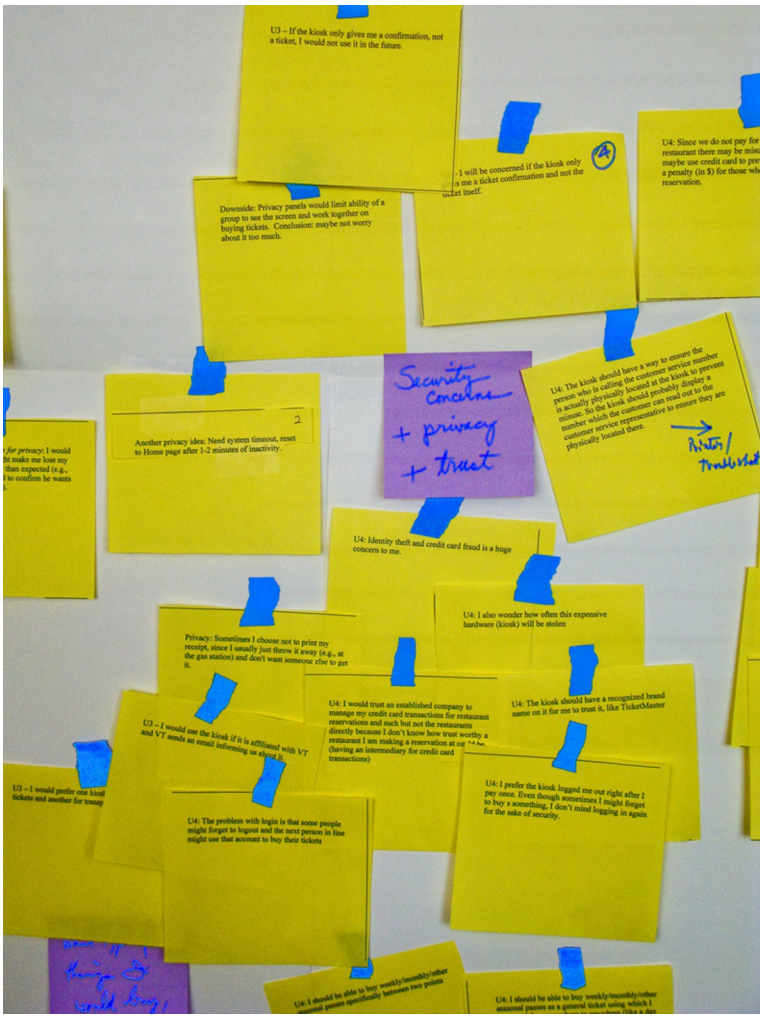

Fig. 8-4

A group with a growing topical label.

Fig. 8-5

A topical label that has grown in scope during affinity diagram building.

the affinity diagram, expanding its purview to include security, privacy, and trust concerns.

8.7.4.4 Splitting large groups

As groups grow from taking in more and more work activity notes, they can get too large and the topic too general to be useful in organizing the work activity notes. Split groups with more than about 10–12 work activity notes as follows:

- Find one or more subtopics within the group.
- Split the group into one or more subgroups based on affinities or commonalities with the subtopics.
- Add precise (and usually narrower scope) labels to each new subgroup.
- Add a "supertopic" label (see explanation below) above to represent this group of new subgroups (usually some variation of the group topic before splitting).
- The new subgroups are now hierarchical "children" of that supertopic label (this is how the WAAD grows in height).

Supergroup labels and subgroup labels. Keep paying attention to all the group and supergroup labels. When you split a group and create several new labels, including the one for the new supergroup, this is a time when labels can suffer in precision and effectiveness. Adjust labels to maintain their descriptive power and their power to discriminate between groups, without looking at the notes within the groups. Apply this test for coherence within a group: Does the label express what all the notes have in common?

Example: Group Splitting in the WAAD

At the top of Fig. 8-6, we see the updated group label, "My concerns about security, privacy, and trust," that resulted from the growth of the label in Fig. 8-5. As notes further built up in that group, it became too large and had to be split. It was tempting to split this one into the three subgroups already named in this label. However, before that the team decided that there were security-related issues in the organizational perspective that were somewhat different from those of the customer. So they first split the top label into "Our organizational perspective" and "My customer's perspective. As an aside, to be modular by retaining context, each of these should explain what those perspectives are about, namely security, privacy, and trust.

The team followed up with the obvious split of "My customer's perspective" into the three kinds of security-related concerns, as you can see in the three blue labels on the right side of the middle of the figure for: "My need for fraud protection," "My feelings about trust," and "My need for privacy."

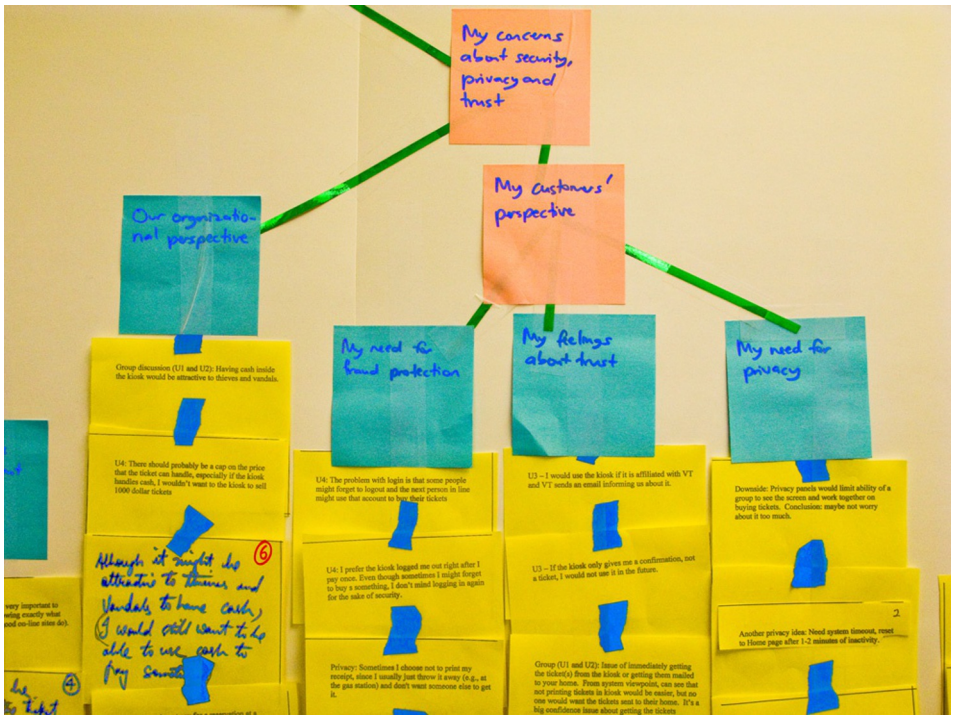

Fig. 8-6
Group affinity labels (in blue).

8.7.4.5 As you work

Keep refining and reorganizing the groups and labels. The order and organization of the groups and their labels should be considered flexible and malleable.

- Split a group if its notes address more than one topic (i.e., if some work activity notes don't quite fit the group topic).
- Combine two groups if they are about the same topic.

Keep it moving. Don't get distracted with details and sidebar discussions.

- Highlight the more important notes.
- Don't get tangled up in premature discussions about design or implementation.

Topical labels for groups evolve. Groups will grow and morph as they mature into more clearly defined sets of notes, each related by affinity to a specific topic. This is what Cox and Greenberg (2000) call *emergence*, "… a characteristic of the process by which the group interprets and transforms … raw [data] fragments into rich final descriptions."

8.7.5 Use Technology to Support WAAD Building

A very large wall space works well for WAAD building (Fig. 8-7).

Fig. 8-7
Team working to build a WAAD.

For teams that do WAAD building frequently, there are higher-tech WAAD-building tools. In Fig. 8-8, we show a team at Virginia Tech using affinity diagram software on a high-resolution large-screen display as an alternative to paper-based work activity note shuffling (Judge, Pyla, McCrickard, & Harrison,

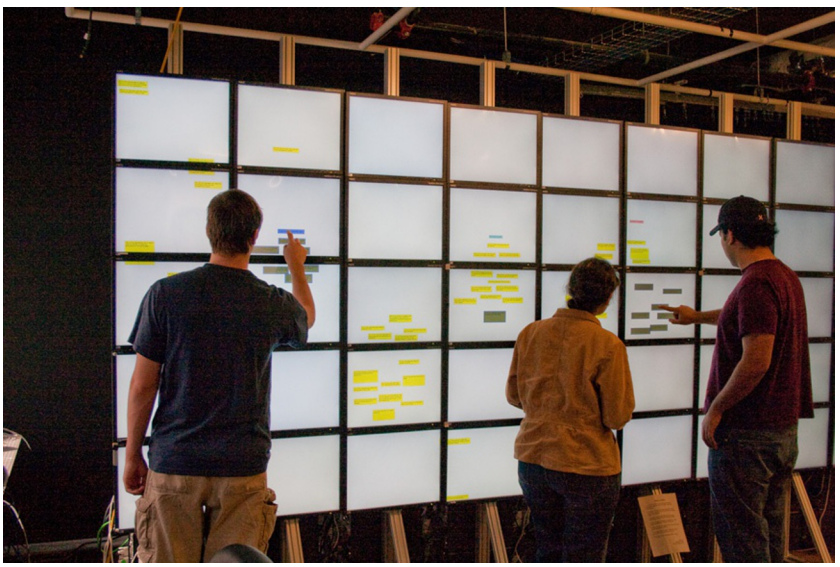

Fig. 8-8
Building a WAAD on a large touchscreen.

2008). Each analyst can select and manipulate work activity notes on a laptop or tablet before sending them to the wall for group consideration, where they can move them around by touching and dragging.

8.7.6 Continue Organizing Groups into a Hierarchy

In Fig. 8-9, showing part of the affinity diagram for MUTTS, you can see groups (blue labels) connected into supergroups (pink labels).

Similarly, you can group second-level groups to form a third level with yet another level of labels. As with group labels, wording of higher-level labels has to represent their groups and subgroups so well that you do not have to read the labels or notes below them in the hierarchy to know what the group is about.

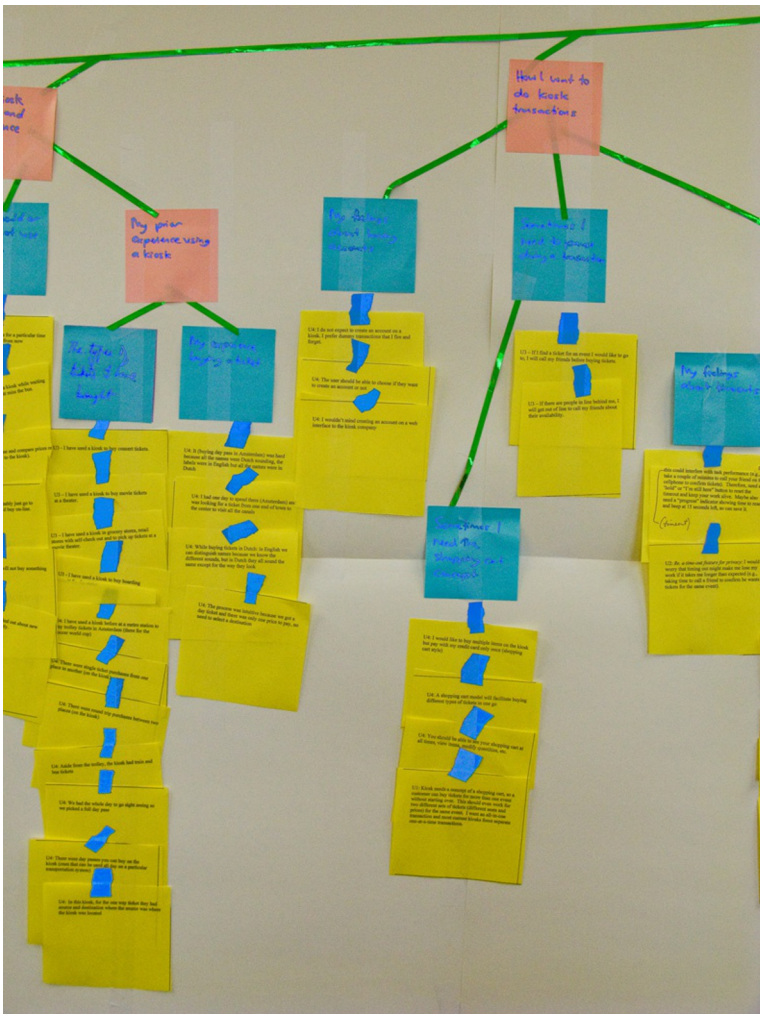

Fig. 8-9
Second-level superlabels for supergroups shown in pink.

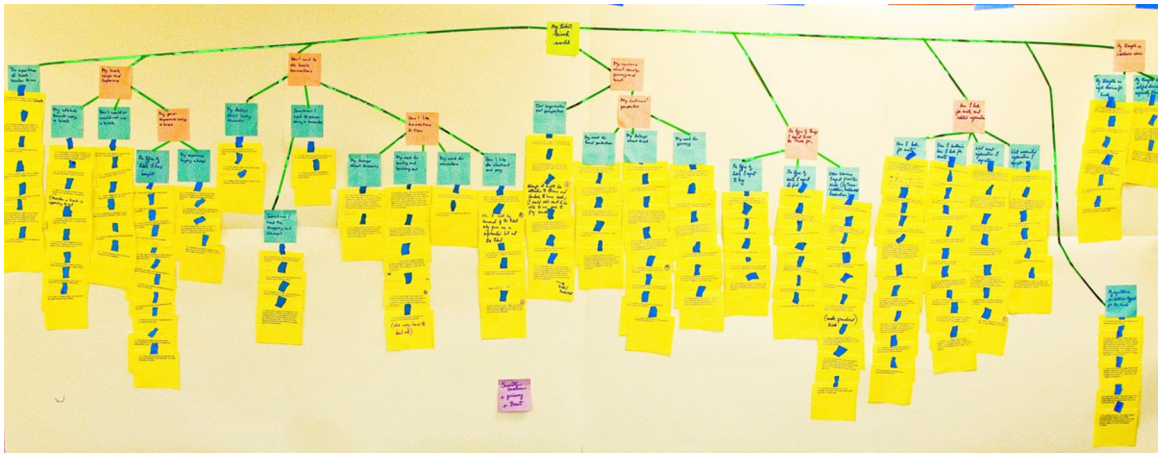

Fig. 8-10
The WAAD that we built for the MUTTS example.

In Fig. 8-10, you can see a photo of a large part of the overall WAAD we built for MUTTS.

Just as a further example of WAAD structure, Fig. 8-11 is a close-up photo of the MUTTS WAAD showing details for three groups having an overall label, "The type of things I expect to use the kiosk for."

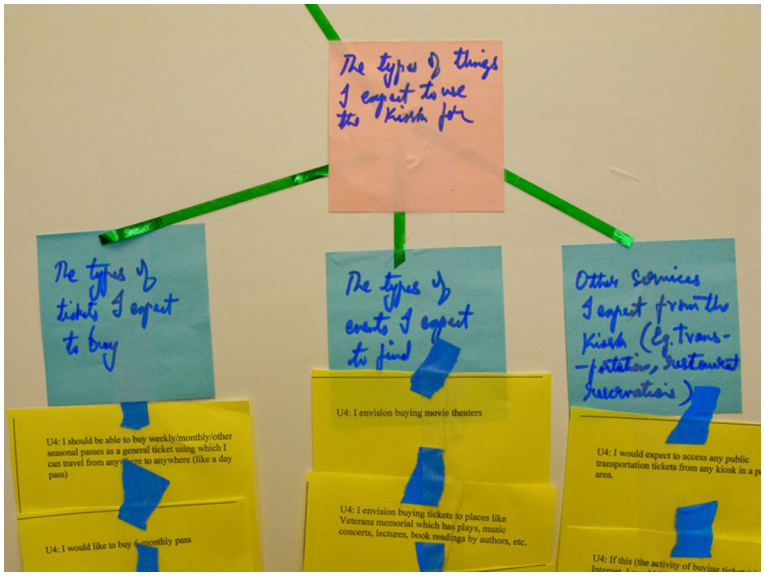

Fig. 8-11
A closeup of the MUTTS WAAD.

8.7.7 At the End, Create "Highlights"

Create a highlights display. Finally, as your team discusses the posted contextual data notes, it is useful to pull out the main and most interesting points and display them as highlights to focus on what's most important.

Example: Sorting Out TKS Work Activity Notes

As a summary of most of this chapter, the following is a large example of sorting out work activity notes obtained from TKS data. This example was based on about 120 selected data notes from the usage research for the TKS. We used the data sorting techniques described in Section 8.6.1 and put each note into these structures: requirements, models, and the WAAD.

Even though this example did turn out to be rather large, it is something many readers and instructors have asked for since the first edition came out. We wanted to include enough data notes to be realistic and to represent most of the important categories in the results but still not be too large for inclusion in this chapter.

The contents in this example are generic data notes, obtained before we had developed the concept of work activity notes. They are probably somewhere between raw data notes and work activity notes. Any flaws you spot in these notes make them like notes you might see in a real project, which is what they are.

Most of those under requirements could just as well be under user stories. Also, as we said earlier, each note could appear in more than one place in this organizing structure, but we choose just one for simplicity.

Here is how we did the analysis for a small selected sample of data notes.

23: The kiosk should remind people to take the ticket and credit card (at the end of the transaction).

Requirements > Interaction design > Transaction flow

Note to reader: These sequences of terms in italics are an attempt to show path names using node labels within a hierarchical organizing structure.

13: Need graphical display of seating arrangements (text description of types of seating not meaningful enough to decide).

Requirements > Interaction design > Features > Visual display of seating arrangements

11: Sort by categories (sports, movies, etc.), date/time, price, location. User drills down into hierarchical structure.

Requirements > Information architecture > Structure, organization by category

18: It will be very important to have a confirmation page showing exactly what I'm buying before I pay (as good online sites do).

Models > The flow model

106: I would like to be able to browse by different topics (type of event). For example, in big cities, even in music there will be different genres.

Models > Task models

70: I would use the kiosk if it is affiliated with Middleburg University and MU sends an email informing us about it.

Work activity affinity diagram > User ticket-shopping behavior > Likelihood of using a kiosk

02: Idea: Although marketing people might not think to put a kiosk next to the ticket window at the ticket office, it would be very helpful for people who get there and find the ticket office closed.

Work activity affinity diagram > Business issues > Kiosk locations

Example: Large Example of Sorting Out Work Activity Notes for the TKS Project

Requirements

Interaction design

Transaction flow

18: It will be very important to have a confirmation page showing exactly what I'm buying before I pay (as good online sites do).

21: The kiosk should remind people where the ticket comes out.

22: Part of the ticket selection *process* is the option to view the map to the venue.

23: The kiosk should remind people to take the ticket and credit card (at the end of the transaction).

57: Need a "bread crumb" kind of trace of my progress through the kiosk system, showing what I've done in a step-by-step display at the top.

Features

Visual display of seating arrangements

10b: Look at seating options versus prices, will I find an option allowing several friends to sit together?

13: Need graphical display of seating arrangements (text description of types of seating not meaningful enough to decide).

Access to "more information"

12: Alternative (*to seeing top events on first page*): have a button for current events and recommendations on first page. Make the button very obvious so no one can miss it. Have a "More" button to see more details and narrow down the choices. [Interpretive comment: This is a very specific design idea (at the level of saying it is a button). This happens frequently in this kind of usage research data and appears in several data notes in this example. You could change the words a bit to make it less design-centric. For example, you could change "button" to "option" or "capability."]

49: I need lots of information to make my choices. Need an "additional information" button for each event, sort of like Netflix, to give me a short synopsis (4–5 sentences in a paragraph), like the text of an online movie trailer.

Calendar-driven choices

51: High-priority need/want: Calendar on front page. Pick date and click "What's going on today?" or "What's going on for this date?"

55: Choosing date and time. Kiosk gives options for current day, this coming weekend, within the current week, etc. Future dates selected from an interactive calendar image.

Shopping cart concept

56: Kiosk needs a concept of a shopping cart, so a customer can buy tickets for more than one event without starting over. This should even work for two different sets of tickets (different seats and prices) for the same event.

128: A shopping cart model will facilitate buying different types of tickets in one go.

Information architecture

Content

Information about what's going on around town

05b: I'd also use it just to find information on what's going on around town.

143: For example, sometimes I want to see information about popular events that are showing downtown this week.

Event- or activity-related content

08: I'd want it (*the kiosk*) to include more than just movies and sports—for example, museums, concerts, special shows.

10a: Buying—for example, student tickets to Hokie basketball. Need to declare status (student vs. public).

116: I envision buying admission to local Friday night bars, local play houses, major concert halls, sporting events.

Structure, organization by category

11: Sort by categories (sports, movies, etc.), date/time, price, location. User drills down into hierarchical structure. [Again, this is a design idea. Sometimes certain work roles give very specific design ideas because of their experience. Even though it is the UX designer's job to interpret them, you should capture them as design ideas to consider.]

Information organization for display

06 Recommendation (top priority)—I'd want to see the most current events (top picks for today and tomorrow) on the first page, so I can avoid searching and browsing for those.

49B: An "additional information" button for each event would give me more details.

Information organization for storage and retrieval

52: High priority: Access event information by event title (directly) or by type (event category). For titles, could use alphabet to choose from at top (like some websites for, for example, the employee directory of a company).

53: Use "intelligent" mappings from a select letter of the alphabet. This will map to any event of any type that could conceivably be associated with that letter. For example, if user chooses "B," it would list Middleburg University basketball, Orioles baseball, the Blue Man Group. Similarly, an "S" would lead to sports and then a "B" would lead to basketball and baseball. [Again, this is full of specific design ideas.]

Functionality

Searching

83: I would like to be able to search for events by price, artist, venue, and/or date.

104: If I am looking for a specific band, I expect a Google style search where I type in the name of the band.

112: It would be really nice to be able to search for interesting events, say, within two blocks from where I am currently.

Browsing

74: I would like to be able to browse all events on the kiosk.

106: I would like to be able to browse by different topic (type of event). For example, in big cities, even in music there will be different genres.

107: I would like to be able to browse by locations.

Sorting

75: I would like to be able to sort the results I find using some criteria.

Personal privacy

15: Sometimes a kiosk has a time-out feature to help protect privacy (so the next person can't see what I was doing, if I forget to clear it when I leave).

47: Privacy: I don't want people in line behind me to see what I'm looking at and what I'm doing, so I need some kind of limited viewing angle for the screen or "privacy screen" at the side (like on old-style open phone booths).

48: Downside: Privacy panels would limit the ability of a group to see the screen and work together on buying tickets. Conclusion: maybe not worry about it too much.

Transportation tickets

100: I would expect to access any public transportation tickets from any kiosk in a particular area.

101: I would expect to be able to buy one-way passes, day passes, and monthly passes.
110: I would like to be able to specify source and destination and look for travel options even if I am not at either of those places.

Activity-based design

108: I think after buying tickets for an event, prompting "Would you like to get transportation tickets to get there?" would be good.
123: While using the kiosk to buy entertainment tickets, I would like to have the functionality to plan for an entire evening (transportation, event tickets, and dinner reservations).

Models

Note: The notes we list under each model below would actually be integrated into the corresponding models and not appear as notes, as they do here.

User work roles

No notes mentioned a user work role directly. Everyone involved already knew the main roles.

User personas

76: If I find a ticket for an event I would like to go to, I will call my friends before buying tickets.
04: If I'm in Middleburg, I'd probably just go to the venue; at home (Charlotte), I'd buy online.
70: I would use the kiosk if it is affiliated with Middleburg University and MU sends an email informing us about it.
88: In a big city, I will be spending more time commuting, so if there is a kiosk in the metro station I will be more likely to use it.
60: I have used a kiosk in grocery stores, retail stores with self-checkout and to pick up tickets at a movie theater.
136: Identity theft and credit card fraud are huge concerns to me.

The flow model

18: It will be very important to have a confirmation page showing exactly what I'm buying before I pay (as good online sites do).
21: The kiosk should remind people where the ticket comes out.
22: Part of the ticket selection *process* is the option to view the map to the venue.
23: The kiosk should remind people to take the ticket and credit card (at the end of the transaction).
24: Part of the ticket selection process is getting directions for how to get there.

Task models

14: I'd want to be able to use cash, credit card, or debit card to pay. I'd slide my credit card as I do at a gas station.

18: It will be very important to have a confirmation page showing exactly what I'm buying before I pay (as good online sites do).

21: The kiosk should remind people where the ticket comes out.

22: Part of the ticket selection *process* is the option to view the map to the venue.

51: High-priority need/want: Calendar on front page. Pick date and click "What's going on today?" or "What's going on for this date?"

74: I would like to be able to browse all events on the kiosk.

75: I would like to be able to sort the results I find using some criteria.

106: I would like to be able to browse by different topic (type of event). For example, in big cities, even in music there will be different genres.

107: I would like to be able to browse by locations.

113: It would be really nice to be able to filter down search results from a query by event type, etc.

114: I would like to specify a station name and say what events are within two blocks of that station.

Artifact model

37: From a system viewpoint, you can see that not printing tickets at the kiosk would be easier, but no one would want the tickets sent to their home. It's a big confidence issue about getting the tickets immediately.

38: Need an option to print out the *driving* directions.

Physical environment model

02: Idea: Although marketing people might not think to put a kiosk next to the ticket window at the ticket office, it would be very helpful for people who get there and find the ticket office closed.

41: *About needing a printer in the kiosk*: System view: huge maintenance and reliability problem! You absolutely cannot ever allow any kiosk to run out of paper or ink or to have the printer go down. Otherwise, the customer will be very upset and probably never use the kiosk again.

84: I would prefer the kiosk to have a touchscreen instead of a keypad.

105: I also wonder how often this expensive hardware (kiosk) will be stolen.

Information architecture model

11: Sort by categories (sports, movies, etc.), date/time, price, location. User drills down into hierarchical structure.

49: I need lots of information to make my choices. Need an "additional information" button for each event, sort of like Netflix, to give me a short synopsis (4–5 sentences in a paragraph), like the text of an online movie trailer.
52: High priority: Access event information by event title (directly) or by type (event category). For titles, could use alphabet to choose from at top (like some websites for, for example, the employee directory of a company).
53: Use "intelligent" mappings from a selected letter of the alphabet. This will map any event of any type that could conceivably be associated with that letter. For example, if user chooses "B," it would list Middleburg University basketball, Orioles baseball, the Blue Man Group. Similarly, an "S" would lead to sports and then a "B" would lead to basketball and baseball.

Work activity affinity diagram

User ticket-shopping behavior

Generally, how I might use a kiosk

01: Normally, I buy tickets at the venue of the event just before the event. For special events, I might buy online.
76: If I find a ticket for an event I would like to go to, I will call my friends before buying tickets.
79: I will only browse to find out about new events, not to buy immediately.
80: I might even go home and compare prices on other websites (compared to the kiosk).

Likelihood of using a kiosk

04: If I'm in Middleburg, I'd probably just go to the venue; at home (Charlotte), I'd buy online.
05a: I'd like to see a ticket kiosk in town here. I'd try it out and maybe would change to buying tickets at the kiosk for events.
70: I would use the kiosk if it is affiliated with Middleburg University and MU sends an email informing us about it.
72: If I had 30 minutes to spare at the metro station and there was a kiosk, I might browse it.

Familiarity with using kiosks

60: I have used a kiosk in grocery stores, retail stores with self-checkout and to pick up tickets at a movie theater.
61: I have used a kiosk to buy movie tickets at a theater.
62 I have used a kiosk to buy concert tickets.
63 I have used a kiosk to buy boarding tickets for the metro.

Trust issues

131: The kiosk should be located in a nice location for me to trust it. If it is in a shady location, I will not trust it.

135: I would trust an established company to manage my credit card transactions for restaurant reservations and such but not the restaurants directly because I don't know how trustworthy a restaurant I am making a reservation at could be (having an intermediary for credit card transactions).

136: Identity theft and credit card fraud are huge concerns to me.

Business issues, decisions

Branding and appearance

68: A kiosk has to be presented in a professional way; it needs to look official.

69: It (the kiosk) should not look cheap like a holder for free brochures.

Kiosk locations

02: Idea: Although marketing people might not think to put a kiosk next to the ticket window at the ticket office, it would be very helpful for people who get there and find the ticket office closed.

07: Proximity: It (*a kiosk*) would have to be close to where I live or work or shop.

64: A kiosk would be helpful in the theater for when there are long lines.

Kiosk hours

03: Most of my free time is outside normal business hours and after many businesses are closed.

Credit card usage

14: I'd want to be able to use cash, credit card, or debit card to pay. I'd slide my credit card as I do at a gas station.

Cash transactions

17: It's complicated to recognize bills (cash) and dispense change.

19: Having cash inside the kiosk would be attractive to thieves and vandals.

20: Regardless of the difficulties it might present to designers, I would still want to be able to use cash to pay sometimes.

Printing tickets

37: From a system viewpoint, you can see that not printing tickets at the kiosk would be easier, but no one would want the tickets sent to their home. It's a big confidence issue about getting the tickets immediately.

39: If ticket(s) I buy from the kiosk are going to be mailed to my home, I'd worry about getting them in time for the event.

40: If you buy tickets at the kiosk and they are mailed to your home, you need a receipt, so would have to have a printer in the kiosk, anyway.

41: *About needing a printer in the kiosk*: System view: huge maintenance and reliability problem! You absolutely cannot ever allow any kiosk to run out of paper or ink or to have the printer go down. Otherwise, customers will be very upset and probably never use the kiosk again.

42: But it (the ticket printer *will* go down) *could* happen, no matter how careful you are, given the amount of traffic and usage. What then? Need a customer service phone (e.g., hardwired to the company representative).

Keyboards versus touchscreens

44: Keyboard? Soft keyboard on touchscreen only; never a real keyboard on a public kiosk!

84: I would prefer the kiosk to have a touchscreen instead of a keypad.

Include video trailers?

50: Also, need video trailers. Downside: expensive to produce and take too long, holding up other people in line.

Include restaurant reservations?

125: Because we do not pay for a reservation at a restaurant, there may be misuse of the kiosk. So maybe use credit cards to prevent misuse and declare a penalty (in $) for those who do not show up at a reservation.

Vandalism and theft

105: I also wonder how often this expensive hardware (kiosk) will be stolen.

Include shopping suggestions?

71b: How about offering shopping suggestions like Amazon does: Others who have bought tickets for this event have also considered this other event?

Opting out

127: There should be an easy way to say no to suggestions after I buy a ticket or something (so people are not pressured to buy all this related stuff that are is based on purchases I made).

Design decisions

Privacy, security

Bail out of transaction

58a: To use at Metro station: Need a quick cancel to bail you out immediately and go to the home screen without leaving a trace of what you were doing (for privacy with respect to the next customer).

58b: To recover later, need a quick path to a specific item. Maybe use event ID#s to get there directly next time, like using a catalog or item number in search for online shopping.

Time out of transaction

16a: Need *a time-out feature for privacy*, to close out window after one customer leaves and before the next one arrives.

59: Another privacy idea: Need system timeout, reset to home page after 1–2 minutes of inactivity. But this could interfere with task performance (e.g., take a couple of minutes to call your friend on the cellphone to confirm tickets). Therefore, need a "hold" or "I'm still here" button to reset the timeout and keep your work alive. Maybe also need a "progress" indicator showing time to reset and beep at 15 seconds left, so can save it.

Downsides

16b: I would worry that timing out might make me lose my work if it takes me longer than expected (e.g., taking time to call a friend to confirm he wants tickets for the same event).

Help, customer support

132: The kiosk should have a 24/7 customer service number prominently displayed.

User accounts?

137: I do not expect to create an account on a kiosk. I prefer dummy transactions that I fire and forget.

138: The user should be able to choose if they want to create an account.

139: I wouldn't mind creating an account on a web interface to the kiosk company.

Necessity for logins

140: User acts require logins and some people might forget to logout and the next person in line might use that account to buy their tickets.

141: I prefer the kiosk logged me out right after I pay once. Even though sometimes I might forget to buy something, I don't mind logging in again for the sake of security.

8.7.8 Observations from This Example

The above exercise reflects how this process would happen in a realistic project:

- The data notes are not the best examples of properly synthesized work activity notes.
- Many categories in the results overlap, and many notes went into more than one category. These observations reflect the fact that each of these categories is just one way to view the overall picture of the project with its own perspective.
- Some of the category names could have been better. This reflects a realistic problem that occurs when people sort things into categories.
- Almost every note could have gone into the WAAD. That is because it's the nature of a WAAD to not exclude any topic. This also makes the WAAD a nice visual representation of the whole project. As we decided what to put in the WAAD, we used this heuristic: If the note was about a feature, it went into requirements or a user story. The WAAD got notes about general context and design issues. In the end, the requirements seemed to be the largest output of the process, but the WAAD also was substantial.

8.8 LEAD A WALKTHROUGH OF THE WAAD TO GET FEEDBACK

If feasible in your budget and schedule, bring in users and clients and other stakeholders to walk them through your WAAD to share your findings and to get feedback. The purpose of doing a walkthrough is communication, to explain your process briefly and share an appreciation of user work activities and associated issues with all stakeholders.

Guidelines for sharing your findings:

- For management, emphasize high-level issues, cost justification, data integrity, security, and such corporate goals.
- Highlight the most important points and issues discovered.
- Create interest with unexpected things learned.
- Show graphical representations; flow models can be the most effective, as they show your interpretation of the flow of information and materials within their business process.
- Sell your usage research process.

Get management and software developers engaged to show them the effectiveness of your process.

Exercise 8-2: WAAD Building for Your Product or System

Goal: Get practice in building a WAAD to organize you work activity notes by category.

Activities: If you are working alone, this will be the last time you have to buy pizza, at least in this chapter.

However you assemble your team, using the work activity notes created in the previous exercise, do your best to follow the procedure we have described in this chapter for WAAD building.

Take digital photographs of your work process and products, including the full WAAD, some medium-level details, and some closeups of interesting parts. Hang them on your fridge with magnets.

Deliverables: As much of the full WAAD for your system as you were able to produce. It is probably best to keep it rolled up into a bundle for safekeeping unless you have the luxury of being able to keep it taped to the wall. You should also have the digital photos you took of your WAAD. If you are working in a classroom environment, be prepared to share the photos in a narrated slide show

and to discuss your WAAD and the process of building it with other teams in the class.

Schedule: This is one of the more time-consuming exercises; expect it to take 4–6 hours.

8.9 SYNTHESIZE THE "ELEPHANT" THAT IS USER WORK PRACTICE AND NEEDS

Immersion

A form of deep thought and analysis of the problem at hand—to "live" within the context of a problem and to make connections among the different aspects of it (Section 2.4.7).

Synthesis is the process of putting together diverse inputs, facts, and observations of parts of a concept to make conclusions that characterize and aid understanding of the whole concept.

Each of the models we will discuss next provides a different perspective into the work domain. As we mentioned previously, it is like the blind men and the elephant (source unknown). The role of synthesis is to find connections among these models and put pieces together to form the whole elephant. Teasing out the connections through combination, fusion, and other ways of sifting through the data unearths hidden relationships and insights into the work domain. This is where immersion pays off.

The task structure model (Section 9.6) might reveal the elephant skeleton, and maybe the task sequence model (Section 9.7) reflects its skin. Perhaps the flow model (Section 9.5) shows how the elephant moves.

Sometimes you need to create hybrid models (Section 9.12) to integrate multiple views into the same frame and unearth different connections and flesh out the true nature of the elephant. For example, in the MUTTS effort we discovered in one of our information models (Section 9.10) for a student user class that each student at MU carries an ID card called the MU passport. This passport is a magnetic card (like a debit or credit card) and carries money that students can spend at all campus eateries. We had another information model for the payment options. During the synthesis exercise we discovered that allowing students to use their MU passport as a payment option would be a big user convenience factor.