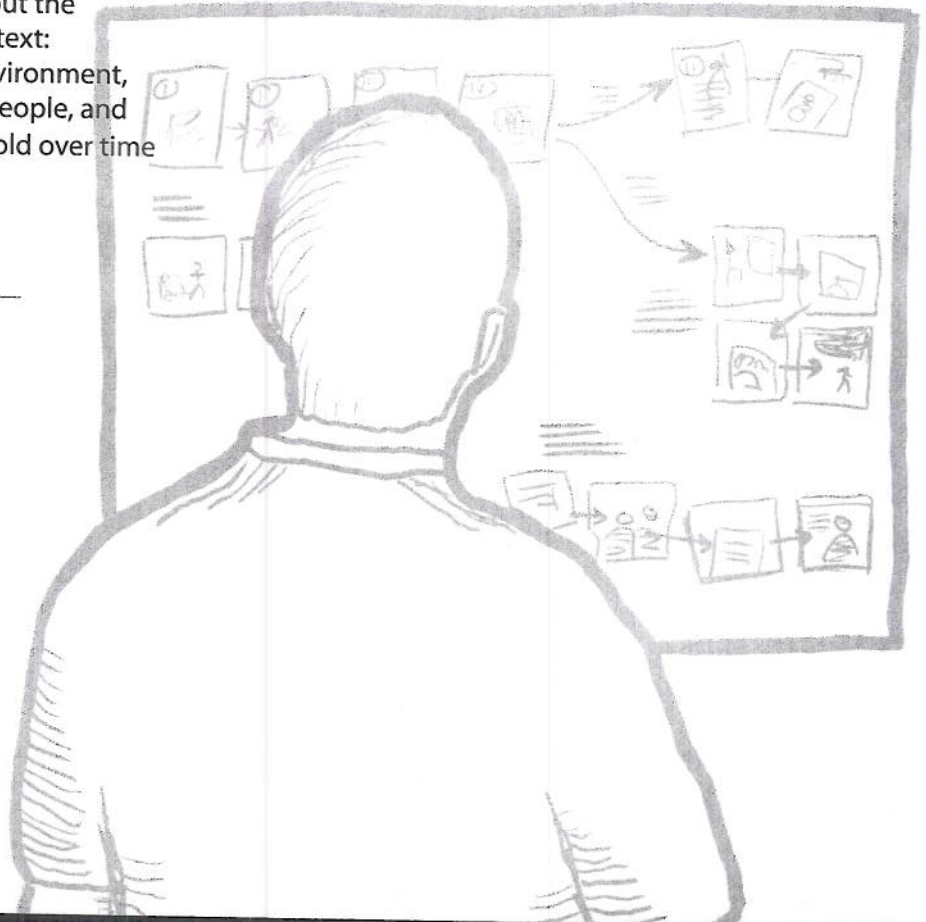


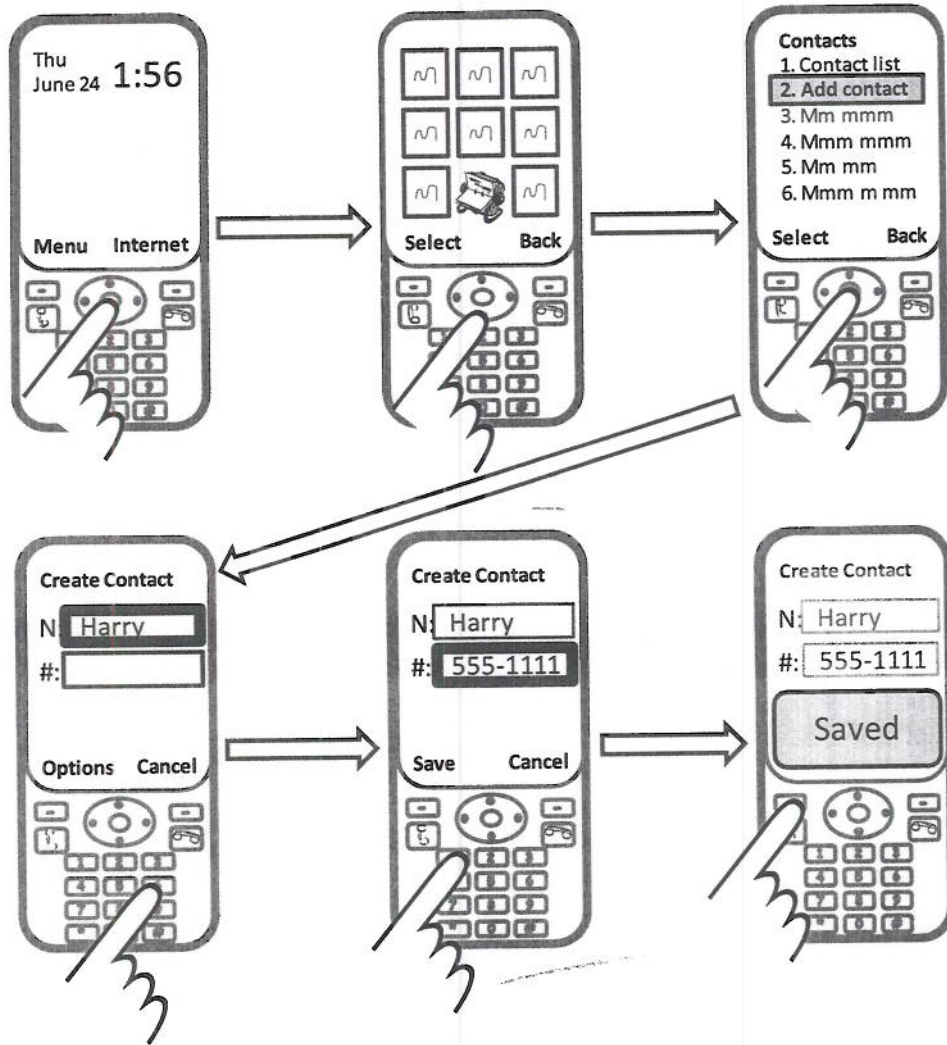
Section 4

Snapshots in Time: The Visual Narrative

What makes interaction design unique is that it imagines a person's behavior as he or she interacts with a system over time. Storyboards capture this element of time as a series of discrete images that visually narrates what is going on scene by scene.

- 4.1 Sequential Storyboards** introduces the storyboard as visual narrative that captures key ideas as a sequence of frames unfolding over time
- 4.2 The State Transition Diagram** formalizes the storyboard. It represents interaction states, transitions triggered by interactions, and multiple decision paths through the storyboard
- 4.3 The Branching Storyboard** reveals the branching storyboard as a way to visually illustrate decision paths that occur over time
- 4.4 The Narrative Storyboard** tells a story about the interaction context: the physical environment, the actions of people, and events that unfold over time





More relevant than how I made these visuals are the decisions I had to make in deciding how the sequence would unfold. Did you find yourself making similar decisions?

- **Should I show the user in the scene?** Is that extra detail worth it? In my storyboard, I decided to include a person's finger, as it shows what was done to initiate transitions between frames.
- **What key frames should I use to create the sequence?** If the storyboard recorded every single action the user took (e.g., every key press) and interface response, it would be excessively long. Instead, I chose key images to capture the essence of the sequence. For example, frames 4 and 5 each represent entering a string of letters for the name and phone number. I decided to leave out the details of how this is done as unnecessary elaboration.
- **What key transitions should I show?** As mentioned, each frame represents a state where the empty space between successive frames includes transitions caused by some user action. You have to decide what transition details are worth showing (perhaps as more fine-grained states and transitions) and what you should leave out. Each transition may actually include many minor user interactions and visuals that are just not worth showing in detail. In the above, I decided to include the transitions that show how one navigates from the home screen (frame 1) to the top-level functions menu (frame 2), to the menu where I can select the 'Add Contact', and so on. However, I left out actually selecting the contact icon in Frame 2, and navigating to the 'Add Contact' menu item, as I thought that could be easily filled in by the viewer's imagination.

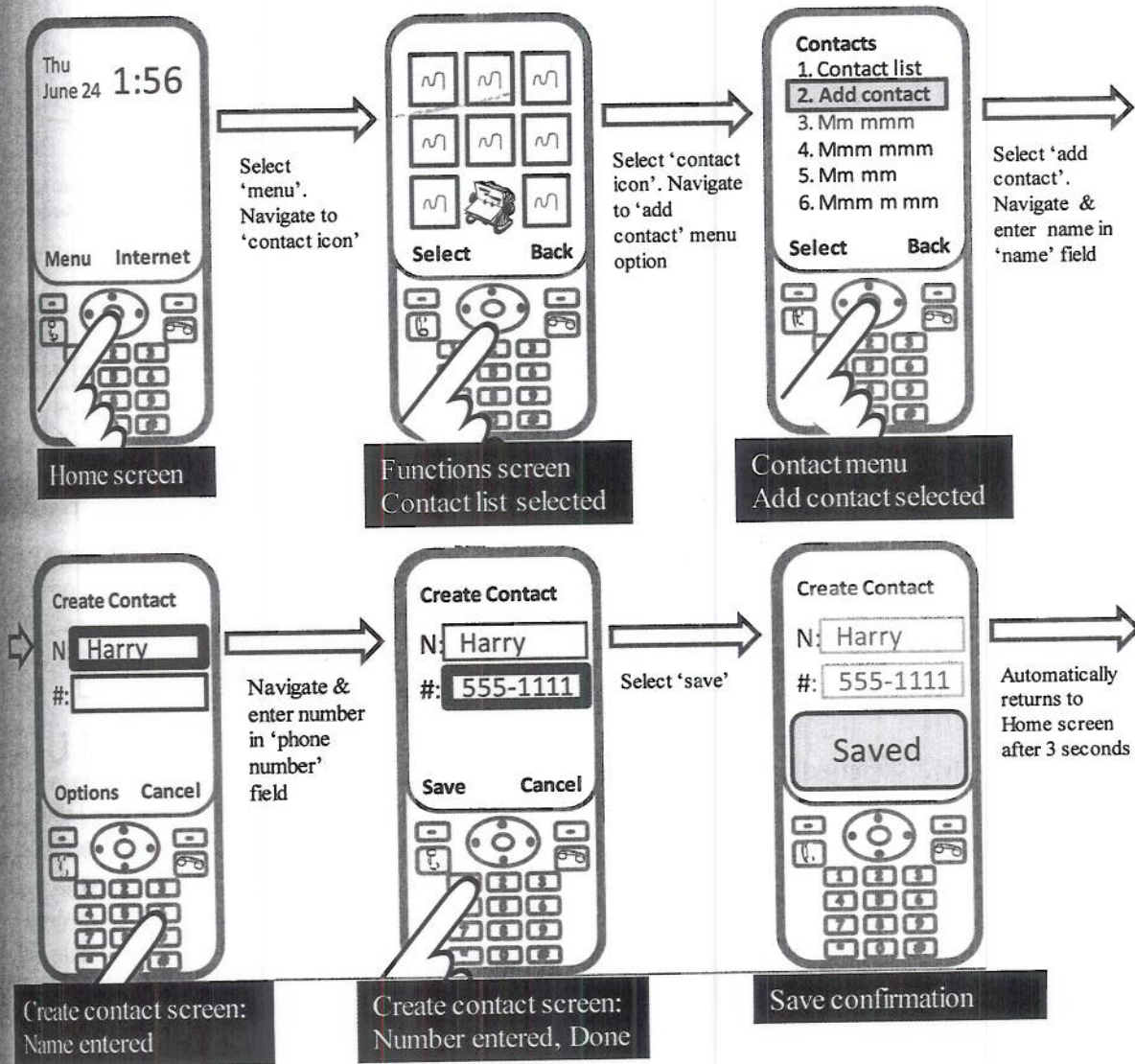
Annotating Images and States

When you create a storyboard solely using images, you are leaving it up to the viewer to reconstruct what the individual frames mean, what the empty space between the frames – the transitions – have left out, and (sometimes) what the user did to make all that part of the sequence happen. You already know how to annotate a sketch, and the same thing can be done to annotate your frames as needed. What is more important is that you should also annotate the transitions.

Exercise

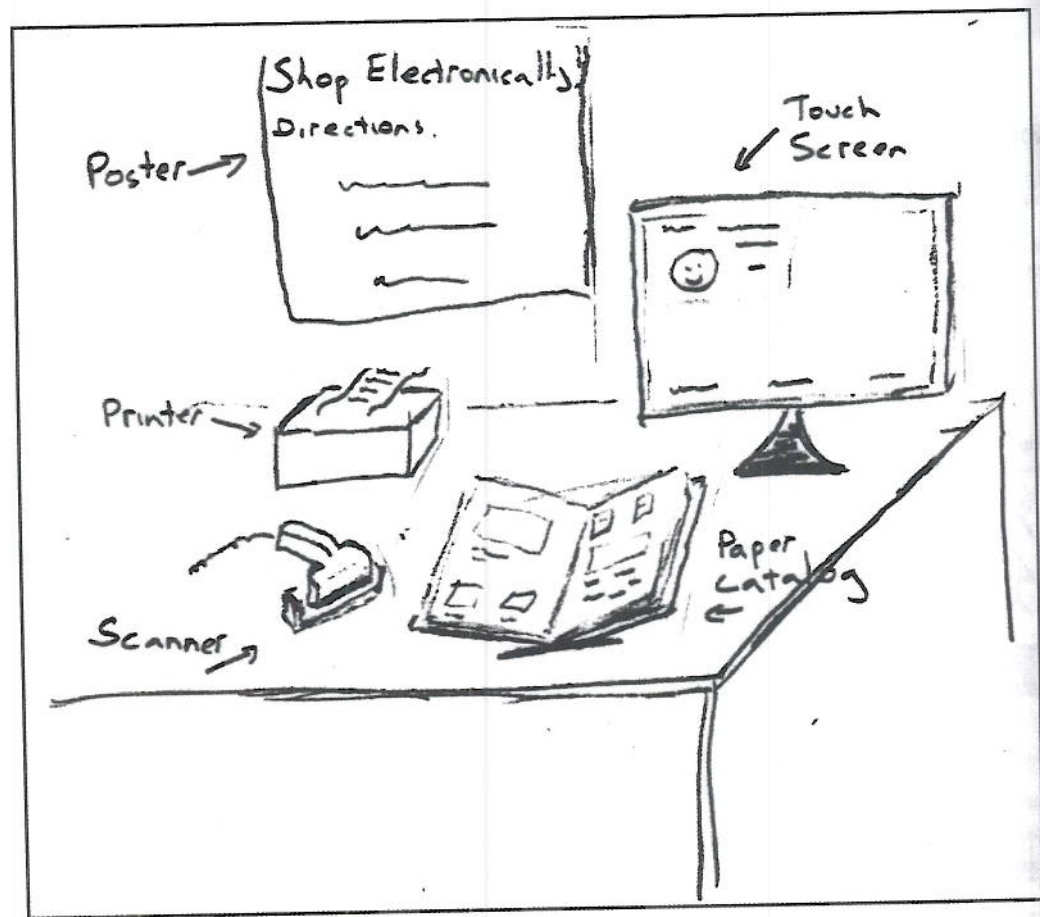
Annotate your frames and transitions so that a person unfamiliar with this sequence can easily understand it.

My version is shown below.

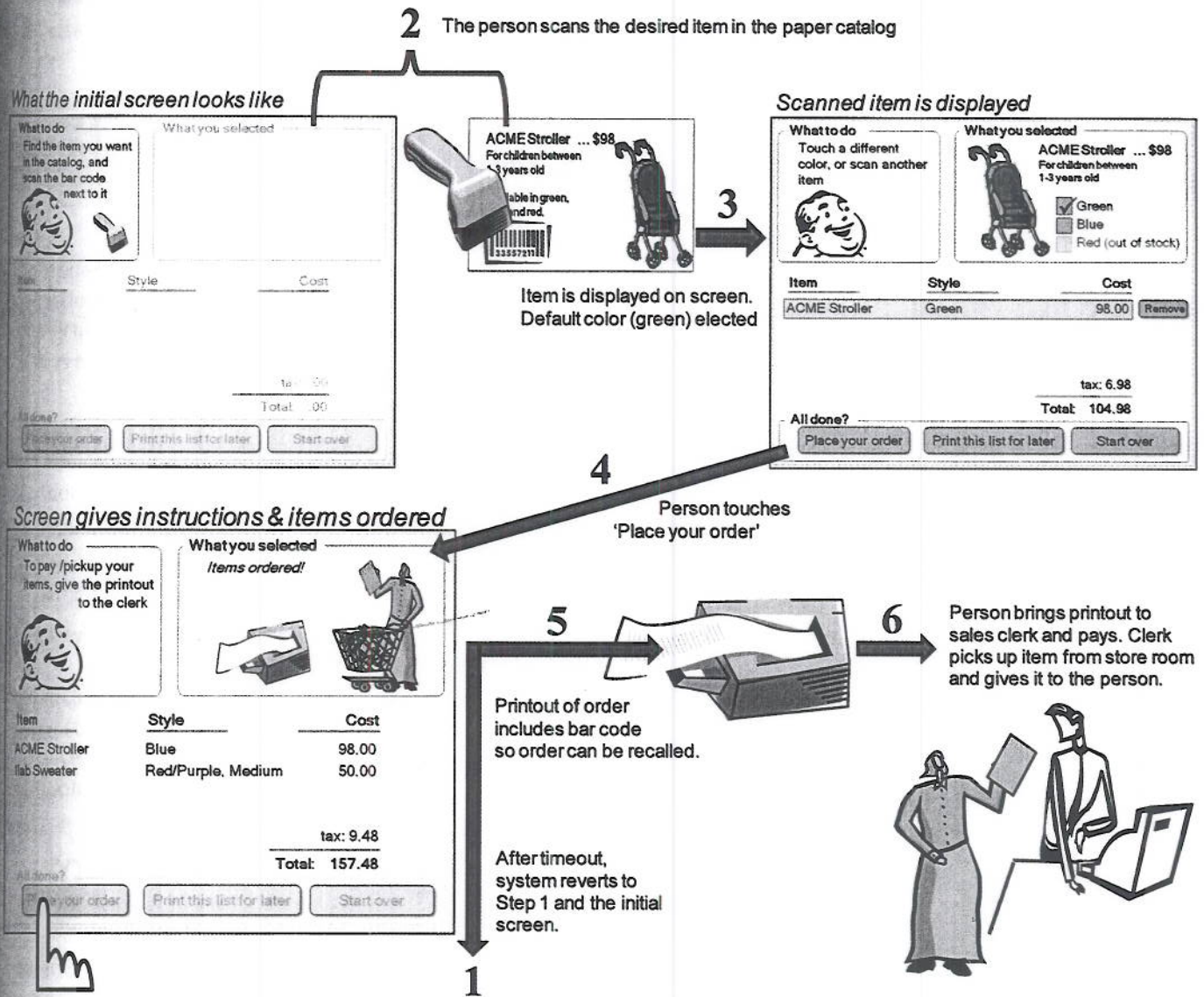


Exercise

In Chapter 3.4, we introduced an interactive shopping system. Let's detail this a bit more, and create a storyboard of it. The context is a real store. People can walk into the store, where they see paper catalogs situated next to computers. As they browse the catalog and see something they want to buy, they can scan (using a bar code reader) particular items from the catalog, which displays the items on the screen. When they place an order, the order details print out and they bring it to a sales clerk who then retrieves the items from a store room. Using the sketch shown in Chapter 3.4 as the basic design, construct a storyboard showing a person buying a blue stroller.



In my solution I first sketched out what the person may see in the store: a table with a screen, a poster showing getting started instructions, a paper catalog, a hand scanner, and a printer. I then used PowerPoint (again) to construct a storyboard around a template, where I copied that template to successive slides and filled in the details of each key frame. I also used sketches and 'found objects' to fill in some of the details: clip art and images found on the web (Chapter 2.3).



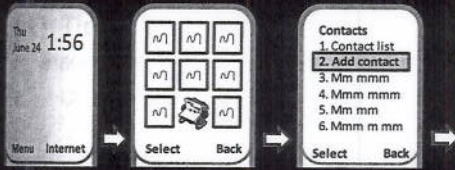
Note that this storyboard has somewhat of a hodge-podge appearance due to the different clipart and photographs used and the cramped space available to make this sequence fit in this book's page size. Yet it suffices to capture – as a storyboard sketch – the essence of this sequence. I can always beautify this later if needed.

YOU NOW KNOW

Sequential storyboarding is a commonly used technique that tells a visual story of a user experience sequence unfolding over time. The key challenge in storyboarding is to decide what sketches to include as key frames, and whether viewers can mentally fill in the space – the transitions – between these frames. Annotating the storyboard can help here, especially by explaining the user's interactions that happened during the transitions.

The State Transition Diagram

4.2



a way to visually illustrate interaction states, transitions and decision paths over time

The sequential storyboard in the previous chapter represents a single sequential interaction episode. Sequences are appropriate for early design sketches, where you will likely focus on capturing the main series of events that occur as a person pursues his or her primary task on your imagined system.

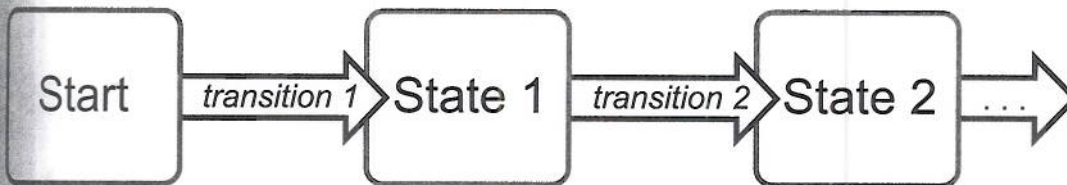
As you move deeper into the design funnel, you will have to flesh out additional details of your selected designs, which could include:

- Adding more key frames and finer grained transitions within a sequence to illustrate exactly how the interaction happens.
- Showing the many options the person can pursue – the decision paths – at particular stages of your system.
- Showing how choosing particular options would lead to different sequences.

All this can get quite complex. One way to manage this complexity is by thinking of your storyboard as a **state transition diagram** that captures **states**, **transitions**, and **decision paths**, as well as the many ways that one can draw these states and transitions.

A STORYBOARD AS STATES AND TRANSITIONS

As a sequence, each step in the storyboard represents a single (possibly labeled) **transition** from one **state** to another. A **state** usually represents a moment in time during the interaction. A **transition** is what triggers a change in state, where transitions are typically triggered by one or more user actions. Combining these into a sequence creates a **transition diagram**.



You have many options on how you can sketch these states and transitions; some are shown below. Illustrations are variations of the cell phone exercise presented previously in Chapter 4.1.

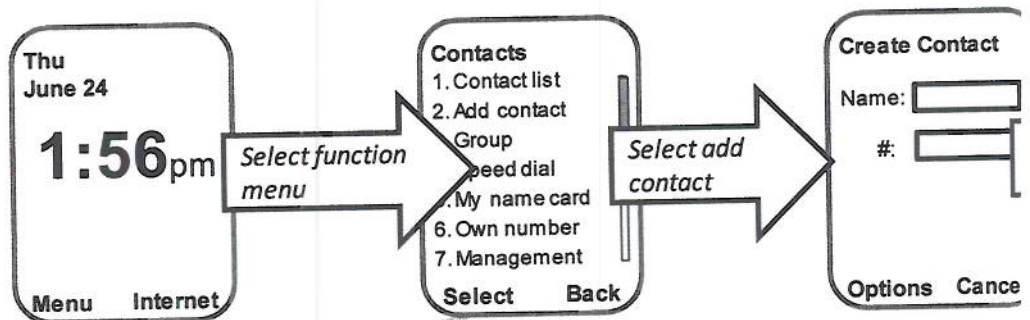
Materials

- a cell phone
- a digital watch

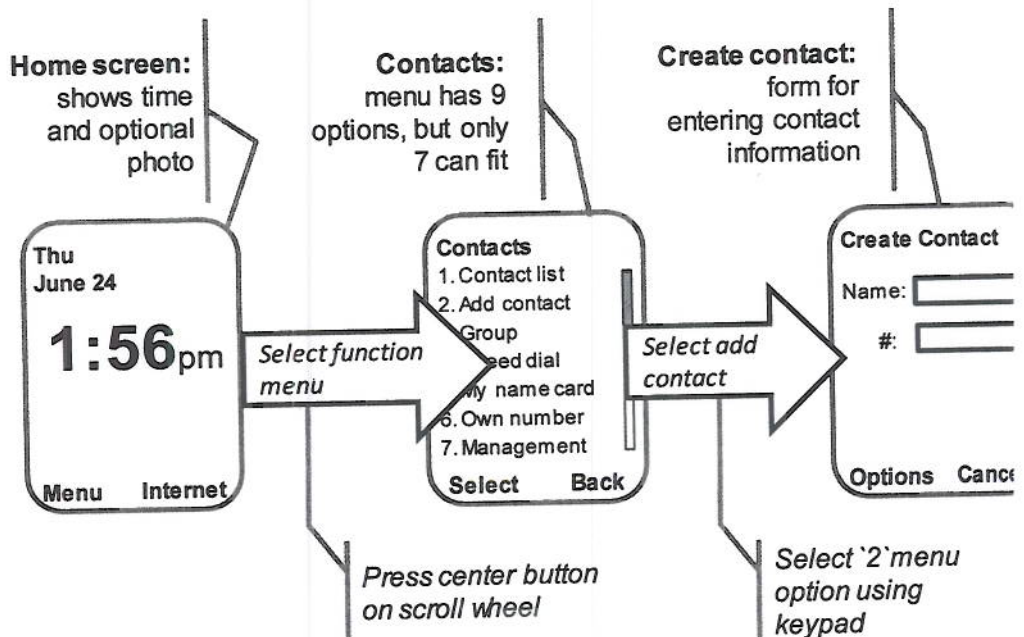
1 The Abstract State Transition Diagram. You can use text labels and annotations to describe each state as an abstraction. This is appropriate for early designs, where you're trying to sketch out the flow of user activities as a person uses the system to do a task without having to detail (or commit to) what the interface would necessarily look like.



2 The Visual Interface State Transition Diagram. You can sketch the appearance of the interface itself as it passes through each state. This gives very rich information, as it is a literal diagram. It is appropriate when you are trying to flesh out the fine-grained details of the interface as the task progresses. But it also demands that you have a pretty good idea of what the system looks like at each state, as it will be a bit harder to modify if you change your mind.

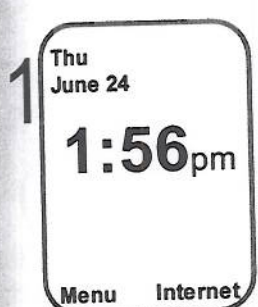
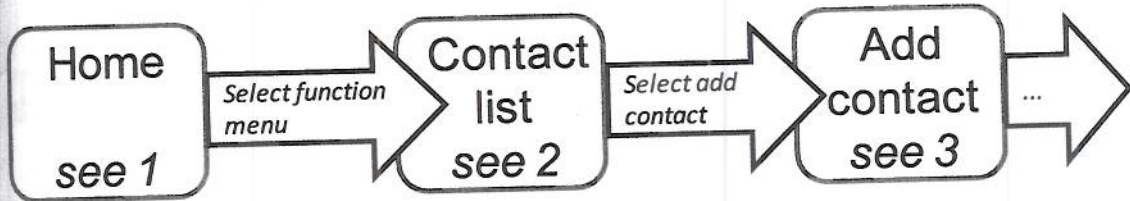


3 The Annotated State Transition Diagram. The state diagram is augmented to include explanatory text. You can annotate each state and transition as much as you want. This example shows the above visual interface state transition diagram with annotations.



4 The Indexed State Transition Diagram. This combines the above methods. The diagram resembles the abstraction, but it also includes indexes to other figures. Those other figures could show:

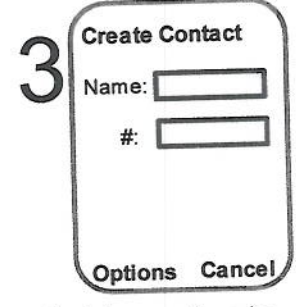
- what the screen(s) look like in that state (as in the Visual Interface Diagram), which is the technique shown in the figures below,
- explanatory text that explains the abstraction,
- another more detailed transition diagram,
- decisions that could be made at that point that lead to alternate sequences (as we will show in the next section).



Possible home screens



Contact list

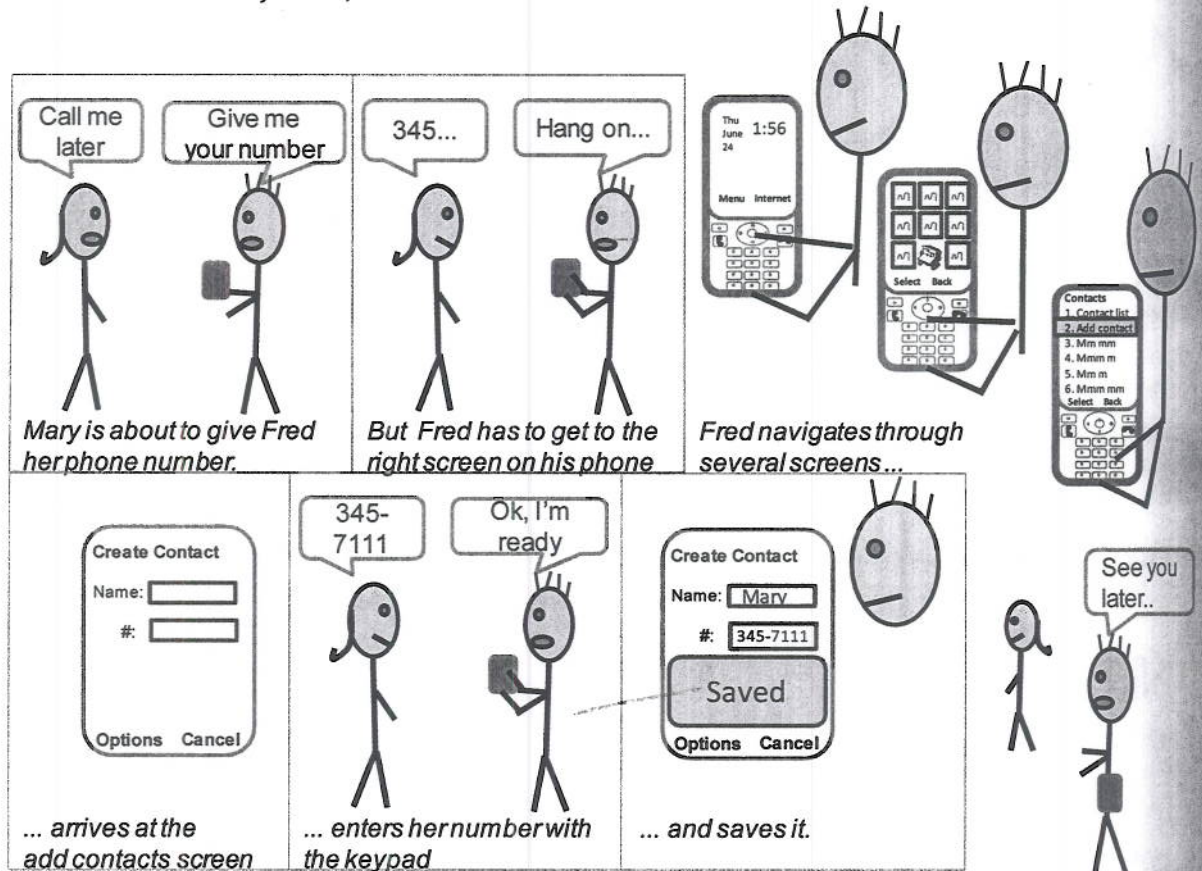


Add contacts

While the particular approach you will use depends on your needs, you will invariably find yourself using indexes to define most complex storyboards. This is because:

- you can generate multiple sketches as variations for what happens at that index (to illustrate, the figure above includes two possibilities of what the cell phone's home screen at index 1 could look like),
- they help you manage complexity that is bound to occur when developing large state transition diagrams.

5 Implying State Transitions by Layout. Instead of using arrows and other notations for showing transitions, you can imply the flow between states by its spatial layout. This is how comic books are usually designed. In this example, I included additional 'states' that show how a conversation led to the cell phone interaction (see Chapter 4.4: The Narrative Storyboard).

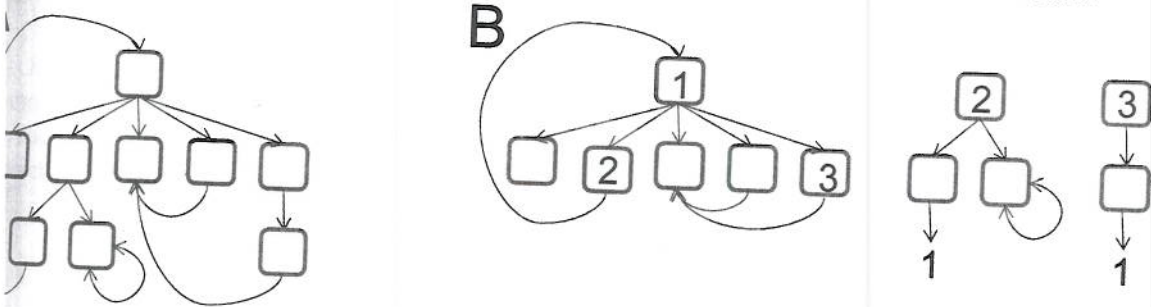


The above is just a sampling of the many ways to draw state transition diagrams. Harold Thimbleby, for example, applies state diagrams and other related methods in detail in his 2007 book *Press On! Principles of Interaction Programming*.

TRANSITION DIAGRAM WITH BRANCHES

Most interactive systems offer people many possible choices of action, although the choices available may depend heavily on what state the system is in. Think about even a simple interface: available choices are presented as menu options, buttons, tool palettes, fields that can be filled in, keyboard shortcuts, responses to mouse actions, and so on. Thus you will rarely represent interaction as a simple linear sequence, unless you are just trying to show how a person accomplishes a single task or set of operations, or perhaps as a subsequence that fits within a larger (indexed) state transition diagram.

you can use transition diagrams to show all these decisions. Essentially, each state can have one or more transitions coming out of it, where they lead to other states or even back to earlier ones. While this can get quite messy, the reality is that you need diagrams like this to help you sketch and reflect on) the interaction flow across your entire design. The next chapter shows you how to do this as a branching storyboard. The two figures below preview what is to come. Figures A and B are identical: Figure B uses indexes to manage complexity, while Figure A shows it all at once.



Exercise
 Using a fairly simple digital watch, create an abstract state transition diagram of what you can do with it (use indexes if you want). Warning: this exercise is much longer and more tedious than you may think! You may only want to try it for a few functions.

show my own solution to this exercise here. However, you should immediately appreciate in this exercise that modeling decisions in interaction design can get quite complex. Even simple systems – such as your digital watch – can have hundreds or even thousands of states, which you would have to diagram as many inter-connecting sequences and sub-sequences.

the confines of sketching, what makes transition diagrams manageable is that you are only trying to flesh out a limited set of key choices and sequences, where these sequences capture the essence of the interaction. Alternately, you may be focused on fleshing out a subset of the system – a limited interaction sequence – as a particular sub-sequence.

References

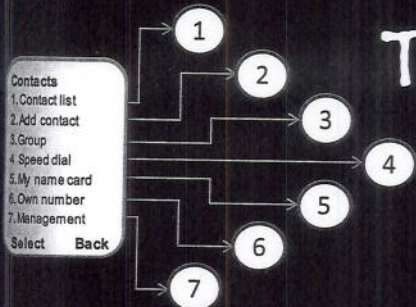
Imbleby, H. (2007) *Press On! Principles of Interaction Programming*. MIT Press.

NOW KNOW

A state transition diagram captures states, transitions, and decision paths. There are many ways to create one. Using boxes (to capture states) and arrows (for transitions and decision paths) is the most common way. Your diagram can be quite abstract, or capture your sketches as they change over time. It can include state names, and can include explanations as annotations. To manage complexity, you can use a state transition diagram to index other diagrams, screens, and explanations, which are often sketches that you can use to explore possibilities.

The Branching Storyboard 4.3

visually illustrating interaction decisions over time



This chapter elaborates the previously introduced concepts of storyboarding by illustrating examples of branching storyboards, that is, state transition diagrams showing decision paths as transitions. It applies what you've learned about state transition diagrams to the cell phone and interactive shopping system examples.

THE CELL PHONE EXAMPLE

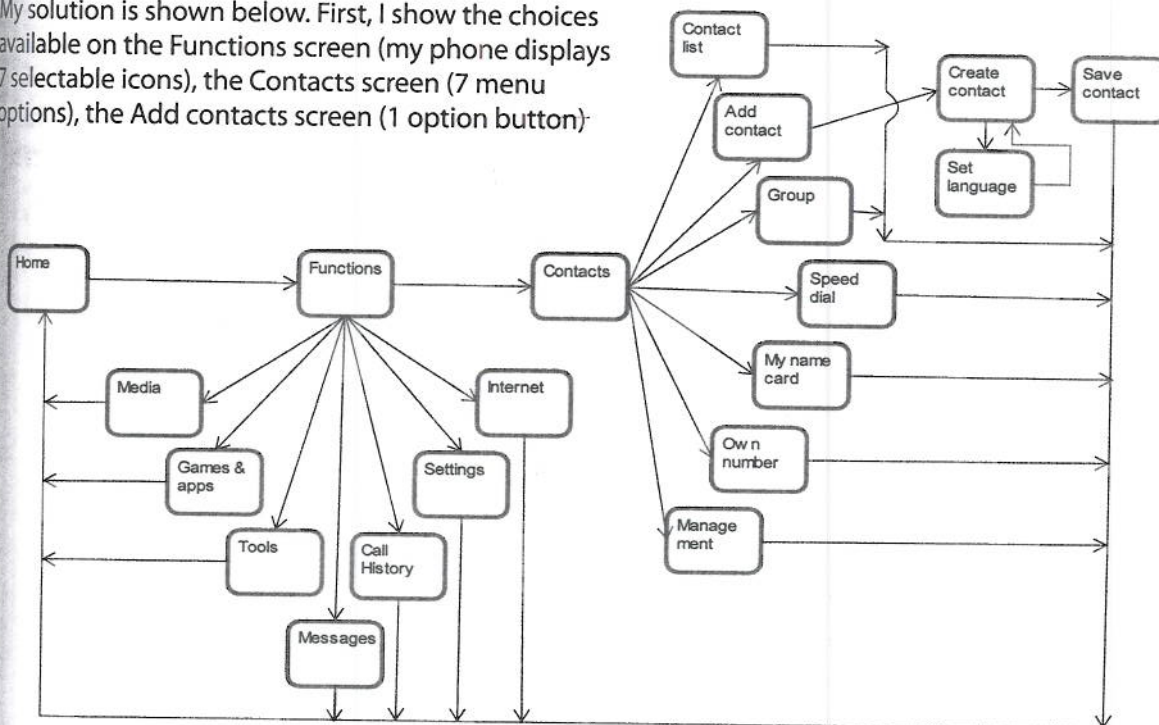
In Chapter 4.1, you sketched out a sequence that captured how a phone's interaction unfolds over time as you enter a person into the phone's contact list. Using your cell phone, revisit that sequence, but this time show a few of the other decision paths a person can make along the way. In particular:

Exercise

The Abstract State Transition Diagram

As before, look at how your cell phone lets you add a contact. This time, sketch an abstract state transition diagram showing alternate paths you could take along the way. Show at least several states and these major decision paths as transitions and states that occur as you move through your phone's interface to the contact list.

My solution is shown below. First, I show the choices available on the Functions screen (my phone displays 7 selectable icons), the Contacts screen (7 menu options), the Add contacts screen (1 option button):



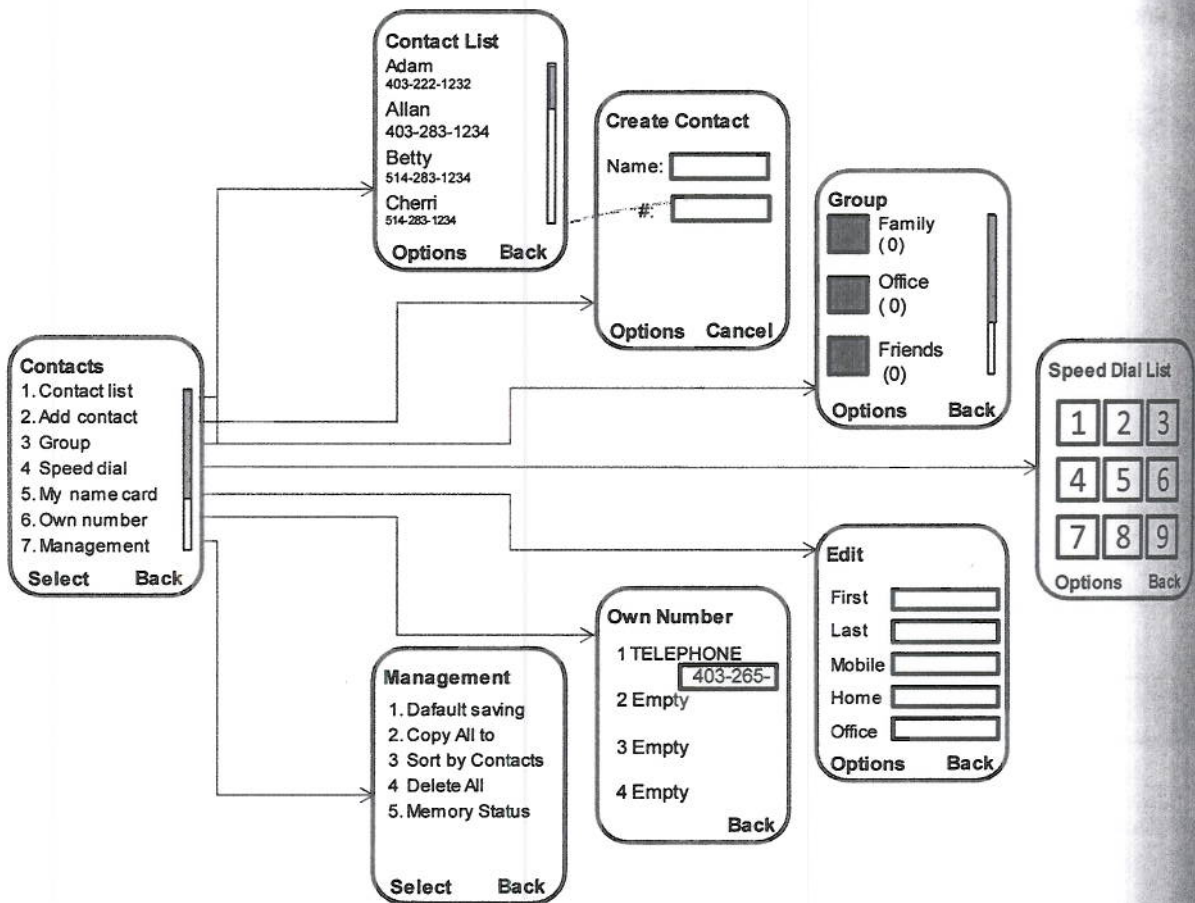
and the Create contact screen (2 options). I also show how all these choices eventually lead back to the Home screen. Of course, much information is left out, but it does show the navigational phone (at least in part).

Exercise

The Visual Interface State Transition Diagram

Based on your previous exercise, sketch a visual interface state transition diagram showing at least one state and all the decision paths coming out of it to another state.

My solution below begins with the 'contacts' state above, where I sketched the appearance of the contacts menu and its seven items. I then sketched the transitions to the seven states that would be displayed by selecting each menu item, where I sketched the appearance of the screens in those seven states.

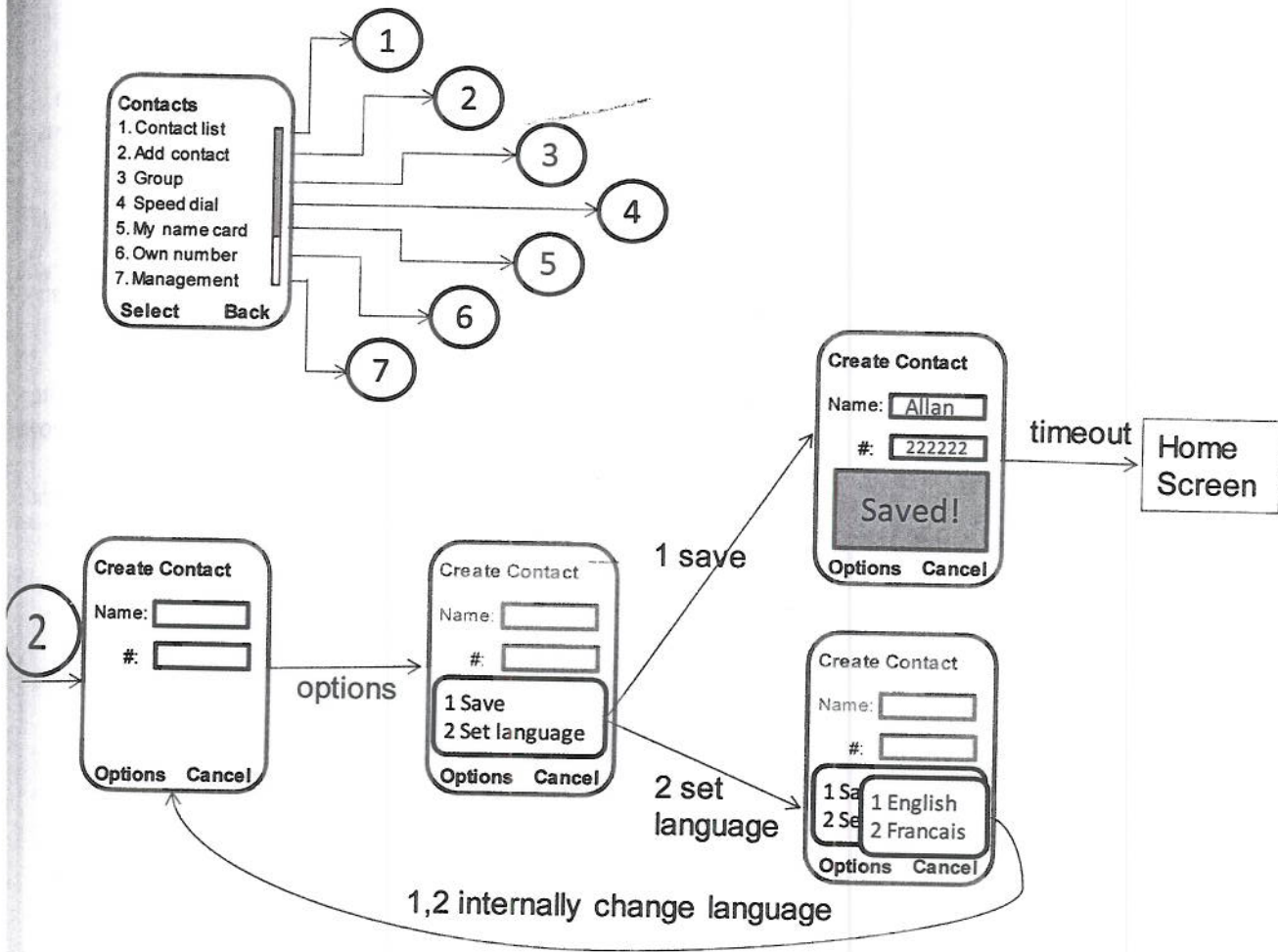


Exercise

The Indexed State Transition Diagram

Convert your sketch in the previous exercise into an indexed state transition diagram. First, show the visual interface within your chosen state. Second, draw all the transitions (decisions paths) coming out of that state, with the new states drawn as indexes. Third, take one of those new indexed states and sketch another separate visual interface transition diagram showing its details.

The solution below is similar to the previous one. The top diagram shows the same contact screen as a state, but now the seven menu options are shown as transitions leading to indexes. Each index is a pointer to another diagram. I show only one of these other diagrams at the bottom, where index 2 is illustrated in full as a partially annotated visual interface transition diagram.



THE INTERACTIVE SHOPPING SYSTEM EXAMPLE

In the previous chapter, we introduced the primary sequence of the interactive shopping system, where we illustrated how a person could buy a single item. We will continue this exercise by developing it into a branching storyboard.

Exercise

Extend the interactive shopping system by including the following sub-sequences in your storyboard. Use indexes to manage complexity.

- **Multiple items.** A person scans in two or more items.
- **Modifying items on the list.**
 - A person removes one or more of the items in the list.
 - A person changes a previously entered item's property (e.g., its color).
- **Comparison shopping.** A person prints out the list without purchasing anything, and then comes back at a later time to buy the items on it (a bar code specifying this particular order is part of the printout).
- **Not buying anything.** The person can cancel this order explicitly, or just walk away.

My solution is shown on the following page. Note that these storyboards almost completely define the behavior of this interactive system.

The first storyboard provides an overview map. It describes how only one option (scanning an item) is available from the initial home screen #1, which leads to the order screen (state #2). It also shows all the basic states #3–7 reachable from this main order screen. These are done as indexes. The storyboards that follow explain what happens at those indexes. Storyboard 3 also has another index to state #8, as it only makes sense when two or more items are shown on the order screen.

3 Changing Item Options

3a

What to do
Touch a different color, or scan another item

What you selected
ACME Stroller ... \$98
For children between 1-3 years old
 Green
 Blue
 Red (out of stock)

Item	Style	Cost
ACME Stroller	Green	98.00

tax: 6.98
Total: 104.98

All done?
Place your order Print this list for later Start over

The person touches desired options...

3b

What to do
Touch a different color, or scan another item

What you selected
ACME Stroller ... \$98
For children between 1-3 years old
 Green
 Blue
 Red (out of stock)

Item	Style	Cost
ACME Stroller	Blue	98.00

tax: 6.98
Total: 104.98

All done?
Place your order Print this list for later Start over

...which updates the details in the item list and the illustration

4 Removing Items

4a

What to do
Touch a different size or color, or scan another item

What you selected
Ilab Sweater ... \$50
Winterweight, snuggly!
 small medium
 large x-large
 Red/Purple
 Black

Item	Style	Cost
ACME Stroller	Blue	98.00
Plain socks	Black	2.00
Ilab Sweater	Red/Purple, Medium	50.00

tax: 9.28
Total: 159.28

All done?
Place your order Print this list for later Start over

The current item displays the remove button. When pressed...

4b

What to do
Touch a different color, or scan another item

What you selected
Plain Socks ... \$2
Stretches to any size
Color: black.

Item	Style	Cost
ACME Stroller	Blue	98.00
Plain socks	Black	2.00

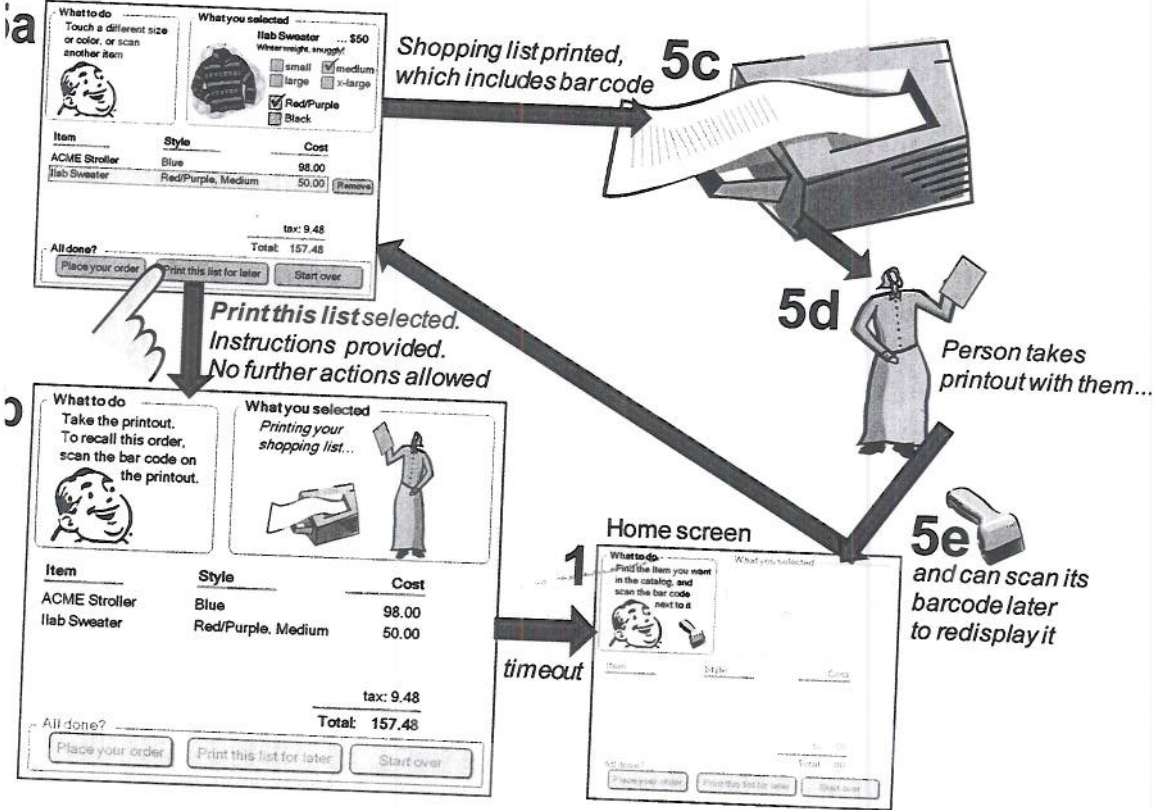
tax: 7.28
Total: 107.28

All done?
Place your order Print this list for later Start over

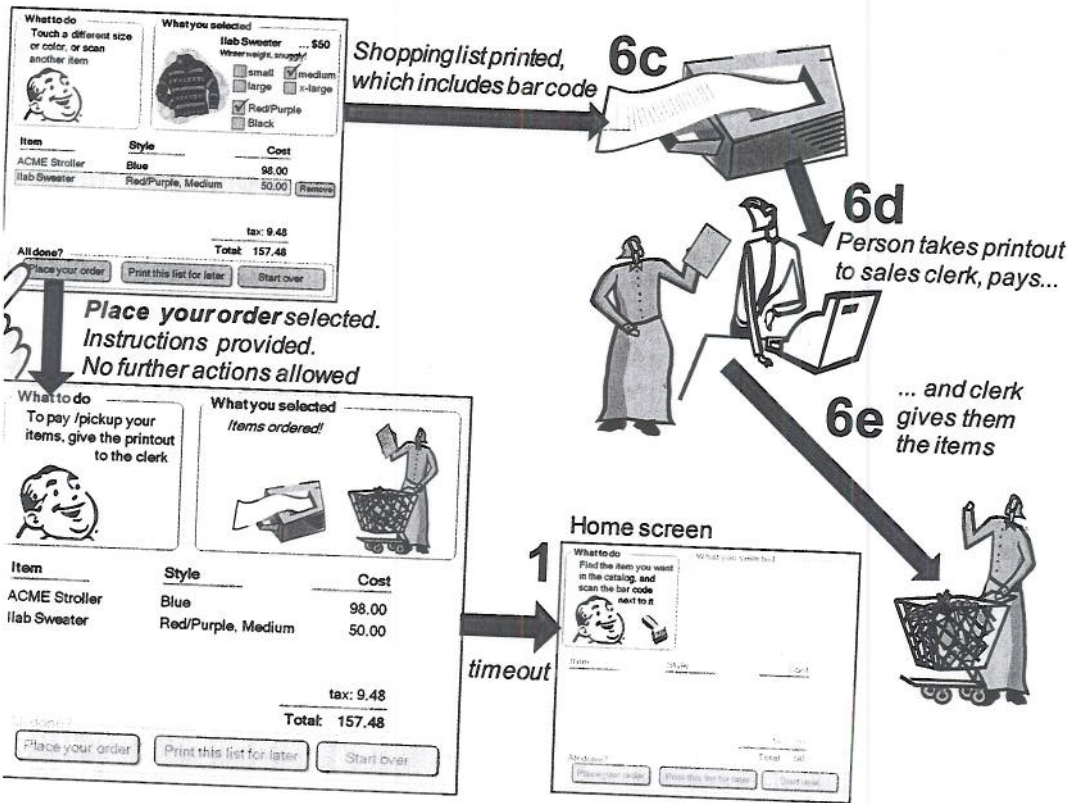
...that item disappears and the previous one is displayed

No items left? → 1
Go to initial screen

Print for Later




Place Order



7 Switching Between Items

7a

What to do
Touch a different size or color, or scan another item



What you selected

Ilab Sweater ... \$50
Winter weight, snuggly!

small medium
 large x-large

Red/Purple
 Black

Item	Style	Cost
ACME Stroller	Blue	98.00
Plain socks	Black	2.00
Ilab Sweater	Red/Purple, Medium	50.00 Remove


tax: 9.58
Total: 159.58

All done? Place your order Print this list for later Start over

The person touches the desired item...

7b

What to do
Touch a different color, or scan another item



What you selected

ACME Stroller ... \$98
For children between 1-3 years old

Green
 Blue
 Red (out of stock)

Item	Style	Cost
ACME Stroller	Blue	98.00 Remove
Plain socks	Black	2.00
Ilab Sweater	Red/Purple, Medium	50.00

tax: 9.58
Total: 159.58

All done? Place your order Print this list for later Start over

...which highlights that item. Details are filled in the 'what you selected' box

YOU NOW KNOW

This chapter illustrated two examples of branching storyboards. They used a combination of techniques to try to manage complexity when showing a multitude of decision paths and possible states.



The Narrative Storyboard 4.4

telling a story about use and context over time

The storyboards featured so far present snapshots of the user interface. But the interface is only part of the story that occurs as people interact: what is missing is context. The narrative storyboard provides this context. It uses a sequence of images to tell a more complete story about people's interaction over time, where each image in the storyboard represents a particular event. They communicate information about the location where the interaction takes place, present the people as personalities, and provide details about the other actions and things people are doing as they interact. As Laurie Vertelney (1998) points out, narrative storyboards are actually a variation of the cinematographic storyboard found in planning movies, except applied to interaction design.

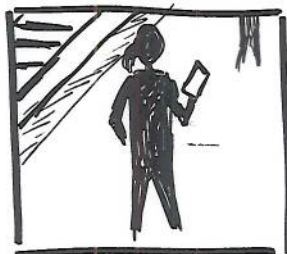
After introducing some vocabulary, we present two alternative techniques for creating narrative storyboards: **sketching stories by hand** or **using photos as source material**.

A VOCABULARY OF CAMERA SHOTS AND FILM MAKING

Film makers use specific terminology to describe the composition of a certain scene within a storyboard. We use some of their terms to describe the scenes in our sketched storyboards, and you can use those terms to think about how you want to compose and vary your own narrative images. A partial list of popular **camera shots** is provided below; a more complete description of these and other terms is found in Katz 1991 and Block 2007.



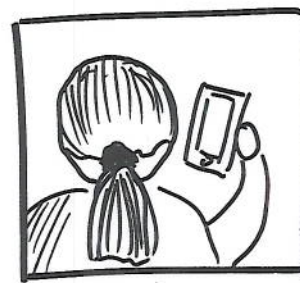
Extreme long shot (wide shot)
A view showing details of the setting, location, etc.



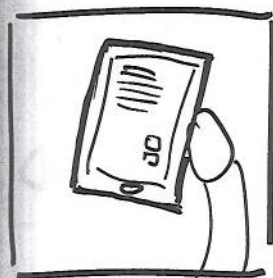
Long shot
Showing the full height of a person.



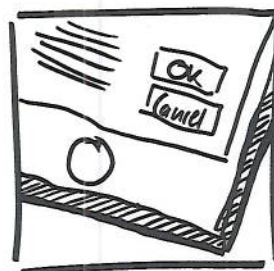
Medium shot
Shows a person's head and shoulders.



Over-the-shoulder shot
Looking over the shoulder of a person.



Point of view shot (POV)
Seeing everything a person sees.



Close-up
such as showing details of a user interface on a device the person is holding.