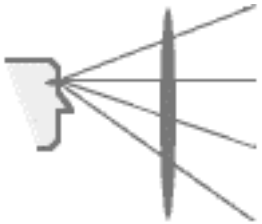
Oacis' Approach to User Interface Design



Focus on the User

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Briefing Contents

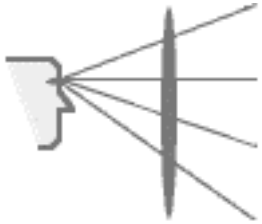
Introduction

Oacis Research is a small business located in Southern California specializing in human factors, user interface design and test & evaluation.

Oacis ***RESEARCH***

Established 1994

Human Engineering Services



Human Factors

Interface Design

Test & Evaluation

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Introduction (continued)

Since opening in 1994, Oacis Research has completed or on-going projects with the organizations shown below.

Who Does Oacis *Work For ?*

- ***Ford Motor Company - Advanced Vehicle Technology***
- ***Ford Motor Company - Automotive Components Division***
- ***Robert Bosch Corporation - Automotive Group***
- ***U.S. Air Force/Anacapa Sciences, Inc.***
- ***Visteon Automotive Systems***

References Are Available On Request

User Interface Design: Comments

These four statements describe Oacis' basic approach to user interface design and evaluation.

- *The role of the user interface designer is to act as an advocate for the user*

- *Design is a series of compromises and tradeoffs... no one gets everything they want*

- *The best way to make decisions about user-related tradeoffs is testing and design iteration*

- *A comment on evaluation and statistical analysis:*

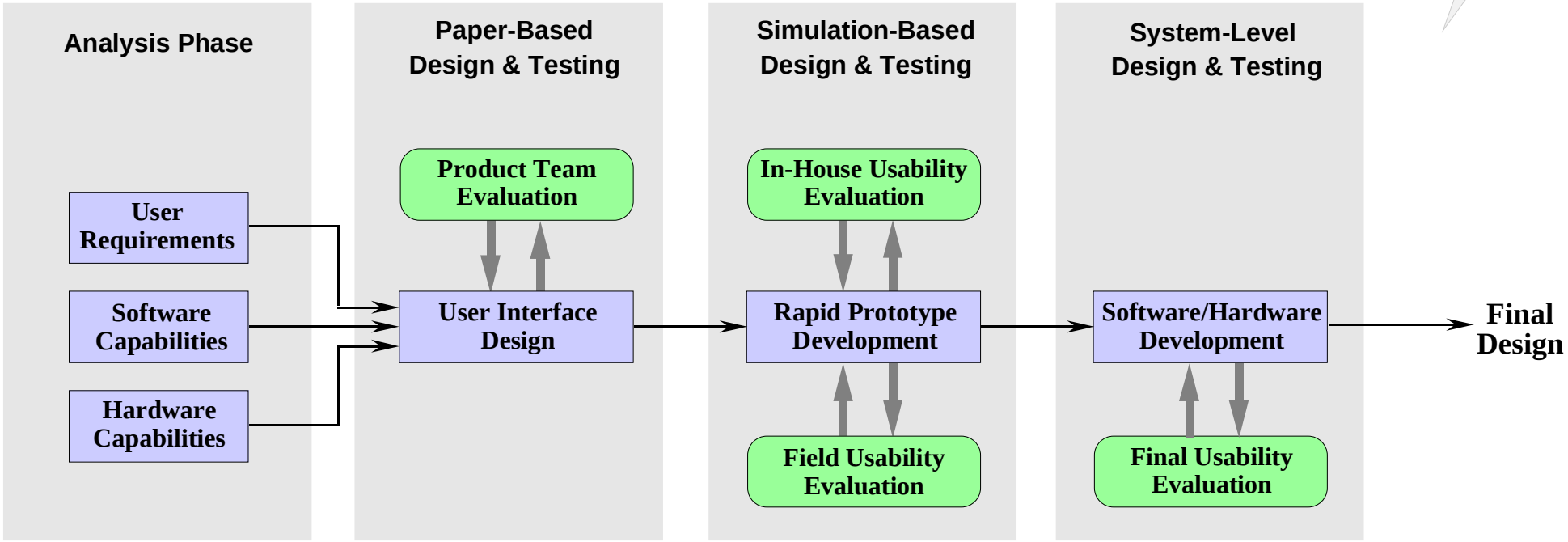
  Statistics are no substitute for common sense and are no more valuable than other sources of evidence that may contribute to a decision. The point is to make technical and business decisions and not separate theoretical constructs.

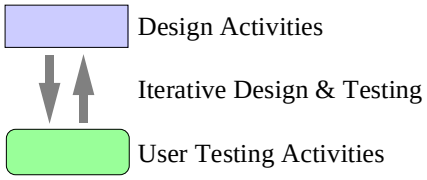
The Design Process: Overview

The Objective: Customize this process to meet Customer requirements

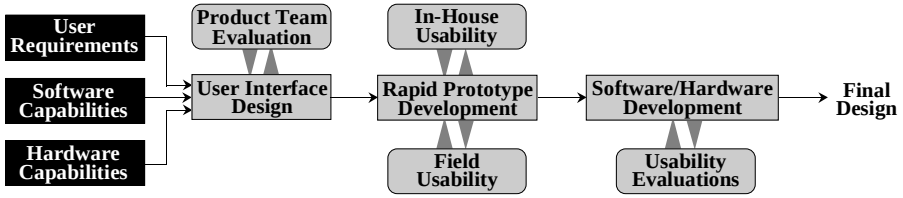
In order to be responsive to differing technical, budgetary and schedule needs, this process has been designed to allow customers to "pick and choose" from the activities shown below (i.e., design, simulation, and evaluation) that fit their specific requirements.

Each component of this process is explained in detail on the following pages.

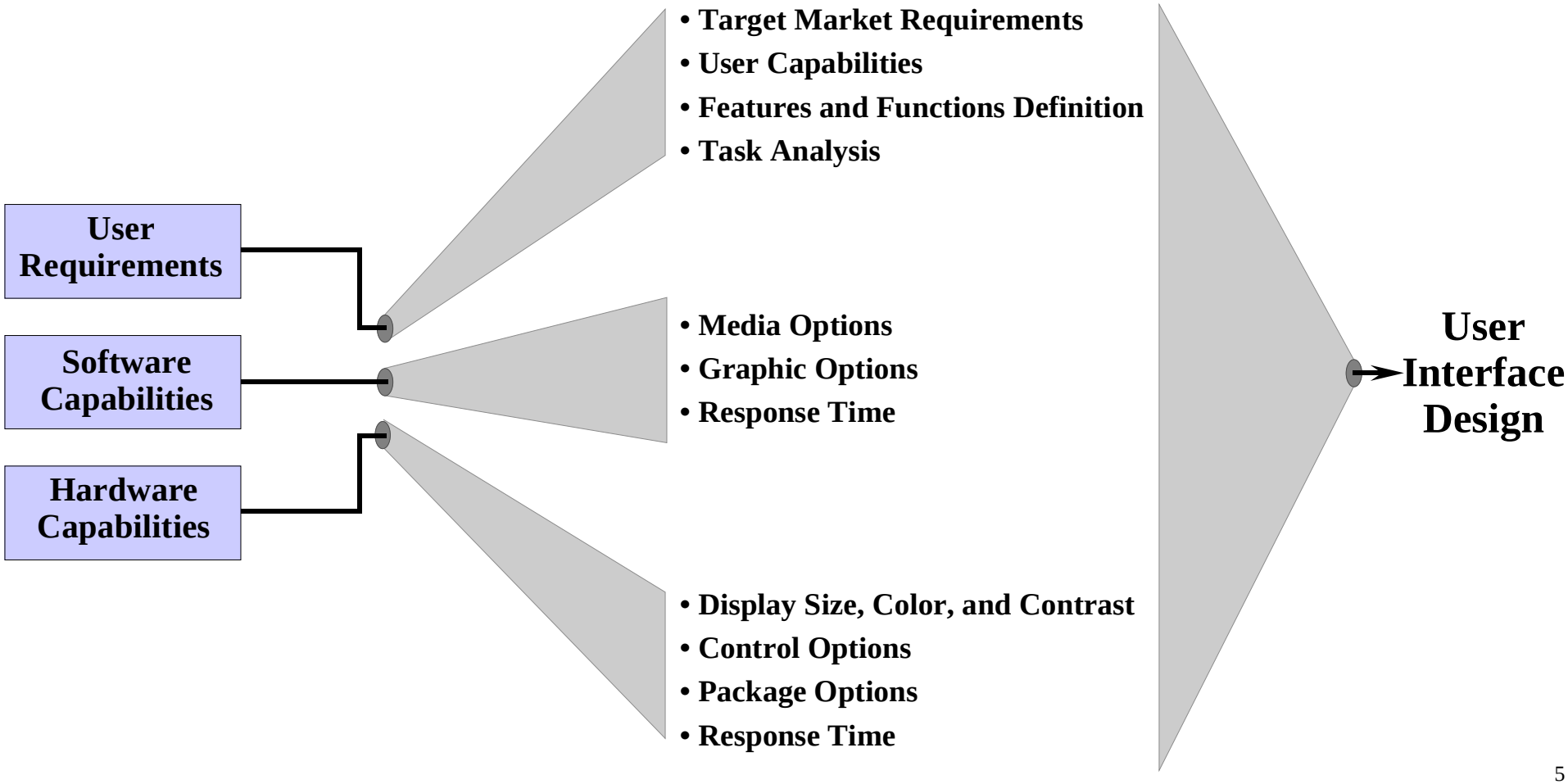




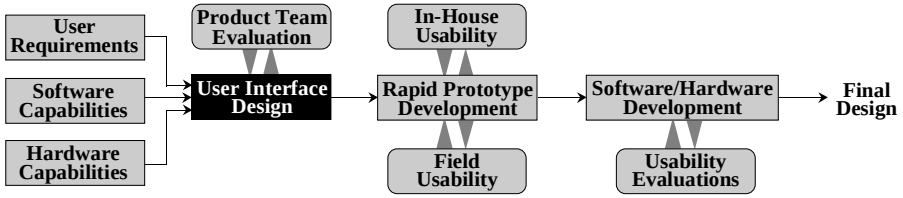
Requirements And Capabilities Analysis



This analysis is a joint effort between Oacis and its customer. The objective is to identify a set of user, software, and hardware requirements and capabilities that will form the foundation for the initial design. A set of example requirements and capabilities are shown below.



User Interface Design Activity



Efficient design is often aided by a model of user activity. The one shown at the lower left is derived from Norman (1986). This model along with a specifically selected list of user and display/control issues is used initially to create a design.

What is a paper prototype?...see the next page.

Feedback from Product Team Evaluation

Non-annotated paper prototypes for Product Team Evaluation

Requirements and Capabilities

User Interface Design

Annotated paper prototype describing the design

User Activity Model

- Establish goal
- Associate goal with action
- Select action
- Execute action
- Perceive system response
- Evaluate system response vs. goal
- Modify goal/action if required

User Issues

- Clear presentation of goal options
- Information required to meet goal
- Clear presentation of action options
- Prompts to facilitate actions
- Clear and timely feedback
- Decisions required to evaluate goal
- Clear error correction options

Display/Control Issues

- Take advantage of user expectations
- Meaningful /consistent prompting
- Meaningful labels and graphics
- Display/control grouping
- Information integration
- System status indications
- Error message design

What Is A Paper Prototype?

An excerpt from an annotated paper prototype begins on page 8.

Examples of paper prototypes used for usability and "understandability" evaluations are shown on pages 14 and 15.

What is a paper prototype?

- A full-size graphic representation of screen format and user controls
- Each page describes one user or system action/response
- A "flip-book" presentation of user-system interactions

What is an annotated paper prototype?

A paper prototype intended for software engineers that describes:

- Screen format with color and font specifications
- Actions required on entering the screen
- Actions required on leaving the screen
- All possible user actions on the screen
- The user's goal and actions for the screen

What is a non-annotated paper prototype?

A paper prototype intended for evaluation by non-design personnel:

- All annotations are removed except the user goal
- Usability evaluators supply the correct action to accomplish this goal (see page 14)
- Also used for "understandability" evaluations (see page 15)

What are the advantages?

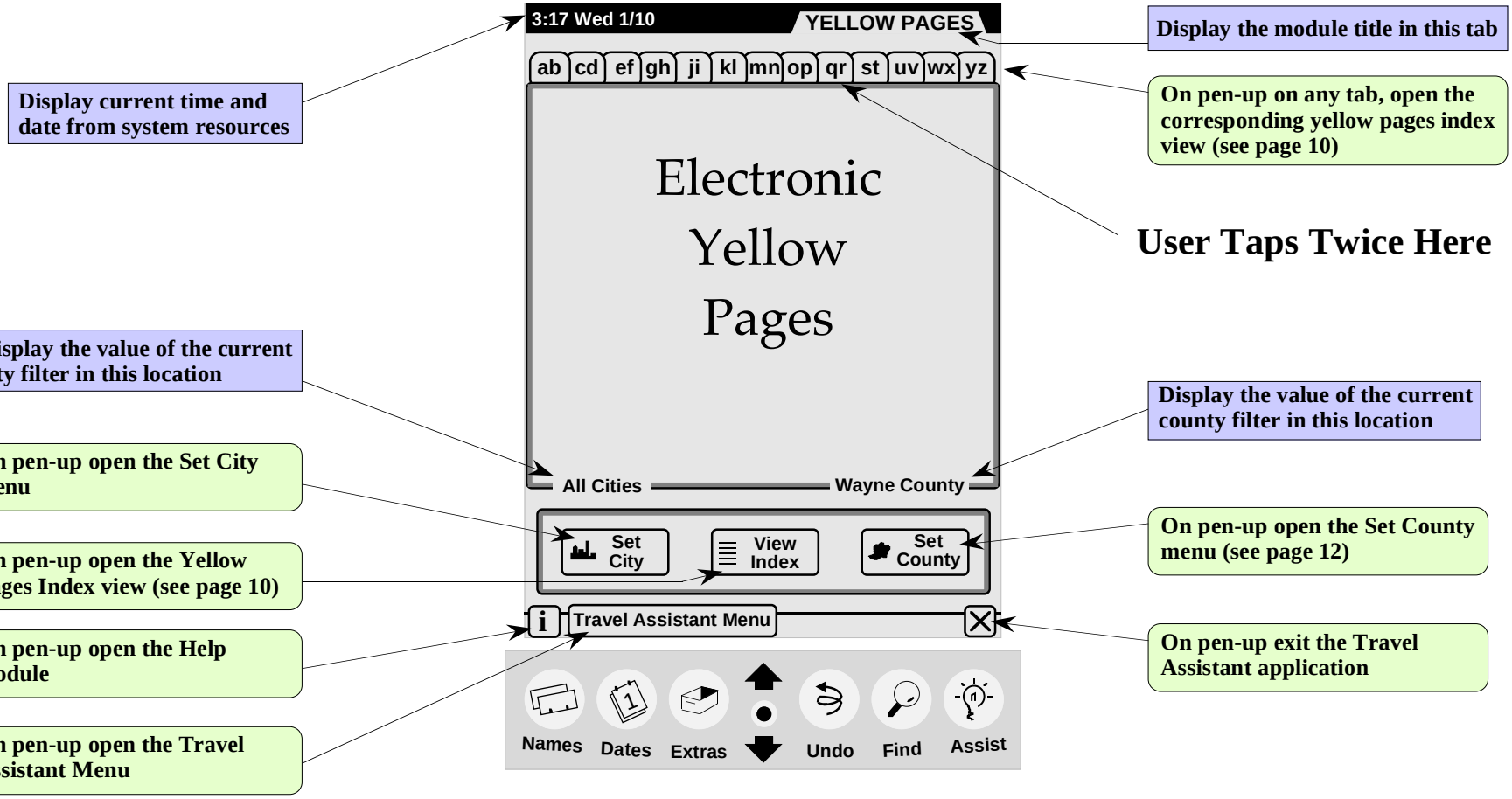
- Low cost
- Easy distribution
- Not constrained by software
- Short revision time
- Graphics-based communication of ideas
- No computer required for evaluations

An Annotated Paper Prototype: Page 1

This is a 5-page excerpt from a 150 page paper prototype. Its main use is to convey design information to other members of the team.

Yellow Pages Module: Initial View

Screen Activity Description	When the user selects the Yellow Pages module from the Main menu, configure the screen as shown below. When the display is complete, wait for a user action.



Display Only Object
User Action Object

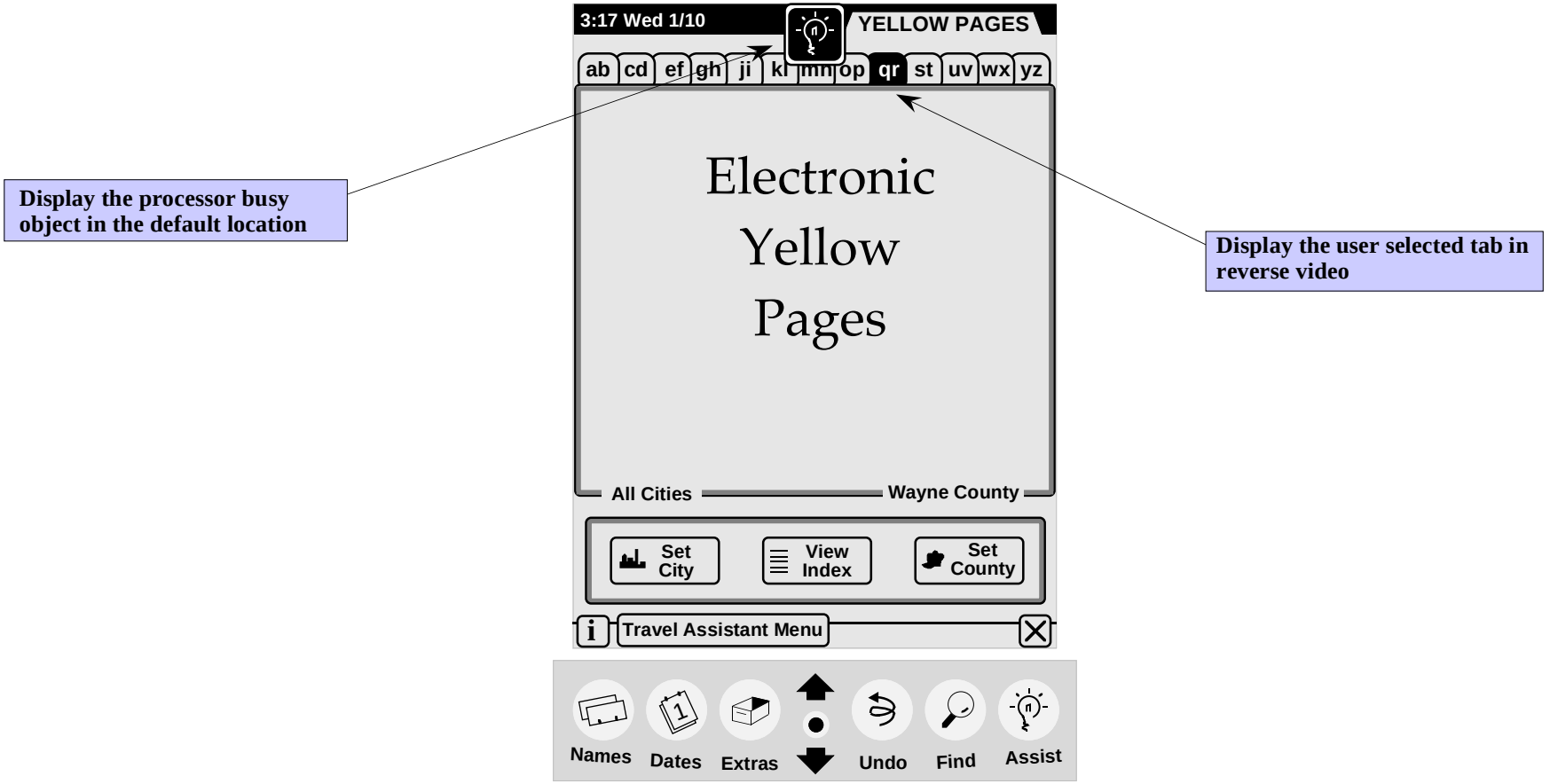
User Goal	Open the index to the "**r**" listing

User Action	User taps twice on the "**qr**" tab using a standard Newton action

An Annotated Paper Prototype: Page 2

Yellow Pages Module: Processor "Busy" View

Screen Activity Description	The user has selected to open the Yellow Pages index view. Display the selected index tab in reverse video. If displaying the index view will require more than 1 second, then display the processor busy object



Display Only Object
User Action Object

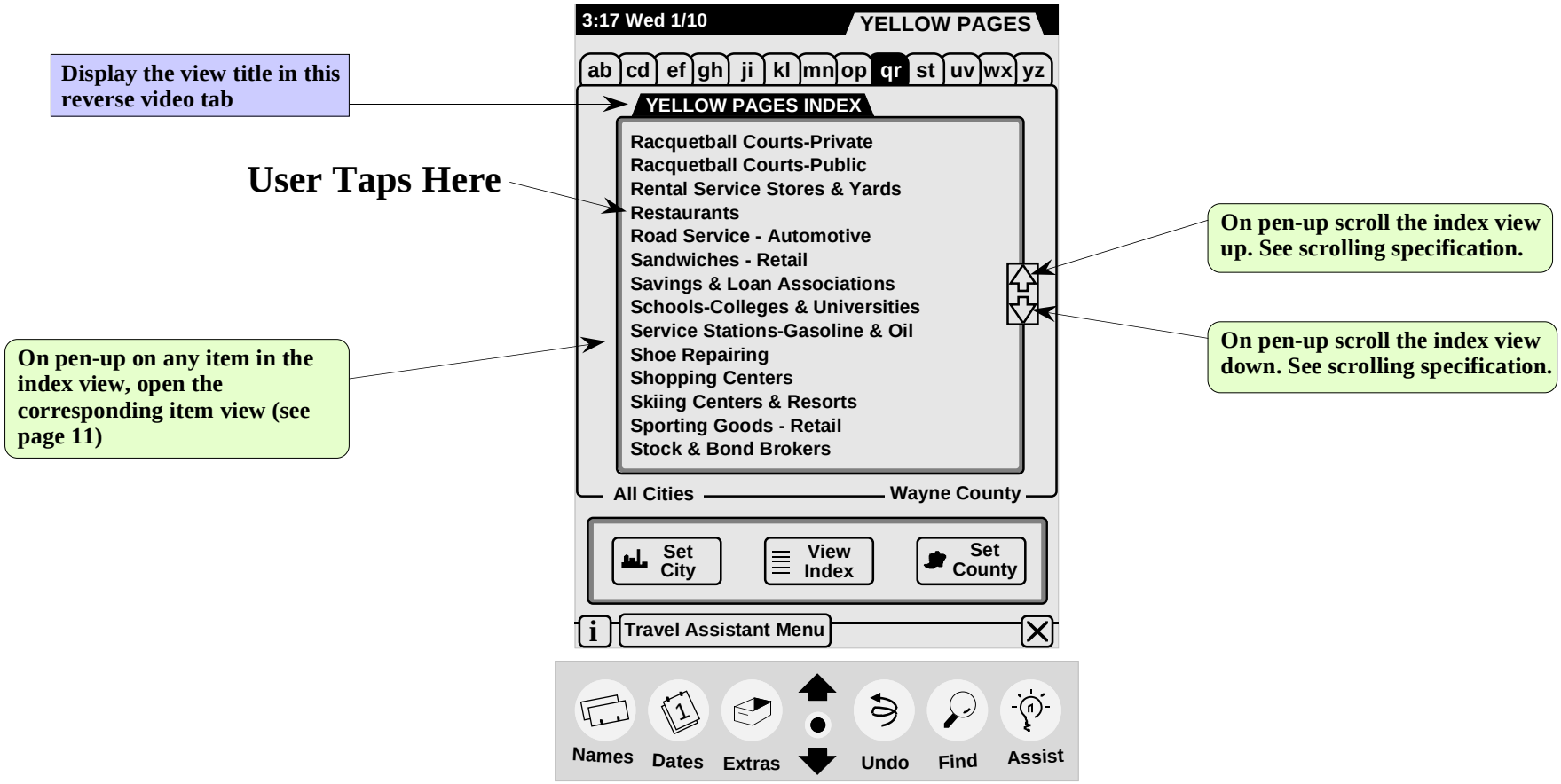
User Goal	User is waiting for the index to open

User Action	None

An Annotated Paper Prototype: Page 3

Yellow Pages Module: Index View (open to the R listing)

Screen Activity Description	The user has selected to open the Yellow Pages index view at the R listing. Display the index view in the location shown below. Remove the gray "active window" border from the outer window. Wait for a user action.



Display Only Object
User Action Object

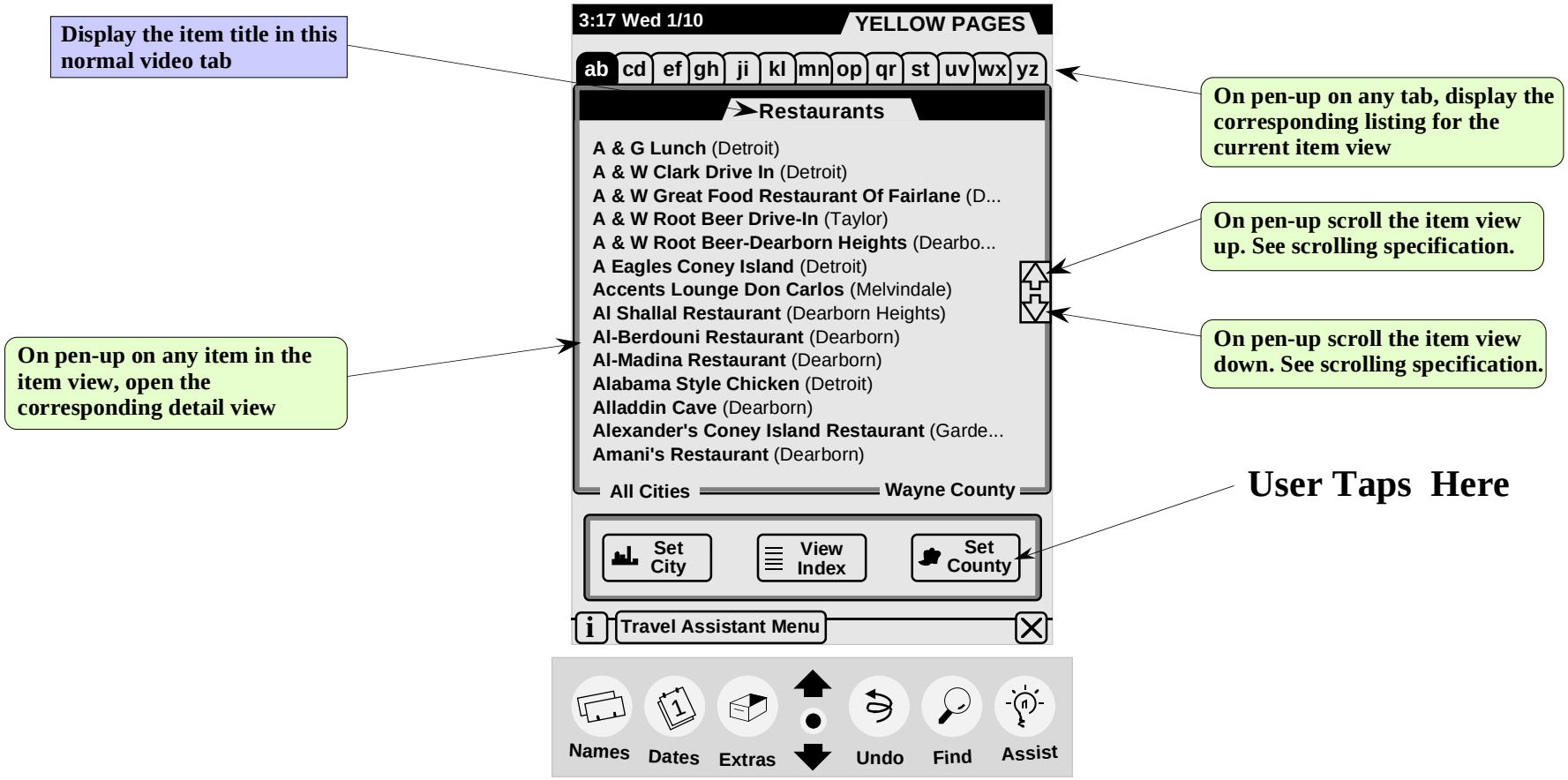
User Goal	Open the Yellow Pages restaurant listing

User Action	User taps once on the Restaurant line using a standard Newton action

An Annotated Paper Prototype: Page 4

Yellow Pages Module: Item View (open to the Restaurant listing)

Screen Activity Description	The user has selected to open the Yellow Pages item view for Restaurants. Display the item view as shown below. Display the AB index tab in reverse video. Display the Restaurant listing beginning with the A listing. Wait for a user action.



Display Only Object
User Action Object

User Goal	Open the Set County menu

User Action	User taps once on the Set County button using a standard Newton action

An Annotated Paper Prototype: Page 5

Yellow Pages Module: Set County Menu

Screen Activity Description	The user has selected to open the Set County menu. Display the Set County menu in the location shown below. Display the Set County button in reverse video. Display a check mark in the Set County menu to indicate the current county filter. Wait for a user action on a Set County menu item or the close box of the Set County menu.

On pen-up on any menu item change the county filter to the selected item and close the menu.

User Taps Here

On pen-up close the Set County menu

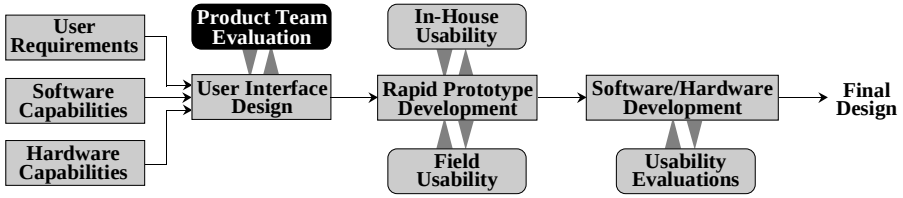
Display Only Object

User Action Object

User Goal	Close the Set County Menu

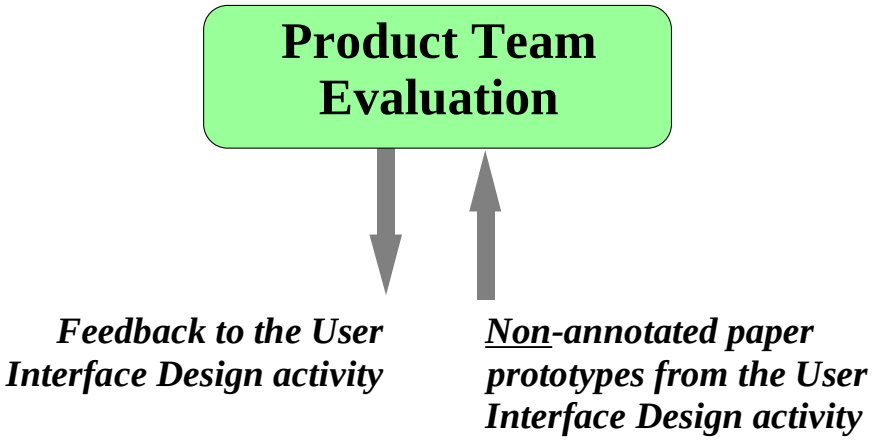
User Action	User taps once on the Set County close box using a standard Newton action

Product Team Evaluations



This is a low cost check on the initial design. It allows the entire product team to have input to the iterative process.

Examples of how paper prototypes might be used in these evaluations are shown on the next two pages.



Objective: A low-cost evaluation of the initial user interface design prior to beginning rapid prototype development.

Participants: Product Team members, preferably those members who are not responsible for user interface or software design.

Methods: The evaluations are based on the non-annotated paper prototypes. The conduct of the evaluations may:
- be formal or informal,
- conducted in groups or individually,
- include interviews with the designer.

Techniques: Paper-based usability evaluations and Paper-based "understandability" evaluations.
(see pages 14 and 15)

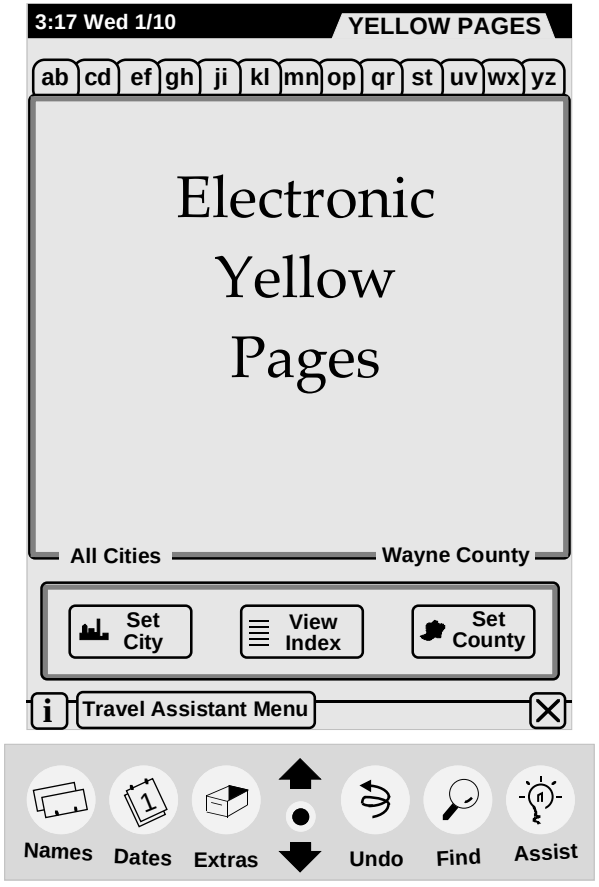
Data: The data may include:
- verbal comments collected by the designer,
- completion of special data collection forms,
- counts of errors and correct responses.

Paper Prototype: Usability Evaluation

All annotations have been removed from this paper prototype converting it to a usability evaluation data sheet.

The evaluator fills in the User Action response based on the item shown in the User Goal box.

The entire evaluation would consist of many individual sheets leading the user through specific tasks.



User Goal	Open the index to the "**r**" listing

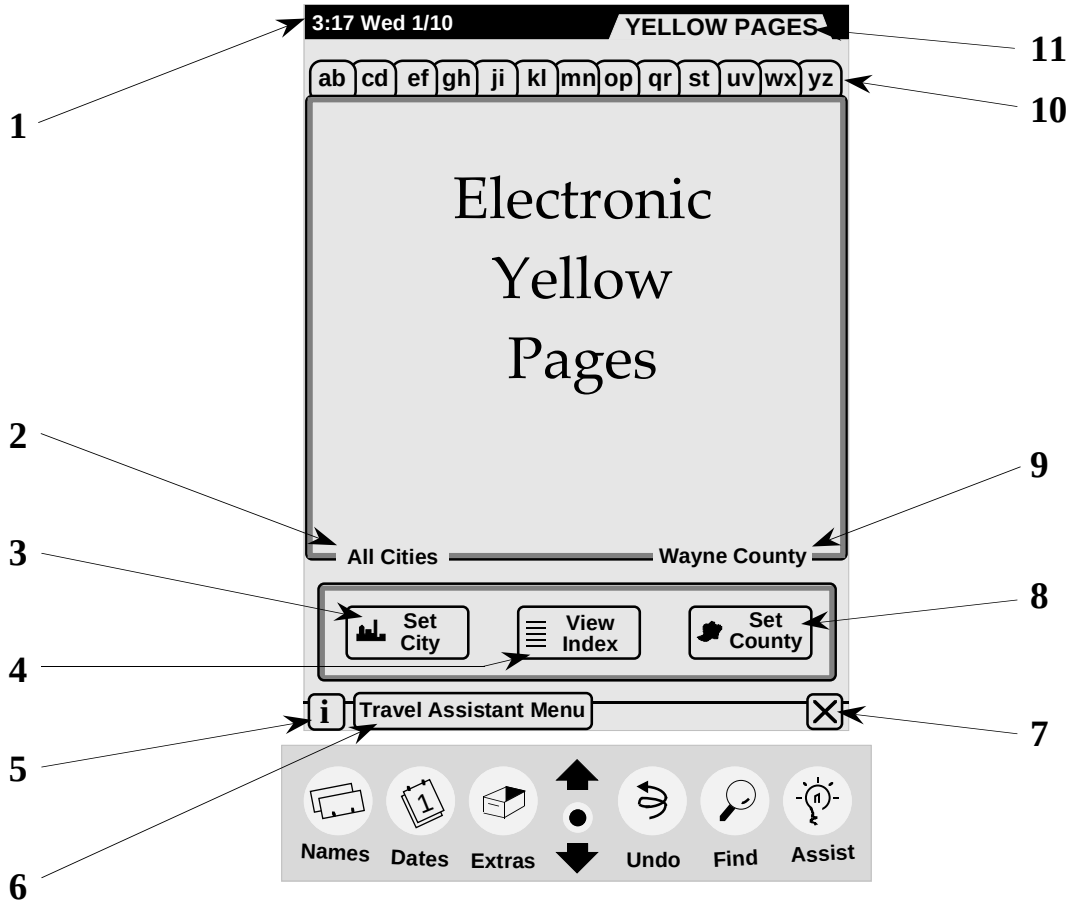
User Action	

Paper Prototype: *Understandability* Evaluation

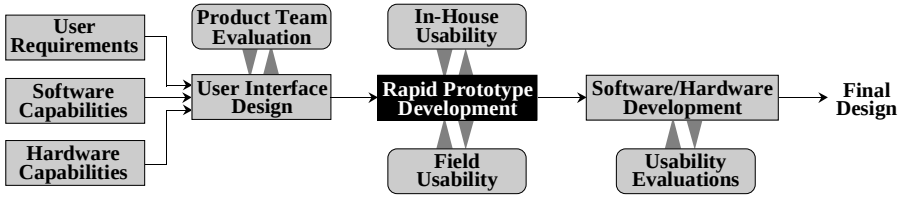
This evaluation is intended for early detection of design components that require further refinement.

Evaluations are conducted as one-on-one or group interviews with the user interface designer.

Moving from number 1 to 11, explain the function and/or significance of each item



Rapid Prototype Development



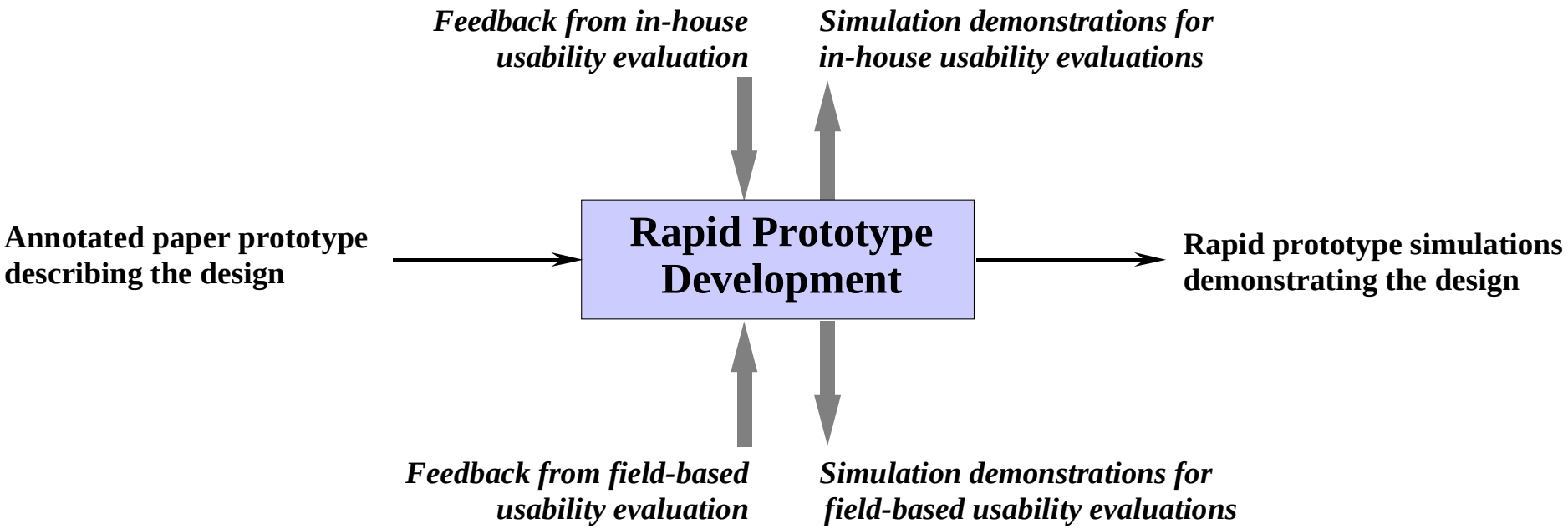
Paper-based designs can be very cost-effective and technically revealing. However, there are instances where there is no substitute for actual interaction.

Oacis has successfully used Macromedia's Director for rapid prototyping of several projects. This application strikes a good compromise between development time and flexibility.

A screen-capture from a Director prototype is shown on the next page.

The following decisions will be made in conjunction with the Customer:

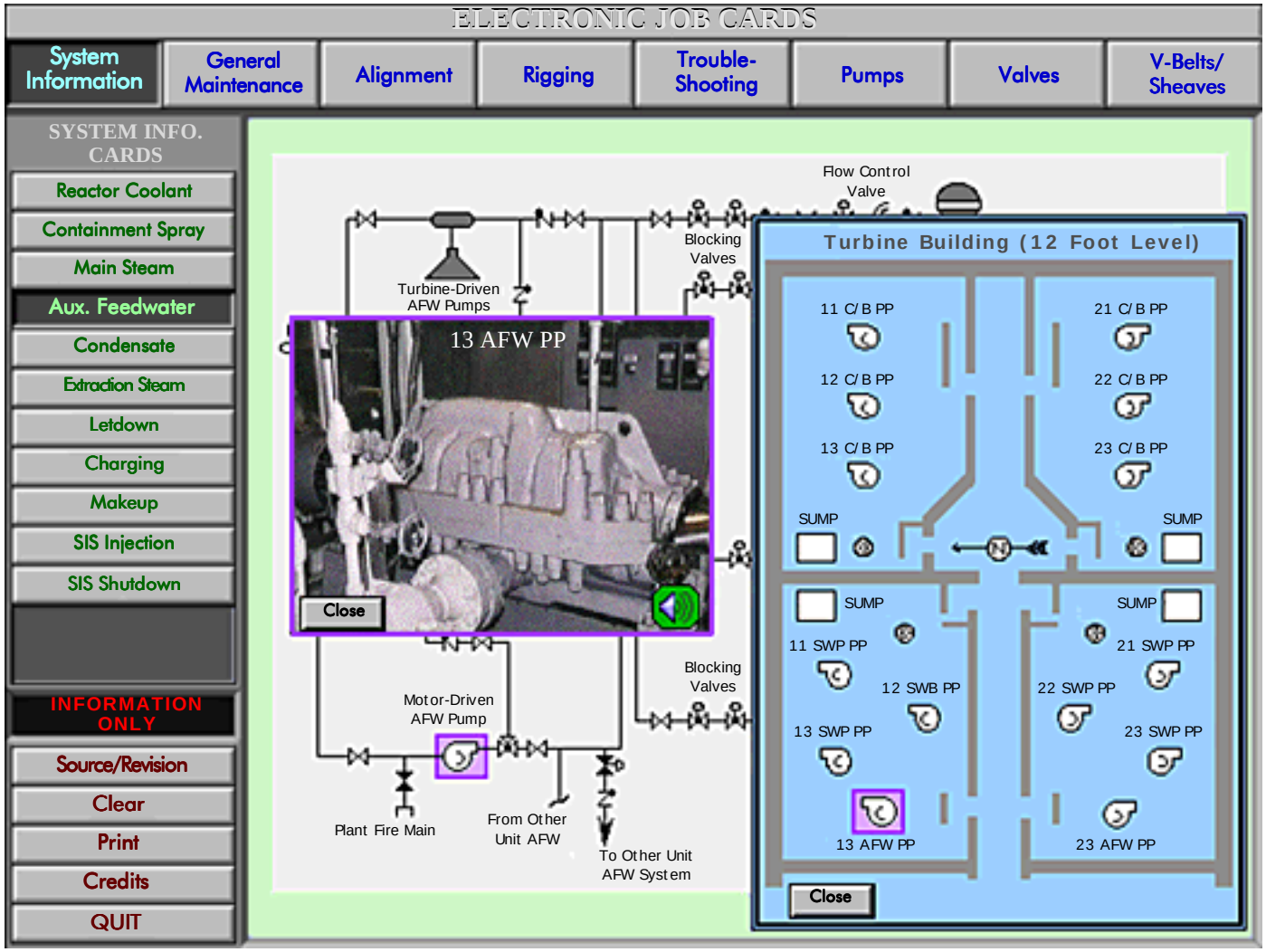
- **The prototyping software to be used**
- **The fidelity of the prototype simulation**
- **The parts of the user interface to be simulated**



Rapid Prototype Example

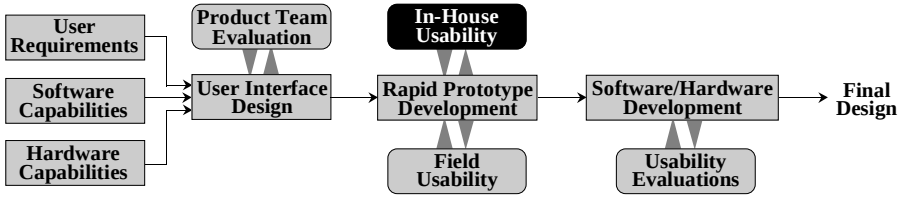
This is a screen-capture from a prototype information system for nuclear power plant maintenance. This screen was designed to assist personnel in locating plant equipment. The user initially clicked on a schematic diagram, then on a floor plan, finally viewing a photograph of the equipment.

Prototype created with Macromedia Director



80% of actual size.

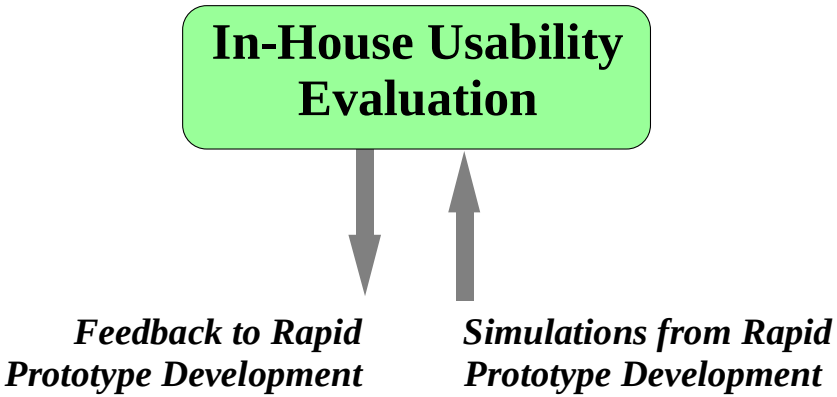
In-House Usability Evaluations



This evaluation is designed to be a low-cost activity using in-house, non-technical employees.

It is used as a final check on the design prior to field testing with representative end users.

It can also serve as a pilot-test of the field evaluation experimental design.



Objective: A relatively low-cost usability evaluation prior to field-based usability evaluation.

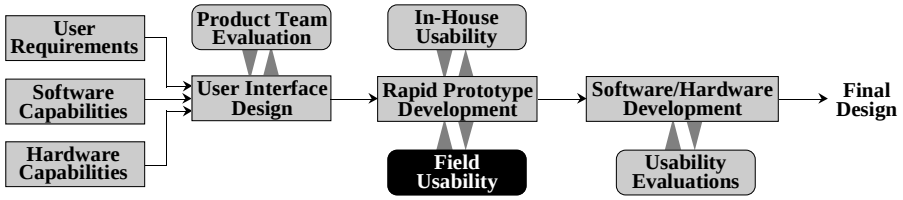
Participants: Non-technical Customer employees

Methods: The evaluations are based on the rapid prototype simulations. They are formal one-on-one sessions conducted by a study moderator. The participants are given specific tasks and objectives to be accomplished.

Techniques:
- Usability Observations
- "Understandability" Interviews
- Ease-of-Use Ratings
- Workload Ratings

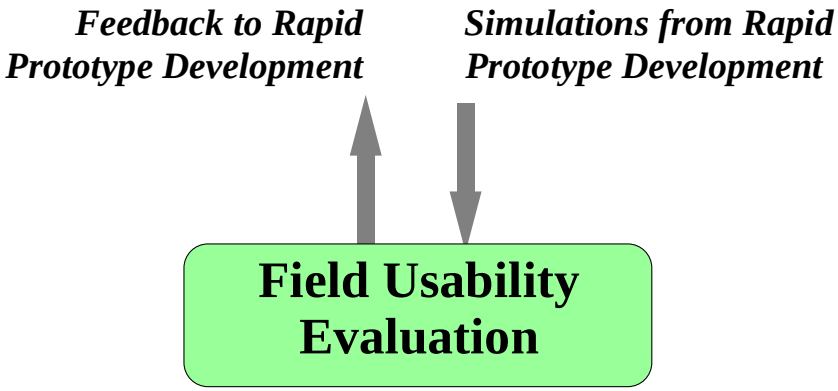
Data: The data may include:
- Reasons for user problems
- Design components not understood by the user
- Ease-of-Use statistics
- Workload statistics
- Task completion times and errors

Field Usability Evaluations



This evaluation takes the design in rapid prototype form to actual end-users. This activity is often conducted with the assistance of a market research field service company.

The intent is a final check on the design prior to software development.



Objective: A moderate-cost usability evaluation prior to software development.

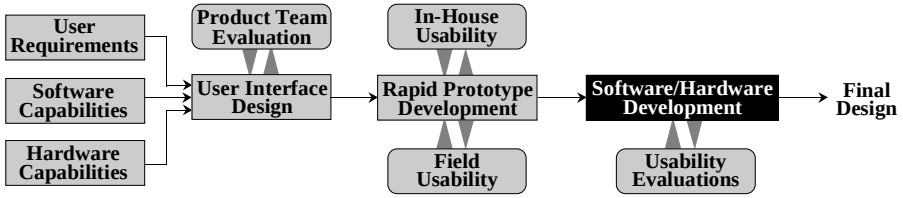
Participants: Individuals in the current and future target markets for this product (often obtained through a market research field service company).

Methods: The evaluations are based on the rapid prototype simulations. They are formal one-on-one or group sessions conducted by a study moderator. The participants are given specific tasks and objectives to be accomplished.

Techniques:
- Usability Observations
- "Understandability" Interviews
- Ease-of-Use Ratings
- Workload Ratings

Data: The data may include:
- Reasons for user problems
- Design components not understood by the user
- Ease-of-Use statistics
- Workload statistics
- Task completion times and errors

Software/Hardware Development



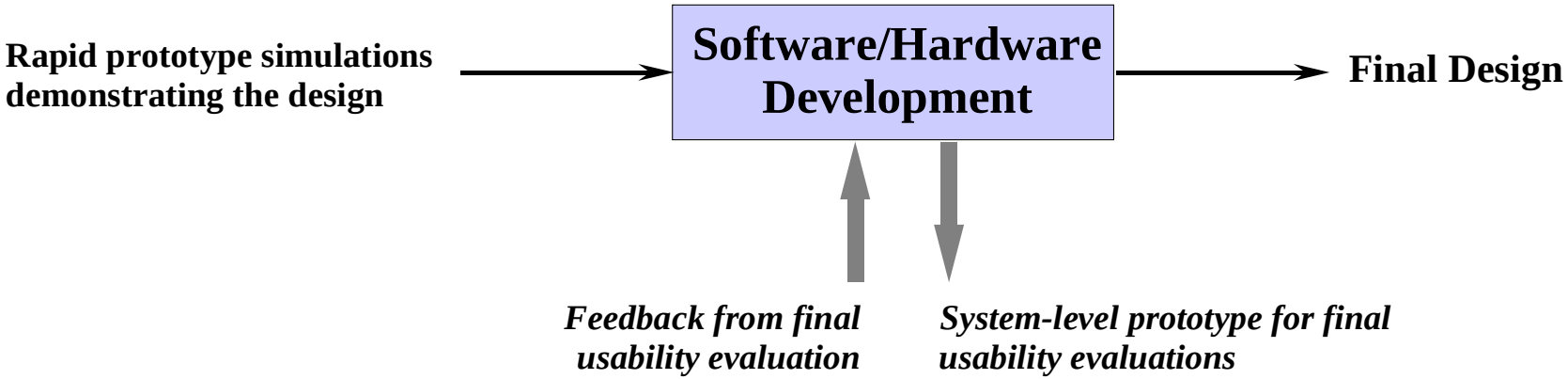
This activity emphasizes two issues:

(1) Continued in-house evaluations as development proceeds, especially if continuing design issues remain.

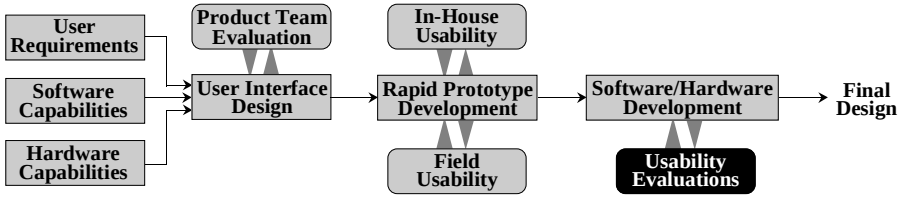
(2) Components of a design that can not be effectively tested without coding them in final form. In this case consideration may be given to "hooks" in the software to facilitate subsequent evaluations.

Special Considerations:

- **Iterative testing as the development proceeds**
- **Software and hardware "hooks" to facilitate user testing**

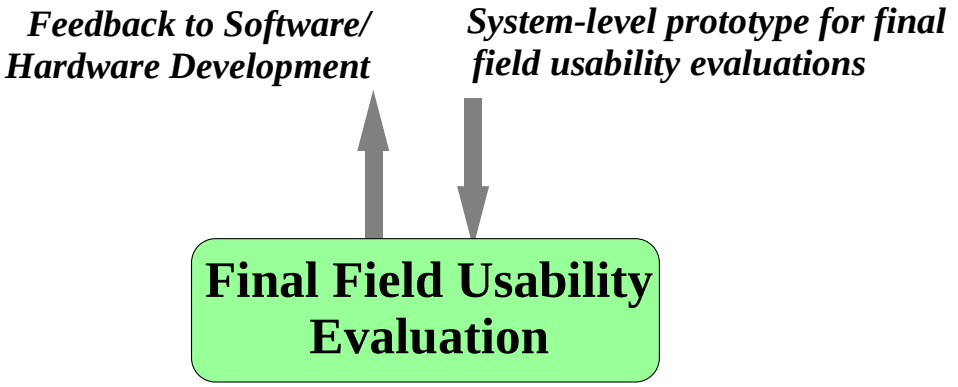


Final Usability Evaluations



This activity addresses two types of evaluations. Those that could not be effectively conducted until the product is in final form and secondly, a final usability check prior to production.

Depending on the project requirements and history, final usability testing may or may not be required.



Objective: A final usability evaluation prior to production.

Participants: Individuals in the current and future target markets for this product (often obtained through a market research field service company).

Methods: The evaluations are based on the system-level prototypes. They are formal one-on-one or group sessions conducted by a study moderator. The participants are given specific tasks and objectives to be accomplished.

Techniques:
- Usability Observations
- "Understandability" Interviews
- Ease-of-Use Ratings
- Workload Ratings
- Field Observations

Data: The data may include:
- Reasons for user problems
- Design components not understood by the user
- Ease-of-Use statistics
- Workload statistics
- Task completion times and errors

Final Comments

The process described in the briefing has been specifically designed to allow the customer to "pick and choose" the design and evaluation activities that fit their requirements. The finesse in customizing this process comes in deciding which activities to perform and how to allocate resources among them. After a discussion of project requirements, Oacis is prepared to provide a proposal and cost estimate for any of the individual activities in this design process.

If you have questions or require further information about this process, please contact Oacis Research. We can arrange a teleconference or potentially an on-site meeting at your convenience.

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