

Rochester Institute of Technology

A Thesis submitted to the Faculty of
The College of Imaging Arts and Sciences
in Candidacy for the Degree of
Master of Fine Arts

Graphic Design & Ubiquitous Graphic User Interfaces; The Third Wave of Computing

by Frank Marino
May 2001

Approvals

Chief Advisor

R. Roger Remington

May 16, 2001
Date

Associate Advisor

Peter Byrne

May 16, 2001
Date

Associate Advisor

Andrew Phelps

May 16, 2001
Date

School Chairperson

Nancy Ciolek

5/16/01
Date

I, Frank Marino, prefer to be contacted each time a request for reproduction is made.
I can be reached at the following:

716.726.5889
fmarino1@rochester.rr.com

Frank Marino

MAY 16, 2001
Date



Acknowledgements

I would like to thank the following people and groups for their help and support throughout my entire MFA experience at RIT:

Laura Marino
Perry & Russell Marino
R. Roger Remington
Deborah Beardslee
Bruce Ian Meader
Andrew Phelps
Peter Byrne
Patrick Fricke
Sarah Bartoo
Paul Porter
Dan Harel
Mike Telek
Walter Bubie

Doug Beudet
Kathy Donnelly
2001 RIT Design Grads
Jeanette & Gabriel Vilar
Sebastian & Linda Marino
Julia Marino
John Marino
Joy Shaw
Jack & JoAnn Spronz
Jack & Francine Spronz
Marisa & Nicholas Spronz
Sr. Lucille Nalbhone
Kristina Matthews

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Graphic design & *ubiquitous graphic user interfaces*.
the third wave of computing.

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Thesis Project Definition

Graphic design is an integral component of user interface design. Ubiquitous computing is the a form of computing that is “everywhere all the time” through technology advances in hardware, software, and communication networks. Consumers are able to retrieve and send information whenever a task needs to be completed. Graphic design is part of the visual mechanism through which people interact with devices. The visual interactive components of these devices are the part of computing systems that are addressed in this project.

This thesis addresses the problems that arise when people need to interact with several devices at a given time. The goal is to make the experience of an imaging appliance as enjoyable and useful as possible. Graphic design is the key component in the visual communication aspect of these devices. The ideas used in the scenarios that are described in the ideation stage assume that future technologies are mainstream and used by the mass consumer. Although these assumptions may or may not come to fruition, graphic design will still be a integral part of that user experience.



Precedents

Ubiquitous Computing News

This web site focuses on current news that is happening in the field of computing. Several new products and concepts have been developed, generating a need for a graphic user interface. Products such as cell phones, messaging pagers, handheld computers, and wearable computers include operational interface elements and feedback attributes. These devices are examples of evolving technology that are starting to interact on a regular basis. Currently in their infant state, these products will eventually be capable of highly advanced dialogue. This thesis explores what could be possible for an integrated imaging appliance in the midst of this integrated system of devices.

Xerox Palo Alto Research Center

Xerox PARC started activity around this topic in 1988. The ideas have evolved over the last thirteen years. Some ideas have become reality, and others are still to be developed. Graphic design has not been the focus area of the scientific research at the center. The research has concentrated on technology development rather than design. This thesis hopes to augment the principles of previous research and add to the pool of knowledge that will help graphic design relate to user needs. Graphic design can help communicate the meaning, function, and form of the information at hand.

Kodak Design & Usability Center

Kodak has been a leader in imaging for over one hundred years. Digital imaging has become a priority for new product development leading to future growth. Design research for products that will be part of the third wave in computing have been studied mostly from the Industrial Design perspective. This thesis project begins to address concepts to solve user interaction problems. This activity will help to build upon previous knowledge while bringing new ideas for a more robust solution to a design problem.

Additional References

See the Bibliography on page 58 for other research references.



Research

Research Summary

Research for this project ranged from literature reviews, web site reviews, to professional input from Kodak executives and thesis advisors. All of these sources helped to make well-rounded decisions in relation to graphic design. These sources acted as guides for design decisions.

The research and information gathering for this thesis topic has been very thought provoking. Ubicomp user interfaces have already started to make their way into our daily lives. The industry has coined the term 'pervasive computing' to describe this phenomenon. Information appliances are becoming more popular among the consumer market. These appliances are suited to meeting specific needs as opposed to meeting a variety of needs in the way that a PC does. These appliances range from primitive technology such as LCD displays with 16 values of gray to more expensive large size HDTV LCD displays for interactive devices. These two technological extremes still require a graphic interface for human interaction. Constraints exist on both sides.

Information appliances such as digital cameras, PDAs, portable computers, music players, and digital music instruments are currently the most advanced products in this category. Donald Norman (Human Factors Expert, The Nielsen Norman Group) suggests that MIDI instruments have been the ideal ubiquitous device for years. Whether it be a digitized drum set or a synthesized keyboard, an entire symphony of instruments can be controlled from the interface of a MIDI capable device. The industry standard of MIDI helped develop this technology to its widespread use. Other standards in computing such as Sun Microsystems JAVA and JINI operating systems will help to develop future ubicomp applications. This is a difficult technological standardization to accomplish.

Well integrated visual communications will be one of the key interfaces for these devices. Other technologies that may be used in addition to GUIs are voice recognition, handwritten recognition, location IDs (like global positioning systems), gesture recognition, and intelligent agents. Donald Norman writes that there are three axioms these interfaces should achieve: a) simplicity, b) versatility, and c) pleurability. Users have tasks that they want to accomplish such as listening to music, viewing pictures, writing letters, communicating with others, storing and retrieving information, and the list goes on. Computers are getting more complicated to use. The third wave of computing will most likely require several devices only handle a few tasks each. For example, an imaging device might capture, store, retrieve, send, and share images. An audio device might play, record, store, retrieve, send, and share sounds for a user. The challenge is to design a system that users can understand: in other

Research

words, a system of devices that can communicate with each other seamlessly. Users want to perform tasks with a minimum amount of effort and be assured that a task will be completed without worry.

In summary, the literature that has been reviewed reinforces the need for good graphic design in ubicomp. This is a complex issue of systems that will require that close attention be paid to the details that a user requires. These user needs will then have to be interpreted by a device through hardware and software interfaces. Using task-based models will ensure that this market of information appliances is a strong indicator of what we can expect to see in future products.

Problematic Designs

Several products that relate to ubiquitous computing user interfaces have problems associated with them. Some blame poor marketing, bad design, no demand, or incorrect pricing. Whatever the reason, lessons learned from past products can help generate innovative solutions for the future.



1960s head-mounted display from Ivan Sutherland's research at MIT.



In 1998, Apple discontinued the Newton MessagePad and eMate portable computing platform.



Early ad for a leaning platform for a worker while speaking on a telephone.

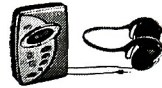


A complicated TV remote control has several functions in a small working surface.

Research

Successful Designs

Several products have proven to be successful in their usage by consumers. Some of these items have become standard for a majority of people in modern society. These innovative products have become a common affordable solution to human needs worldwide.



In 1981, Sony released the first Walkman portable music player.



Wristwatches help people keep closer sense of time as compared with older assumptions of time-keeping.



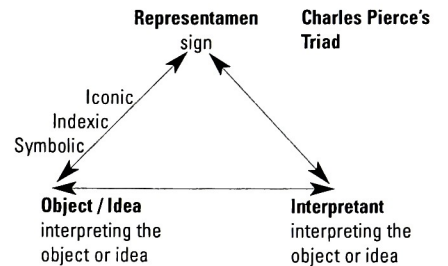
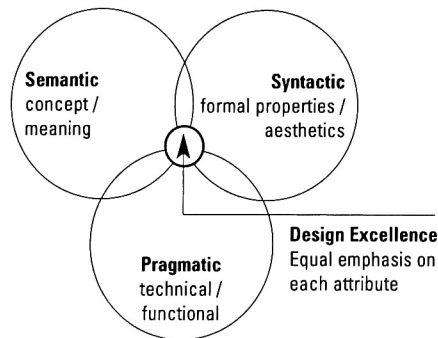
Eyeglasses have become a necessary non-invasive means of vision correction.



The Palm series of products are dominating a large portion of the PDA market.

Operations Model from Semiotic Theory

The Semiotic Model (adapted from The Ulm Institute of Design – the general philosophical theory of signs and symbols) is composed of three components: semantic, syntactic, and pragmatic attributes. In order for a design to attain excellence, it must strive toward a balance of all three attributes.



Semantic: Meaning – concept, content, context, hierarchy, message, symbols, words. Perception – balance, emotion, gestalt. Communication – accuracy, clarity, appropriateness, integrity, language, readability.

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Syntactic: Form – composition, hierarchy, proportions, typography.
Structure – grid system, margins, rhythm, white space.
Variables – position, size shape, texture, tone, weight, color.

Pragmatic: Ergonomics – accessibility, environment, human factors, legibility, lighting, visibility. Production – fabrication, materials, tools, processes.
Specification – interactive, mailed, posted, static, kinetic, time-based.

Iconic: Example - a color photograph of a car

Indexic: Example - the shadow of a car

Symbolic: Example - a logo of a car

Perception Theories

Space, Depth, and Distance – 2D and 3D form perception: light / brightness, contrast, illusions, size, overlap, value, color, aerial perspective, detail, linear, texture, shadow, blur, transparency, position, orientation, motion, time.

Visual Perception – Gestalt theory: figure / ground, ambiguity, stability, closure, reversal, pattern, overlap, balance, symmetry, asymmetry, repetition, harmony, rhythm, variety, contrast, dominance, association, familiarity, order, hierarchy.

Prescriptive Principles of Organization – Spatial organization – centralized, linear, radial, clustered, grid systems. Symmetry groups – identity, operations, translation, rotation, reflection, transformations. Proportional theories – golden section, renaissance, the modular, anthropometrics.

Communication Model (process by D. Perlo)

Source -> Message -> Encoding -> Noise -> Channel -> Decoding -> Receiver

LATCH Theory

Richard Saul Wurman (Information Architect Expert) identifies the LATCH acronym as a method of information organization. His theory is that information can be presented in the following categories in a variety of forms:

Location	- example: east to west
Alphabet	- example: a through z
Time	- example: 1800 through 2000
Category	- example: shoes, shirts, pants, etc...
Hierarchy	- example: large to small



Research

Software Agents vs. Direct Manipulation

Software agents and wizard style of interaction are pre-planned solutions that try to address user needs. Sometimes agents can be helpful and at other times obnoxious. Wizards are a forced pre-determined workflow that anticipates a user need. If tested enough, the wizard approach has been proven to be helpful to novice users.

Direct manipulation puts the control of the software up to the user. This type of interaction requires learning. After the learning stage occurs, the user can customize an interface for their own needs that most meet the task at hand.

Distributed vs. Centralized Computing

Centralized computing (a local computer that can handle a wide range of tasks) is most common today. On the other hand, distributed computing is handled by smaller devices that handle fewer tasks per feature. This technology will lead to a ubiquitous computing solution. For example, a simple standard operating system could exist on several devices. A coffee machine with this system could easily be compatible with a daily routine that starts brewing coffee, adjusts a furnace, turns lights on, and fetches the latest pertinent morning information, etc. . . .

Anthropological Approach

During an interview with Dr. Liz Rogers (Kodak visual anthropologist), she spoke of a Post-Modern approach to anthropology. This approach consists of studying a group of people without pre-conceived notions of what the outcome will be. The observation sessions would be a time for informal learning in the environment of the consumers. The anthropologist asks questions, observes actions and then studies the data gathered during the session. The skill of the anthropologist is to follow a conversation so that it does not stray too far off of the topic being studied, while providing a broad view of that topic. These ethnographic studies help to change assumptions and build new knowledge of the topic.

Key Influential Quotes

Donald Norman

“Well-designed objects are easy to interpret and understand. They contain visible clues to their operation. Poorly designed objects can be difficult and frustrating to use.” (*Norman, The Psychology of Everyday Things, p2*)



Research

“The user needs help. Just the right things have to be visible: to indicate how the user is to interact with the device.”

(Norman, The Psychology of Everyday Things, p8)

“Provide a good conceptual model. A good conceptual model allows us to predict the effects of our actions.”

(Norman, The Psychology of Everyday Things, p13)

“Seven stages of action:

- forming the goal
- forming the intention
- specifying the action
- executing the action
- perceiving the state of the world
- interpreting the state of the world
- evaluating the outcome”

(Norman, The Psychology of Everyday Things, p48)

“The invisible computer of the future. You won’t notice the computer because you think of yourself as doing the task, not as using the computer.”

(Norman, The Psychology of Everyday Things, p185) A well-designed interface helps to diminish the visibility of functionality.

“Design should make sense of natural properties of people and of the world: it should exploit natural relationships and natural constraints. As much as possible, it should operate without instructions or labels.”

(Norman, The Psychology of Everyday Things, p188)

“Graphical and Industrial Designers, those who possess the design skills that combine science and a rich body of experience with art and intuition. Here is where “joy” and “pleasure” come into the equation: joy of ownership, joy of use.” *(Norman, The Invisible Computer, p191)*

“Three Axioms for Information Appliances: simplicity, versatility, and pleasurability.” *(Norman, The Invisible Computer, p67)*

“Information appliance, an appliance specializing in information: knowledge, facts, graphics, images, video, or sound. An information appliance is designed to perform a specific activity, such as music, photography, or writing. A distinguishing feature of information appliances is the ability to share information among themselves.” *(Norman, The Invisible Computer, p53)*



Research

Bruce Tognazzini:

"Natural Law: The real world is a complex, adaptive structure formed from a few simple, driving principles, and humanity, through millions of years of evolution, has become attuned to its every nuance. If we want our own artificial worlds to communicate most effectively, we will model them after the real world, following its rules wherever appropriate."

(Tognazzini, TOG on Interface, p149)

Kevin Mullet:

"Simple designs have a greater emotional impact than complex designs, precisely because they can be immediately recognized and understood at a visceral level." *(Mullet, Applying Visual Design, p15)*

Common Errors in User Interface Design:

"Gratuitous Dimensionality - eg. 3D office"

"Overly Literal Translation - Metaphors have limits"

(Mullet, Applying Visual Design, p23)

Gui Bonsiepe

"the interface is the totality of all communication between the computer and the user. It offers the user information and in turn receives information from the user." *(Bonsiepe, Interface, p42)*

"Design contributions to interface development:

- observing, analyzing, and interpreting work processes
- formulating the functionality of use
- structuring the command options
- sketching the storyboard
- structuring the action space
- designing the documentation
- designing the tutorials
- designing the marketing materials" *(Bonsiepe, Interface, p47)*

Jakob Nielson

"Graphic Design, there is much more at stake than simple pretty pictures, and good graphic design can significantly improve the communicative value of the interface, leading to increased usability." *(Bonsiepe, Interface, ppviii)*

Jessica Lipnack and Jeffrey Stamps

"Four ages of organization:

- Nomadic - 3 million to 10,000 B.C.
- Agricultural - 10,000 B.C. to 18th century
- Industrial - 18th to 20th century
- Information - 1945 to 21st century." *(Lipnack & Stamps, Virtual Teams, p46)*



Synthesis

Interrelationships and Patterns

The research phase of the thesis process was extremely helpful in formulating methods and validating a need for this project. After reading and interviewing several resources, it was evident that existing work could be expanded upon. The imaging appliance is a viable device with which to implement a ubiquitous user interface with. It seems natural to explore a path of developing ideas that incorporate an imaging device. This would be is part of a larger system of devices that speak the same language.

Design helps bring these systems together in a way that makes sense to the user. It has been difficult to separate technology development from design development during the process. The two disciplines need to interact with each other seamlessly so that the solutions are robust enough to fit user expectations. Several educated assumptions based on the research phase formed boundaries in which the user interface prototypes could be built. Technological assumptions are high bandwidth communication standards, miniaturized fast microprocessors, integrated operating system software, and distributed computing networks. Some technological assumptions for this project are speech recognition capabilities, and high resolution displays that will allow the user interface to function appropriately.



Ideation

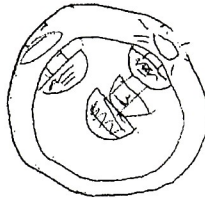
Description

The sketching stage is an important precursor to the design applications. Most of the ideas that are explored during this stage are expected to push the envelope of ideation. Pencil sketches express quick ideas that extend into a variety of directions. Several concepts are explored and flushed out. Two concepts are extracted from the sketches to test and present to an evaluation group.

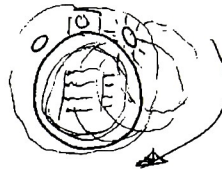
The following ideation pages address the application problems that are explored in this thesis. These pages are the result of the proceeding stages of research combined with the problem of solving the implementation phase of the thesis. This stage of the process contains the essence of all prior work with the goals of the entire project.

Ideation

Sketch Page 1



→ PANELS SLIDE OUT



→ menu ROTATES DOWN AND OUT



→ menu SLIDE DOWN



→ 2 UI PANELS SLIDE IN AND OUT,
REVEALING INFO UNDERNEATH

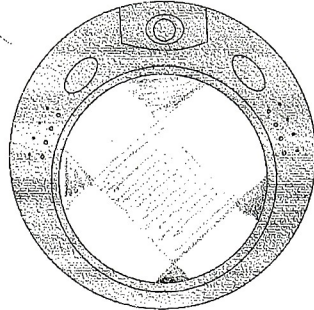


→ 4 UI PANELS SLIDE IN AND
OUT REVEAL 4 MODES.

Ideation

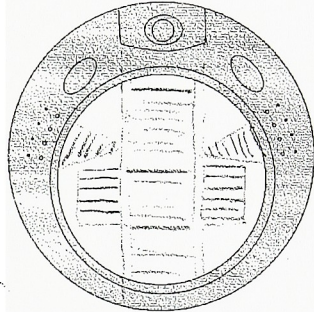
Sketch Page 2

2.15.01



GRID 1 -

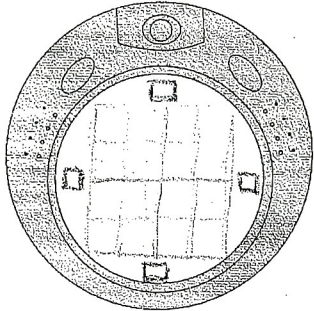
DIAGONAL



GRID 2 -

- CENTER FOCUS

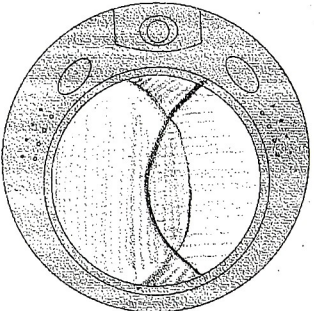
- ID INTEGRATED



GRID 3 -

- SQUARE PROPORTION

- SYMMETRICAL



GRID 4 -

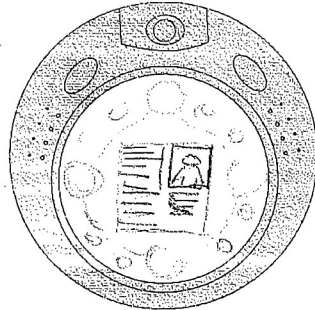
- HEMISPHERES

- OVERLAPPING TRANSPARENCY

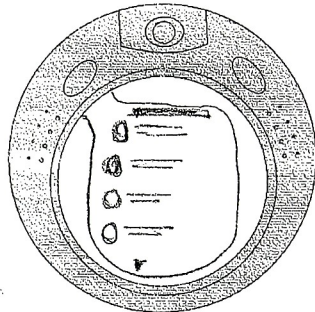
Ideation

Sketch Page 3

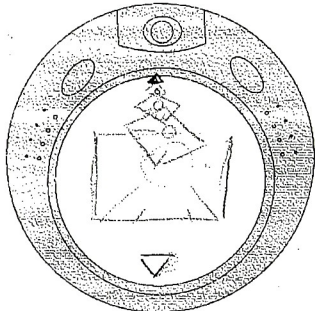
2.15.01



- ROUND BUTTONS AROUND
OUTSIDE



"BLOW" UP MENU - COMES OUT
OF LEFT BUTTON



"TAKE PICTURE" - ANIMATES
QUICKLY IN FROM TOP

- ARROWS NAVIGATE IMAGES
IN AND OUT

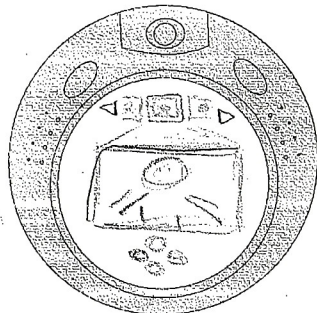
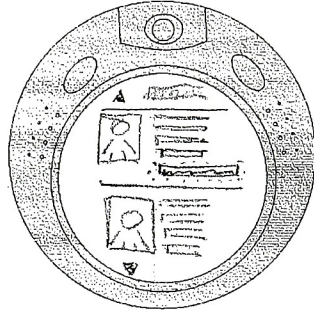


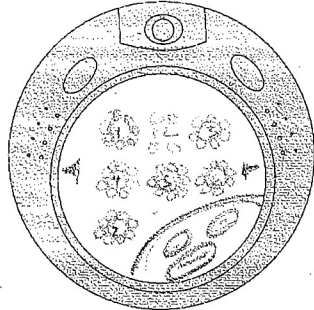
IMAGE DISPLAY THROUGH
A "FILMSTRIP" THAT CAN
BE SCROLLED

Ideation

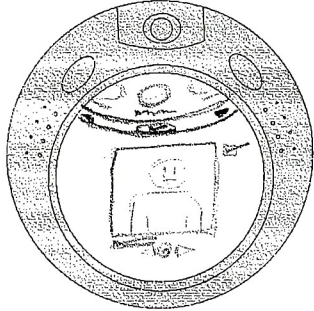
Sketch Page 4



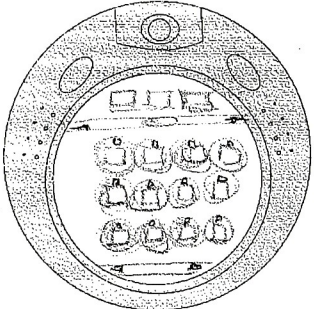
- SINGLE?
- ADDRESS BOOK DISPLAY
- PHOTO + DESCRIPTION



- "GROUP" ADDRESS
- GROUP CATEGORIES BY NUMBER - THUMBNAILS ARE AROUND CENTER IMAGE



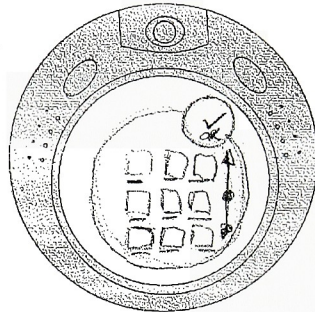
- TAGA PICTURE FOR EMAIL
- CURVILINEAR
- TOP AREA IS A ROTATING PANEL WITH ARROWS AND AN ENTER BUTTON



- MENU DISPLAY
- GEOMETRIC
- MULTIPLE THUMBNAIL DISPLAY

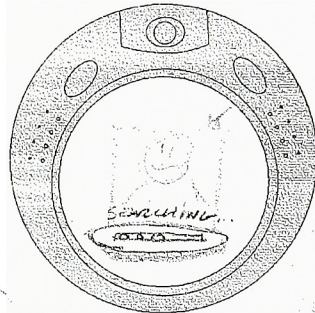
Ideation

Sketch Page 5

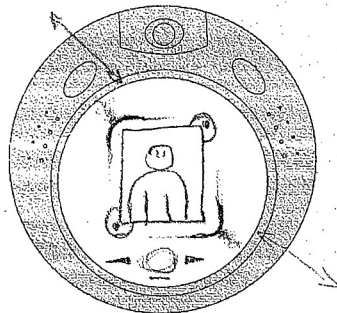


ROUND MENU SELECTION WINDOW

- FOR EMAIL PICTURES OR SHARE PICTURES

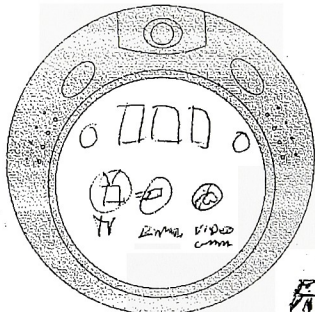


- SEARCHING FOR A DEVICE TO SHARE WITH...
TV, ANOTHER DEVICE, PRINTER, KIOSK...



- PANEL SQUEEZE IN + OUT

- SIMPLE FUNCTIONS, ONLY 2 ON SCREEN AT A TIME.

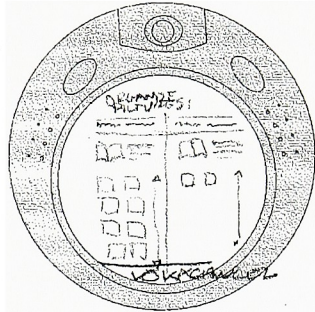


SEND A PICTURE TO A TV FOR A SHOW SHOW.

- E-MAIL
- TV
- VIDEO GAME

Ideation

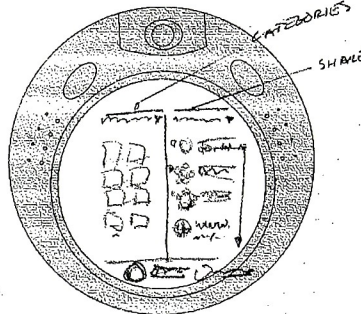
Sketch Page 6



ORGANIZE:

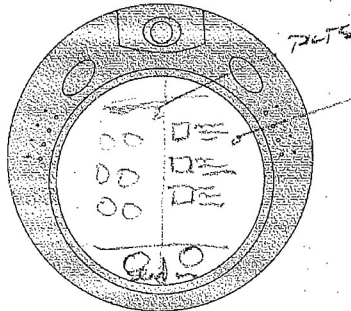
CATEGORY:	▼ RICEFLUDAY
	VACATION
	NEW...

IN OUT



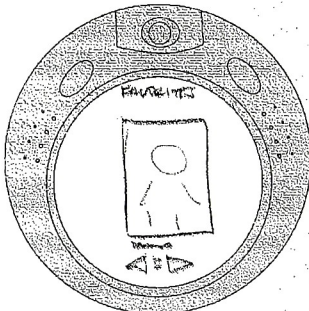
SHARE: - SEND TO GROUP
- SEND TO WEBSITE

DRAG AND DROP



PRINT TO KIOSK:
STORES / KIOSK FOUND NEAR YOU / FAVORITES

- CLOSEST TO YOU / FAVORITES



REVIEW FROM LIST:

FAVORITES (LIKE WALLETS)

ALBUMS (ARCHIVED)

CURRENT (UNORGANIZED)

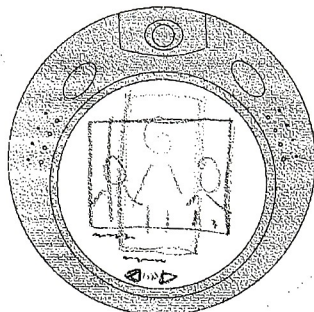
NEW CATEGORY

Ideation

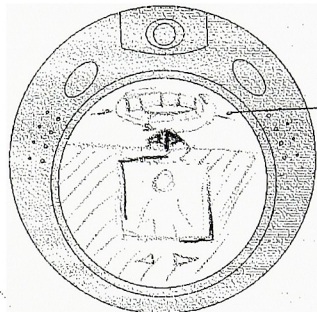
Sketch Page 7



THUMBNAILS

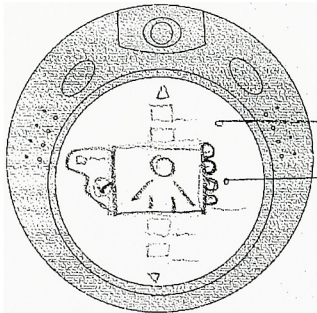


- PICTURE REVIEW LARGE



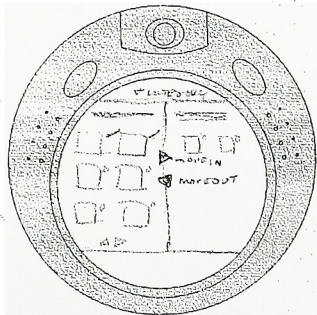
- MULTIPLE THUMBNAILS

QUICK THUMBNAIL REVIEW



SMALL THUMBNAILS

LARGE PREVIEW

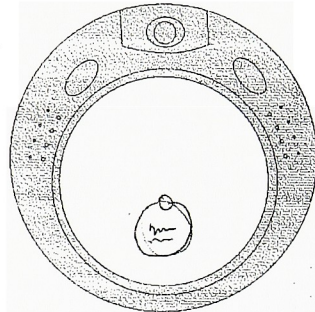


ORGANIZE!

- OR MAYBE DRAW+DRAW?

Ideation

Sketch Page 8

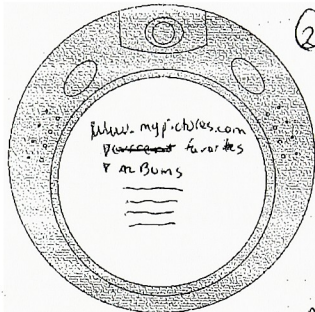


①

- INTERNET - flow

- ~~CONVERTING~~

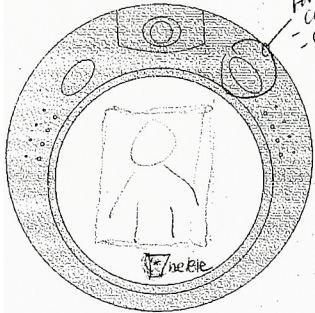
- CONVERTING, ADDRESSING, SITE;



②

mouse/p → go

mouse/DN → on



HAVE CAPTURE (1) PICT
- CAPTURE VIDEO (HOLD)

① TAKE PICTURE + VIDEO (CAPTURE)

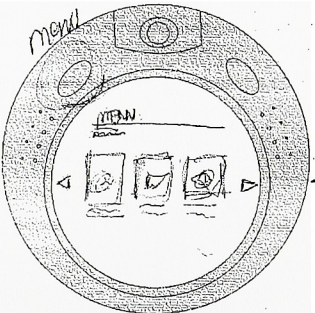
② CREATE A CATEGORY (ORGANIZE)

③ SEND PICTURE TO A GROUP (SHARE)

④ PRINT TO A LOUPE KIOSK (PRINT)

⑤ SEND TO A WEB SITE (SHARE)

⑥ REVIEW PICTS FROM PAST (REVIEW)
(Setup)



- Quick menu?

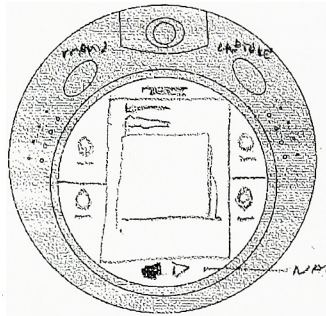
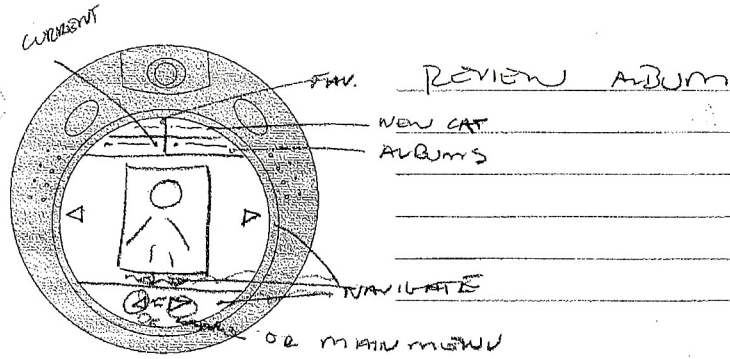
- main menu?

top 3 functions (most used)

2 | 14 | 1 | 13 | 15 | 15
 same PRINT REVIEW | Setup
 ORGANIZE

Ideation

Sketch Page 9



Review - with CATEGORIES

OUTSIDE

Intermediate Evaluation

Committee Reviews

Throughout the thesis process committee reviews were scheduled to get a sense of the state of the project. The committee added several opinions on topics such as technical functionality, user interface assets, design process, theory relations, professional relations, and literature references.

The following notes are results of these meetings:

- Send Andrew Phelps an email about Bruce Dahmer (PARC) contact, conference in Chicago, and 4 in 1 software architecture task based design methodology (ACM, IEEE)
- Comment to define upfront underlying goals of the users – define user needs
- Define product that Thesis will focus on, even though UI could focus on several products
- List theories that effect thesis: aesthetics, semiotics, perceptual, etc...
- Contact Aaron Marcus about email dialog
- Book References: Landow (hypertext), Calvino (literature and philosophy), GUI Bloopers, Kevin Mullet, Wurman, Information Architecture, Jenny Preece, Brenda Laurel
- Hierarchy of hardware button modes (maybe add more) to secondary menu options. Keep main tasks physical.
- Try one demo scenario with finger interaction, and the other with stylus?
- Collect evaluation feedback during the show? Viewers could comment by recording speech, input text, or writing with pen / paper.
- Try to pose a question and viewer answers by performing task.
- Walk through the tasks first (demo) then exploratory mode.
- Try one demo for each and one exploratory for prototype.
- In communication section, imaging device first, secondary features make the product a ubiquitous device.
- Evaluation process in parallel with documentation
- Consider construction of questions for evaluation
- Targeted viewers for question style
- How to measure – metrics?
- Run evaluation questions by team before actual evaluation
- Ask Dan Harel if I can use the actual model in a glass case

Intermediate Evaluation



Assessments

Before and during the development of the application prototypes several people reviewed the work. Validity of the concepts were assessed by committee members and colleagues at Kodak. As a Senior Interaction Designer at Kodak, I reviewed this thesis with other designers and managers for project validation. Opinions of others helped influence the decisions that were made to design the user interfaces. Most of the feedback was positive with little negative criticism. This was an encouraging factor to the development of the prototypes. The professionals in design did not have many issues with the work. A feeling of anticipation for user testing was pressing toward the next phase of validation. If the intermediate evaluation was any indication, the retrospective evaluation would hopefully provide similar results.



Implementation

Description

The implementation phase of the thesis consisted of the development of user scenario writing, storyboard development, and prototype application building. The user interface considers workflow as well as design attributes.

The scenarios were written to connect the target segmented market with the product concept. Both scenarios describe what uses and functions most consumers would most likely perform while using an imaging appliance. A device like this does not exist yet so relationships from cameras, computer software, PDAs, cell phones, and physical photo albums were used to influence the user interface design of this product.

The storyboards are intended to visualize the written scenarios in the simplest of forms. These are used as visual references to explain how a consumer would use the product. The storyboards also begin to hint toward how user interaction will occur between the consumer, hardware, and software.

The prototype application visually simulates what the actual use of the product would be. These are the tools that will be used for evaluation and validation of the ideas by means of a user test. The challenging portion of this part of the thesis is explaining to audiences what the user interface work actually is. A quality user interface seems to be hidden and taken for granted by consumers. It is a medium that when designed well becomes invisible to the user. It turns into a natural extension of usage after the user's first exposure to the product.

Please reference Appendix C for the interactive demonstration of these applications. The CD contains the kiosk portion of the project that was presented during the gallery show.

Implementation



User Scenario 1

Julia is a 32 year old mother of two. She is having a Batman home birthday party for her 3-year-old son Billy and would like to record the events of the party with her Kodak handheld imaging appliance. During the party, she is very busy preparing food and games for the 10 children attending. She has little time to fiddle with complicated tasks. The task of capturing and sharing the event is one that takes some planning ahead of time, just as other aspects of the party. Ease of use, simplicity, and memory-making are Julia's main goals for capturing this party.

Her primary picture taking-tasks are:

- each child as they arrive with her son
- random spontaneous events that occur
- video blowing out the candles
- son cutting the cake
- games that children are playing
- group together
- her son opening presents

Her secondary tasks are:

- creating a dynamic archive of the events of the day
- email pictures to her mother who is out of town
- email pictures to the children that attended the party
- displaying a slideshow of pictures and video on TV during the party
- inserting the kids' pictures into a Sony Playstation so that a Batman game is customized with kids' faces. This will be used as part of the gift for each kid.

UI Interactions:

- take a picture
- record video
- create an event for image storage before the party
- create notifications of image availability
- preview and personalize images
- print multiple pictures during the party
- connect the imaging device to the TV for slideshow during the party
- connect with a Sony playstation game and create gifts
- web site picture management and albuming

Assumptions:

- email addresses are preloaded into the system
- wireless home network is installed
- all electronic devices can interface with each other seamlessly
- voice commands are common
- electronic calendar is synched with imaging device

Implementation

Scenario 1 Screen Shots

Take a picture:



The hardware controls are intentionally kept simple. A user can press the capture button at any time to take a still picture. Audio feedback helps to notify the user that a picture has been captured before the picture can be displayed on the screen.

Review a picture:



A quick view of the picture is displayed for 5 seconds. A delete option is also displayed in case the user would like to take another picture.

Take a video:



Pressing and holding the capture button records video. The LED indicator flashes along with a "Recording" message until the session is done.

Implementation

Scenario 1 Screen Shots

Activate the menu:



Press the menu hardware button to activate the menu.

Menu animates 1:



The background is shown along with the scroll picture buttons.

Menu animates 2:



The current set of pictures slides onto the screen from left to right.

Implementation

Scenario 1 Screen Shots

Full menu display:



The current set of pictures are displayed on the top quarter portion of the screen. The menu options are displayed on the lower three quarters. The quick menu indicates a customized feature set that adapts to a user's needs. Most common tasks are placed into the first four slots. The set up button allows for system adjustments.

Press the scroll pictures button:



This button scrolls to the active set of pictures to the right. These buttons allow flexibility for a large set of pictures to be reviewed quickly.

Press the edit button:



The edit button allows access to the editing options that are available on the device.

Implementation

Scenario 1 Screen Shots

Edit menu display:



The edit menu consists of a typographic drop down menu that displays selectable options.

Select a picture border:



The user selects a birthday border from the list of available options. The border is displayed on the thumbnails for immediate feedback.

Select a picture to preview:



Clicking on the thumbnail allows the user to access a larger view of the picture with the selected border.

Implementation

Scenario 1 Screen Shots

Preview the picture border:



An enlarged view of the picture and border are displayed. Simply click anywhere on the screen to go back to the previous menu.

Close the menu:



Press the hardware menu button to close all menus.

Mark pictures for selection:



Mark the check boxes in order to select the picture. This action creates a selected set with which to perform a function.

Implementation

Scenario 1 Screen Shots

Press the print button:



Pressing the print button will start the action of sending the marked picture to the printer nearest to the user.

Printing status 1:



The device searches for a compatible printer nearby. If the printer accepts prints, the pictures can be transferred automatically.

Printing status 2:



Status update informs the user of each important step of the process as prints are sent from one device to another.

Implementation

Scenario 1 Screen Shots

Printing status 3:



The last message informs the user that the prints were sent successfully.

Press the share button:



After the pictures have been selected they can be shared by pressing the share button.

Share menu display:



This menu displays three options that the user shares pictures with most often.

Implementation

Scenario 1 Screen Shots

Select pictures to share:



Mark the check boxes in order to select the pictures. This action creates a selected set.

Press the TV button:



The user wants to display the selected pictures on a television as a slideshow.

Send to TV status 1:



The device searches for the nearest TV to display the slideshow on. The TV is compatible to receive the pictures. A familiar feedback sequence allows the user to feel confident the device is working.

Implementation

Scenario 1 Screen Shots

Press share button:



To share pictures with others on the internet, the user would go through familiar functionality of selecting pictures and pressing the share button.

Press the internet button:



The selected pictures are going to be posted on the user's web site. Preset parameters allow for ease of connection to the user's picture area on their personalized site.

Online directory selection 1:



The user needs to select where the pictures are to be placed on the web. A pre-existing folder can be selected or a new one may be created.

Implementation

Scenario 1 Screen Shots

Online directory selection 2:



The user checks the “birthdays” directory to file the party pictures. They are indexed by date, party title, and reference to who is in each picture. This process happens with auto face detection to help automated indexing for later reference.

Share to internet status:



The pictures are sent to the user’s site quickly. They are filed and ready for access to those who have access rights. The families of the kids that attended the party would have access to pictures so that they could participate in the event remotely.

Implementation

User Scenario 2

Marisa is a 26-year-old single woman who enjoys outdoor activities. She is currently taking a vacation in Hawaii with two of her best friends. She would like to document her trip with her Kodak imaging appliance. She would also like to update her web site with her favorite shots throughout the trip. Her friends both have Kodak imaging appliances as well. They often share pictures with each other.

Her primary picture taking tasks are:

- documenting the major events of the trip with pictures and voice annotation
- reviewing pictures from past digital photo album events (reminiscing)
- creating 3 auto albums of the entire trip (storytelling)

Her secondary tasks are:

- sharing pictures with her friends on the trip as well as family in NYC
- sending picture postcards to friends across the USA
- connecting with friends at home, like picture chat live

UI Interactions:

- take a picture
- create a category for image storage
- create notifications of image availability
- print multiple pictures immediately to local imaging kiosk
- select key pictures for web posting

Assumptions:

- email addresses and distribution lists are preloaded into the system
- wireless network is always accessible
- all electronic devices can interface with each other seamlessly
- voice commands are common
- voice activated mode selections are enabled

Implementation

Scenario 2 Screen Shots

Take a picture:



To take a picture, the user would simply press the right hardware button. The image is previewed instantly.

Take a video:



To capture a video, the user would press and hold the right button while capturing video. Releasing the button would stop recording the action.

Activate the menu:



To activate the menu, the user would press the left menu button.

Implementation

Scenario 2 Screen Shots

Menu animates onto the screen:



The menu icons progressively draw onto the screen from first priority to third. This method of screen drawing helps to lead the user's eye and aids visual hierarchy.

Menu display:



The main menu displays the top three functions that the consumer commonly uses. The icon list scrolls left and right for expansion of additional functions.

Press organize button:



To organize pictures, the user would select the organize button.

Implementation

Scenario 2 Screen Shots

Organize menu display:



The organize menu is laid out as a two column grid. It lists the current set of pictures on the left and other categories on the right. The user can change the sets of pictures by selecting other categories under the drop down menu.

Select a category menu:



To select a picture category, the user would press the menu to see a list of available categories. The user can either pick an existing category or add a new one.

Select a specific category:



The user selects the vacation category and files her current pictures into that specific directory.

Implementation

Scenario 2 Screen Shots

Select pictures to categorize:



The user selects the pictures by clicking on them. The picture number background turns red to indicate the selection.

Click and drag the pictures:



The picture group can be dragged to the right portion of the screen. This dragging action adds the pictures to the selected category.

Picture categories display:



This screen displays the ease of browsing picture categories by use of drop down menus.

Implementation

Scenario 2 Screen Shots

Select share button:



To share pictures with others, the user would press the share button.

Share menu display:



The share menu shows the selected category of pictures and the destination where the pictures are to be sent. The email groups on the right are the common sets of people that the user normally sends pictures to. This list would also be synched the user's master email list.

Drag pictures to recipients:



The user can drag the selected pictures directly into the recipient's mail folder.

Implementation

Scenario 2 Screen Shots

Share pictures by email display:



The email *in basket* icon appears full and is ready to send.

Press the send button:



To distribute the pictures press the send button.

Sending pictures status 1:



A dialog box obscures the background and a status message appears. The progress indicator displays current status.

Implementation

Scenario 2 Screen Shots

Sending pictures status 2:



As pictures are sent, status is fed back to the user in the form of this message dialog box.

Press the print button:



Press the print button to make prints of the pictures on the imaging appliance.

Print menu display:



The imaging appliance searches the user's area for the nearest professional printer. The printing options are displayed in the right column.

Implementation

Scenario 2 Screen Shots

Drag selected pictures to printer:



The user would drag their favorite pictures to the in box of their choice.

Press print button:



After the pictures are in the printer's in box, a print button becomes active. The user can then press the print button to start the transfer of pictures to the location they choose.

Printing status:



A familiar dialog box displays messages and status of the pictures' journey to the store. The store would also respond, assuring the user that their pictures will be printed promptly.

Implementation

Scenario 2 Screen Shots

Press the review button:



To review and access pictures, the user would press the review button.

Review picture display:



The current set of pictures would be displayed full size. The user can scroll images left and right. There is also a category drop-down menu that can be selected at any time.

Press the scroll button:



By pressing the scroll right button, the next picture in order will be displayed.

Implementation

Scenario 2 Screen Shots

Display picture:



Another picture is displayed.
The corresponding picture
number changes as the pictures
are reviewed.

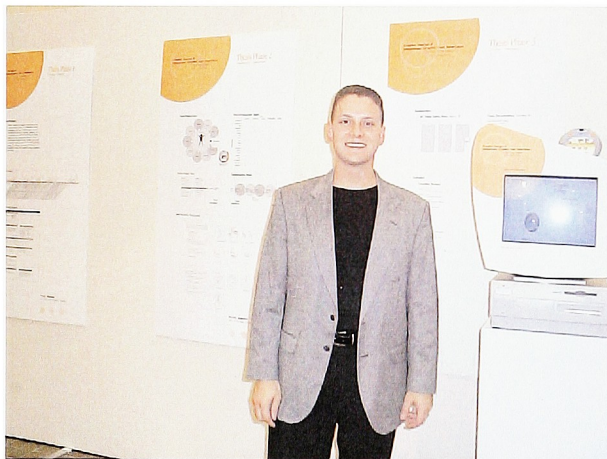
Dissemination

Thesis Show in Bevier Gallery

This work was displayed during the second Graduate Thesis exhibition in Bevier Gallery at RIT. Several hundred people attended the show and reviewed the displays. The show was a good venue to get a general audience exposed to this project. It was interesting to explain the project to others so that they could understand the simple solutions to complex problem solving. Most people did not understand the role that design has in this process until the posters and interactive prototypes were reviewed.



Yasmin Jung interacts with the touchscreen prototypes.

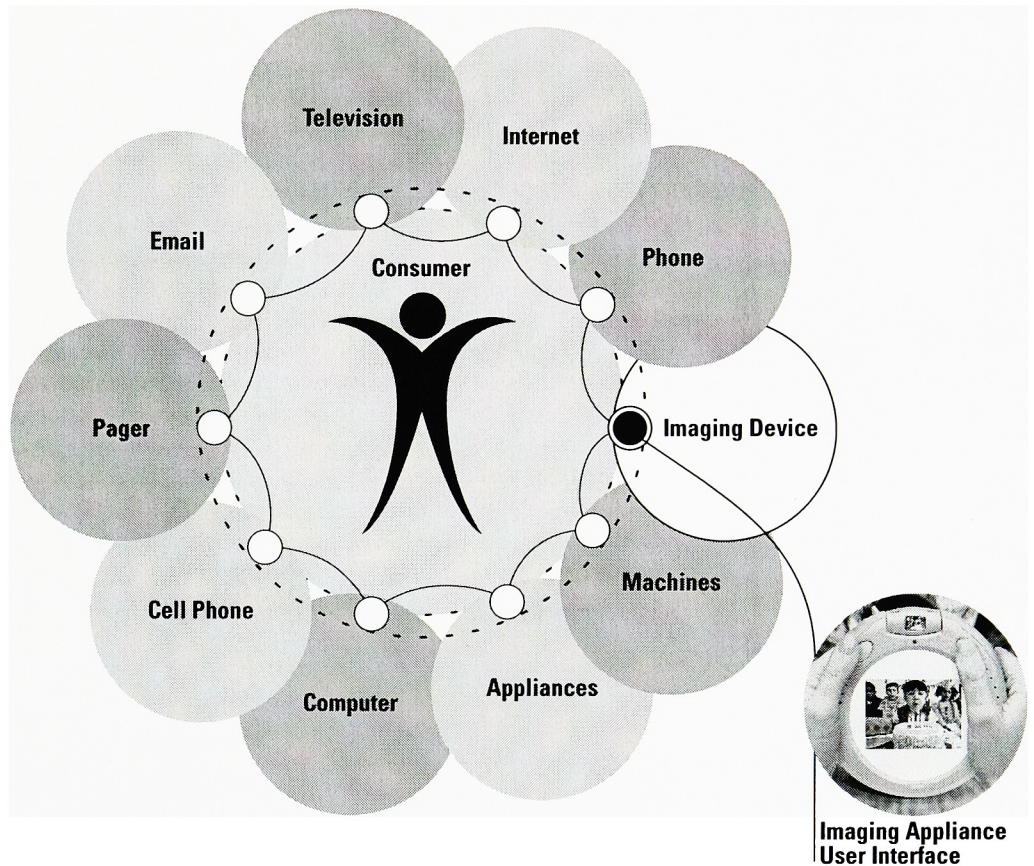


The author – The designer proudly stands in front of his work displaying his Mr. Ubiquitous sport coat.

Dissemination

Thesis Show in Bevier Gallery

This chart was used to explain the focus of this project, an imaging appliance user interface. At the same time, it shows the relationships that the device has with others to make an integrated system.



Dissemination

Thesis Show in Bevier Gallery

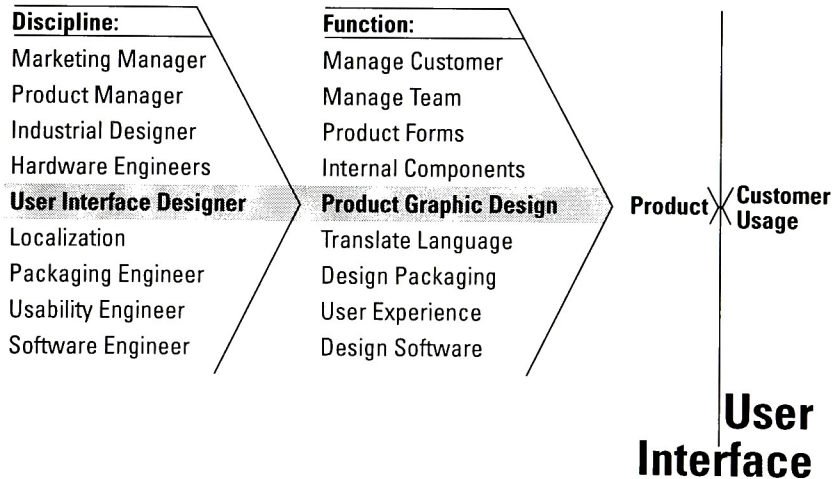
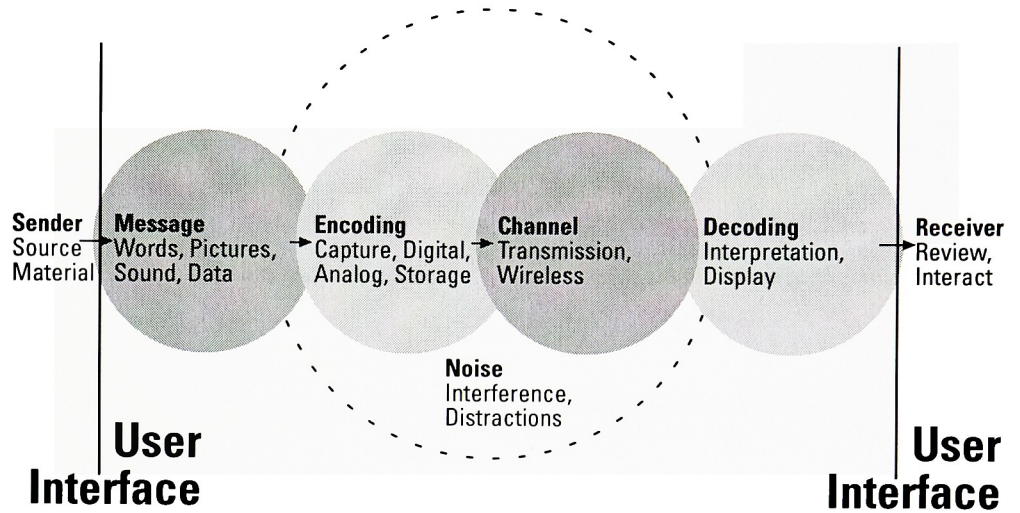
This chart was used to explain the comparative relations between ubiquitous computing and graphic design. This process helps identify common links between the two topics and creates the beginning of some synthesis.

		Ubicomp				
		Anywhere	Accessible	Sharing	Communication	Intuitive
Graphic Design	2 Dimensional				•	
	3 Dimensional	•			•	
	Color				•	
	Composition				•	
	Feedback	•	•	•	•	
	Grouping					•
	Order					•
	Pattern				•	
	Rules				•	
	Shape				•	
	Style	•			•	
	Typography				•	
	Buttons	•	•			
	Fields					
	Messages	•		•		•
	Icons					
	Photography	•				
	Illustration	•				
	Animation	•				

Dissemination

Thesis Show in Bevier Gallery

These diagrams help define the role of user interface in product design. A familiar communication model is used as an inspiration for the diagram. The bottom diagram explains the graphic designer's role in the product process.



Retrospective Evaluation

Evaluation Summary

The interactive prototypes were evaluated by 12 people. See Appendix B for the actual evaluation forms and comments. Each person was given a brief introduction to the project by reviewing the gallery show posters and a short introduction page.

A summary of the results are:

- 1) **Does the imaging appliance concept appear to be useful?**
100%, 100%, 100%, 80%, 100%, 100%, 80%, 100%, 80%, 100%, 80%, 80%
92% Useful
- 2) **Is the information being displayed in a way that makes logical sense to you?**
80%, 100%, 80%, 80%, 80%, 100%, 100%, 80%, 80%, 100%, 80%, 80%
87% Logical
- 3) **How helpful are the graphics in completing tasks?**
80%, 60%, 80%, 80%, 100%, 80%, 100%, 60%, 100%, 40%, 80%, 100%
80% Helpful
- 4) **Are the layout of controls where you would expect them to be?**
80%, 100%, 80%, 80%, 100%, 100%, 60%, 80%, 80%, 40%, 100%, 100%
83% Appropriate
- 5) **Is use of color helpful to communicate meaning and function?**
40%, 80%, 100%, 80%, 80%, 100%, 80%, 80%, 40%, 80%, 40%, 80%
73% Helpful
- 6) **How appropriate is using a stylus with user interface graphics on an imaging device?**
40%, 80%, 100%, 40%, 100%, 40%, 80%, 80%, 100%, 80%, 80%, 60%
73% Useful
- 7) **Do the graphics help you understand how to use the device?**
80%, 60%, 80%, 100%, 80%, 100%, 80%, 100%, 40%, 80%, 80%, 80%
80% Appropriate
- 8) **How would you rate the relation of the hardware buttons with the interaction of the software buttons?**
80%, 40%, 80%, 60%, 60%, 60%, 80%, 100%, 100%, 80%, 60%, 60%
72% Relative
- 9) **Overall, how would you rate the usability of the user interfaces?**
80%, 100%, 80%, 80%, 100%, 80%, 80%, 100%, 100%, 100%, 80%, 80%
88% Usable
- 10) **Overall, how would you rate the aesthetics of the user interfaces?**
100%, 80%, 100%, 100%, 100%, 80%, 100%, 80%, 100%, 80%, 80%
92% Appealing

Retrospective Evaluation



Evaluation Summary

The evaluation process was essential to validate the project goals. The results from the evaluation averages give ratings to the thesis applications. These percentages help to acknowledge the strongest and weakest application attributes. The overall ratings were very favorable.

The participants for this evaluation were solicited through email. Each participant was then familiarized with the project by review of the thesis posters and a brief introduction page (see Appendix C). None of the participants had prior knowledge to this thesis topic. Background information on survey participants is:

- 8 men (ages 23-42)
- 4 women (ages 23-32)
- Kodak Design & Usability employees
- Disciplines: software engineers, industrial designers, graphic designers, human factors engineers
- Intermediate level digital imaging users

The three key positive findings were the overall ratings for product concept (92% useful), usability (88% usable), and aesthetics (92% appealing). The lowest ratings were for GUI color relevance (73% helpful), stylus interaction (73% useful), and hardware / software button mapping (72% useful).

The comments also revealed suggestions to:

- label the hardware buttons shutter and menu
- make the hardware buttons reversible so that left handed people have equal treatment
- checkmark usage might be too small, try alternative selection methods

Overall, the significant findings verified the initial evaluation by the thesis committee and gallery reviewers. The concept has been validated as a viable solution to a user interface on a ubiquitous imaging appliance. Most ratings favored the prototypes with little negative comment. Opportunities still exist to improve details of the product's workflow. These prototypes begin to address the complexities of ubiquitous computing. Future opportunities would lead to testing:

- transfer data rates
- connection availability
- user acceptance of continuous networked products
- language / graphic transitions into new technologies



Conclusion

Graphic design will be an important component of ubiquitous computing devices. In conjunction with other disciplines, graphic design has tested well in defining a possible user experience with an imaging appliance. This form of computing will take a user experience to a new level of interaction that does not yet exist. These future systems will be smarter than the solutions of most existing consumer products. With the advent of these new systems, a host of additional human issues will most likely arise, such as privacy, computing connection costs, an entire ubiquitous infrastructure, standards compliance, and human willingness to embrace new technology.

New technology creates new problems. The age old needs of communication will remain intact. The knowledge that modern man has acquired through advanced technologies will continue to evolve into a modern accessible network. Attributes such as letterforms, written language, spoken language, audio, video, symbols, artwork, and images require graphic design to make logical sense of complex systems. Graphic design is the part of the system that becomes the visual link between large data structures, complex and simple information display, order, organization, and aesthetic presentation. The internet has helped foster this modern day information revolution. As technology increases accessibility, ubiquitous computing solutions will become readily available. When human needs align with technological infrastructure to coexist simultaneously, graphic designers will be ready to support this interpretive connection between humans, communication, and technology.

Glossary of Terms



Aesthetic	A sense of the beautiful, pleasing in appearance, appreciative and pleasing to the senses
Digital imaging	The process of creating images from digital and analog sources. Images are sourced as digital data and can be transform into other forms from email back to traditional prints
Graphic user interface	A computer program designed to allow a user to interact easily with a computer, typically a mouse, button, or touchscreen is used for interaction
HCI	Acronym for Human Computer Interaction, a discipline that deals with the design of computer user interfaces and relations to Human Factors, Graphic Design, and Computer Science
HDTV	Acronym for High Definition Television
JAVA	A programming language from Sun Microsystems that works on a variety of systems: Mac, PC, Unix, Phone, TV, etc.
JINI	A technology from Sun Microsystems that provides mechanisms that group devices together into a service network secured through a JAVA application.
LCD	Acronym for Liquid Crystal Display
LED	Acronym for Light Emitting Diode
MIDI	Acronym for Musical Instruments Digital Interface
Methodology	A body of methods, procedures, and analysis of principles that apply to a project
MIT	Massachusetts Institute of Technology
PARC	Acronym for XEROX Palo Alto Research Center, a corporate research facility that has been responsible for many of the technological advancements in computing
PDA	Acronym for Personal Digital Assistant
Pragmatic	A branch of the semiotic model that deals with the relation of the practical matters in a design project. (eg. computer monitor size, cost vs. resolution)

Glossary of Terms



Semantic	A branch of the semiotic model that deals with the relation of meaning and signs in a design project. (eg. a flower graphic could imply a sweet smell)
Syntactic	A branch of the semiotic model that deals with the visual relationships of design. Formal relations between individual objects as well as the entire design. (eg. a car has several components that make a visual statement, the relation of a headlight case and a door handle reinforce this attribute)
Ubiquitous	Existing or being everywhere at the same time, constantly encountered, widespread
Ubicomp	Ubiquitous computing. Computing that exists everywhere all the time
User centered design	Design that places the user at the center of the design process. User needs are analyzed and tailored so that the design is appropriate for the problem.
UI	Acronym for User Interface
Workstation	A computer system or personal computer

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Credits

Photography

Imaging Appliance - Phil Larock and Pete Cristantello,
Eastman Kodak Company.
Children Photos - PhotoDisc, Inc.: images AA011265, AA021292, and AA032867.

Industrial Design

Imaging Appliance - Dan Harel, Eastman Kodak Company.

Editor

Thesis Documentation - Kristina Matthews.

Prototype Audio Effects

Apple Mac OS 9.0 system sound sets - Jim McKee, Earwax Productions.



Appendices

Appendix A**Thesis Planning Report**

The thesis planning report was completed in Fall quarter 2000. This plan was the fundamental building block of the entire thesis process. This document helped define goals and objectives that the committee could agree upon.

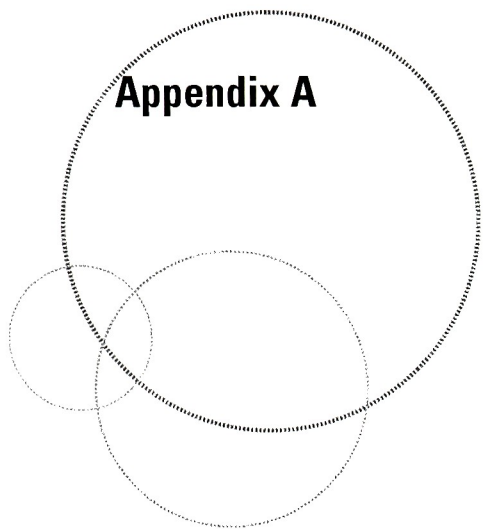
Appendix B**Evaluation Forms**

The evaluation forms were used as a medium to explore key findings for common users to communicate their opinions in a controlled setting. The following pages are the outcome of these evaluations.

Appendix C**CD ROM**

This CD ROM contains the interactive applications and PDF electronic documentation. The CD is compatible with both Apple Macintosh and Microsoft Windows systems.

Appendix A



Thesis Plan

College of Imaging Arts and Sciences
Rochester Institute of Technology



**Graphic Design &
Ubiquitous Graphic User Interfaces:
The Third Wave
in Computing.**

Frank Marino
11.14.00



Table of Contents

Title - Graphic design & *ubiquitous graphic user interfaces*: the third wave of computing.

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Committee

Thesis Committee -

Professor R. Roger Remington
RIT Graphic Design
(Chief Advisor)

Professor Andy Phelps
RIT Information Technology
(Associate Advisor)

Professor Peter Byrne
RIT Computer Graphics Design
(Associate Advisor)



Needs Assessment

Graphic design will play an important role in communication to and from ubiquitous computing (ubicomp) systems.

In graphic user interface design, ubicomp is about distributing computation in the environment, as opposed to keeping it bottled in a desktop-bound personal computer. Visual communication has had a role in computer user interfaces since computers were invented. A means of communication to and from systems has traditionally been conveyed through numbers, alphabets, symbols, illustrations, pictures, video, animation, graphics, verbal, and auditory content. Research was started in this area of computing in 1988 at Xerox PARC by Mark Weiser. "Long-term, the PC workstation will wither because computing access will be everywhere: in the walls, on wrists, and in "scrap computers" (like scrap paper) lying about grabbed as needed. This is called ubicomp. (Mark Weiser 1993)"

The first wave of computation was mainframe and terminal computer interaction. The second and present wave is personal computer and network desktop interaction. The idea of ubicomp as the third wave of computing will become our next way of interacting with computers. The internet, wireless hand held devices, and open operating systems will aid the development of ubicomp. Alan Kaye of Apple calls this the "Third Paradigm" of computing.

Graphic design is one component of this third wave that will help organize and structure information so that it is meaningful to the user. This discipline is important to ubicomp because graphic design is integral in the communication model as the interpreted message to be delivered and received. There is a need for graphic design in a ubicomp environment where the computer will become an invisible device. The computer surrounds the user everywhere rather than the user specifically seeking a specific workstation. This communication need will become one of the input and output methods for these systems.

Visual communication through graphic design plays an important role in ubicomp. This form of computing is just starting to make its way into society. It is difficult to predict if these systems will become mainstream. The factor that remains constant is that human computer interaction will be needed in some communicative capacity. Constraints exist because of slow technological advancements. The constant need for designed communication will remain important for effective interaction.

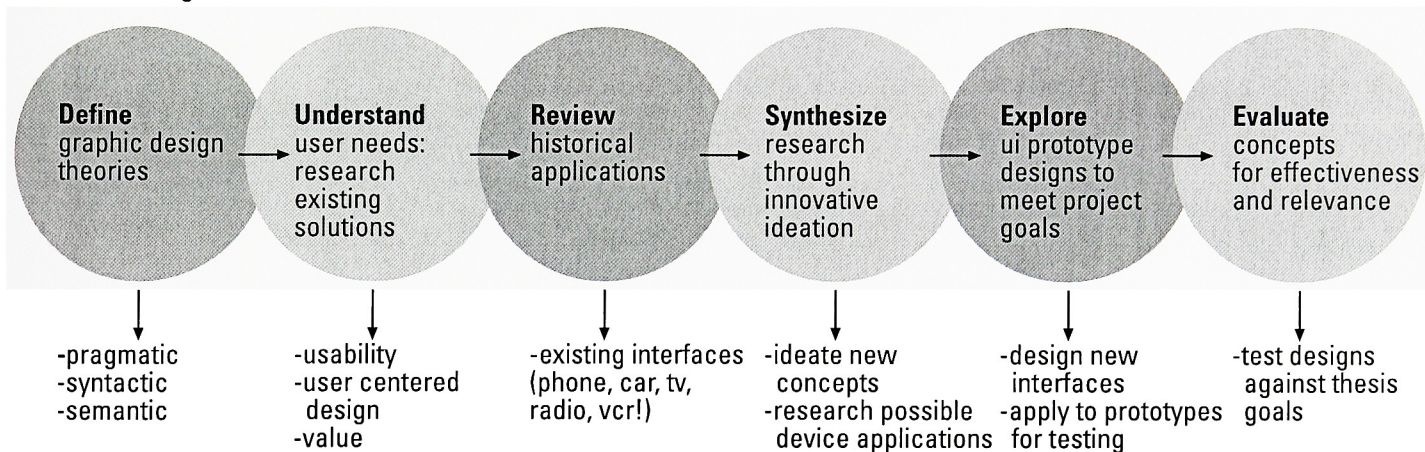
Problem Statement

An example of a ubiquitous function that many people currently utilize is learning to write with an instrument such as a pen or pencil. After the learning the instrument, it becomes second nature to use it while drawing or writing. In most situations the instrument helps complete the task rather than hinder use. The need that exists with ubicomp is to create a user interface that becomes second nature to people. Part of this interface will include communication tools that will include graphic design applications.

As a result of this thesis work, graphic designers will have a reference point as a research focus for ubicomp graphic user interface design. To meet the needs of this problem, several design related activities will occur. Understanding user needs for ubicomp and the considerations of user interface design are critical in designing successful solutions. To facilitate the design process, this project will:

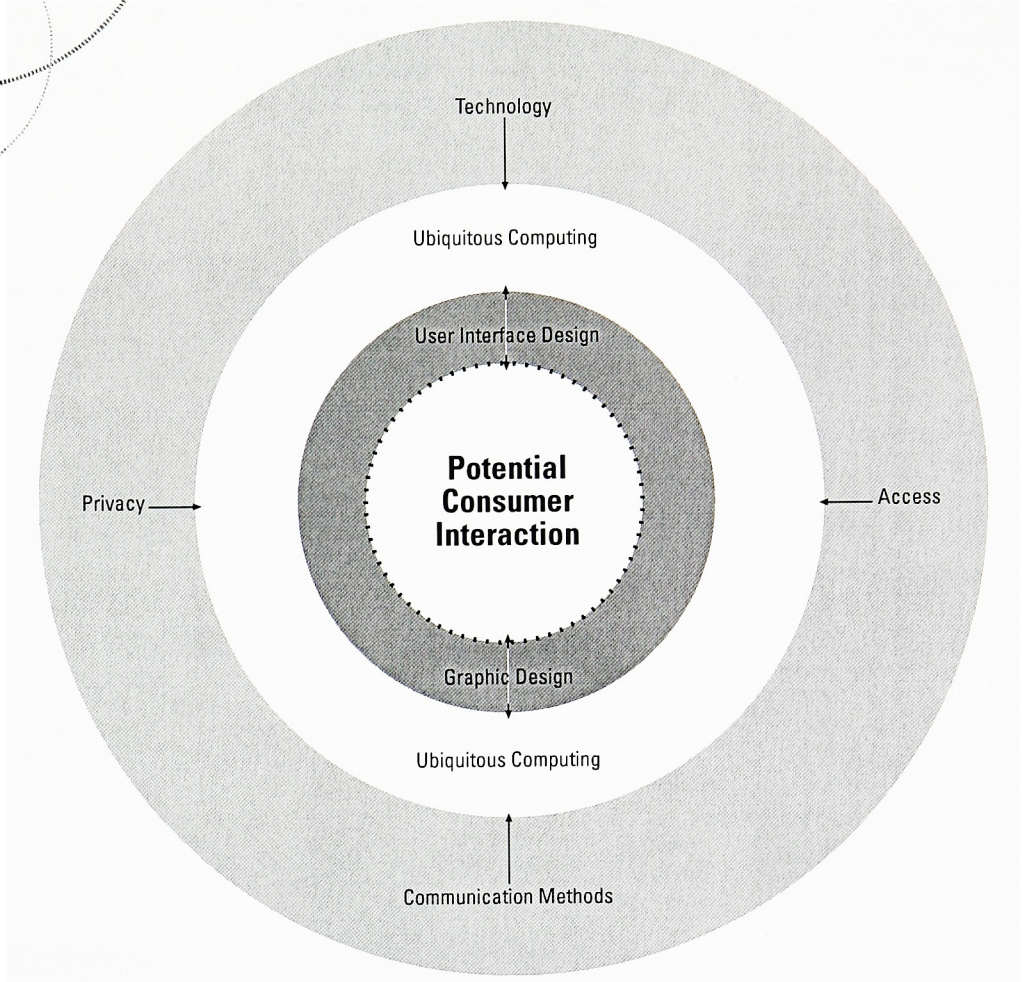
- define theories of graphic design and it's relation to user interaction
- understand user needs to help guide research through existing technological solutions and applied design principles
- review historical design solutions and applications for prior learning and user experiences
- synthesize these learning and innovate through the ideation of new design concepts
- explore aesthetically pleasing user interaction that meets the end user goal of communication to and from a ubicomp environment
- evaluate concepts for their effectiveness and relevance to ubicomp

Problem Diagram:



Problem Statement (continued)

Boundaries and Challenges For User Interface Design:



Mission Statement

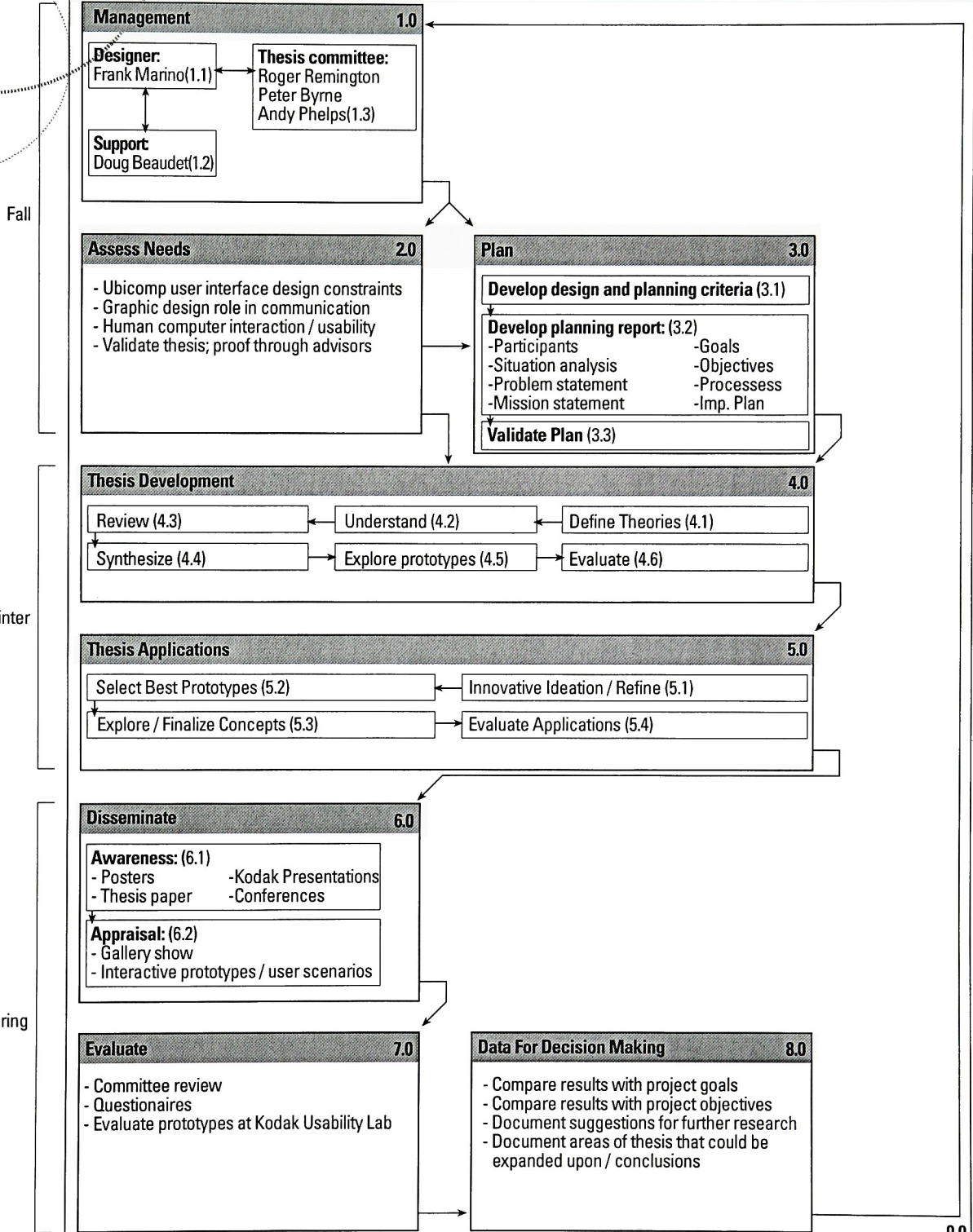
Mission Statement -

This graduate thesis project is a demonstration of graphic design components in ubiquitous graphic user interfaces. This is a device for communication of user input and computer output during human computer interaction. After having experienced the outcomes of this thesis, the viewer will better understand the role of graphic design in this type of computer application.

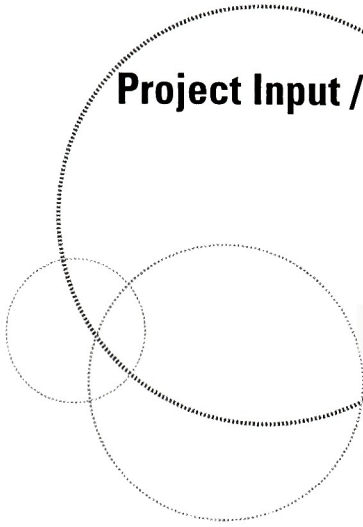
	Goals -	Objectives -	Processes / Strategies -
Research / Info. Gathering	<ul style="list-style-type: none"> - To review historical design interfaces and related products 	<ul style="list-style-type: none"> - To provide reference to historically related success stories and failures 	<ul style="list-style-type: none"> - Research existing UI solutions - Create a reference document to successful / failed historically related products
Content	<ul style="list-style-type: none"> - To understand user needs and existing graphic design solutions 	<ul style="list-style-type: none"> - To obtain relevant links from historical solutions to current and future needs - To understand the problem that graphic design needs to solve 	<ul style="list-style-type: none"> - Define historical objectives and future needs - Compare and contrast how these relate and compliment each other - Research technical limitations and advantages of this medium - Understand where graphic design is appropriate solution to a communication problem
	<ul style="list-style-type: none"> - To define graphic design theories as they relate to ubicomp 	<ul style="list-style-type: none"> - To collect the needs of ubicomp users - To define the relevance of graphic design to ubicomp 	<ul style="list-style-type: none"> - Research ubicomp ui needs and list requirements - Research basic communication model and diagram results - Create a comparative chart of how direct links between design and ubicomp - Create a list of design attributes that influence ubicomp interfaces
Application	<ul style="list-style-type: none"> - To synthesize the research to form new concepts 	<ul style="list-style-type: none"> - To clarify how design theory aids successful communication - To mix previous research with new concepts 	<ul style="list-style-type: none"> - Contrast clearly designed information with confusing information - List semiotic model attributes - Create user scenarios that describe user needs - Create visual example to help explain scenario
	<ul style="list-style-type: none"> - To explore prototypes of innovative user interface designs 	<ul style="list-style-type: none"> - To utilize valuable learning with a new set of requirements - To design prototypes that appear and function to best fit customer needs - To expose new ways of approaching graphic design in ubicomp applications 	<ul style="list-style-type: none"> - Compare previous learning with new scenarios - Develop the input for prototyping - Create several graphic system designs for UIs - Create storyboards to explain context - Reach into the future for blue sky possibilities for UI designs and explore new concepts - Push the design envelope into futuristic thinking
Evaluation	<ul style="list-style-type: none"> - To evaluate these concepts and prototypes to verify validity 	<ul style="list-style-type: none"> - To present prototypes and concepts for evaluation - To motivate designers of the opportunities new user interfaces present 	<ul style="list-style-type: none"> - Create presentations for digital media - Create presentations paper / print examples - Distribute thesis methodology / results - Present as creative influence to peer groups

Project Network Diagram

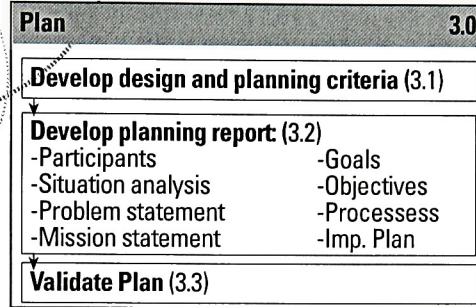
Title - Graphic design & ubiquitous graphic user interfaces: the third wave of computing.



Project Input / Processes / Output Diagram



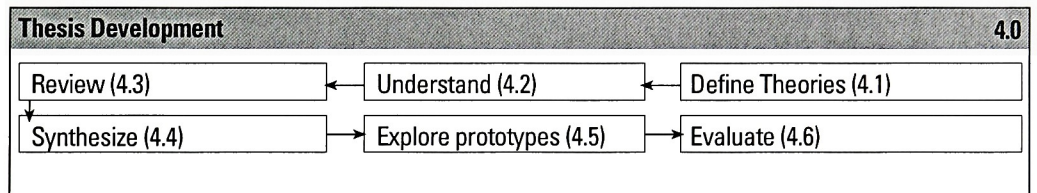
Portion of diagram to analyze:



Analysis:

Inputs	Processes	Outputs
Resources: - Thesis Validation by advisors - Understanding the design role in ubicomp	Activities: - Develop the planning report - Write reports - Develop diagrams	Outcomes: - Final project plan - Validate plan with thesis committee
Assess Needs (2.0)	Plan (3.0)	Thesis Development (4.0)

Portion of diagram to analyze:

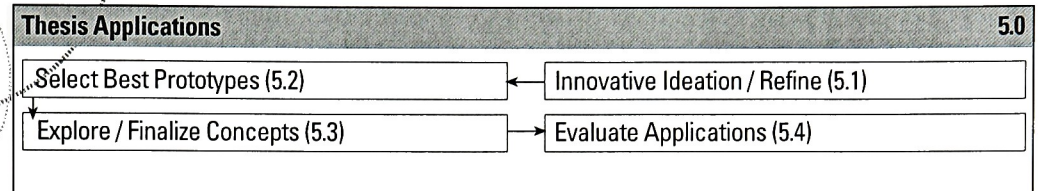


Analysis:

Inputs	Processes	Outputs
Resources: - Project plan	Activities: - Research design theory in relation to ubicomp interfaces - Establish relevant links between theory and project - Develop several user interface design prototypes options - Develop an evaluate survey	Outcomes: - User preferred prototype - Ideas for more iterations on prototypes
Plan (3.0)	Thesis Development (4.0)	Thesis Applications (5.0)

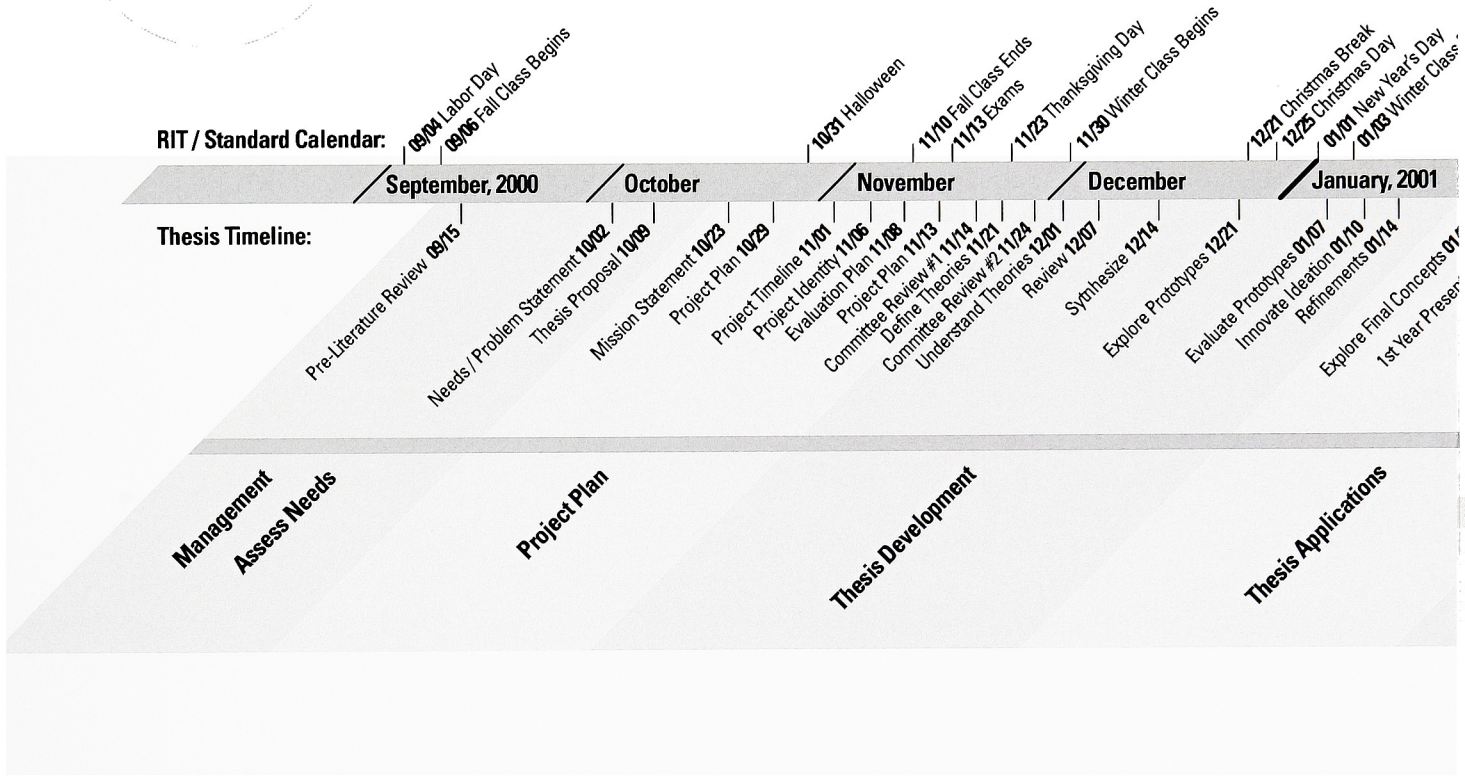
Project Input / Processes / Output Diagram (continued)

Portion of diagram to analyze:



Inputs	Processes	Outputs
Resources: - Create scenarios that describe the needs that could be approached with this thesis - Compare previous learning with new scenarios and develop the input for prototypes	Activities: - Innovative Ideation / Refine - Explore UI Concepts - Explore / Finalize Concepts - Evaluate Applications - Create several graphic system designs for UIs - Create storyboards to explain context - Reach into the future for blue sky possibilities of UI designs and explore new concepts	Outcomes: - Awareness - Appraisal
Thesis Development (4.0)	Thesis Applications (5.0)	Disseminate (6.0)

Project Time Line



Evaluation Plan

Plan Validation - Validate project plan with thesis committee and Kodak support team. Reviewers will analyze the project plan and feedback comments on it's validity.

Development Evaluation - What do potential users think and know about ubicomp? Observation of people using existing technology will help to understand user interaction and usability. Analysis of records and existing documents from reports will help understand the problem.

Application Evaluation - Conduct a survey for the usability of the initial prototype designs. The survey will help to understand the reactions to interactive prototypes of typical user scenarios.

Dissemination Evaluation - During the gallery show, observation of reviewers will validate understanding of the information presented. A short paper and interactive survey will be presented along with the information presented. A collection box for the paper survey will be integrated with the presentation.

Usability Test Evaluation - Observation of potential users in a controlled environment will be conducted in the Kodak Corporate Design & Usability department. A questionnaire will be developed for relevant information.

Phase:	Evaluation:	Instrument:	Questions:
Plan Validation	Collect judgements from thesis committee	Project planning report	Is this thesis important? Relevance to design? Is thesis on the right track?
Development Evaluation	Observation Research	Conduct interviews Existing research papers	What do users think about ubicomp? Do these ideas make sense?
Application Evaluation	Analyze prototypes	Conduct survey Conduct interviews	Is this prototype usable? Do this prototype fulfill a need?
Dissemination Evaluation	Observation	Conduct written survey Conduct interactive survey Conduct interviews	Is this prototype usable? Do this thesis fulfill a need? Suggestions for improvements?
Usability Test Evaluation	Observation	Conduct interviews	Is this prototype usable? Do this thesis fulfill a need? Suggestions for improvements?



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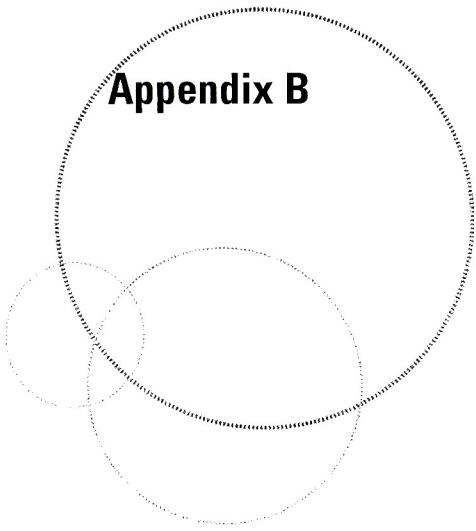
Dreyfuss, Henry
Loewy, Raymond
Marcus, Aaron



Glossary of Terms

aesthetic	A sense of the beautiful, pleasing in appearance, appreciative and pleasing to the senses
graphic user interface	A computer program designed to allow a user to interact easily with a computer, typically a mouse, button, or touchscreen is used for interaction
HCI	Acronym for Human Computer Interaction, a discipline that deals with the design of computer user interfaces and relations to Human Factors, Graphic Design, and Computer Science
methodology	A body of methods, procedures, and analysis of principles that apply to a project
PARC	Acronym for XEROX Palo Alto Research Center, a corporate research facility that has been responsible for many of the technological advancements in computing
pragmatic	A branch of the semiotic model that deals with the relation of the practical matters in a design project. eg. computer monitor size, cost vs. resolution
semantic	A branch of the semiotic model that deals with the relation of meaning and signs in a design project. eg. a flower graphic could imply a sweet smell
syntactic	A branch of the semiotic model that deals with the visual relationships of design. Formal relations between individual objects as well as the entire design. eg. a car has several components that make a visual statement, the relation of a headlight case and a door handle reinforce this attribute
ubiquitous	Existing or being everywhere at the same time, constantly encountered, widespread
ubicomp	Ubiquitous computing. Computing that exists everywhere all the time
user centered design	Design that places the user at the center of the design process. User needs are analyzed and tailored so that the design is appropriate for the problem.
UI	Acronym for User Interface
workstation	A computer system or personal computer

Appendix B



Evaluation Form

Evaluation Participant Name:

Jeanie Michelly
(Name)

4.27.01
(Date)

Comments:

used or displayed? (Another sub-category under vacation)

Was not quite ~~so~~ sure how the mail list was selected once you dragged + drop. I looked back + realized it was exactly where the stylus was released. It would be nice if graphically the choices were highlighted when the stylus was over it.

How easy is it to select ^{non-neighboring} pictures that are not all displayed on the screen at once?

The hardware buttons were confusing at first. Would text be appropriate?

Could these hardware buttons be configurable so left-handers can take a picture using the left button?

The graphics are very subtle. ~~But they~~ I think they would be more helpful if they were a little bolder in color + did a little more to reassure me that what I am doing is what I want to do.

Evaluation Form

Evaluation Participant Name:

Dave Gotham
(Name)

4.27.01
(Date)

Comments:

FOR THE INTERFACE ~ ESPECIALLY IN LIGHT OF THE
SCALE OF THE TOUCHSCREEN/ TOUCHPOINTS ~ PERSONALLY
I WOULD TETHER A STYLUS TO THE DEVICE & AVOID
THE POSSIBILITY OF SOMEONE USING A BALL POINT PEN
AS SHOWN IN THE DEMO:

*² = YES - PERHAPS COULD BE EVEN STRONGER W/
CHANGING COLORS OR MORE ANIMATION WHEN FUNCTIONS
ARE ACTIVATED: ALSO, WHEN DRAGGING IMAGES ~ PERHAPS A
MENU-LIKE GRAPHIC (ALA MAC'S) WOULD BE EVEN MORE
INTUITIVE:

³ = SAME COMMENT AS "" - QUESTION # 5

GREAT JOB FRANK!

Appendix C

