

Issues in Personalizing Shared Ubiquitous Devices

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Background

- FX Palo Alto Laboratory
 - PARC ⇔ Xerox as FXPAL ⇔ Fuji Xerox
 - ~30 researchers (Multimedia, NLP, Quantum Computing)
- Mobile Interactions Group
 - HCI, CSCW, Ubiquitous Computing
 - Machine Learning, User Modeling, IR



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Billsus



Jim
Vaughan



Recent projects

- m-Links
 - Accessing the Web on very small Internet devices
- PIPs
 - Personalizing shared ubiquitous devices
- Connections
 - Seamlessly connecting information and people



Shared ubiquitous devices

- They're everywhere



The Web

- Personalization rocks



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“Real world” devices

- Personalization works here too



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Personalization

- Has a rich history in computer science
 - Single-user applications
 - Multi-user applications
 - Operating systems
 - The Web
- Examples
 - Font menus in MS Office
 - Teleporting and Virtual Network Computing (VNC)
- Our focus
 - Photocopiers, projectors, large shared displays



Designing for use

1. Observe users
2. Design a system
3. Deploy the system
4. Observe the system in use



Shared devices in our lab



presentations, brainstorming, and printing

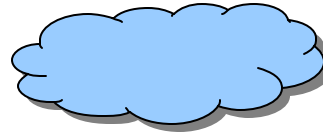


Observations

- Users engaged in numerous peripheral activities that diverted their attention
 - Podium PC: searching for presentations
 - Plasma display: laptop search and set-up
 - Printer: going back to the office to print
- How might personalization help?

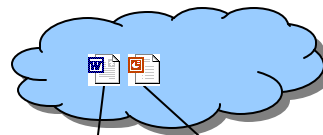


Personal Information Cloud



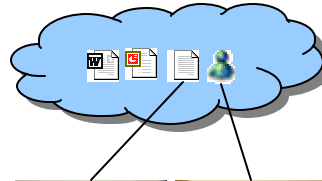
Personal Information Cloud

- Contains data we touch throughout the day



Personal Information Cloud

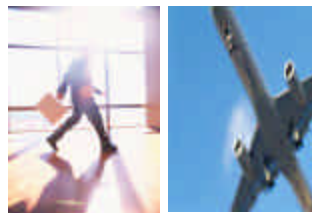
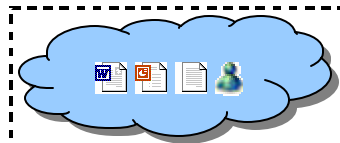
- Contains data we touch throughout the day
- Populated by use of any computing device



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Personal Information Cloud

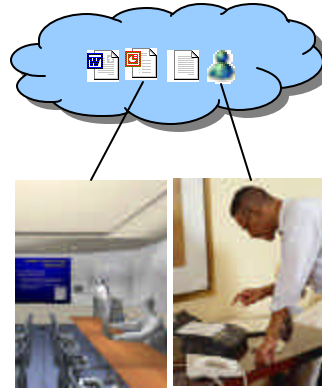
- Contains data we touch throughout the day
- Populated by use of any computing device
- Follows us wherever we go



FX(PAL

Personal Information Cloud

- Contains data we touch throughout the day
- Populated by use of any computing device
- Follows us wherever we go
- Increases capabilities of existing devices



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Personal Interaction Points (PIPs)

- Personalize multi-user document devices
 - Numerous potential personalization features
 - Starting point: “smart” access to personal document history at shared devices
 - Combine personal resources with device-specific UI for common device tasks
 - Not teleporting or VNC

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Designing for use

1. Observe users
2. Design a system
3. Deploy the system
4. Observe the system



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But how should we deliver personalization?

- Embedded
 - More available?
 - Less private?
- Portable
 - More trusted?
 - Less usable?



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We'd like to compare the two

- Traditional evaluation techniques not appropriate
- Need to deploy these systems in the real world
- Need a comparative evaluation technique for UbiComp



Designing for use

1. Observe users
2. Design a system
3. Deploy the system
4. Observe the system in use

Designing for *evaluation*

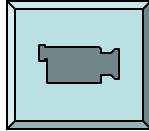
1. Observe users
2. Design a system
that embodies multiple design alternatives
3. Deploy the system
in various situations
4. Observe the system in use
to compare design alternatives across situations



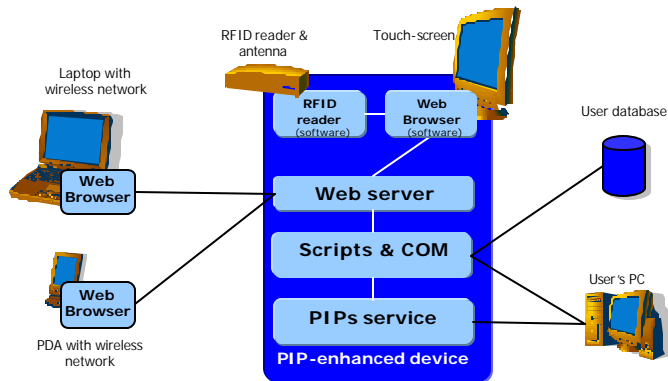
Designing for *evaluation*



Video



Architecture



- No software installed on user's PC
 - Only need to know PC name and login name
 - Low entry barrier for users



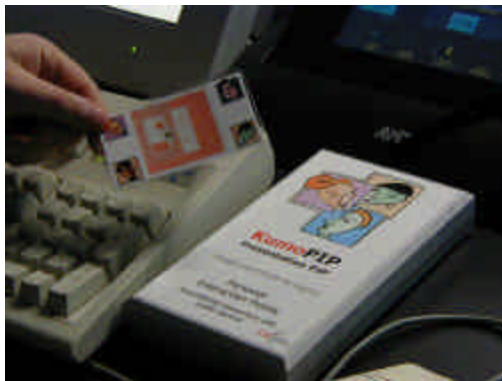
Hardware

- Presentation PIP
 - Added 15" touch-screen display
- Brainstorming PIP
 - Added touch-screen overlay, networked PC, wireless keyboard (hid PC behind display)
- Printer PIP
 - Added networked PC, 15" touch-screen display (hid PC in cabinet next to MFD)



Hardware (cont'd)

- Radio Frequency Identification (RFID) tag readers for embedded interfaces



Hardware (cont'd)

- COMPAQ iPAQ Pocket PCs with wireless networking for portable interfaces



Software: Core features

1. Monitor user interactions
2. Quick and easy login
3. Secure document retrieval
4. Contextual, personal, specialized UI



1. Monitoring user interactions

- PIPs monitors your interactions to populate and organize your personal information cloud
- PIPs exploits existing Windows OS file monitoring capabilities
 - C:\documents and settings\user\recent\
 - Tracks every file access, not just the “Start→Recent” menu contents



2. Quick & Easy Login

- PIPs uses contactless smart cards to quickly and safely identify users
- Card exchanges small amount of private data with public device
 - TripleDES encrypted password
 - System maps card IDs to usernames
 - System “impersonates” user using these credentials
 - Creating a new card invalidates the user’s old card ID



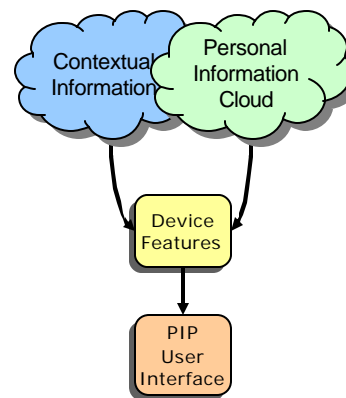
3. Secure document retrieval

- PIPs can securely access personal data anywhere on the network
- Uses existing network capabilities
 - No “superuser” account; only access resources as if you were logged in normally
 - Exploit “hidden” shares in NT networks
 - C: is shared as C\$ for admin users
 - All paths are mapped to UNC names
 - C:\temp\foo.txt → \\carp\c\$\temp\foo.txt



4. Contextual, personal, specialized UIs

- PIPs provides a web-based user interface that is contextual, personal, and specialized
- PIPs integrates contextual and personal resources with device features
 - Hard to integrate directly with device hardware/UI
 - Proxy UI drives the underlying hardware



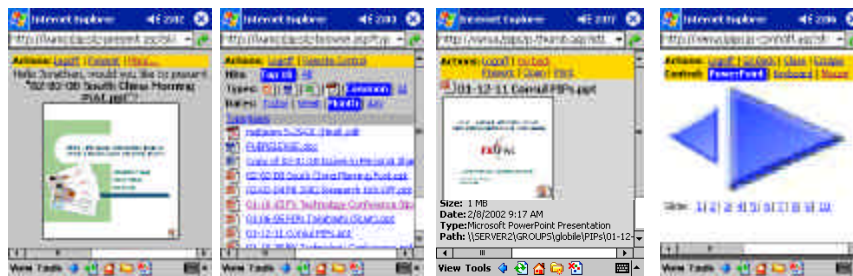
The embedded interface



- RFID card login (or browser authentication)
- UI tailored to device being controlled
- Shortcuts resolved from user's desktop



The portable interface



- Users pick PIP, browser authentication
- Laptop UI similar to embedded, smaller palmtop UI
- Kept UI as similar as possible to embedded



Deployment

- Released over two years ago
- 2 PIPs still in active use today
 - Presentation PIP used for over two thirds of presentations in conference room
 - Brainstorm PIP used for nearly all documents accessed in brainstorming room
 - Printer PIP infrequently used
- Qualitative and quantitative data
 - Notes of observations
 - Unsolicited email and verbal feedback
 - Interviews of adopters and non-adopters
 - Usage logs

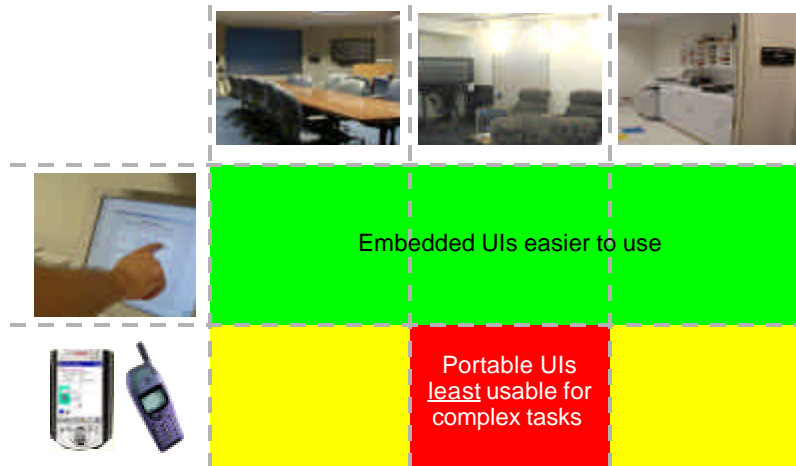


Issues

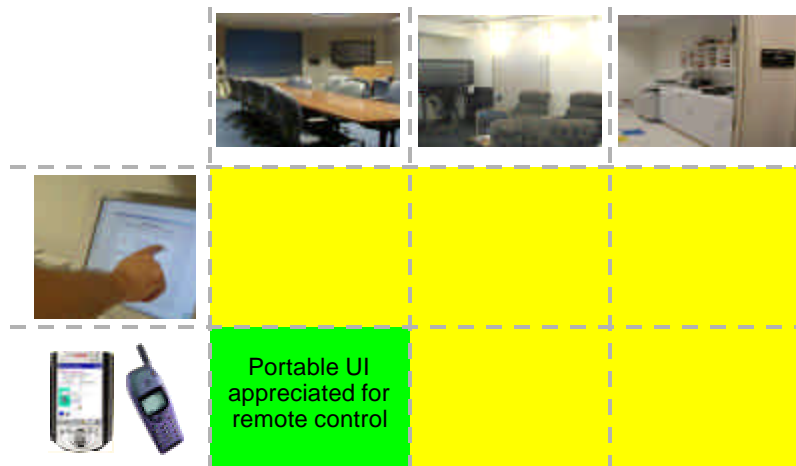
1. Usability
 - Learnability, efficiency, errors, user experience
2. Utility
 - Features users perceive as useful
3. Availability
 - Is the system there for you when you need it?
4. Privacy
 - Is your sensitive information hidden from others?
5. Trust
 - Is your data is safe from corruption or misuse?




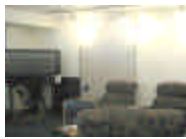
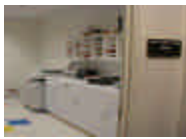


1. Usability



2. Utility

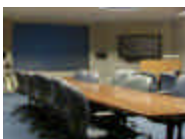
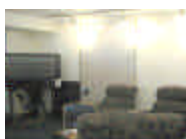
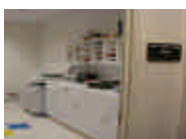
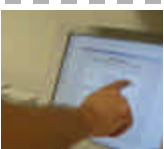



3. Availability

		
	Embedded UIs always there, always on	
	Users forgot to bring their portable devices Batteries died, wireless networking failed	

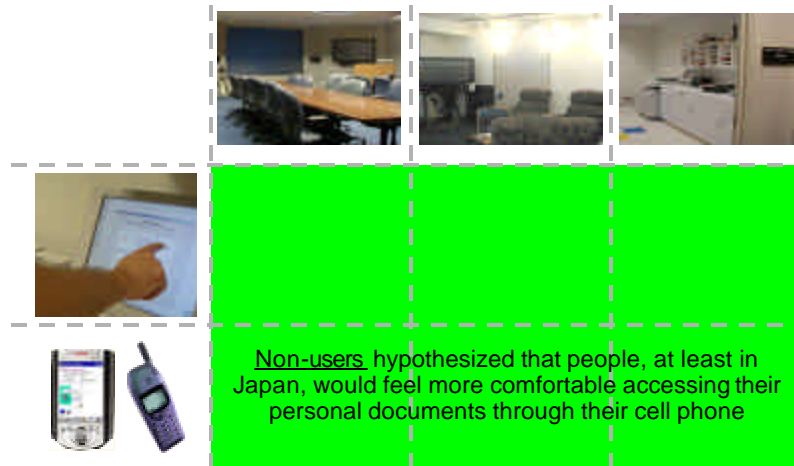


4. Privacy

		
	Users noticed privacy issues in formal setting	informal setting, close colleagues
		quick interaction, low traffic



5. Trust



Embedded advantages

- Embedded UIs more usable
 - Especially for complex tasks
- Portable UIs can confuse users, alter user experience
 - “Do I need to load my presentation onto the Pocket PC before presenting in the conference room?”
 - “...you feel you have a relationship with the portable device, rather than the actual device.”
- Embedded UIs more available
- Embedded UIs simpler to implement

Leverage existing embedded UIs when possible



Portable advantages

- Portable UIs remote control can be very useful
 - Especially for simple ongoing tasks in large spaces
- Portable UIs provide better privacy
 - Particularly in formal or public places, where users can be overseen
- Portable UIs are “cooler”
 - The novelty of using portable UIs generated interest

Hybrid UIs can combine the benefits



Designing for evaluation

- Not for the faint of heart
 - Added technical effort (design/development)
 - Added social effort (promotion/support)
 - Design alternatives and situations are complex
- But worth it!
 - Reinforced that designers must carefully consider situation and tasks in creating UbiComp systems
 - Observed relative strengths and weakness of embedded versus portable approaches
 - Process led to a system that is still in use over two years later



When user complaints indicate success

- Xerox PARC researchers were encouraged when people complained they couldn't take their PARCTABs home with them
- We too were encouraged when people complained they couldn't take their personal information clouds with them on business trips
- We're now modifying our architecture to extend its reach...



Ubiquitous Computing Vision

“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it”

— Mark Wiser, “The computer of the 21st century,”
Scientific American, 1991.

A little personalization goes a long way



More Info?

- Papers:
 - Issues in Personalizing Shared Ubiquitous Devices. Jonathan Trevor, David Hilbert, and Bill Schilit. UbiComp 2002.
 - A Comparative Prototype Research Methodology. Jonathan Trevor and David Hilbert. Workshop on user-centered evaluation, UbiComp 2002.
- Contact Info:
 - FXPAL Web site <http://www.fxpal.com/>
 - David Hilbert hilbert@fxpal.com
 - Jonathan Trevor trevor@fxpal.com
- Summer Internships:
 - <http://www.fxpal.com/summerinterns.html>
 - Application period: Jan 1st – Mar 28th

