HCI NASA Group

Karen Au, Jack Beaton, Jennifer Boriss, Pat Malatack, Rick McMullen

Appendix III
Parallel Design Reviews

Design Space Description and Concept Sketches

Parallel Design Summary

After completing our collection of data, we moved on to a period of parallel design. This posed the threat of a lack of group focus, but was accepted as the best course of action in order to best inspire group creativity in the short term.

As we engaged in parallel design, we imagined several different devices that each adopted a different workflow and used a form factor optimized for that workflow. However, it became apparent during discussion with our clients that potentially any of the workflows could be combined with any of the form factors, and so we broadened the scope of our designs even further. The concept sketches inspired the lists of form factors and workflows, but are placed behind them here, out of chronological order, to reflect our reconfigured understanding of the design space. Clear evolutions from the form factor concepts to the form factor families we identified later on (25) are noted with citations.

After creating the list of available prototyping platforms (D1) we continued to do a modicum of open-ended design, mainly on the iRiver Clix form factor (D4) but a renewed focus on our requirements constrained and focused our thoughts to a single prototype, ending this phase of our group process.

Potential Form Factors

1. Miniature Device (as later Miniature family of form factors & iRiver E10, D4)

This simple form factor is a very small, portable device that will be carried around with a technician. This device would have limited functionality - the ability to record voice, a camera, and locate problem reports - but little else. It would have few buttons and no keyboard. These small devices would be distributed to technicians, and larger base stations would exist for other functionality.

2. "Digicam" Device (as later Camera family of form factors & N95, D4)

The digital camera style form factor would have a cell phone's internal components and keypad, while retaining the size, shape, and appearance of a conventional digital camera. This would make it a familiar picture-taking platform for users while retaining the functionality of a cell phone, allowing it wireless access and easy programmability.

3. "Wearable" Device (as later Wrist PDA family of form factors & Zypad, D2)

The wearable style form factor would be a small computer that could be worn on the wrist of a technician. It would have a touchscreen and function keys, but not an entire keyboard. A camera in would fit in the back and a stylus would allow the technician precise control of the screen functions. This form factor would only work for single-handed use.

4. "UPS" Device (as DIAD form factor, B27)

The UPS style form-factor is for a larger, very durable portable device much like those created by Symbol for the United Postal Service. These would have a full keyboard, stylus, camera, and touchscreen. Because the screen of the UPS style device would be larger, technicians would be able to use their fingers - even gloved - to navigate.

Potential Workflows

1. Intelligence Augmentation Workflow

The intelligence augmentation workflow involves technicians carrying with them a device which supports their current problem reporting habits. After using the device to gather media, the reports would be typed up on a nearby base station.

This device would be able to record sound and image and would serve to help technicians remember what needs to be reported. For instance, a part's serial number and description could be recorded as a voice memo.

While this does support the current workflow, it also doesn't significantly improve on it.

2. "All-in-One" Workflow

For the all-in-one device, problem reporting would be done remotely through a portable device. Rich media can be added to a problem report if they are useful in describing the problem, but the device is designed with the expectation of text entry. Computer terminals would be used only for docking and charging these devices - all functions of problem reporting could be done from the device itself, without a base station.

At first we thought that this workflow was unsustainable in a handheld interface, but user testing and concept validation found this to be the proper goal of our project.

3. WAD-Structured Workflow

This device would be used primarily for the direct annotation of progress on the WAD through buy-offs, and problem reports become simply another type of workstep annotation/buy-off. This unifies all paperwork and reporting that the technician must do into a single device with a single interface. It also allows the PR system to leverage the WAD system for additional context as to the likely nature of the problem.

While we agreed that this would be the ideal future relationship of the PRACA & WAD systems, this ambitious movement is out of the scope of our project.

Parallel Design Concept Sketches

### "Wearable" Form Factor with All-in-One Workflow

This allows for the wearable "single-handed" entry with stylus as well as the ability to drag and drop audiovisual recordings into layers of rich media for tagging photos. An onscreen keyboard and graffiti would be available for text entry.

Although there were concerns about the ability to use such a device one-handed and the possible danger of getting a hand stuck in machines, this design was dominant throughout the parallel design process due to the many creative ideas it inspired.
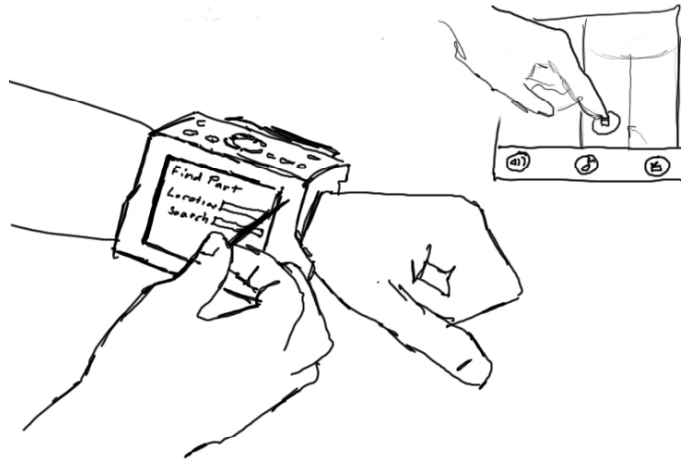
"Digicam" Form Factor with WAD-Structured Device Workflow

This design would feature a cell phone keypad for T9 text entry and a directional pad. Otherwise, it would appear as a normal digital camera. After swiping in on the card reader, technicians would receive their daily WADs, and buy-off on worksteps by taking a picture, granting NASA real-time progress reports via a photographic record of all work, while still being faster than the current WAD system. When a "Tag PR" option is chosen, the current picture(s) must be captioned with a PR typed at a nearby base station.
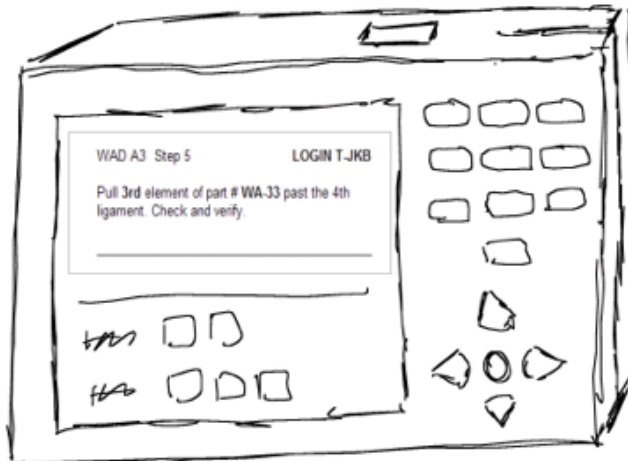
Miniature Form Factor with Intelligence Augmentation Workflow

This very small device has limited interaction and functionality - only problem report retrieval, a camera, and a voice recorder. The technicians use this device to augment their memory, for instance by speaking a part number into the device and using that voice memo to correctly file a problem report at a base station later.


"UPS" Form Factor with All-in-One Workflow

This portable device with a touchscreen allows the technician to complete all steps of problem reporting remotely. The technician can describe the problem using the touchpad and select options of the form on the touchscreen either with fingers or a stylus.

Open-Ended Miniature Designs

These two designs were based upon the intriguing iRiver Clix form factor we identified
D4 during the review of potential prototyping platforms. It was the experience of their
creation and design criticism that made it clear that a focus upon a single, feasible,
testable prototype design was the logical next step of the project.

iRiver Clix with Intelligence Augmentation
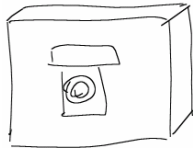
This design has five controls: four buttons
on each side of the screen, and a slider that
covers or exposes the lens on the back.
The user creates and adds to PRs by
recording rich media.
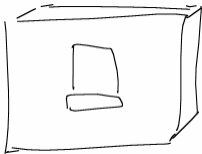
The left and right buttons both begin the
recording of rich media. When the lens is
exposed, and a left or right button is
clicked, a picture is taken; if it is held
down, a video is taken until it is released.
When covered, it creates an audio recording.
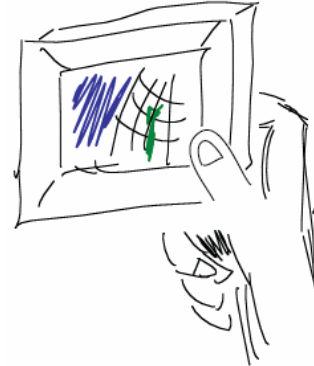
Pressing down cycles to other PRs. One PR in the circular list is always a blank, which is
used for creating a new PR if rich media is record onto it.

Pressing up switches modes to a replay mode of the current PR, in which left and right
select the rich media file and down plays it. Up again switches back.

The device also relies on a system of part number bar codes
that can be automatically read from photographs, and the
ability to instantly call up several PRACA browser
windows filled with the data captured from the device at
the moment it is docked, so the text fields of the report can
be completed.
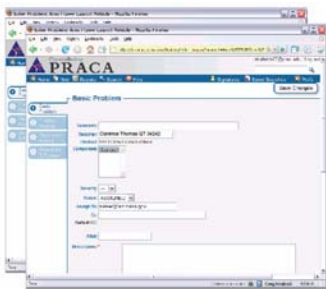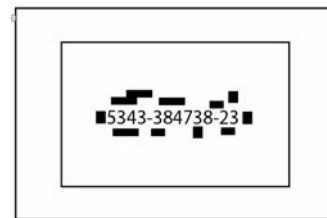
It was pointed out that this design approach was essentially
a blind alley. The design called for a deviation from the
present actual device with the inclusion of a camera, yet also
allowed its interaction to be limited by adherence to four
buttons. This made it vulnerable to such usability problems
as the modal switch of the use of the buttons. Therefore, the
design called for being limited by the form factor in some
ways but not others, without any apparent pattern.

While the modal switch could be fixed by using the same circular scrolling interaction as
for the normal mode, we could not build this design, even enough to test.

PDA & Cell Phone with All-in-One & Intelligence Augmentation

This device emphasized that the user could potentially enter all information on the device in the All-in-One workflow, or could make their own decision to leave some fields off until returning to the base station, in which case the Intelligence Augmentation workflow was possible. Knowing the restrictions of handheld text entry and that under some circumstances a desktop base station might be right nearby, this more flexible workflow became the standard of our ultimate design. This design also suggested that the mobile interface and desktop interfaces should be as consistent as reasonably possible.

This device has a 4-directional pad, T9 keypad entry, a stylus touch screen, and a bar code scanner with image text recognition. The following wireframes describe a sample task-based walkthrough of its interaction.
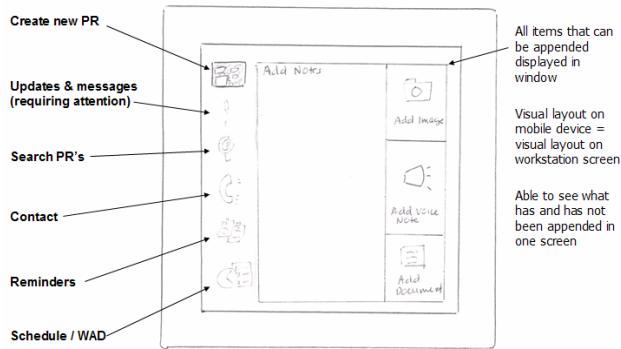
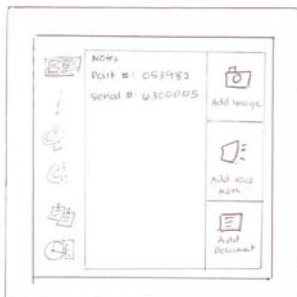1. Create new problem report.

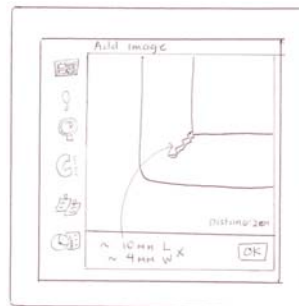Select "Add Notes."

2. Add notes with stylus.

3. Add notes with image capture.

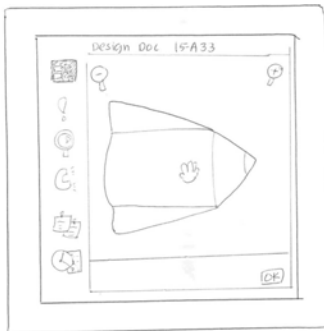4. Notes appended, select "Add Image."
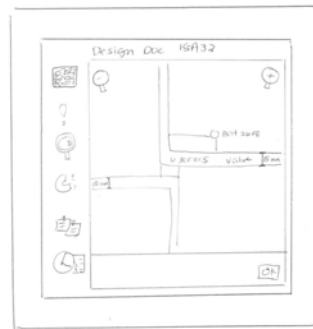

5. Capture image, add comment.

6. Image & audio file appended, select "Add Document."

7. Scan document bar code or enter document ID.

8. Document retrieved, navigate and zoom in.

9. Press "OK."

10. Document appended & linked to Description.

11. Upload to computer workstation, review, enter additional information.