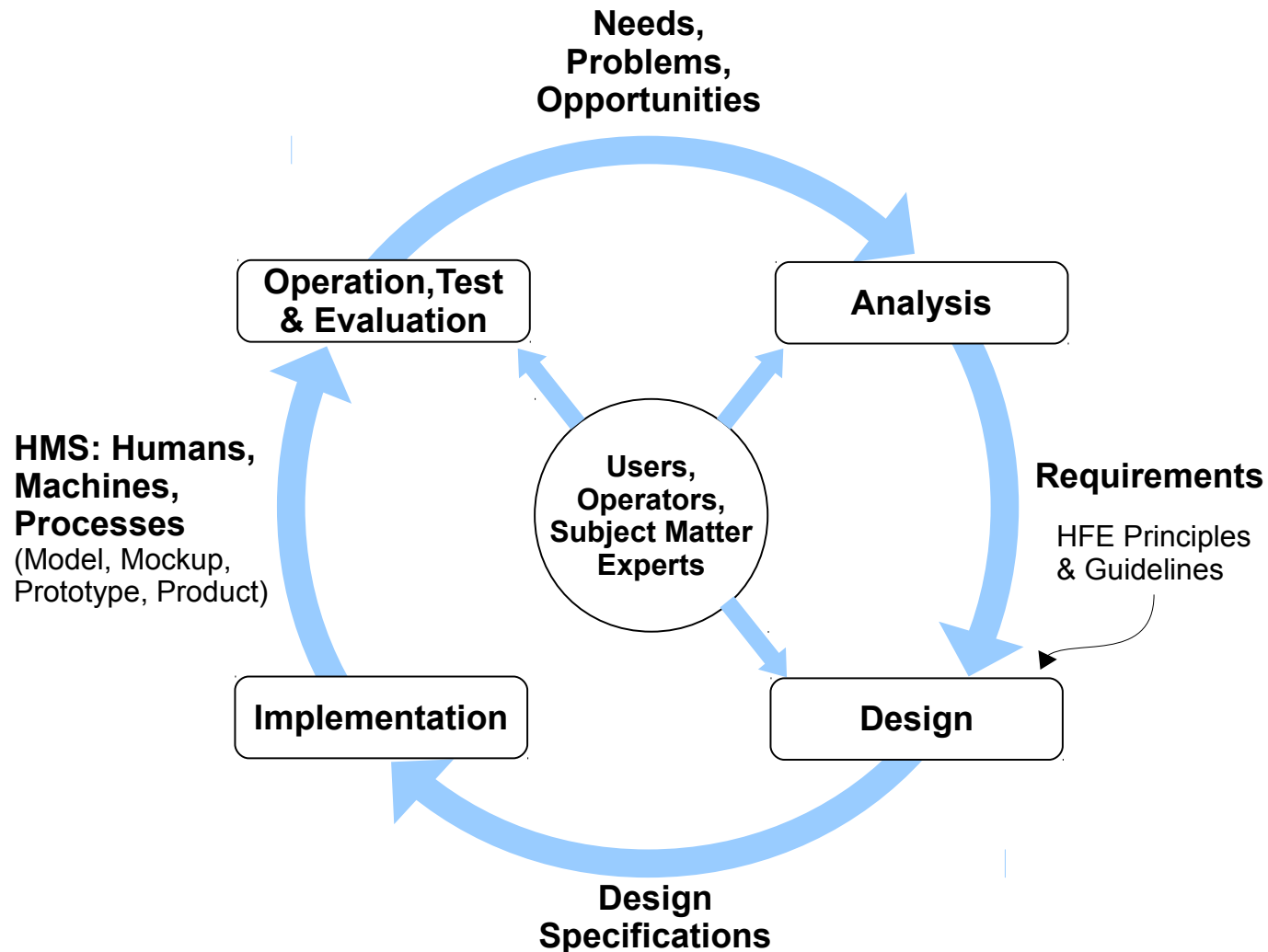


HMSE Implementation: Models, Mockups, and Prototypes



A User-Centered Human-Machine Systems Engineering Process

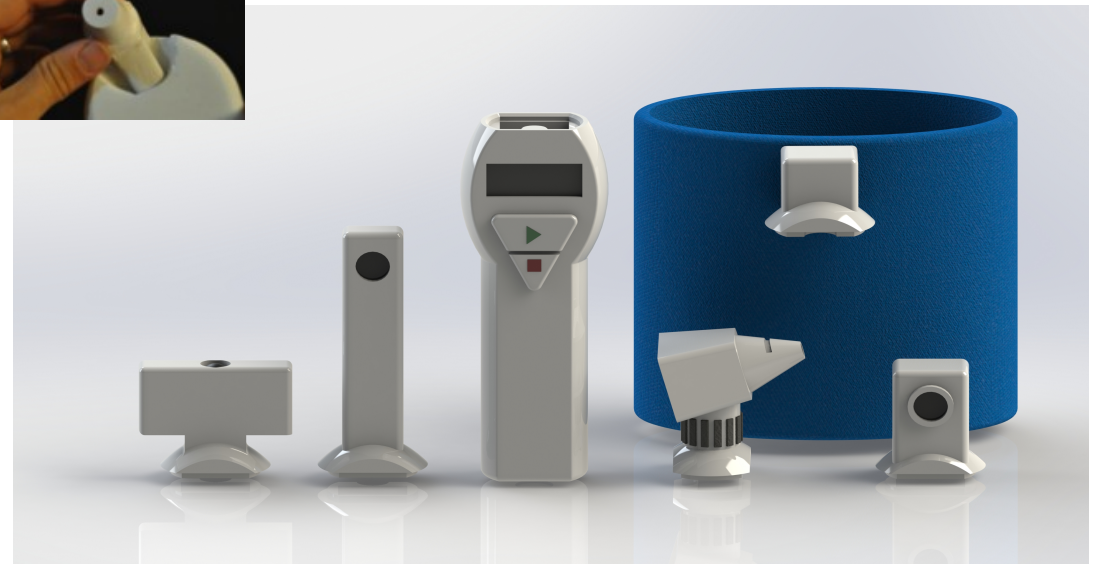
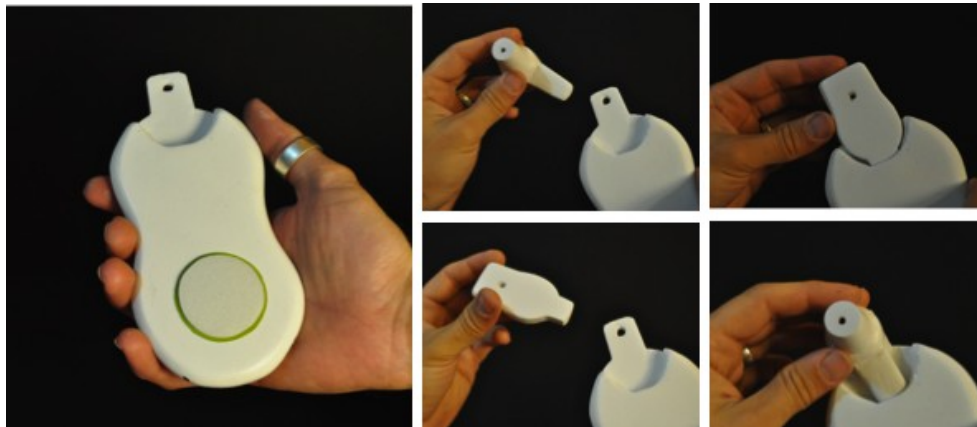


Implementation and Operation

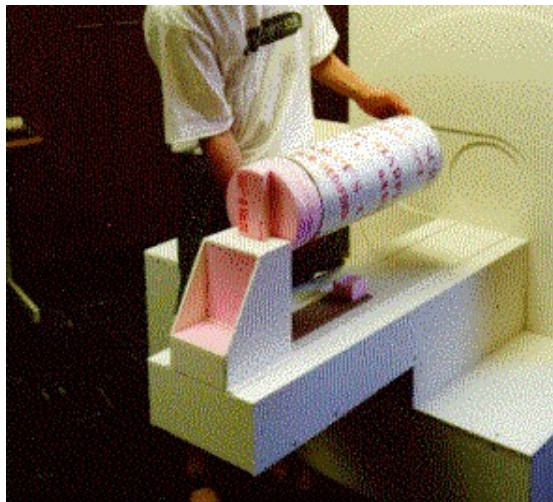
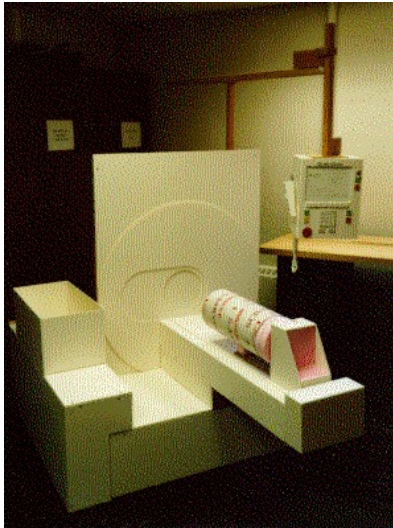
- Implementation
 - Static Mockups
 - Dynamic Mockups
 - Digital Storyboards
 - Virtual Prototypes
 - Part-Functional Prototypes
 - Functional (Engineering) Prototypes
 - Computer Models and Simulations
 - Operational Systems
- Operation
 - Mockups, Storyboards
 - Scripted Role Playing
 - Prototypes
 - Simulated Scenarios
 - Computer Models
 - Simulation
 - Operational Systems
 - Real Operation

Static Mockups

- Simple cell phone for older users
- Unified Medical Instrument



Mockups: Silicon wafer slicing saw

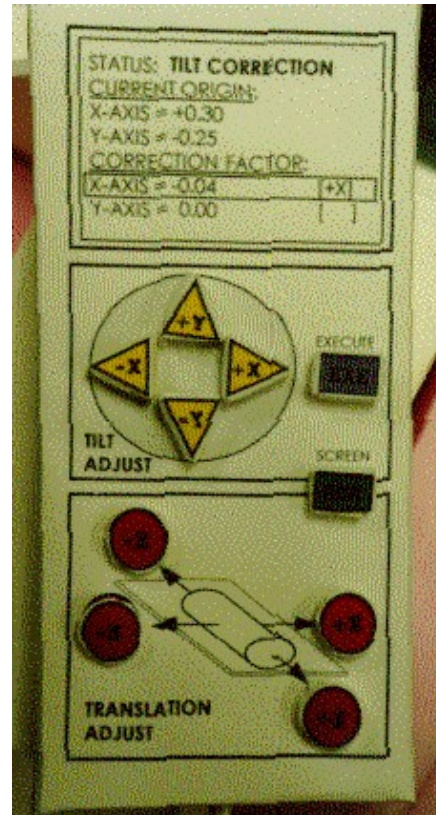


Cockpit Mockups

-
- Search web for “cockpit mockup images”

Dynamic Mockups

- Wafer saw controls & displays (changeable panels)

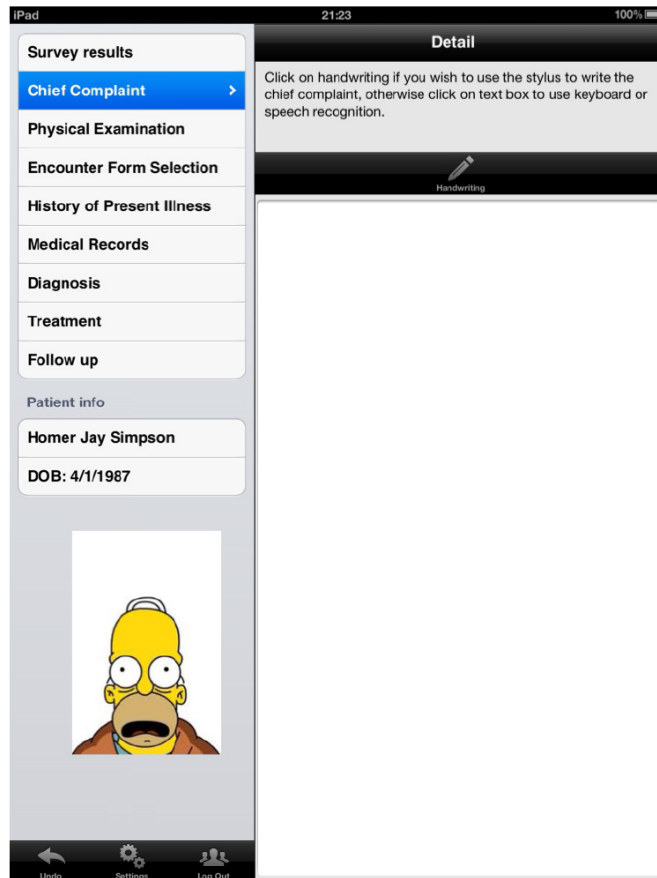


- PDA paper mockup

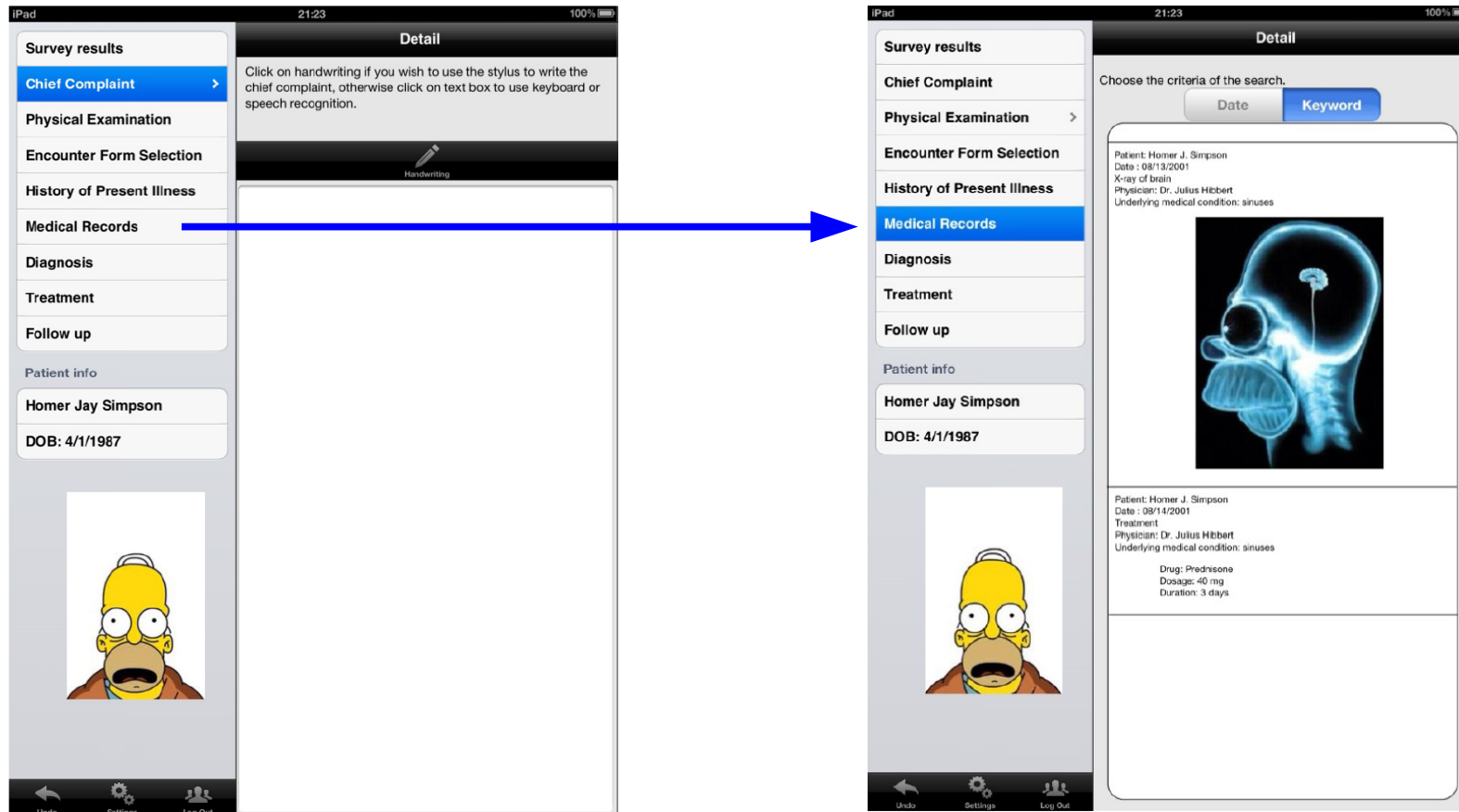
Dynamic Mockups: Digital (Electronic) Storyboards

- Healthcare Toolkit
- Emergency Cesarean Delivery Facilitator

Mockup/Electronic Storyboard: Healthcare Toolkit (on iPad)



Mockup/Electronic Storyboard: Healthcare Toolkit



ECD Prototype 4 Storyboard

View 12c

ECD Summons

Summons Message:

You are being summoned for an emergency C-section delivery, at (Hospital),(Location), with Dr.(Name of OB) for(Patient ID#).

Clock
4/3

SUMMON ALL 1

Name of OB Laura McD

Cause of ECD Placenta Previa ▼

Patient ID #####

Patient Name Billie Holliday

Hospital Providence

Location XXXXXX

| | | | | |
|--------------------------|---|-----------------------|---|-----------------|
| OB | ✓ | ▼ Laura McD | • | ON SITE |
| OB Nurse | ✓ | ▼ Hansi Karlsen | • | 3 miles |
| Surgical Ass. | ✓ | ▼ Penelope M. S. Cruz | • | 1 mile |
| Anesthetist | ✓ | ▼ Fred Humor | • | ON SITE |
| Scrub Nurse | ✓ | ▼ Gill Forster | • | 11 miles |
| Circulating Nurse | ✓ | ▼ Charles Froom | • | ON SITE |
| Physician | ✓ | ▼ Cathrine Highland | • | ON SITE |
| Respiratory Ther. | ✓ | ▼ Stuart Prime | • | ON SITE |

↶

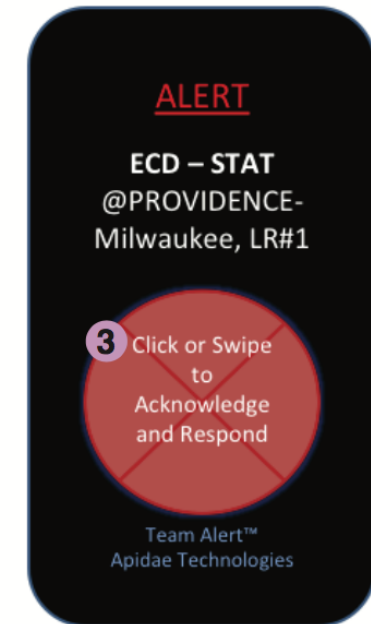
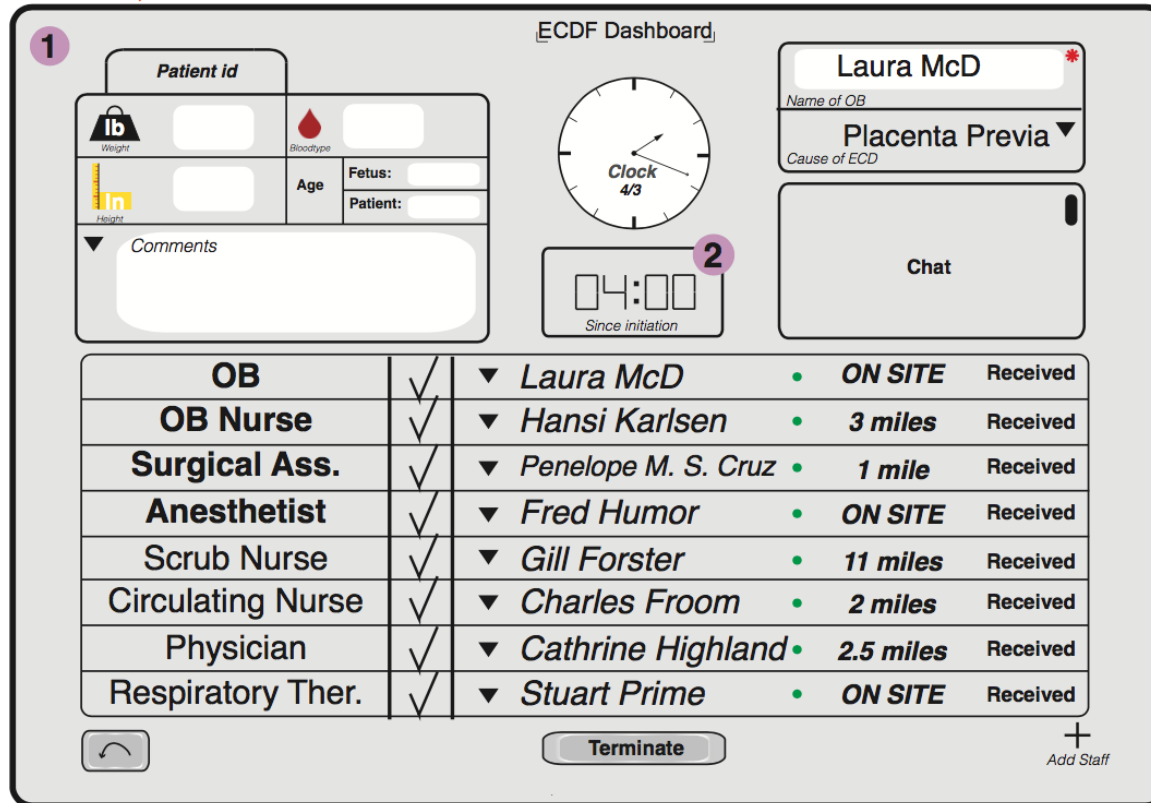
View 12c: Dispatcher is satisfied with the summons message and sends it out by pushing the "SUMMON ALL" button.

Main interactions :

- 1 SUMMON ALL button is pushed

ECD Prototype 4 Storyboard

View 13



View 13: *Summons message is dispatched to staff through app, and the monitor screen named; Dashboard, appears.*

Main interactions :

- 1 *Dashboard with monitor and modify options*
- 2 *Timer shows*
- 3 *Message alert at app*

ECD Prototype 4 Storyboard

View 14

ECD Dashboard

2 Patient id

| | |
|-----------------|------------------|
| Weight: 145 lb | Bloodtype: 0-neg |
| Height: 5'3" | Age: [blank] |
| Fetus: 37w / 3d | Patient: 31 yrs |

Comments: Allergic to antibiotics

Clock: 4/3

06:41 Since initiation

Name of OB: Laura McD

Cause of ECD: Placenta Previa

Chat

| OB | ✓ | ▼ | Staff | Distance | Status | Read |
|-------------------|---|---|---------------------|-------------|--------|----------|
| OB | ✓ | ▼ | Laura McD | • ON SITE | Read | |
| OB Nurse | ✓ | ▼ | Hansi Karlsen | • 3 miles | Read | 3 |
| Surgical Ass. | ✓ | ▼ | Penelope M. S. Cruz | • 1 mile | Read | |
| Anesthetist | ✓ | ▼ | Fred Humor | • ON SITE | Read | |
| Scrub Nurse | ✓ | ▼ | Gill Forster | • 11 miles | Read | |
| Circulating Nurse | ✓ | ▼ | Charles Froom | • 2 miles | Read | |
| Physician | ✓ | ▼ | Cathrine Highland | • 2.5 miles | Read | |
| Respiratory Ther. | ✓ | ▼ | Stuart Prime | • ON SITE | Read | |

Terminate

+ Add Staff

1

ALERT

RESPONSE ACKNOWLEDGED

Sent: 1:36 minutes ago

ECD - STAT

@PROVIDENCE- Milwaukee LR#1

Call Central Desk

Are you (select one):

Already In-House

On My Way

Unavailable

View 14: Staff members opens alarm and dispatcher types in patient information. It is showed as Hansi Karlsen, but is being done by all other staff members as well.

Main interactions :

- 1 Summons message is opened
- 2 Patient information area is filled out
- 3 Summons message now appears as "read"

ECD Prototype 4 Storyboard

View 15a

ECD Dashboard

Patient id: 145, 0-neg, 5'3", Fetus: 37w / 3d, Patient: 31 yrs

Comments: Allergic to antibiotics

Clock: 07:35 Since initiation

Name of OB: Laura McD
Cause of ECD: Placenta Previa

| Role | Staff | Status | Action |
|-------------------|---------------------|---------|---------|
| OB | Laura McD | ON SITE | REPLIED |
| OB Nurse | Hansi Karlsen | 4min | REPLIED |
| Surgical Ass. | Penelope M. S. Cruz | 2min | REPLIED |
| Anesthetist | Fred Humor | ON SITE | Read |
| Scrub Nurse | Gill Forster | 15min | REPLIED |
| Circulating Nurse | Charles Froom | 3min | Read |
| Physician | Cathrine Highland | 3min | REPLIED |
| Respiratory Ther. | Stuart Prime | ON SITE | REPLIED |

Buttons: Terminate, Add Staff

Mobile App Interface:

ALERT
RESPONSE ACKNOWLEDGED
Sent: 1:36 minutes ago
ECD - STAT
@PROVIDENCE-Milwaukee LR#1

Are you (select one):

- Already In-House (1)
- On My Way
- Unavailable

What is your Estimated Time to Arrival (ETA)? (2)

1--5--10--15--20
ETA: 11 Minutes Confirm

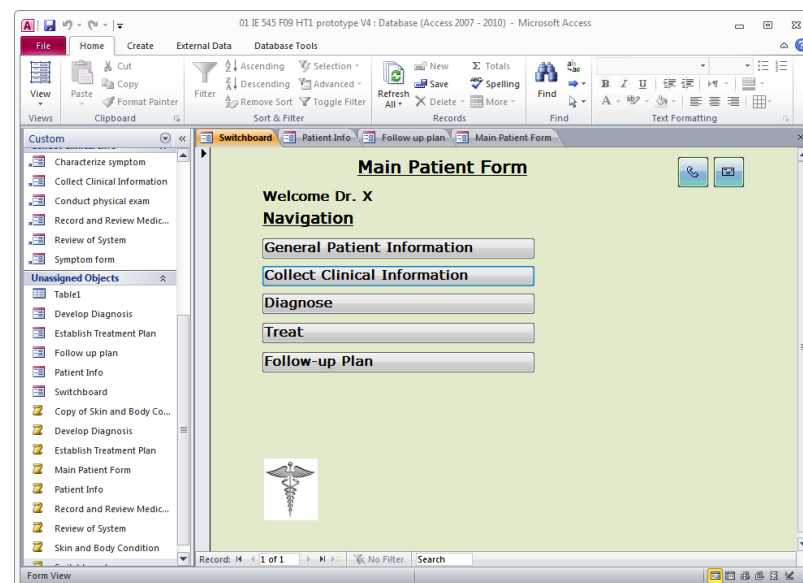
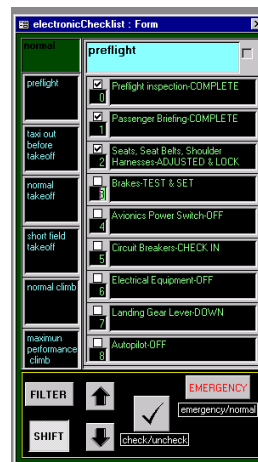
View 15a: Staff members reply with their availability and estimated time of arrival (ETA) via app.

Main interactions :

- 1 Staff members reply
- 2 Staff members notes ETA
- 3 ETA and notification status

Virtual Prototypes

- DVD-VHS Player (Dynamic HTML)
- Cockpit Electronic Checklist (MS Access)
- Healthcare Toolkit (MS Access)



Virtual Prototypes

- Weapon Sight UI

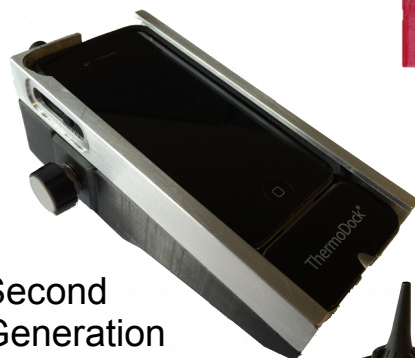


Part-Functional Prototypes: Healthcare Toolkit Unified Medical Instrument

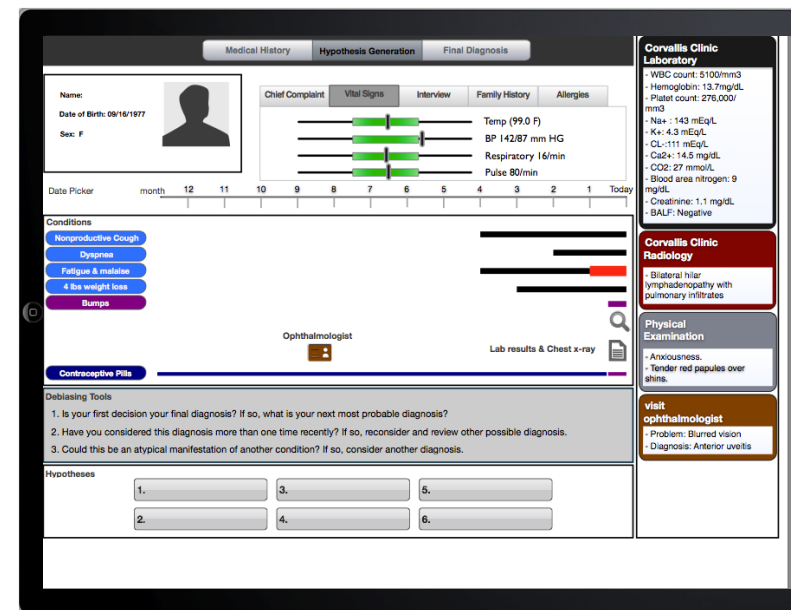
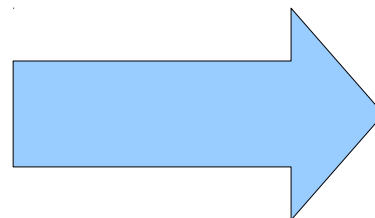
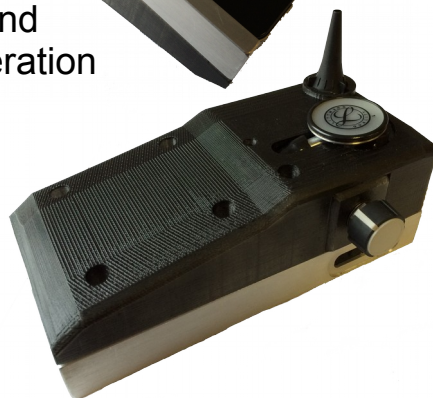
UMI Functional
Prototypes
(Capstone Projects)



First Generation



Second
Generation



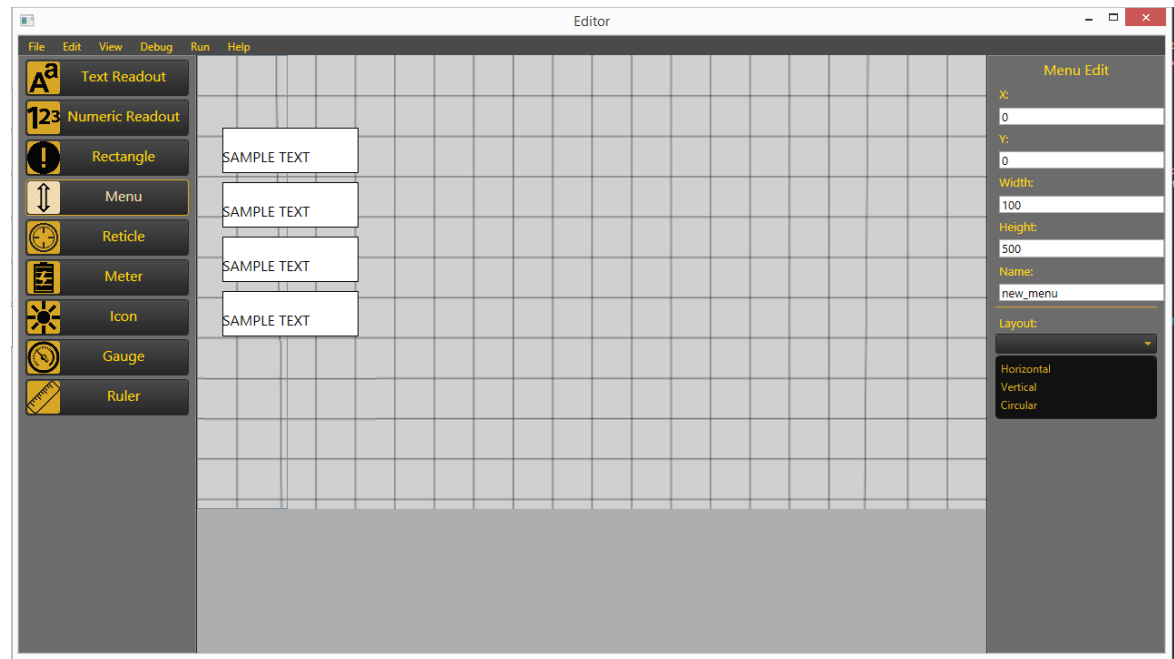
iPad Diagnosis Decision Aid
(Mockup for MS Thesis)

Rapid Prototyping Environment For Targeting Device UI Development

Gen 3 TD Emulator
(Part-Functional Prototype)



Graphical User Interface
Development Environment:
GUIDE



Functional Prototype: ECD Facilitator V3

The screenshot shows a web browser window with the URL `flightdeck.ie.orst.edu/ECD/ECD-3.1/`. The page title is "Emergency Cesarean Delivery Facilitator". The main content area has a light blue header with the text "Summon Team". To the right of the header, there is a box containing patient information: "Patient:", "Status:", "Reason for CS:", and "Assembly Location: OR 1". Below the header, a blue heading reads "The following medical personnel will be summoned on the call". Underneath, there is a list of medical roles with corresponding dropdown menus: Obstetrician (Matthew Olsen), Surgical Assistant (Cathy Falk), Anesthetist (Solomon Graves), OB Nurse (Alice Harbin), Scrub Nurse (Simon Grimble), Circulating Nurse (James Bowers), Family Practice Physician (Chris Bluth), and Respiratory Therapist (Joel Hayter). Below this list is a section titled "Summons Data" with input fields for "Patient First Name", "Patient Last Name", "Existing Patient ID", and "Patient Status". At the bottom, there is a navigation bar with five tabs: "Summon Team", "Summons Information", "Team Status", "Patient Checklist", and "Patient Medical Information".

Computer Models: Digital Human Modeling

Dr. Onan Demirel, OSU ME/Design

A.1 INTEGRATED COCKPIT DESIGN AN INTEGRATED OCCUPANT PACKAGING STUDY FOR A RACE CAR TRANSPORTATION

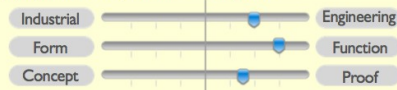
Focus: to incorporate Digital Human Modeling (DHM) early stages of the vehicle development and to improve driver posture comfort (in terms of joint angles and vision) without sacrificing structural integrity.

Methodology: consist of using my Human-in-The-Loop design framework for modeling and simulation, and utilize Virtual Reality (VR) tools to extend the advance visualization techniques during design process.

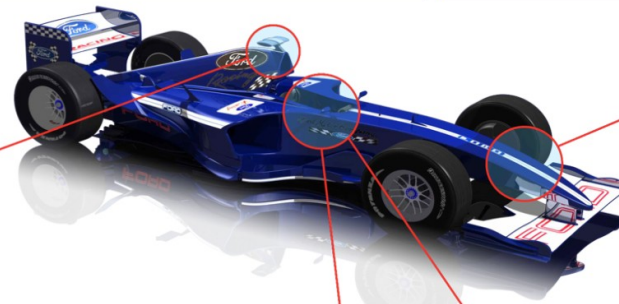
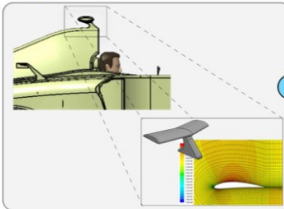
Results: joint angle discomfort were improved while maintaining the aerodynamics and structural integrity of the vehicle. Center of gravity was further lowered.

Future Work: includes a total-vehicle integration design study, which aims to form a high fidelity digital vehicle design system that manages and monitors engine simulation, steering controls, suspensions with DHM.

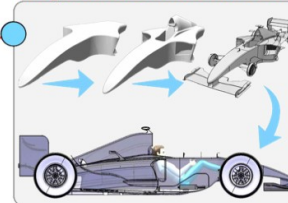
About: This study was held as an integrated concept vehicle development research project at European Ford Design Studios. I was asked to demonstrate an integration showcase of Digital Human Modeling (DHM) and Virtual Reality (VR) for a concept vehicle development.



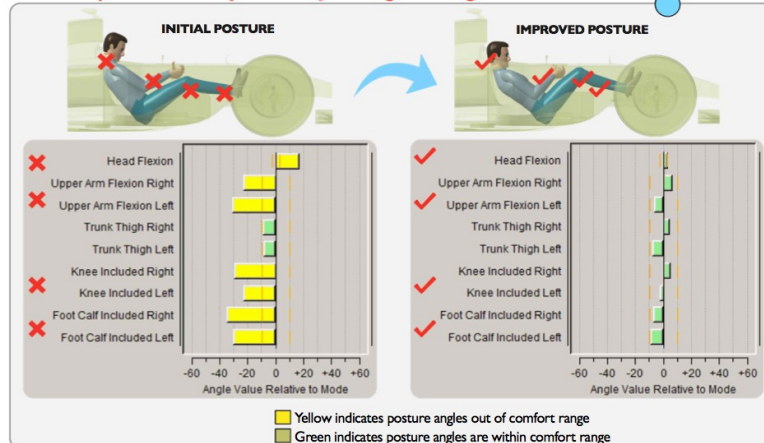
Integrated CFD with DHM



Integrated CAD Model with DHM



Posture Improvement Study Based on Joint Angles through DHM



Assembly Simulation in Virtual Reality with CAVE

