Task Analysis

WSE Requirements Development

- Sources
  - Customer
  - Subject Matter Experts
  - Users, operators
  - Existing, similar systems
  - Brainstorming
  - Process and Task Analyses
- Goals
  - Identify requirements
  - Few, general, unverifiable ("Customer") Requirements
    → perhaps many, specific, verifiable ("Engineering") Requirements

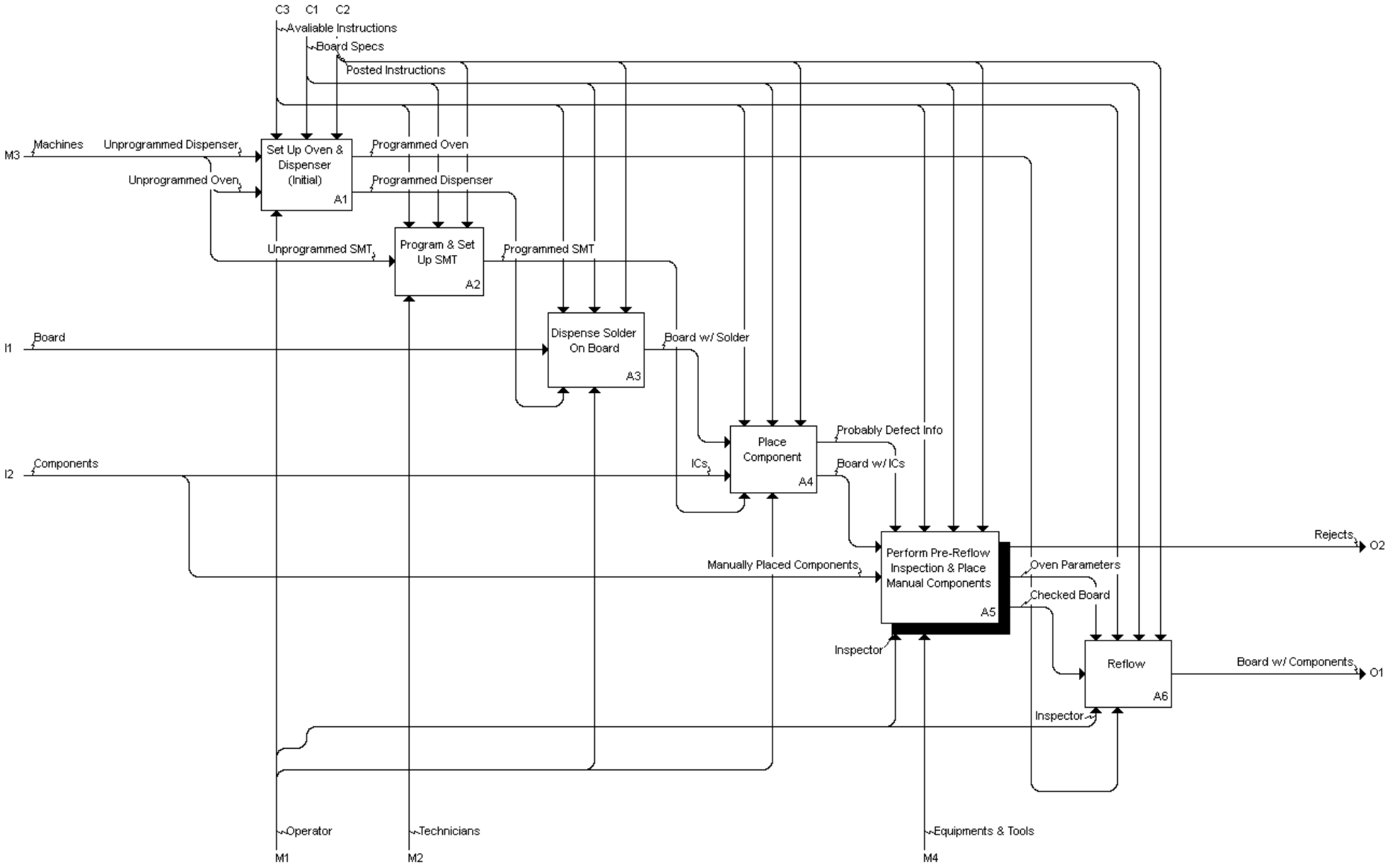
Task Analysis

- Process Analysis (could be called High-Level Task Analysis) Methods
  - Hierarchical Task Analysis (HTA) ≈ IDEF0 Nodelist
  - Functional Flow Charts
  - Functional Analysis/Modeling
    = Activity Analysis/Modeling
    = Process Analysis Modeling (we do this with IDEF0)
  - Process Maps
  - etc.
- Task Analysis (could be called Low-Level Task Analysis) Methods

PRIS Hierarchical Task Analysis
(Process/Task Hierarchy, IDEF0 Nodelist)

A0: Assemble Electronics Components
- **A1: Set Up Oven & Dispenser (Initial)**
- **A2: Program & Set Up SMT**
- **A3: Dispense Solder On Board**
- **A4: Place Component**
- **A5: Perform Pre-Reflow Inspection & Place Manual Components**
  - **A51: Prepare & Review Documents**
  - **A52: Program Reflow Oven**
  - **A53: Inspect Board**
    - **A531: Compare Board Match**
      - A5311: Study iView Diagram
      - A5312: Study Individual Component / Group
    - **A532: Check Components (Loose, Misaligned, Skewed)**
      - A5321: Study iView for Check Components
      - A5322: Assess Individual Component / Group (for Check Components)
      - A5323: Adjust Parts (When needed)
  - **A54: Install Manual Components**
- **A6: Reflow**

Part of PRIS High-Level Task Analysis (IDEF0 A0 diagram)



Task Analysis

- Process Analysis (could be called High-Level Task Analysis) Methods
  - Hierarchical Task Analysis (HTA) ≈ IDEF0 Nodelist
  - Functional Flow Charts
  - Functional Analysis/Modeling
    = Activity Analysis/Modeling
    = Process Analysis Modeling (we do this with IDEF0)
  - Process Maps
  - etc.
- Task Analysis (could be called Low-Level Task Analysis) Methods
  - Process analysis methods, carried to a greater level of detail
  - (Detailed) Task Analysis
  - Flow Process Charts
  - Flow Diagrams
  - Activity Charts
  - Left-Hand Right-Hand Charts
  - etc.

PRIS (Detailed) Task Analysis

Pre-Reflow Inspection Station (PRIS)
Process and Task Analyses
28 March 2012

Process Analysis	Task Analysis										
Task/Subtask	Location	Start Cue	Frequency, Duration	Environmental Conditions	Tools & Equipment	Information	Cognition	Actions	Hazards	Errors	Comments
A0: Assemble Electronics Components											
A1: Set Up Oven & Dispenser (Initial)											
A2: Program & Set Up SMT											
A3: Dispense Solder On Board											
A4: Place Components											
A5: Perform Pre-Reflow Inspection & Place Manual Components											
A51: Prepare & Review Documents	Center WS	new board arrives	1x per board	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	work table	OPIE	remember, decide which documents, forms			docs for wrong board	provide clear link between board & proper docs
A52: Program Reflow Oven	reflow oven	new board arrives	1x per board	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	reflow oven, display, controls	oven procedure, board reflow specs	remember, decide which program, which modes	operate RO controls	burn from RO	programming errors	make sure programming specs are readily available
A53: Inspect Board											
A531: Compare Board Match											
A5311: Study iView Diagram	Center WS	new board arrives	mult x per board	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	computer	iView diagram	remember what's on iView	call up iView diagram		misread diagram, forget diagram details	place display close to board for easy comparisons
A5312: Study Individual Component / Group	Center WS	iView diagram on display	mult x per board	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	magnifier	remembered component details from iView diagram	recognize components, compare components with iView, decide correct/incorrect	remove / replace wrong components		miss, false alarm	
A532: Check Components (Loose, Misaligned, Skewed)											
A5321: Study iView for Check Components	Center WS	new board arrives	mult x per board	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	computer	OPIE	remember what's on iView	call up iView diagram		misread diagram, forget diagram details	place display close to board for easy comparisons
A5322: Assess Individual Component / Group (for Check Com	Center WS	iView diagram on display	mult x per board	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	magnifier	remembered orientation details from iView diagram	recognize components, compare orientations with iView, recognize correct/incorrect orientations			miss, false alarm	
A5323: Adjust Parts (When needed)	Center WS		mult x per correction	300 – 325 lux; 65° – 72° F; 60 – 85 dBA	pliers, needle pick	remembered orientation details from iView diagram	remember proper orientations	adjust components	upper body MSDs	mis-adjust, adjust wrong component	provide arm/wrist rests

WSE Task Analysis Fields 1

Field	Description	Potential Requirements
Task/Subtask	Name of the task/subtask (subprocess)	reminders (task, steps)
Location	Where it is performed	accommodation, accessibility
Start Cue	Event, interval, stimulus that triggers task	
Frequency & Duration	How often, how long	automation, seating, supports, ...
Environmental Conditions	Illumination, temperature, vibration, noise, acceleration, ...	lighting, clothing, ...
Tools & Equipment	Things needed to perform the task	Tools, equipment, etc.

WSE Task Analysis Fields 2

Field	Description	Potential Requirements
Information	Info operator needs to perform task	info to display, visibility, ...
Cognition	Memorization, recall, decisions, evaluations, calculations worker makes to perform task	memory aids, decision aids, other JPAs
Actions	Actions operator needs to perform task	controls, tools, ...
Hazards	Hazards, dangers, risks to the worker	countermeasures, safeguards, safe procedures, ...
Errors	Potential errors the worker could make: omissions, commissions, mistakes, slips, …	JPAs, other countermeasures
Comments	Additional useful info to aid TA	
others (optional)	Sensing, error Risk Priority Number (FMEA), ...	

Some Action Verbs
(useful in Cognition/Actions fields)

- Attend to
- Detect
- Distinguish between
- Feel
- Hear
- Read
- View
- Remember
- Calculate
- Count
- Decide among
- Estimate
- Evaluate
- Generate
- Predict
- Process
- Configure
- Disengage
- Engage
- Grasp
- Manipulate
- Move
- Open
- Pick up
- Position
- Press
- Reach to
- Reach to
- Release
- Transfer
- Turn
- Wait for
- Walk to

WSE Project Assignment

1. (Detailed) Task Analysis on at least 4 tasks/subtasks (4 IDEF0 node tree leaf nodes, i.e., activity boxes not detailed further)
2. Requirements Version 3 (including requirements from TA)
3. Progress Report 3
    i. Cover: Memo Evaluation Form (provided by instructor)
    ii. Memo (see syllabus)
    iii. Separator page: Work Products Evaluation Form (provided by instructor)
    iv. Copies of work products (see above, plus final IDEF0 diagrams)