Human-Centred Manufacturing

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HUMAN Objectives in a Nutshell

Aims to define and demonstrate workplaces where automation and human workers operate in harmony to improve the productivity, quality, performance of the factory as well as the worker satisfaction and safety
Who are our key stakeholders

Engineer

Operator

Management
Co-creation Process

1. Unnatural position
2. Heavy stuff (Machine and Parts)
3. Repetitive Tasks and Long Duration Standing Up
4. Enhanced Visualization with Cognitive/Visual Stress
5. Missing Tools
6. Support for Multiple Tools (Tools >> Hands)
7. Awareness of Impact (bad consequences) of Materials
8. Knowledge Availability
   1. Poor/Inadequate Documentation
   2. Task Complexity (eg: task periodicity, dimension)
   3. Knowledge Sharing

On-site interactive assembly instructions

- David is an experienced worker that has just returned from 6 month work at the preassembly workstation.
- On the start of the shift, David and the team access a list of the planned orders on the shift. First order consists in 40 units of the same SKU, called ‘2-drawer 80 Onyx’
- The HUMAN system determines the sequence of assembly for the carcase by means of needed tools and reference code for each component. David has never assembled this kind of model. As such, the system notifies David to access the official interactive assembly instructions.
- David mounts the AR helmet which automatically shows the virtual representation of selected parts how to do the assembly process, by a 3D sequence of the exploded parts.
- Once done, David acknowledges that he has seen it, and goes on to start with the assembly work. This has shorten the time to get up to speed on the assembly process required, and also avoiding errors.
Co-creation Process

1. User case workshops
   - AIRBUS Use Case Workshop
   - COMAU Use Case Workshop
   - ROYO Use Case Workshop

Needs, Scenarios and Interviews

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**P004**

**BACKGROUND**
- 12 years in company
- Has had several roles within the company
- Works in HDP 400 (horizontal part of the airplane)

**TASKS**
- Tasks vary in length
  - Tasks that take one, two or three days to complete (depending on number of people working on the task)
  - Several types of operations: electric, hydraulic, sealant and functional testing
  - Quality department validates their operations
  - Main problems when performing tasks are caused by:
    - Required components are unavailable (lost, not been prepared or faulty)
    - Reported in LEAN panel or communicated to corresponding logistics worker
    - Machine broken – communicate
  - As a response when there is a problem workers restructure their work
  - Perception that response time is low when there is a problem
  - Have to wear PPE
    - Cap, gloves and glasses always
    - Gas or dust mask when working with sealants
    - Full mask when performing hydraulic testing
  - At end of shift all tools have to be organised and left in the corresponding storage
  - Work area has to be cleaned and organised

**TRAINING**
- All workers receive basic risk prevention training
- Workers in the area have previous experience in the field or have worked with functional plans

**INFORMATION AVAILABILITY**
- Work with printed work instructions in the workstation
- Have panels with components that they have to use in the operations
- Can check if all components are in the panel
- By the end of the task the panel has to be empty

**COLLABORATION PHYSICAL WORKLOAD**
- Collaborative tasks involve lifting heavy components
- Inconvenient component handling
  - Convergence of two problems: heavy components and reduced manoeuvre space
  - Machinery helps with some of the weight lifting but is
### Co-creation Process

#### User case workshops
1. **AIRBUS** Use Case Workshop
2. **COMAU** Use Case Workshop
3. **ROYO** Use Case Workshop

#### Needs, Scenarios and Interviews
- Developers Workshop

#### Story Maps

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Co-creation Process

1. User case workshops
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   - ROYO Use Case Workshop

2. Developers Workshop

- Needs, Scenarios and Interviews
- Story Maps

Key Activity
- Step 1
- Step 2
- Step 3
- Step 4

System Feature
- Feature 1
- Feature 2
- Feature 3

WP2
(sensors, hardware)

WP3
(knowledge, reasoning and intervention)

WP4
(short-term intervention)

WP5
(long-term intervention)
Co-creation Process

1. User case workshops
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2. Needs, Scenarios and Interviews
   - Developers Workshop

3. Story Maps
   - Validation Workshop

4. Refined Story Maps
   - Analysis and Specification

Requirements

Analysis and Specification
Services

• Exoskeleton
• Knowledge-In-Time
• Workplace Optimisation
• Shopfloor Intelligence
• Knowledge Social Network
Impact

• Buy-in from the stakeholders

• Changes to the initial assumptions of the proposal phase

• Development of common understanding (clearer picture)
Lessons Learnt

• Lesson 1: You need champions (the right ones)
• Lesson 2: Continuous management of expectations
• Lesson 3: You cannot work in silos
• Lesson 4: Add expiration dates to co-creation artefacts
• Lesson 5: Keep the core team together