IMPLEMENTING HUMAN-CENTRIC MANUFACTURING WITH FIWARE
A4BLUE CASE - TEKNIKER UC

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A4BLUE Objectives

Put together workers and **ADAPTATIVE AUTOMATION** mechanisms

Put together workers and context-aware **ADAPTATIVE ASSISTANCE TOOLS**

TO

Take **ADVANTAGE** of each others **STRENGTHS**
Increase worker **SATISFACTION** and workability
Increase productivity and overall **PERFORMANCE**

Augmented workers & workplaces
Long term socio-economic sustainability
## A4BLUE Outputs

### Methods & Tools for Sustainability
- Methodology for the definition of the optimal level of automation
- Methodology for usability and satisfaction assessment
- Socio Economic assessment framework

### New or enhanced automation mechanisms
- New: deburring robot and automated tool trolley
- Enhanced: smart torque wrench, dual arm and logistic robot

### A4BLUE Reference architecture and implementation
- New interaction mechanisms: verbal and non verbal
- A4BLUE adaptive framework
- Assistance tools: context aware on the job training and guidance, decision support system and collaborative knowledge management
A4BLUE Framework – Integration
A4BLUE Framework – Interaction

ENTERPRISE LEGACY SYSTEMS
Enterprise Resource Planning, Manufacturing Execution Systems, etc.

MOD.SH.MS
Mediation Services

MOD.EN.ARG
AR/VR Based Training & Guidance

MOD.BU.KM
Collaborative Knowledge Platform Management

MOD.SH.MHMI
Multichannel, Multimodal Human Machine Interaction

MOD.EN.EM
Event Manager

MOD.BU.CQMS
Quantitative measurement of satisfaction

MOD.EN.CAM
Collaborative Asset Manager

MOD.BU.DSS
Decision Support Dashboards

 MOD.SH.DM
Device Manager

VAR
Semantic Repository

MOD.BU.ACE
Automation Configuration Evaluation

SECURITY
Identity management, Safety Management

Re-usability
A4BLUE Framework – FIWARE powered

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Device Manager

MOD.EN.ARG
AR/VR Based Training & Guidance

MOD.EN.EM
FIWARE-ORION
FIWARE-PERSEO

MOD.EN.CAM
Potential GE under evaluation

VAR
Semantic Repository

MOD.BU.CQMS
Quantitative measurement of satisfaction

MOD.BU.DSS
FIWARE KNOWAG

Security

Re-usability
TEKNIKER Use Case – Scenario

Business case

- Collaborative assembly of a latch valve in a fenceless environment including auxiliary activities as logistics and maintenance.

Scenario

- **Actors**: Assembly operator and Maintenance technician.
- **Legacy systems**: Manufacturing Execution System.
- **Robots**: dual arm robot involved in assembly and mobile robot performing logistic activities.
TEKNIKER Use Case – Challenges

▪ To introduce multimodal Human-Robot interaction.
▪ To adapt workplace to process, human (i.e. physical characteristics, capabilities, skills, etc.) and context variability.
▪ To provide assistance to the maintenance technician.
▪ To evaluate trust, usability and worker satisfaction.
TEKNIKER Use Case – Interaction

- Multimodal, interaction with both the dual arm assembly robot and logistic as well as the Manufacturing Execution System.
  
  - **Verbal interaction**: Natural speaking in Spanish.
  - **Nonverbal interaction**: Gesture commands. The natural interaction of both left-handed and right-handed workers has been considered.
The collaborative assembly workspace is integrated with the shop floor manufacturing execution system (MES) and automation mechanisms (i.e. dual arm robot and logistic robot) to adapt its behaviour to process, human and context variability.
TEKNIKER Use Case – Assistance

- Assisting the maintenance technician
  - Intervention request alerts.
  - Maintenance decision support dashboard,
  - Step by step on the job guidance.
19 Participants: 5 Female & 14 Male with an average age of 40 years (9.39)

**Usability, Mental Workload and Trust**

- High usability scores. Natural Speaking gets better usability rates than gestures recognition.
- Centralised Mental Workload: neither under nor overloading.
- Good trust levels.

**Benefits**

- Improves efficiency: reduction of displacements.
- Reduces physical demands.
- Increases safety.
- Opens up job opportunities.
A4BLUE Case: TEKNIER UC video & Further Information

TEKNIKER UC video

https://vimeo.com/330958923

Further info A4BLUE

http://a4blue.eu/
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