Adaptive Automation in Assembly
For BLUE collar workers satisfaction in Evolvable context

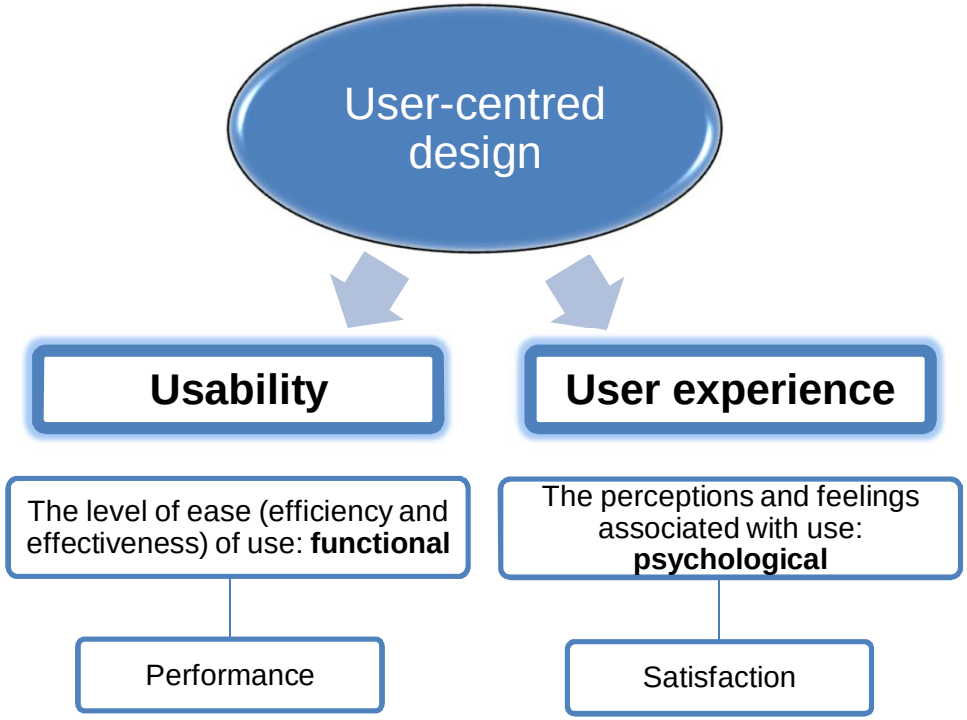
A4BLUE

Methodology for the Development of a Measure of Worker Satisfaction

November 2018

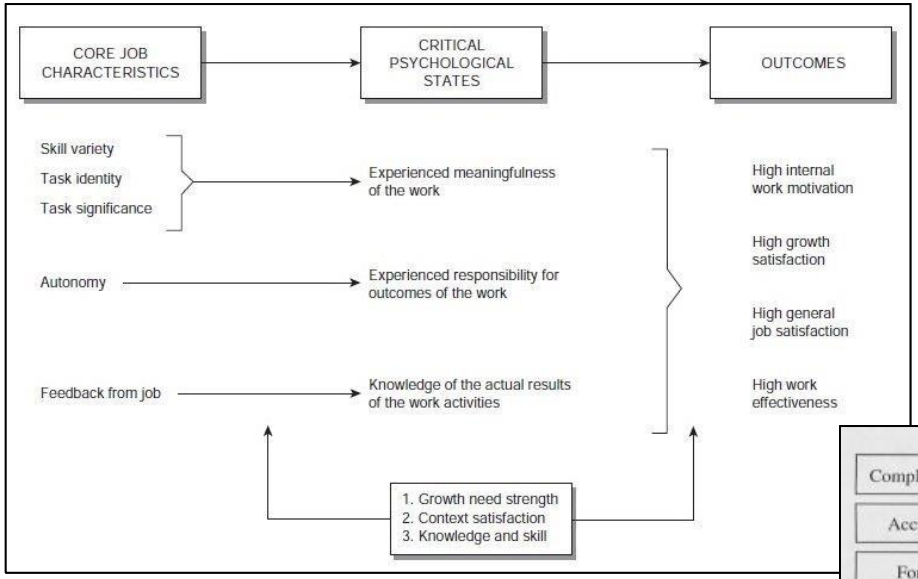
This project has received funding from European Union´s Horizon 2020 research and innovation programme under grant agreement nº 723828

Usability and Satisfaction in A4BLUE

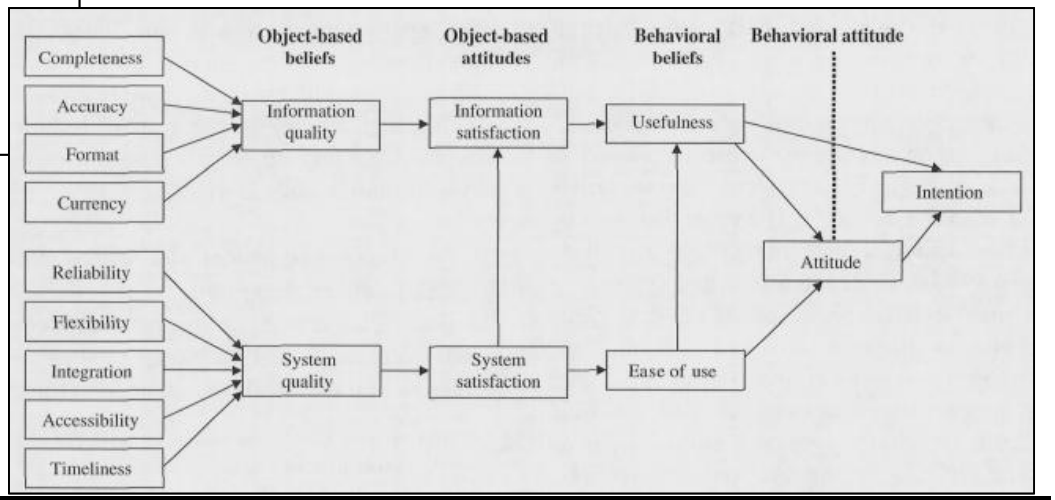


Satisfaction & Acceptance

Job Characteristics Model (Hackman & Oldham, 1975)



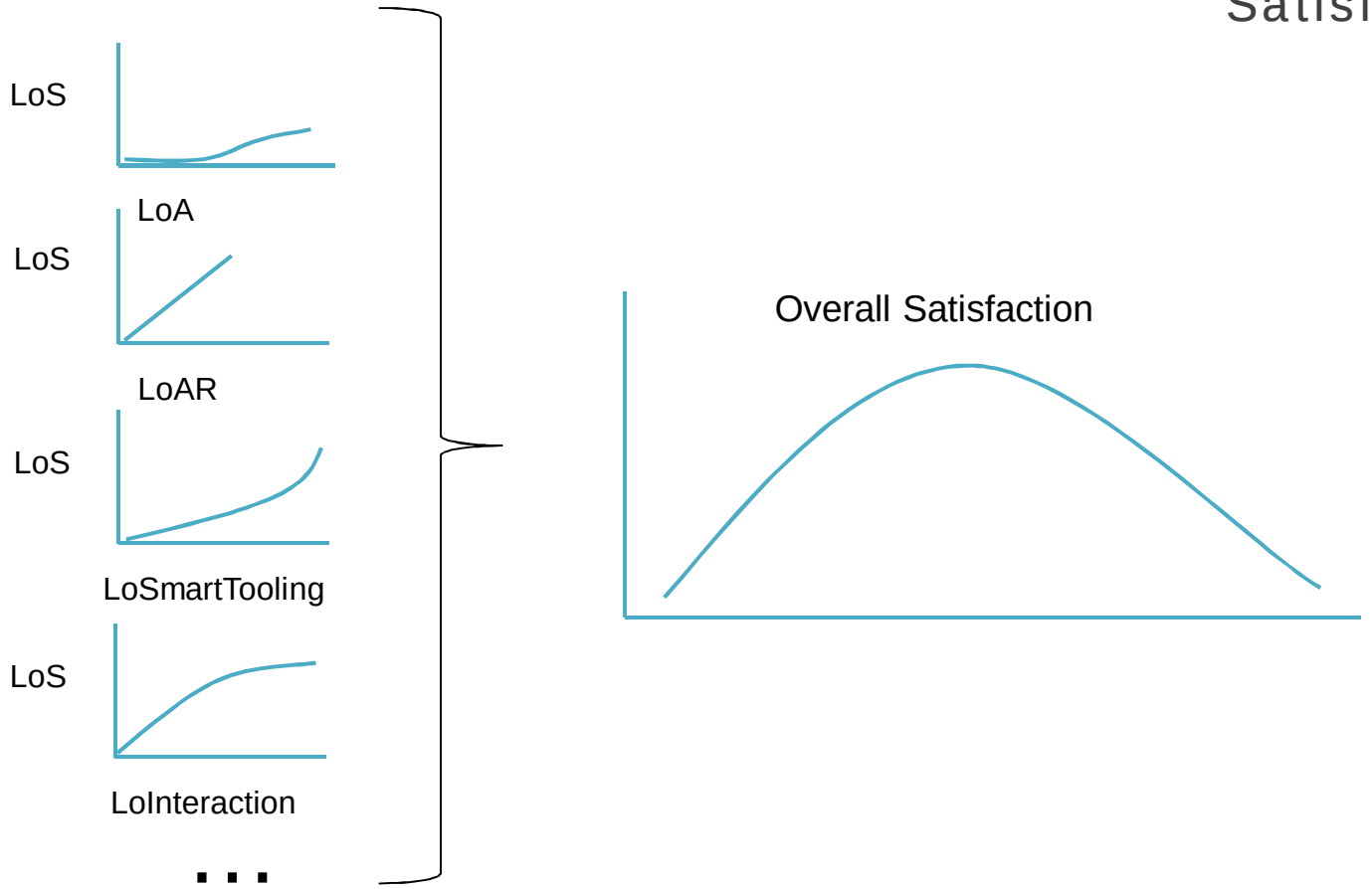
Integration of User Satisfaction and Technology Acceptance (Wixom & Todd, 2005)



Use Case Technologies

Technology	TEK	CESA	RWTH	Airbus
Smart tool				ü
Augmented Reality (AR)	ü	ü	ü	ü
Industrial Robot	ü	ü		
Mobile Robot	ü		ü	
Personal Computer (PC)	ü			
Profiled information	ü	ü	ü	ü
Tablet/mobile device		ü		ü
Multimodal input (gesture/voice)	ü		ü	
Decision support system (including multichannel notifications)	ü	ü		ü
Virtual Reality (VR)		ü		

The Integration of Technology Specific Satisfaction into Overall Satisfaction



Satisfaction Measurement Options

Periodic Adaption

Develop Psychometric Satisfaction Questionnaire

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Main Survey

↓

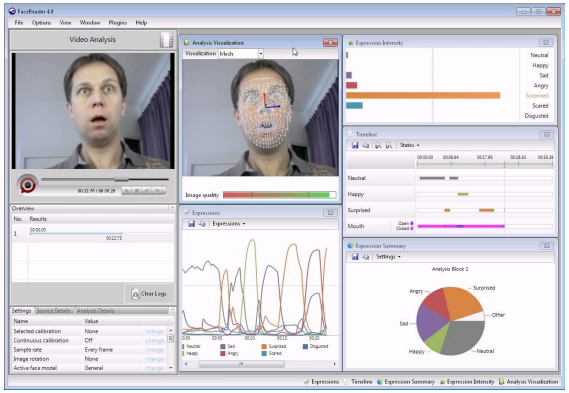
Short survey / Key items

OR

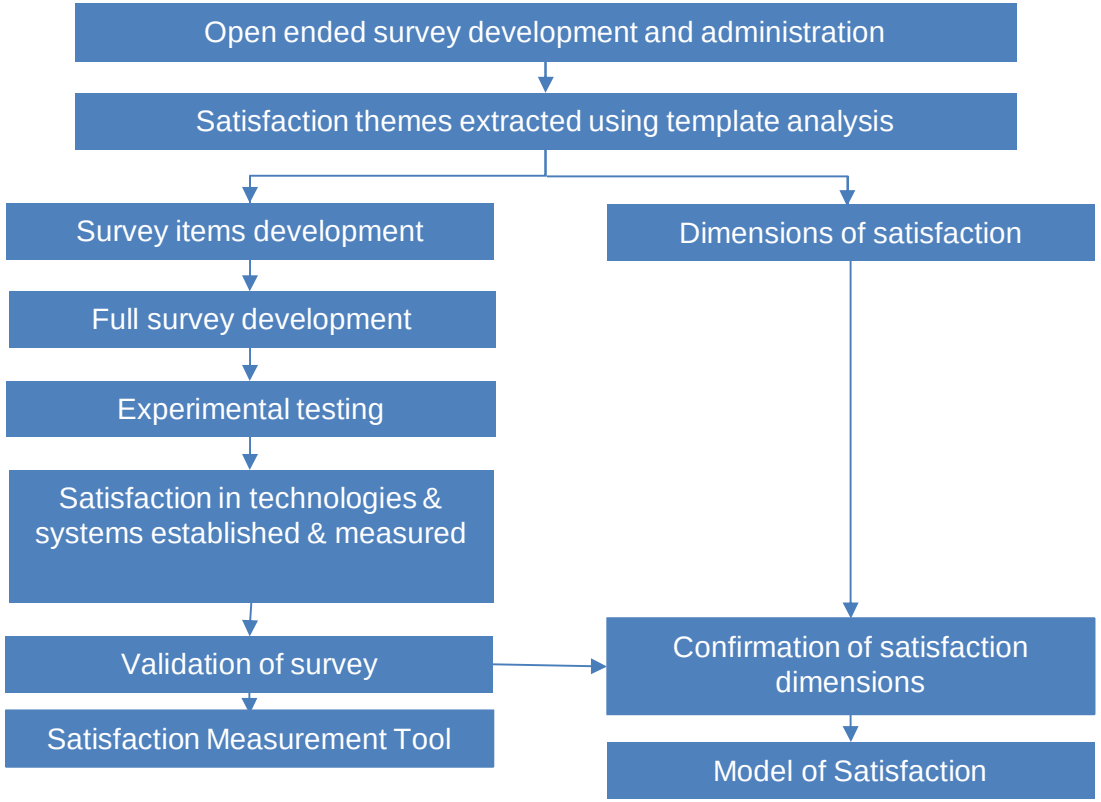
Continuous Self Adapting

Tech Review

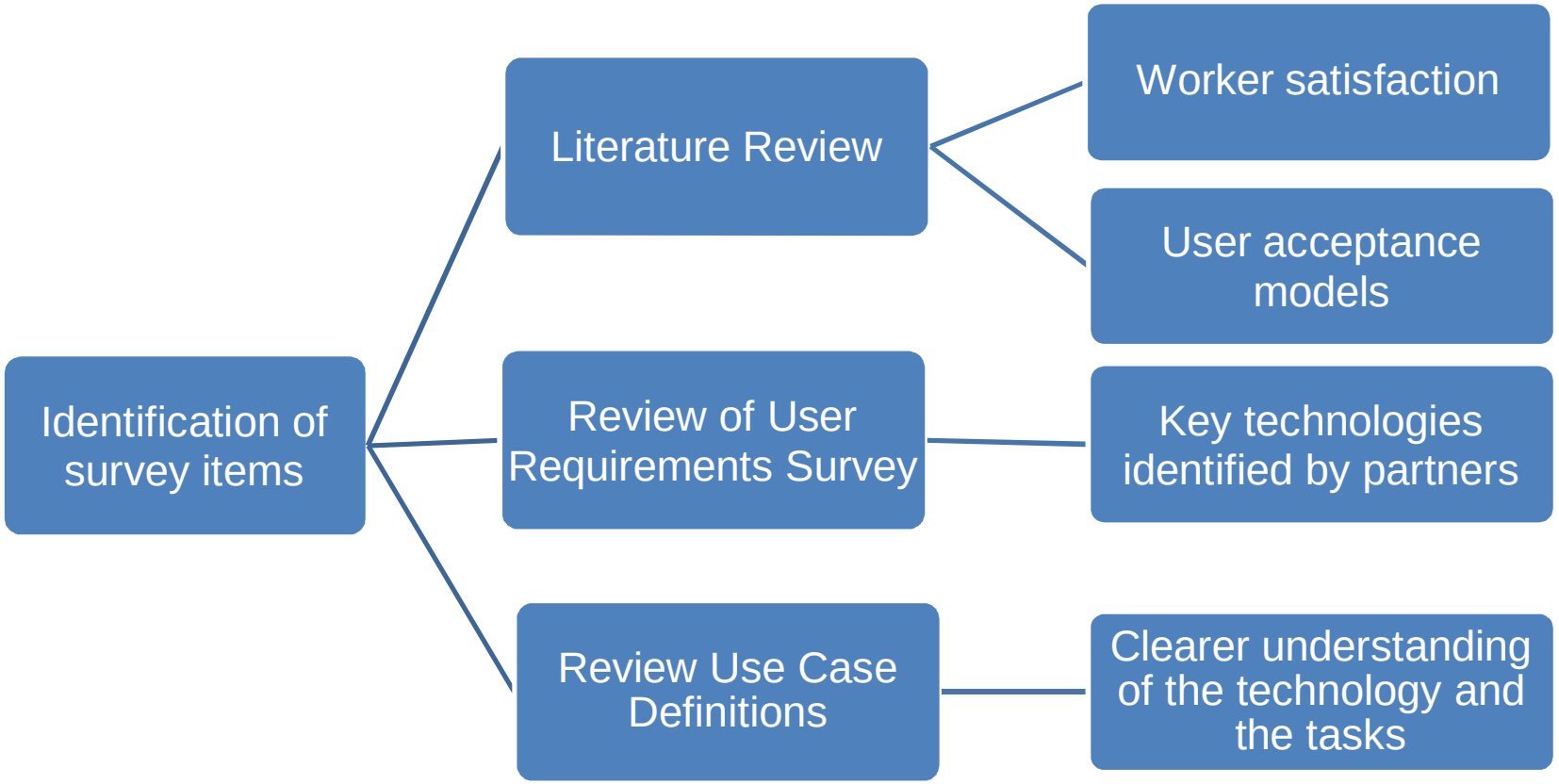
Face Reader?



Satisfaction Model and Measurement



Survey Development



USE CASE SCENARIOS: DATA COLLECTION

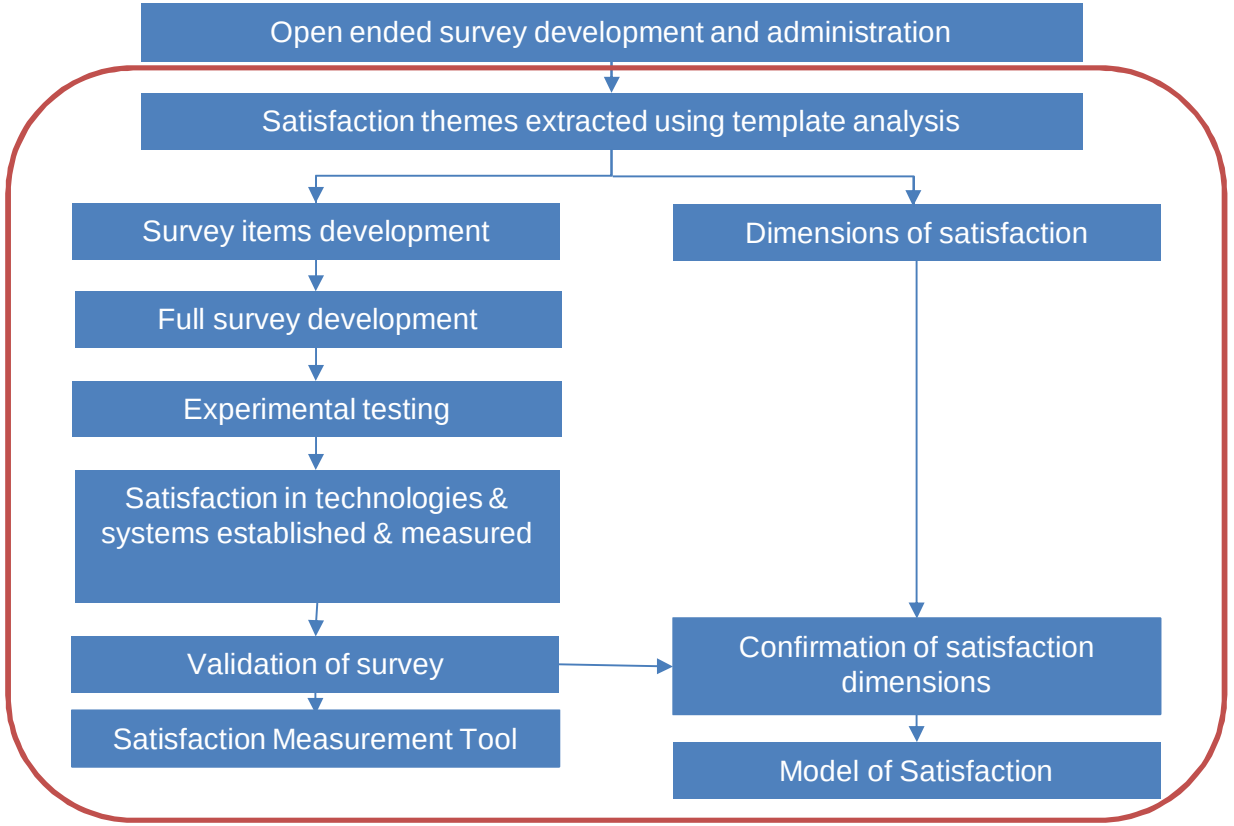
Laboratory Use Case

- TEK
  - Experimentation of As-Is Scenario
  - Open-ended survey
- RWTH
  - Experimentation of As-Is Scenario
  - Open-ended survey

Industrial Use Case

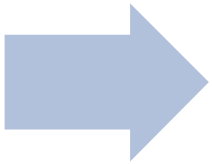
- CESA
  - Observations of As-Is Scenario
  - Observations and interviews
- AIRBUS
  - Observations of As-Is Scenario
  - Observations and interviews
  - Surveys

Next Steps


Open ended survey development and administration
Satisfaction themes extracted using template analysis
Survey items development
Full survey development
Experimental testing
Satisfaction in technologies & systems established & measured
Validation of survey
Satisfaction Measurement Tool
Dimensions of satisfaction
Confirmation of satisfaction dimensions
Model of Satisfaction

Operator completes questionnaire

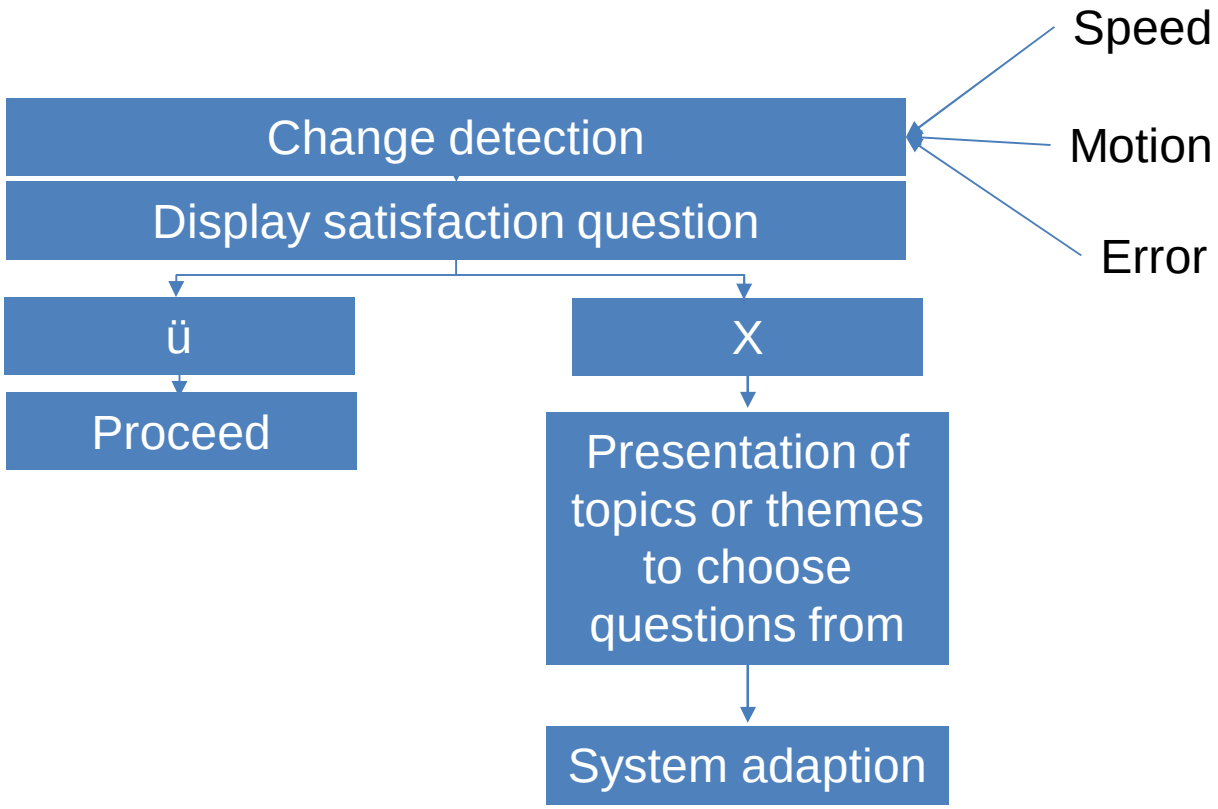
- Operational individual levels
- Task



Recurrent items

- Recurrent operational levels
- Ongoing task

Triggering Criteria



Back-up slides

Adaptive Automation in **Assembly For** BLUE collar **workers** satisfaction in **Evolvable** context

General objective

A4BLUE aims to:

1) To develop and evaluate a new generation of sustainable, adaptive workplaces dealing with evolving requirements of manufacturing processes (i.e. short & long term changes);

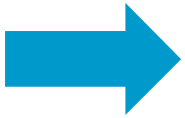
2) To introduce automation mechanisms that are suitable for flexible and efficient task execution in interaction with human workers and by optimising human variability through personalised and context aware assistance capabilities as well as advanced human-machine interfaces.

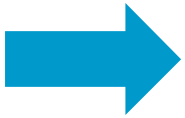
Specific objectives

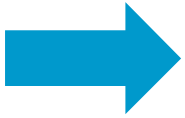
1) Adaptability: by providing an open, secure, configurable, scalable and interoperable adaptation management and assistance system (A4BLUE adaptive framework) that allows effortless integration of heterogeneous hardware and software components and is able to adjust the behaviour of workplace parts according to changes;

2) Interaction: by providing a set of safe, easy to use, intuitive and personalised and context aware multimodal human-automation interaction mechanisms ;

3) Sustainability: by providing methods and tools to determine the optimal degree of automation of the new assembly processes that combine and balance social and economic criteria to maximize long term worker satisfaction and overol performance.





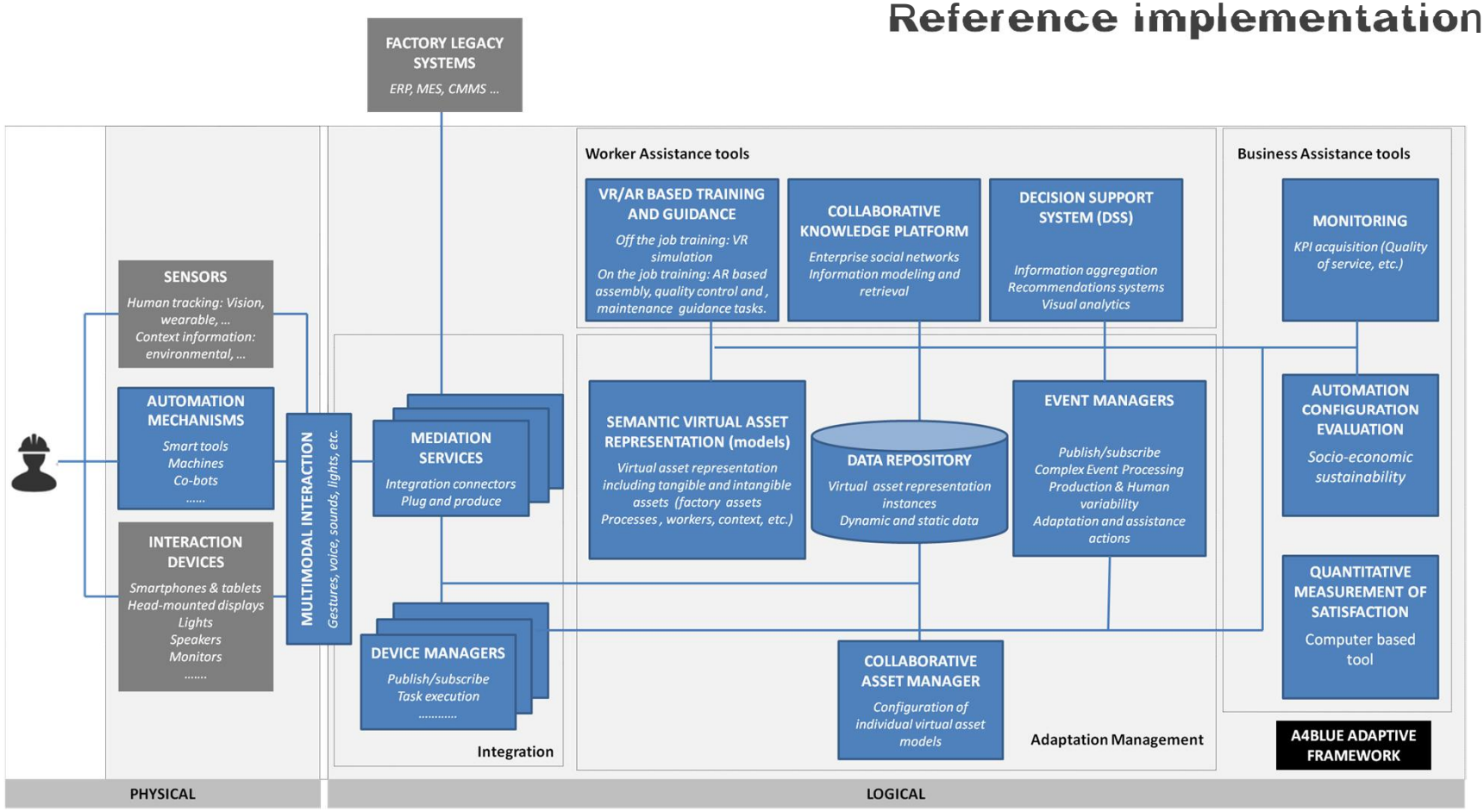


- New or enhanced automation mechanisms
- Plug & Produce Capabilities
- A4BLUE adaptive framework including assistance tools

- Multichannel interaction mechanisms including AR

- Method & Tool for the definition of the optima degree of automation
- Method & Tool for assessment of worker satisfaction
- Usability methodology
- Assessment framework

Reference implementation



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THANK YOU