HuMan
HUman MANufacturing Workplace

Human-Centred Manufacturing

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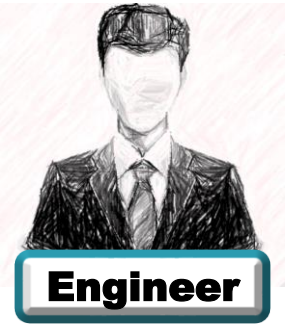
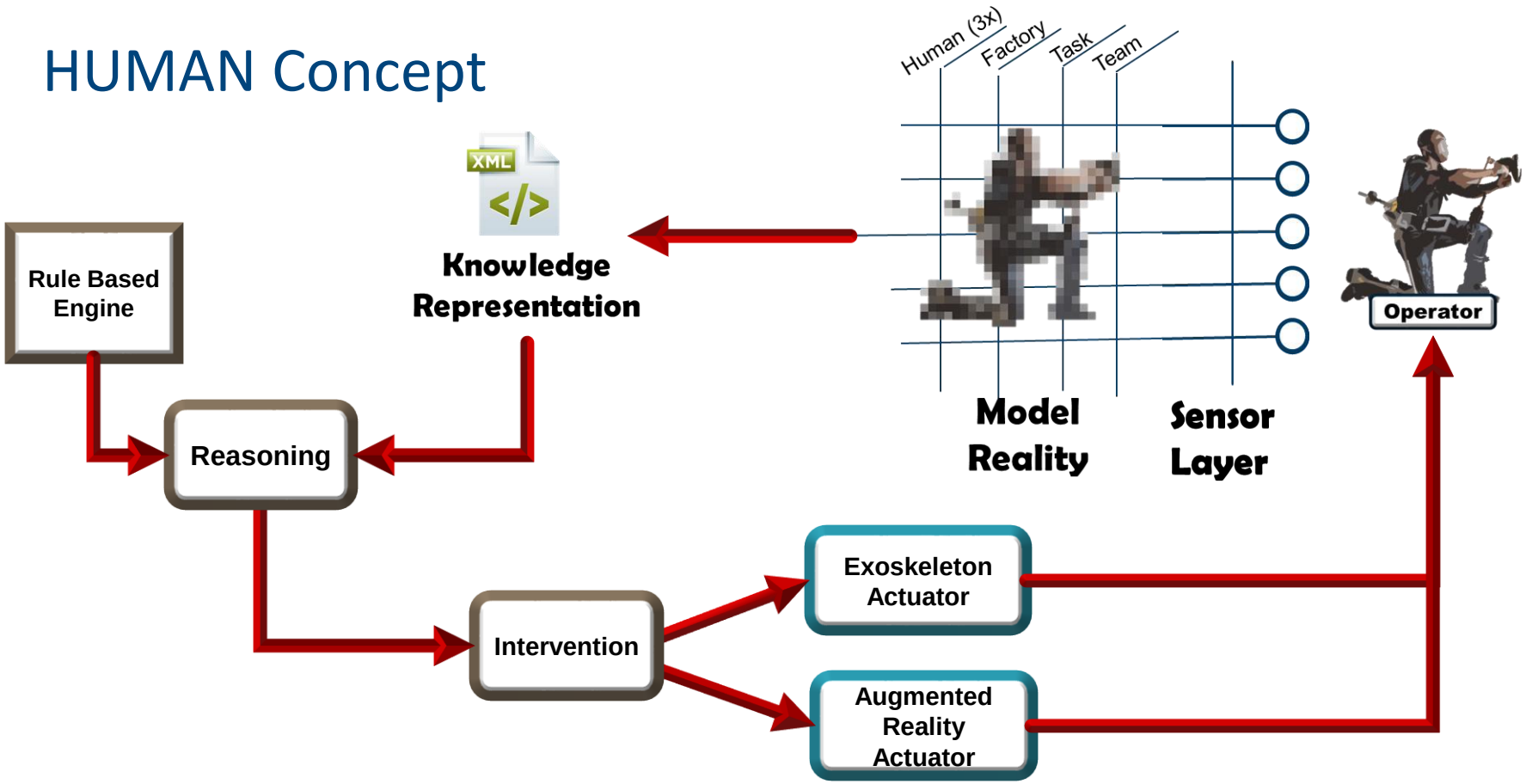
HUMAN Objectives in a Nutshell

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



HUMAN Concept



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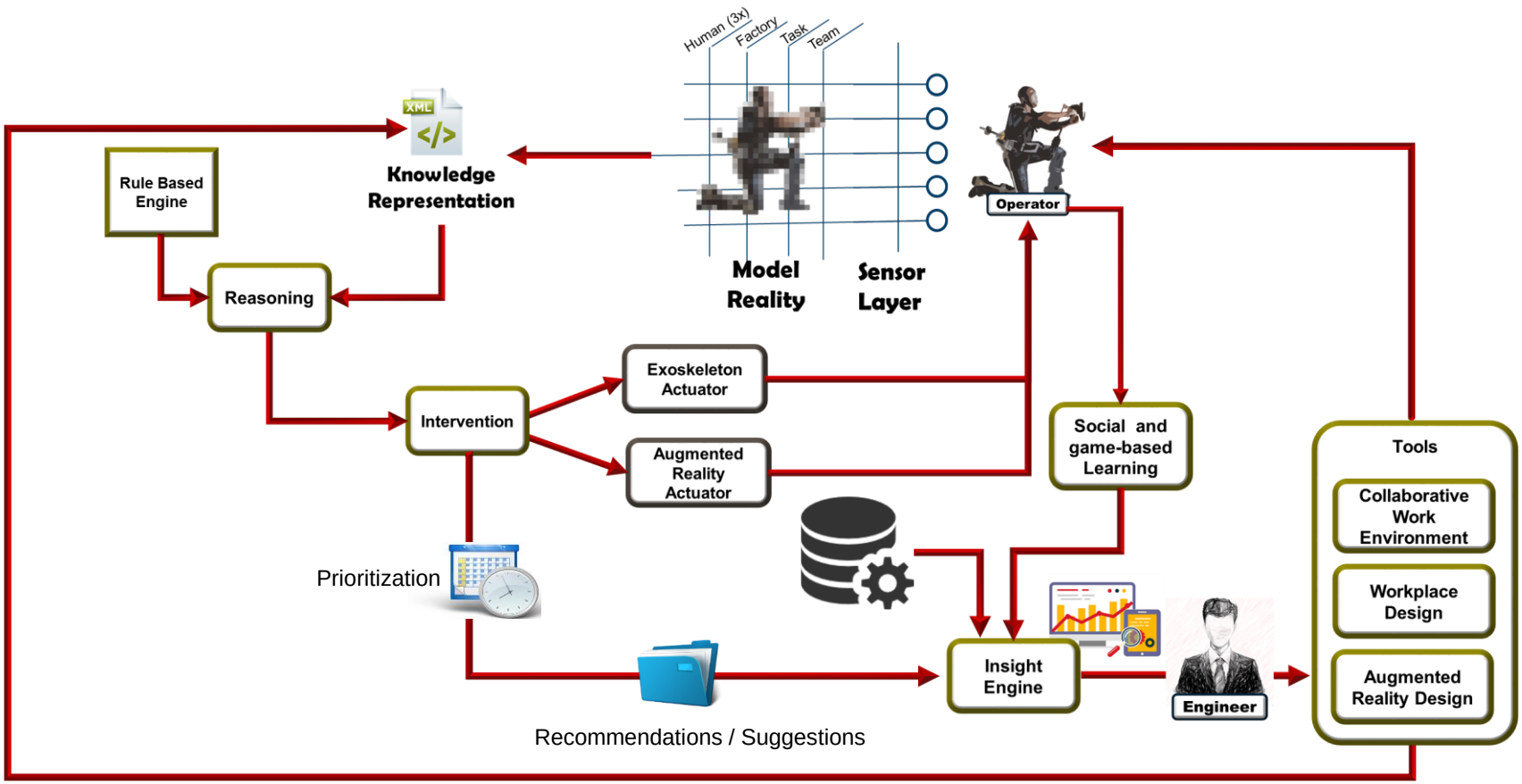

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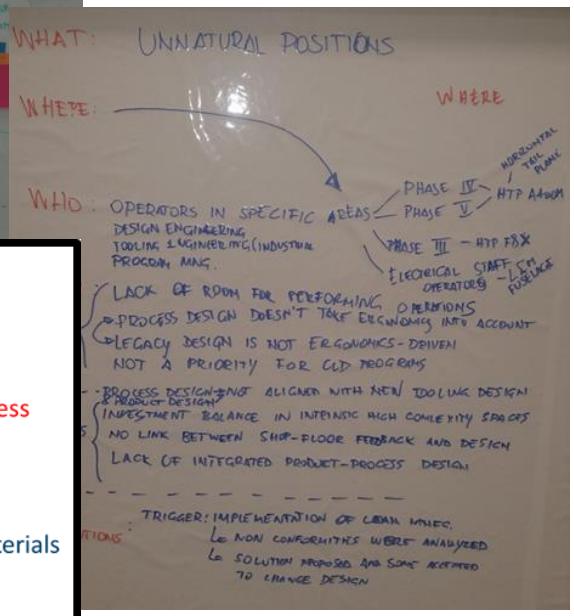
Co-creation Process



User case workshops 1

- AIRBUS Use Case Workshop
- COMAU Use Case Workshop
- ROYO Use Case Workshop

→ **Needs, Scenarios and Interviews**

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**.

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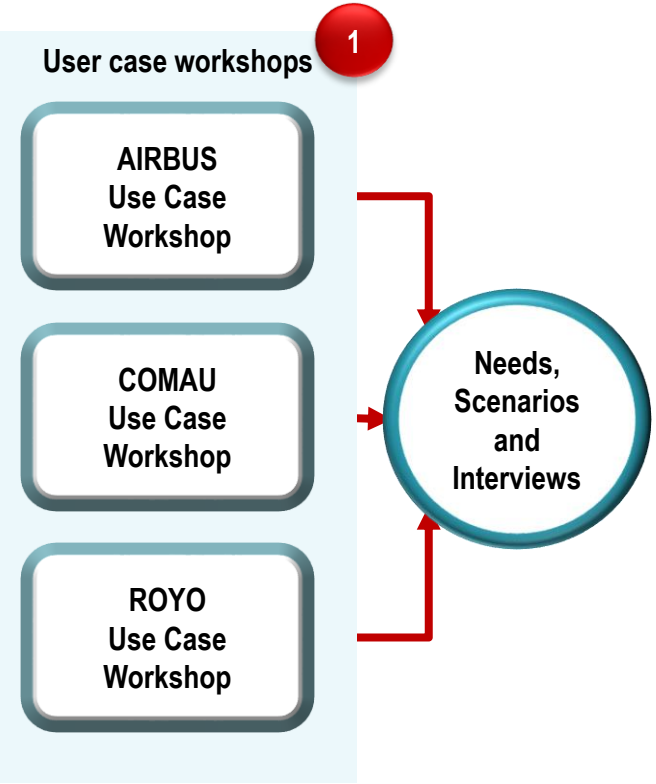

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BACKGROUND	- 12 years in company - Has had several roles within the company - Works in HDP 400 (horizontal part of the airplane)

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	- Collaborative tasks involve lifting heavy components

PHYSICAL WORKLOAD	- Inconvenient component handling
	  - Convergence of two problems: heavy components and reduced manoeuvre space
	  - Machinery helps with some of the weight lifting but is

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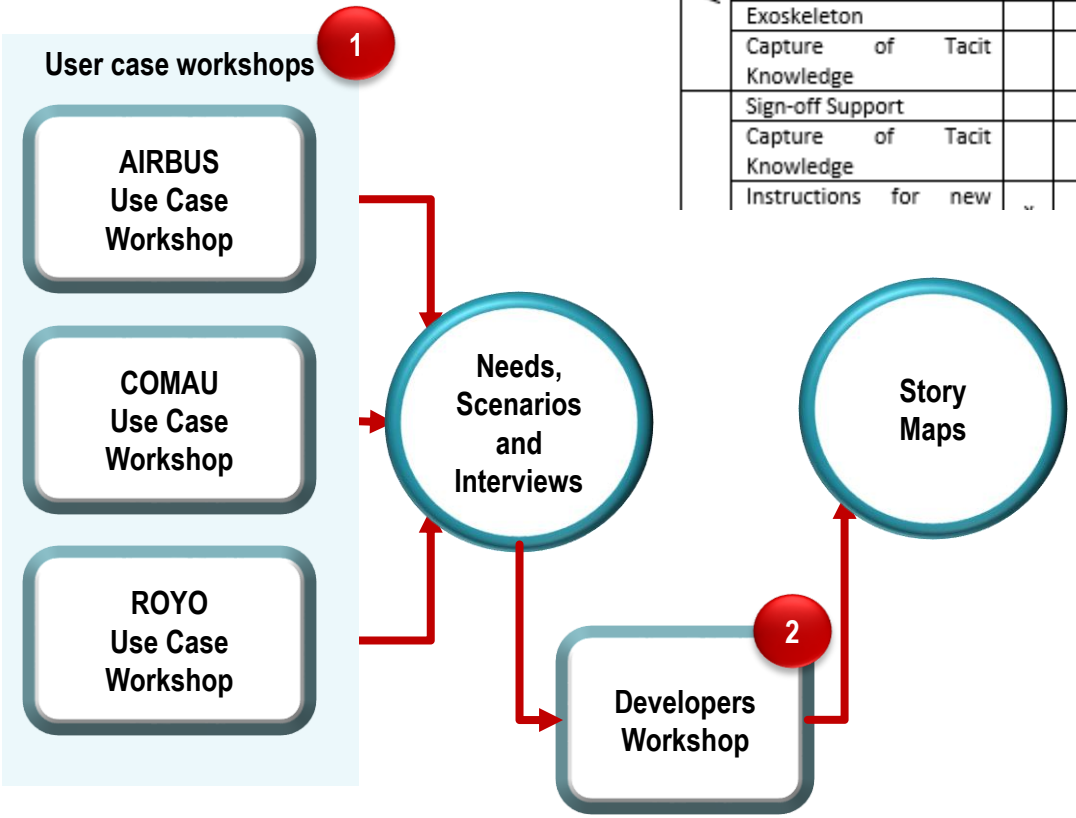
Co-creation Process

Company	Scenario	Job Complexity	Step-by-step Process	Organization Knowledge	Tacit Knowledge Capture	Gamification	Information overlay	Recommendation	Cognitive Intervention	Visual Enhancement	Spoken Command Recognition	Exoskeleton	Workplace optimisation
Airbus	Refreshing old jobs	x	x	x		-	x						
	Line Balancing		x				x						
	Support to Repetitive Tasks			x				x	x				
	Small Parts								x	x	x		
	Exoskeleton											x	
	Capture of Tacit Knowledge			x	x		x						
	Sign-off Support			x	x			x					
	Capture of Tacit Knowledge			x	x		x						
	Instructions for new	x	x				x						



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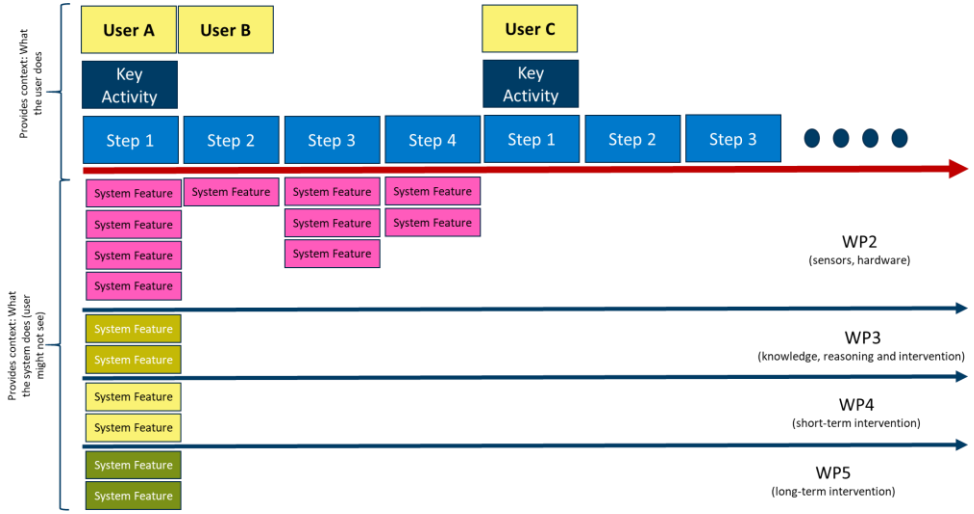

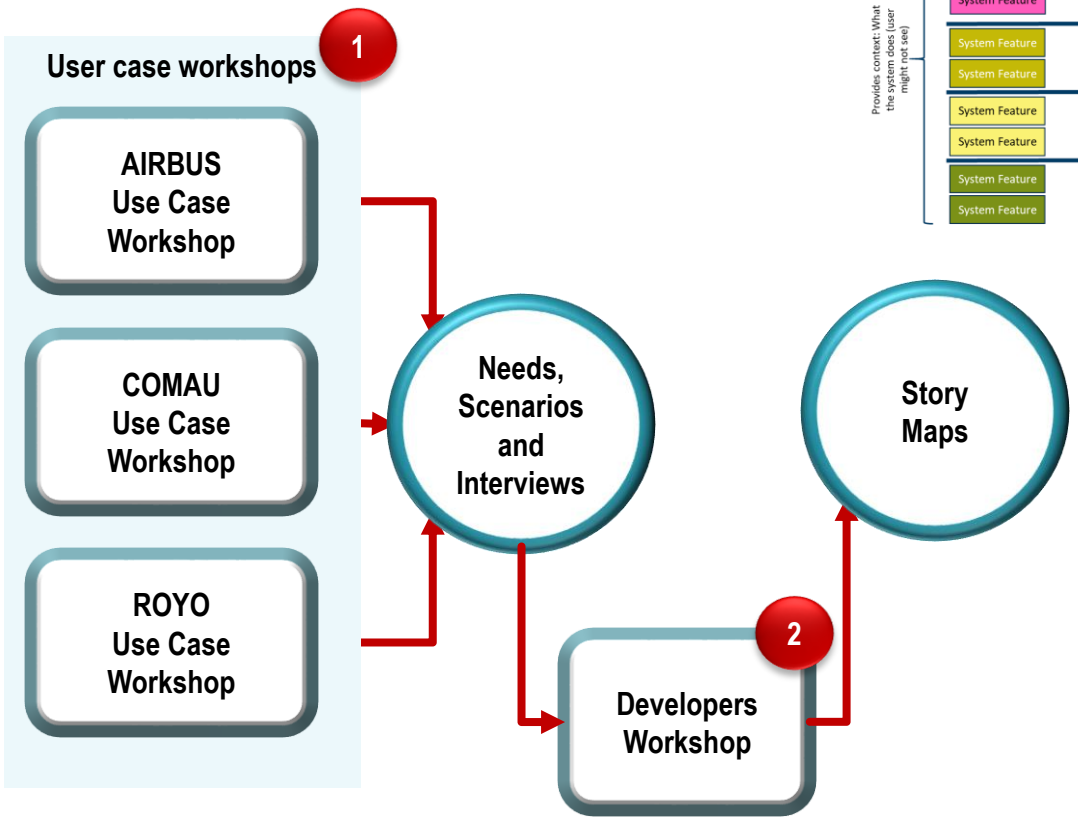

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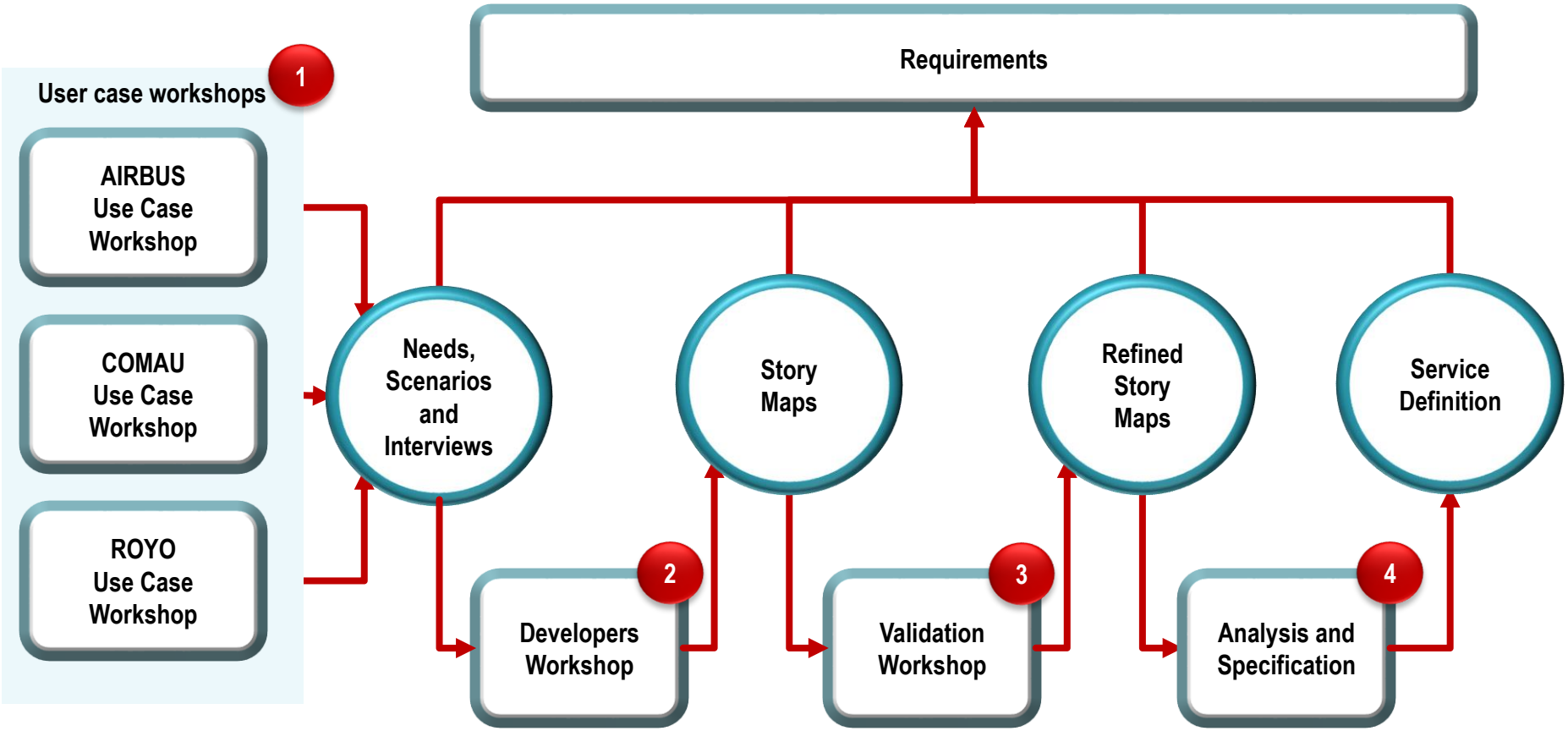

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Services

- 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