



Université

de Strasbourg



INNOVATIVE USER EXPERIENCE APPROACH FOR THE DESIGN OF A MULTI-SIDED PLATFORM

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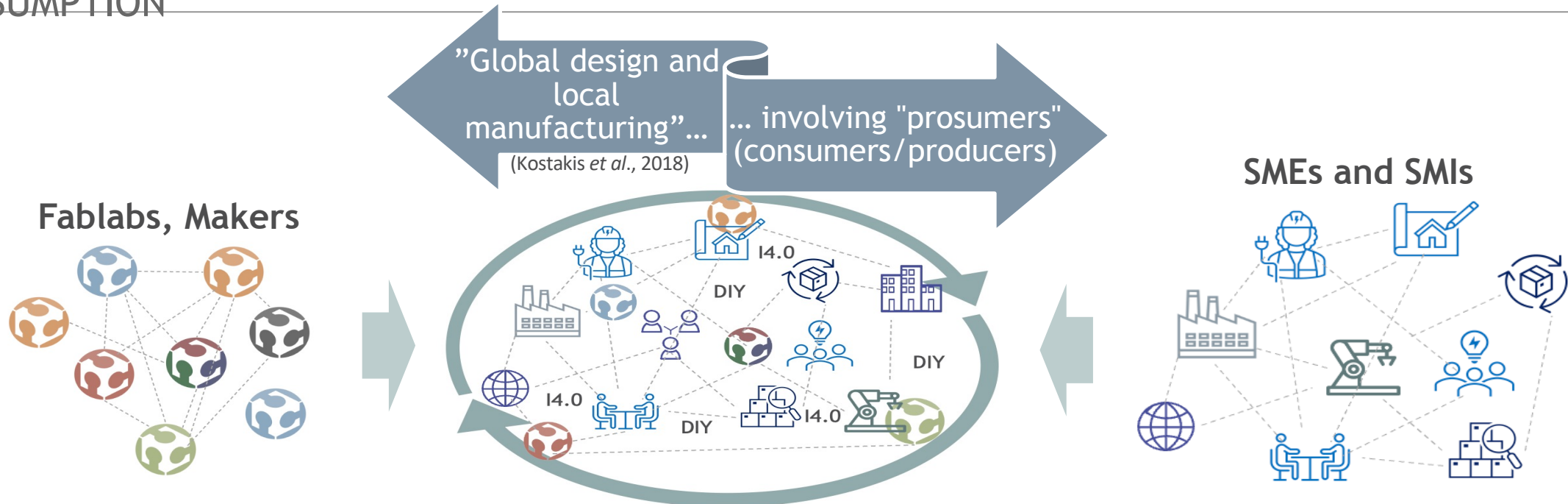
open INnovation Ecosystems for Do It Together process

1



1. CONTEXT

1.1. EU CHALLENGE: DESIGN SUSTAINABLE HYBRID MODES OF INNOVATION, PRODUCTION AND CONSUMPTION



The ambition is to develop small-scale production at local sites supported by Do-It-Together approach



4 Open Manufacturing Demonstration Facilities (OMDFs)
And a multi-sided platform

Involving: SMEs, Large Companies, Technology centres, Universities

Design a TRL6 demonstrator for EU

Make it replicable at 3 levels:

- Technological
- Organizational
- Ecosystem

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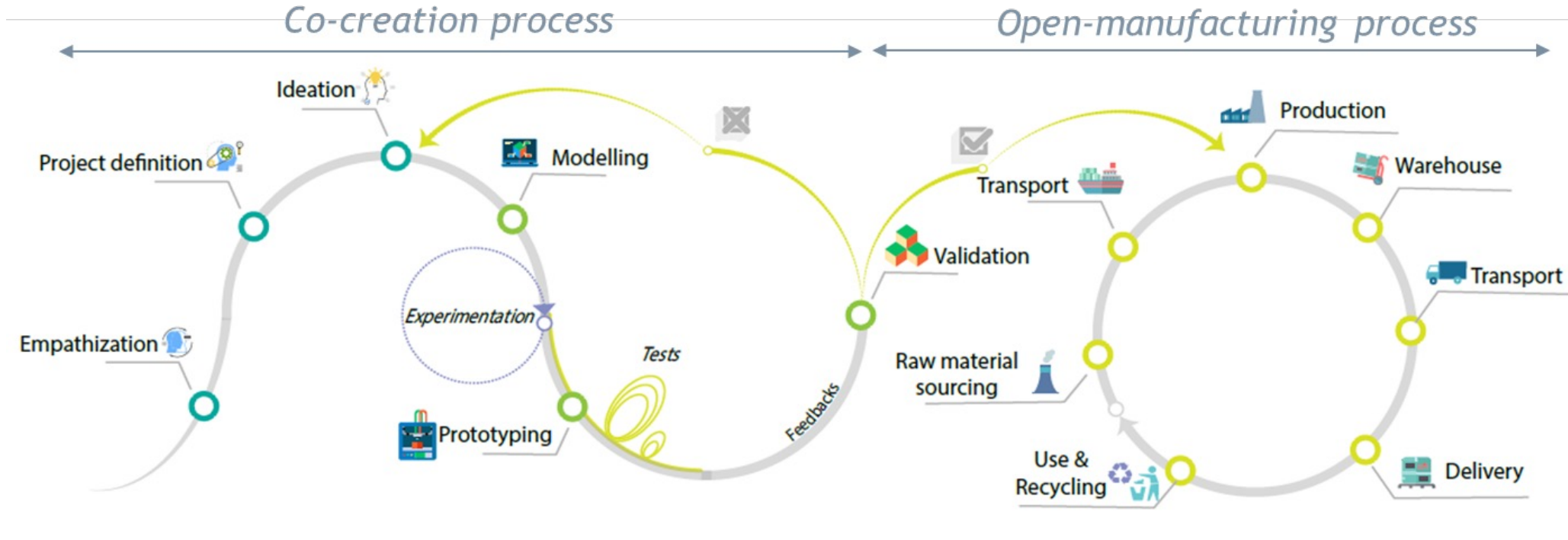


1. CONTEXT

1.2. SIMPLIFIED REPRESENTATION OF THE DO IT TOGETHER APPROACH



the co-creation and the open-manufacturing processes



MARCHE Brunelle, KASMI Fedoua, MAYER Frédérique *et al.*, « Implementing Do-It-Together: The Cross-fertilization of Do-It-Yourself and Open Manufacturing », *Journal of Innovation Economics & Management*, 2022/0 (Prepublication), DOI : 10.3917/jie.pr1.0122. URL : <https://www.cairn.info/revue-journal-of-innovation-economics-2022-0-page-1.htm>

**Different steps / time / places to involve stakeholders
& a multi-scale process cognitive / product / Ecosystem**

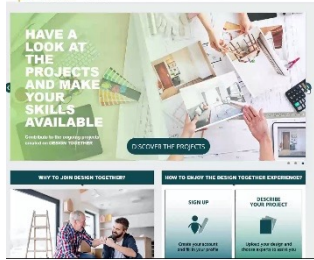


1. CONTEXT

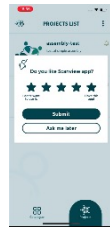
1.3. OVERVIEW OF THE MULTI-SIDED PLATFORM



Technological ecosystem to support co-creation



Website
Project management interface



Mobile app
Project monitoring and references

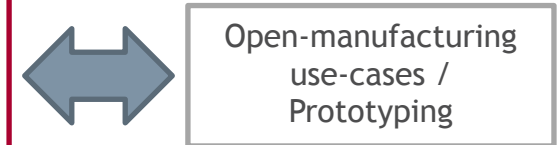


XR app
Creativity and Design

Backend

ERP
Connection between designs and manufacturing

SDO
Environmental Impact Assessment from designs

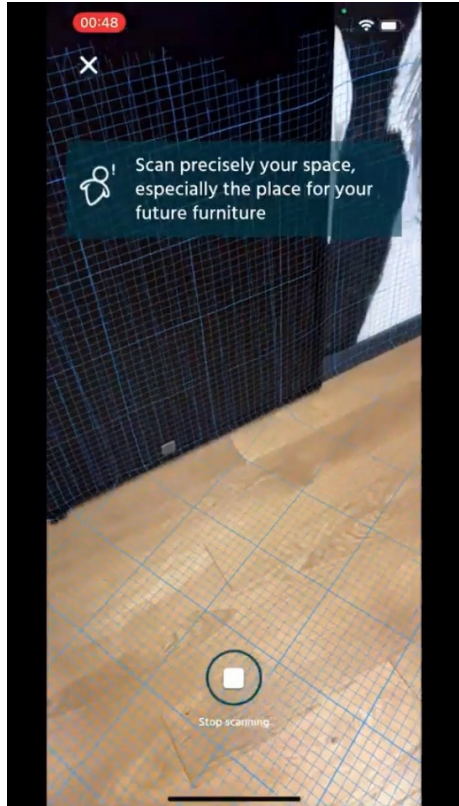


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1. CONTEXT

1.4.1. AFTER 3 YEARS OF DEVELOPMENT - THE SCAN VIEW MOBILE APP



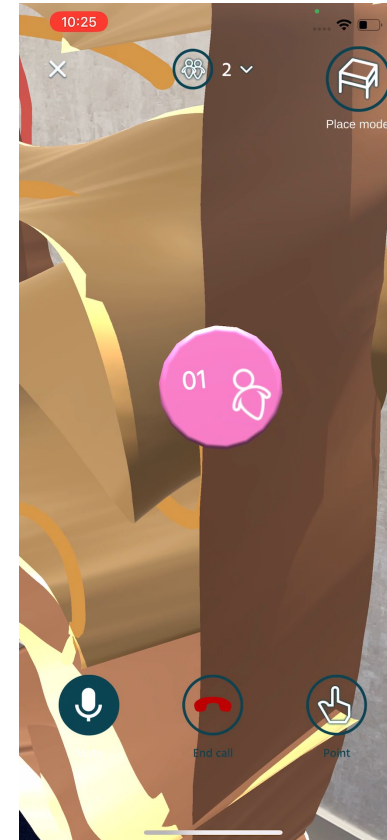
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2.



3.



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5

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 869952



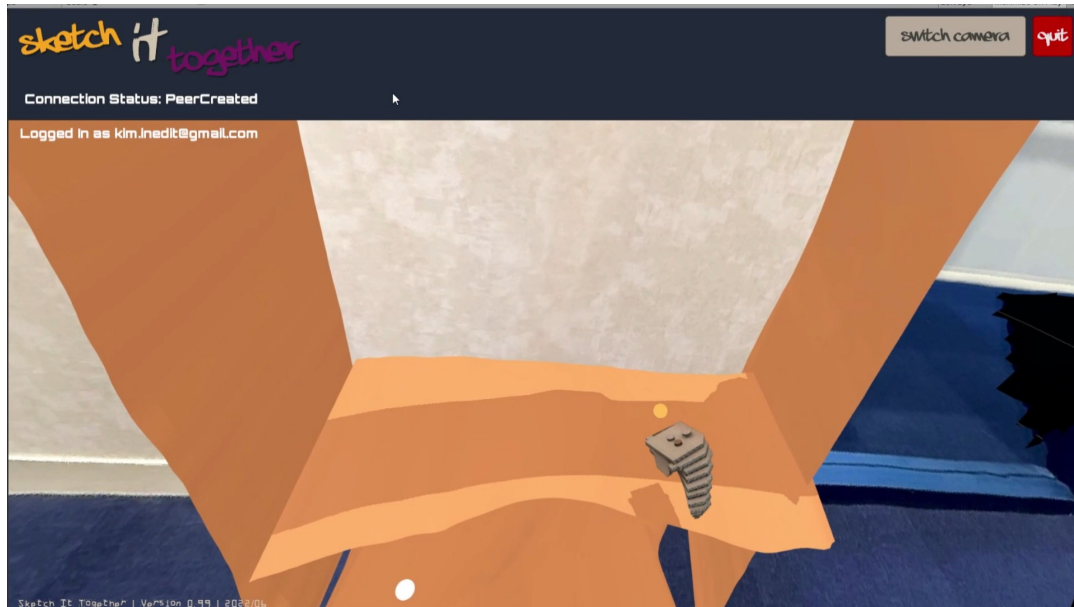
1. CONTEXT

1.4.2. AFTER 3 YEARS OF DEVELOPMENT - CREATIVITY AND DESIGN IN XR



Functions :

- Load projects
- Import and edit scans
- Create sketches with immersive drawings
- Take pictures
- Export sketches to projects on the platform
- Create live immersive sketching meetings



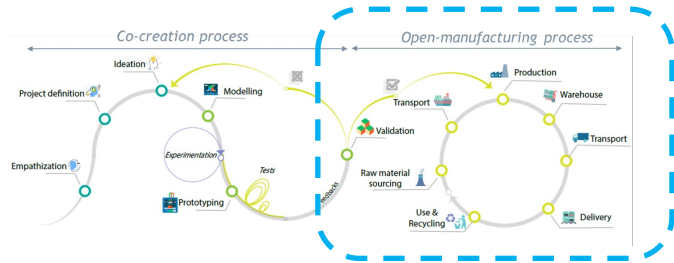
Functions :

- Load projects and import associated data
- Create designs (wood panels or additive manufacturing)
- Create assembly guides in immersive space
- Export generated data to the project on the platform



1. CONTEXT

1.5 OPEN-MANUFACTURING DEMONSTRATION FACILITIES (OMDF)



Italy
Switzerland

FLEXIBLE WOOD
WORK CENTERS

RECYCLED
PLASTIC 3D
PRINTING

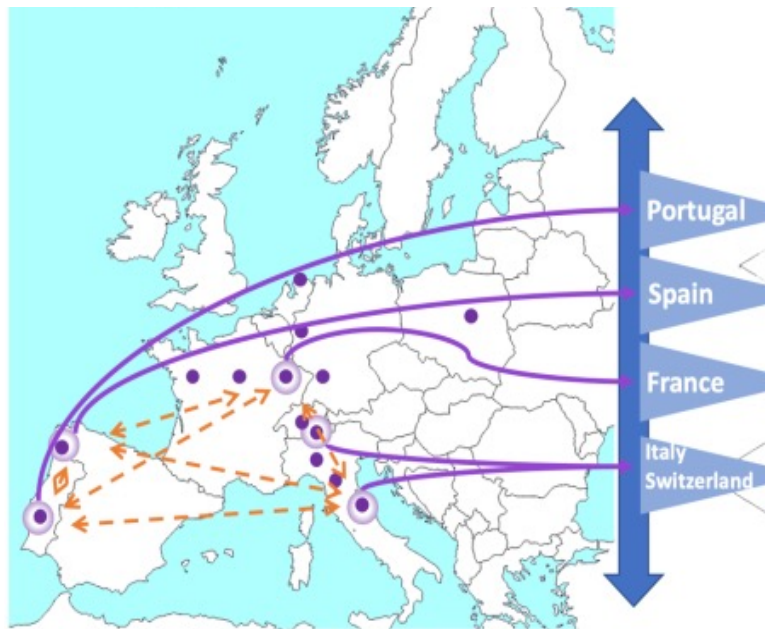
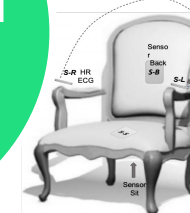
France

Spain

3D PRINTING
OF WOOD

SMARTIFICATION
OF FURNITURE

Portugal

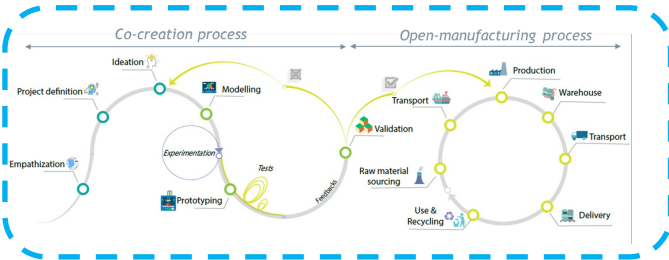


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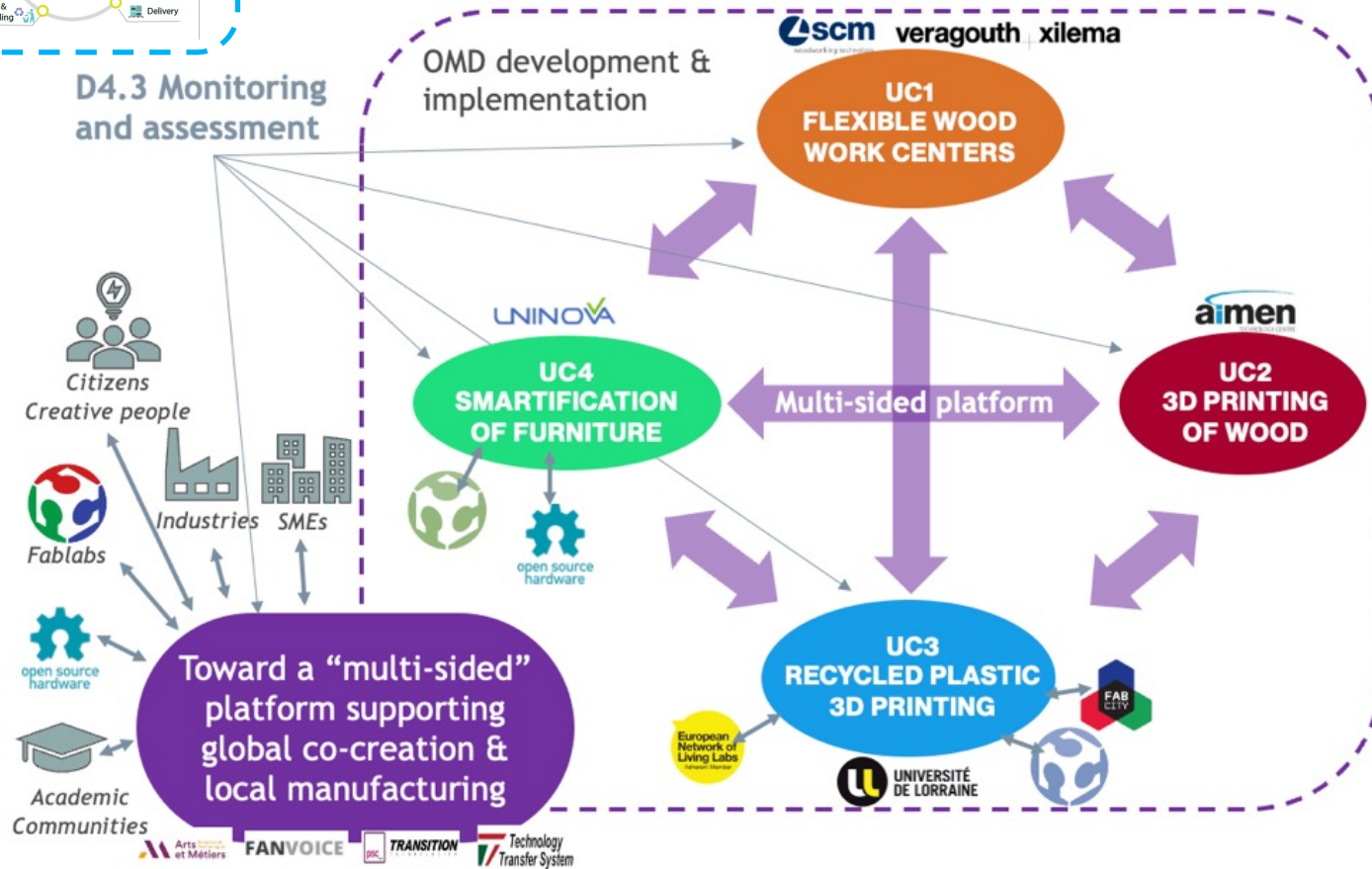


1. CONTEXT

1.6. MAKE & KEEP OUR DEMONSTRATOR ALIVE: CREATE LINKS



D4.3 Monitoring and assessment



OMD in its environment managed by the consortium

- Business Model
- SDO
- Transfer & Open communities
- Valorisation
- Collaboration
- Monitoring / UX testing



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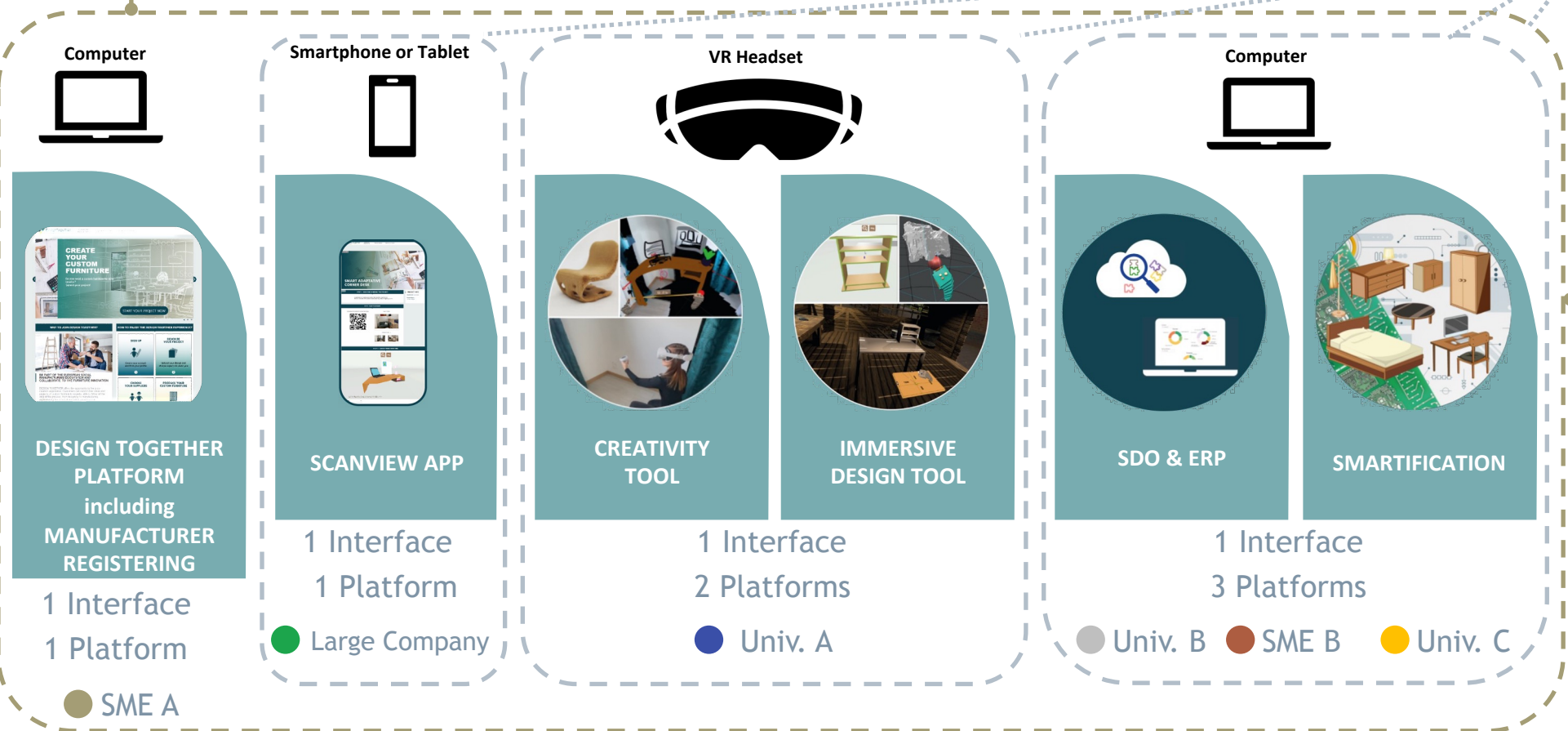


1. CONTEXT

1.7. THE INEDIT MULTI-SIDED PLATFORM: MULTIMODAL INTERFACES AND MULTI-PLATFORM



(a) One process of co-creation supported by multimodal interfaces and multi-platform



Three different users:
 - Project owners (POs)
 - Designers
 - Manufacturers
 With different needs, level of expertise, and uses

Designed and developed by 3 Universities, 2 SMEs, 1 Large Company for an EU project (consortium of 14 partners)
 Must be connected to the open-manufacturing stage of the DIT process (four physical demonstrators: *the manufacturers*)

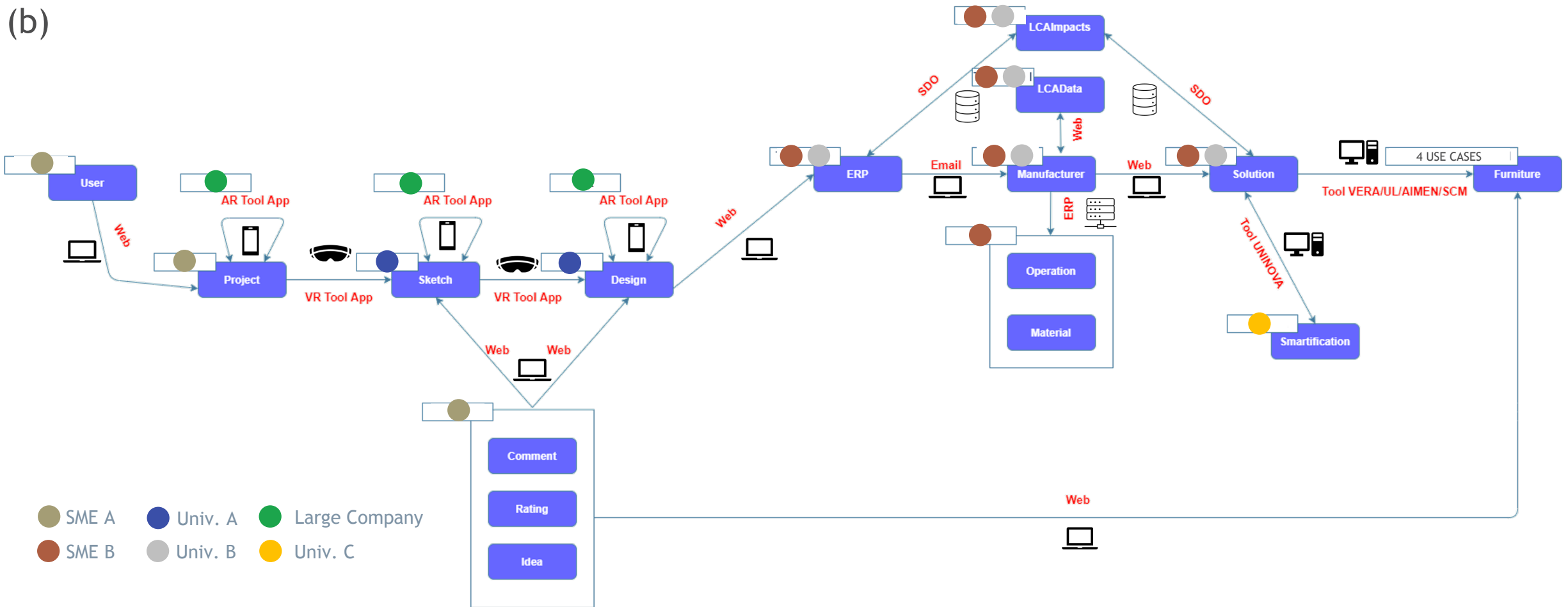


1. CONTEXT

1.7. WORKFLOW OF THE DESIGN TOGETHER PLATFORM



(b)



2. PREVIOUS WORKS

2.1. STATE OF THE ART

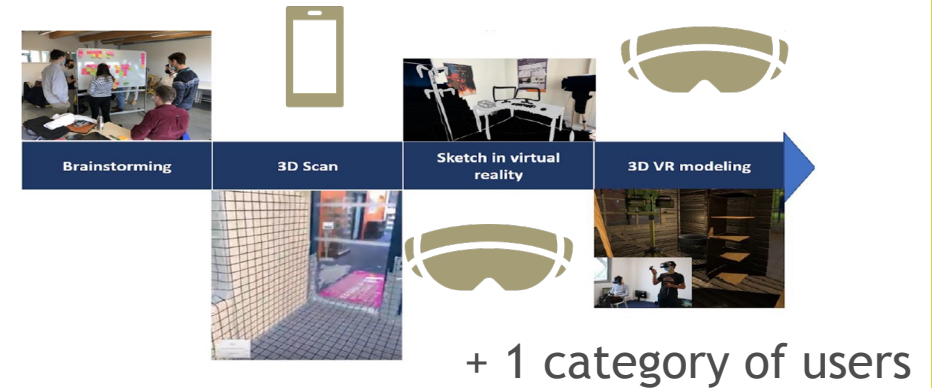
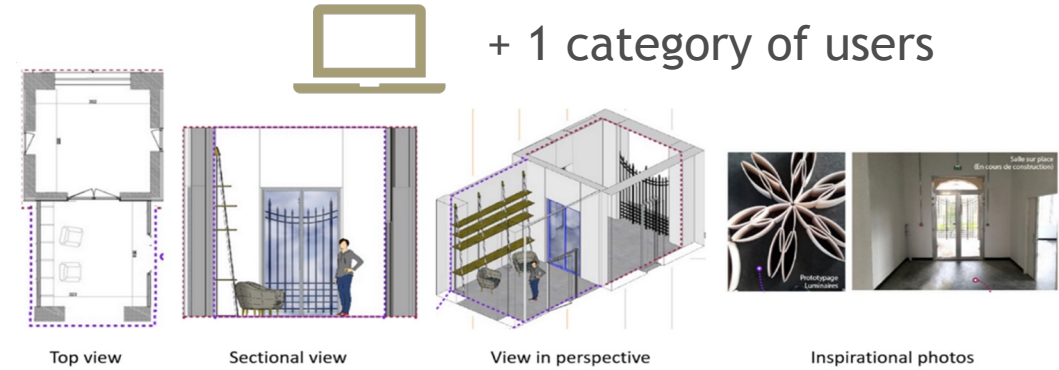


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- Fleury, S., Dupont L., Chaniaud N., Tamazart S., Poussard B., Gorisse G., Richir S. "An investigation of design in virtual reality across the variation of training degree and visual realism" in 2022 IEEE ICE/ITMC & 31st IAMOT Joint Conference, 19-23 June, Nancy, France, pp. 1-7.

- multiple tools are available to evaluate UX but applied independently to individual technologies

- Link between UX and interconnectivity or interoperability between platforms (Trendowicz, et al. 2023), a holistic model of UX (Pallot & Pawar 2012)



No method for understanding UX in an advanced development situation where the desired UX is at the intersection of different technologies, platforms and interfaces



2.2. OBJECTIVES AND RESEARCH QUESTIONS



We seek to evaluate the UX in a demonstrator project at TRL6 level to support the development of a co-creation process connected to an open manufacturing process (DIT concept).

- RQ1: Should each technology (platforms or interfaces) be measured individually or only the overall experience?
- RQ2: How does the measurement of technology usability feed into the overall analysis?
- RQ3: How can an agile process be deployed in such a distributed team so that developers can benefit from the results as quickly as possible?
- RQ4: What can we learn from designing a user experience based on multimodal interfaces and digital multi-platform?



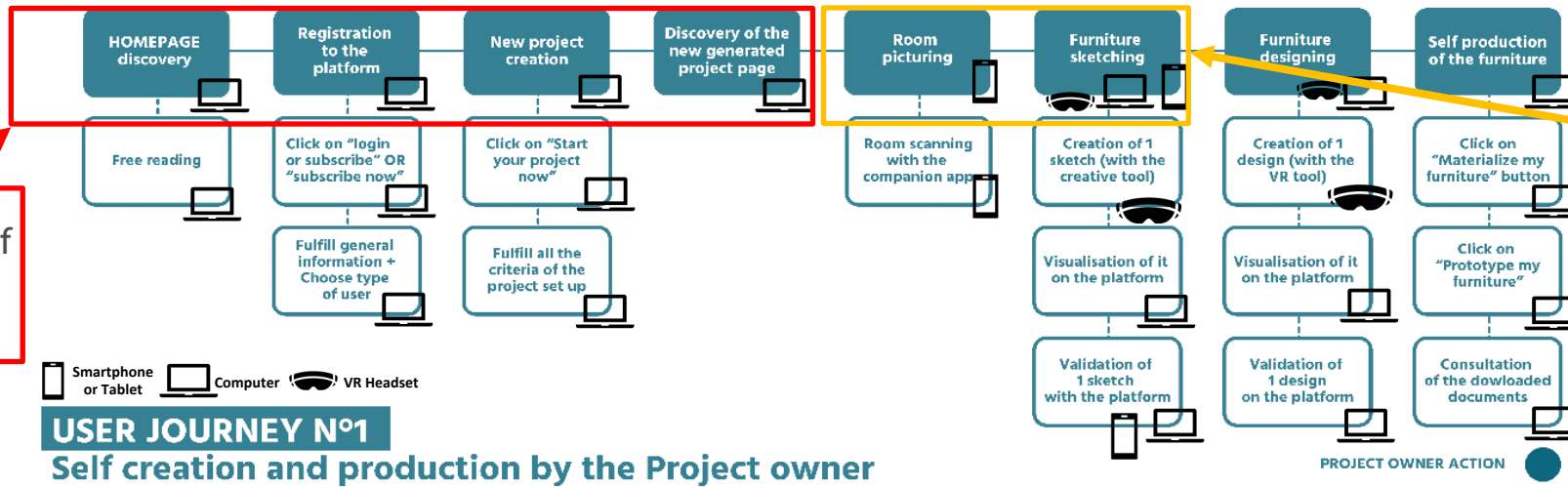
3. METHOD

3.1. FOCUS ON USER JOURNEY 1 - PROJECT OWNER (CUSTOMER)



<https://uat.designtogether.eu/>

- (c)
- 1 Does the user simply understand the context and the concept ?
 - 2 Does the user meets some difficulties during the registration phase ?
 - 3 Does the users is satisfied with the proposed criteria ?
Are there gaps in the way of qualifying one's need?
 - 4 Does the founded information is clear ?
Does the user understand what he has to do without external help ?
 - 5 Does the user succeed to download and connect easily to the companion app ?
 - 6 Does the users succeed to easily vizualise his sketched creation(s) on the platform and validate it ?
 - 7 Does the users succeed to easily vizualise his designed creation(s) on the platform and validate it ?
 - 8 Does the users is satisfied with the downloaded documents ?
Does it need more explainability on them?



- Attrackdiff
- Activity sheet

- Technology experience questionnaire

Global Satisfaction Questionnaire



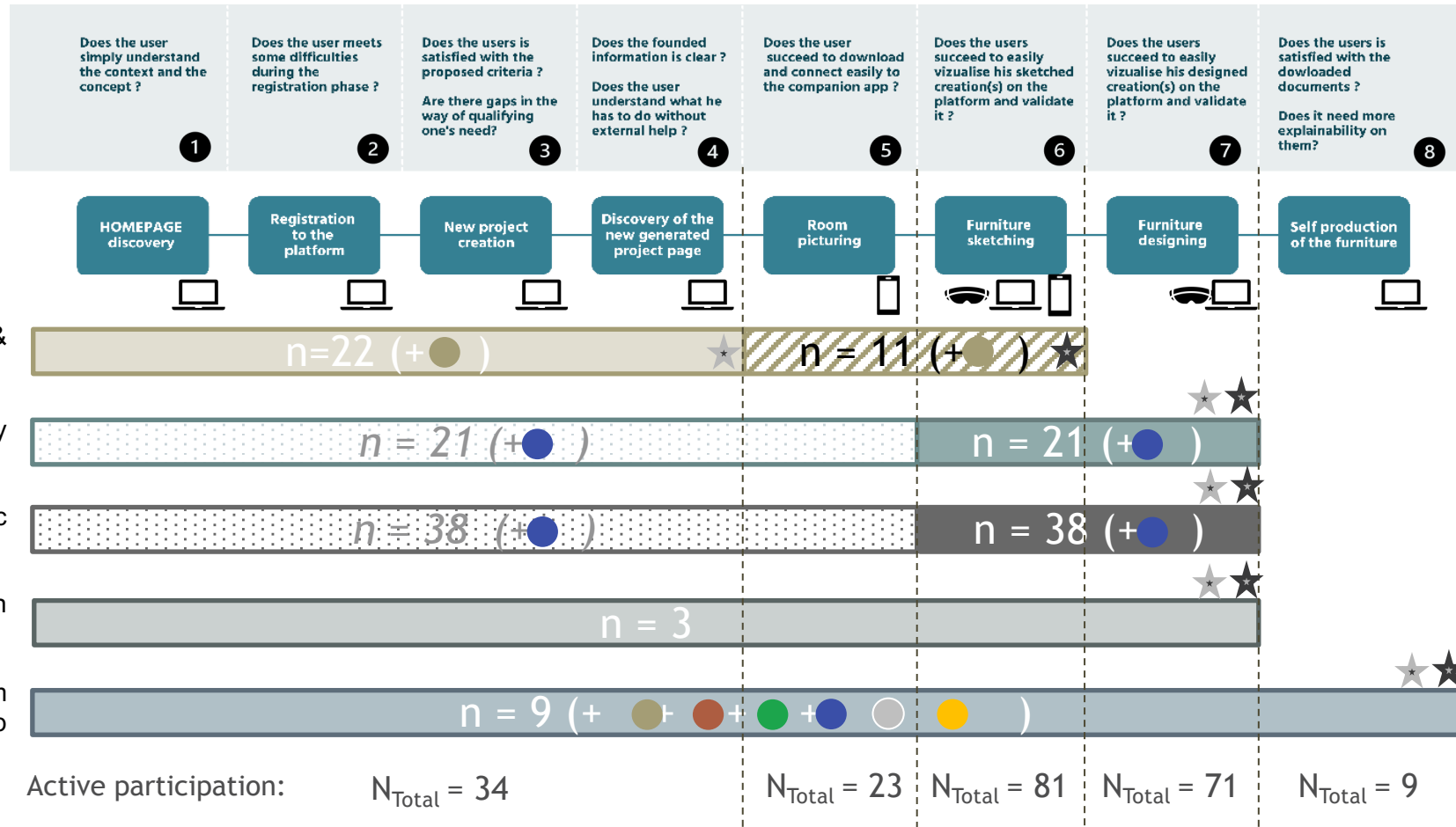
3. METHOD

3.2.1. FIVE PANEL USING THE TECH IN PROGRESS FROM OCT. 2022 TO FEB. 2023



Distribution of users by step and technology

- Panel #1: M2 students in Design & Innovation (Nov 2022)
- Panel #2: Students in Virtual Reality (Dec 2022)
- Panel #3: Engineering Students (Dec 2022 – Jan 2023)
- Panel #4: Professional Designers (Jan 2023)
- Panel #5: Users + Manufacturers from INEDIT + Professional designers (Feb 2023)



- Partial number of total participants
- Demonstration by the animator

- AttrakDiff test
- Technology experience questionnaire

- SME A
- SME B
- Univ. A
- Univ. B
- Large Company
- Univ. C

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3. METHOD

3.2.3 PANELS #1, #3, #5 TESTING THE DESIGN TOGETHER PLATFORM



n=22



N=42



N=9



LF2L, Nancy, Fr.



LVL, Laval, Fr.

University of Applied Sciences and Arts of Southern Switzerland

SUPSI
SUPSI, Lugano, CHE



4. FINDINGS

4.1. DIRECT FEEDBACK FOR DEVELOPERS



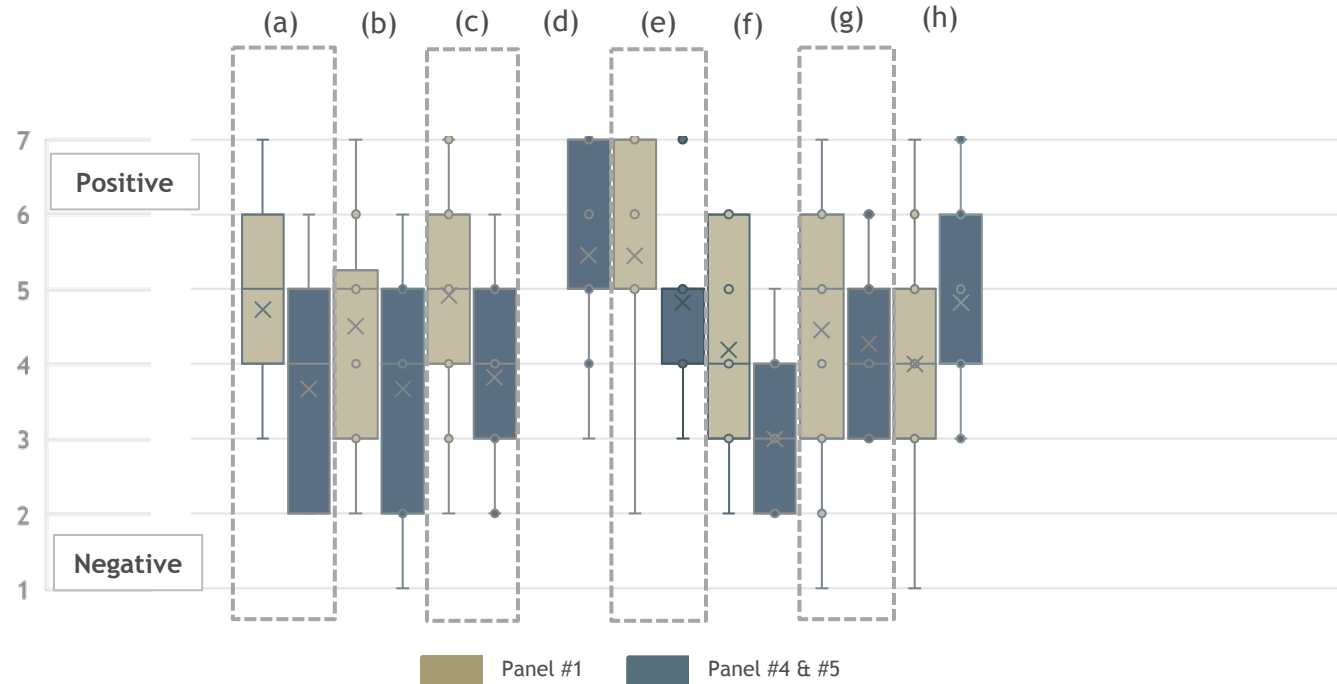
Table entry	Description
Topics	Aggregation proposed by the developer
Points of improvement	Description of the problem raised by users
Motivation / explanation	Expected contribution to the platform and/or technological brick (VR app of Web App)
Actions (to be) done +explanation	Implementation methods carried out or planned
Status (5 options)	Solved
	Intermediate solution
	Modifiable according to the resources of the EU project
	Not modifiable due to the initial choice
	Ideas for future developments

Topic	Points of improvement	Motivation / explanation	Actions (to be) done / explanation	Status
General (Focus group and most participants)	Add sub-tabs on the home page	To "air" the home page which contains too much information	The structure of the platform does not allow it: a platform standard - generic	
	Add a tab for partners	To make INEDIT partners visible	A tab will be added on the website	
	Adapting to users' profiles	To allow users to quickly identify the projects that concern them,	A new tab "my page" was created https://uat.designtogether.eu/en/specific_consumer	
	propose a tutorial: how does this website work?	to be designed when the platform is stabilized	At this stage it is premature, except for the PO, it could have been a plus for the Manufacturers and Designers it is necessary to finalize the developments NB: a video explanation was presented in Lugano and benefited panel #5	
Create an account & complete profile (15)	Account creation	The "next" button is not immediately clickable (waiting for a confirmation email)	This is due to the time of verification of the email address, automatic processing that takes some milliseconds, Warn the user in the tutorial	
	Add a "give your opinion" section	To solicit users of the site to comment on the creation of a project and collect advice	There is already an intermediate solution via the comment block, the announcement message will be modified	
	Add options on the profile page (family situation, gender, housing etc.)	To have more choices in the description and to be better accompanied afterwards	These elements will be added according to the resources available by the end of the project (other developments related to the "back" are a priority)	
Create a project	Modify the button to create a project	The button is on a scrolling image, so it is not always available	It has been deployed on the site after the technical meeting in Lugano (and the passage of panel #5)	



4. FINDINGS

4.2. EASE OF USE AND SATISFACTION WITH THE PLATFORM OVER TIME

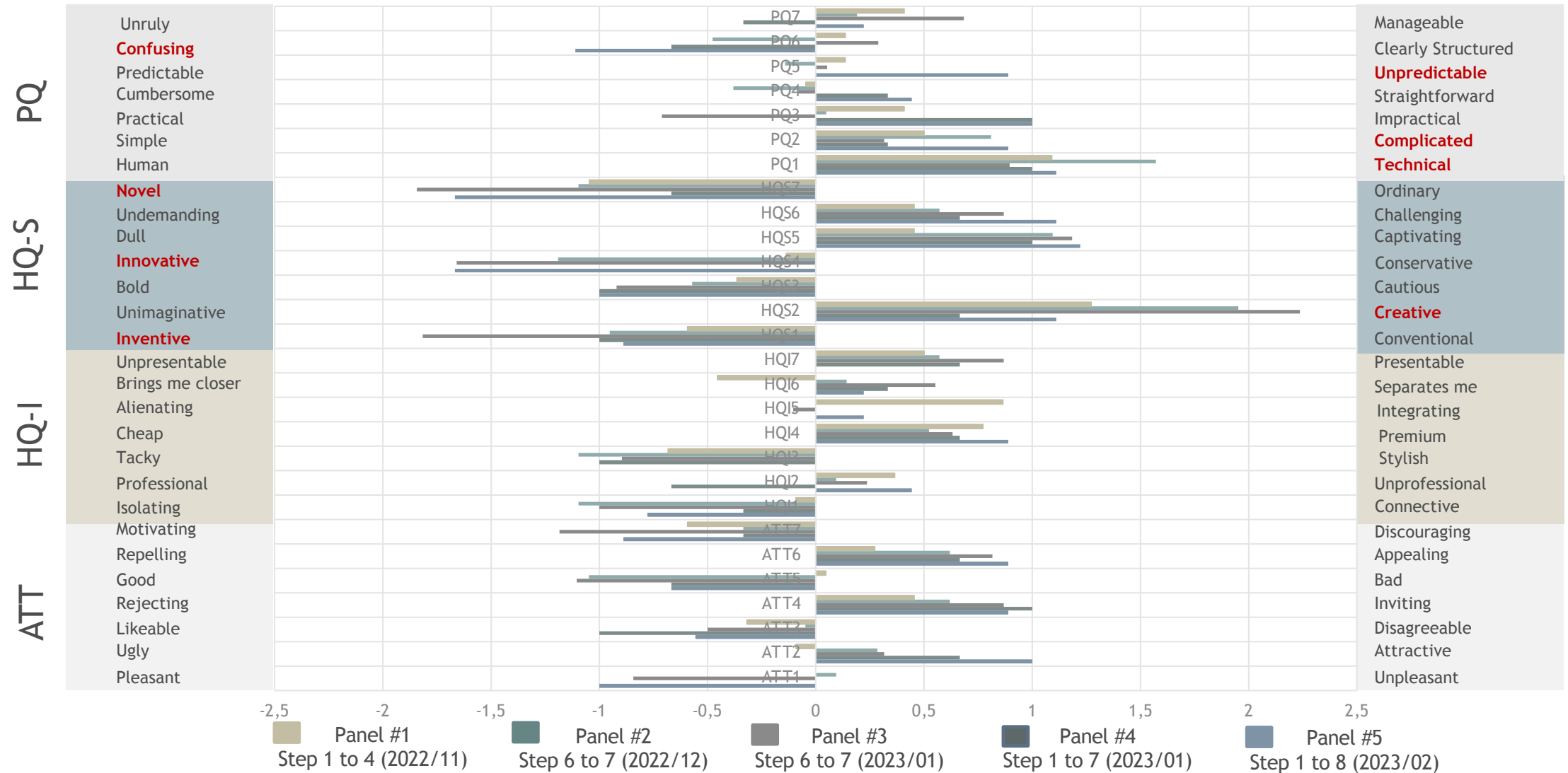


(a) easy of use (AR app) (b) scanner satisfaction (c) easy of use VR app (sketch) (d) VR app (design) satisfaction (e) VR app (both) satisfaction (f) easy of use INEDIT platform (g) INEDIT platform satisfaction (h) Suggest INEDIT platform



4. FINDINGS

4.3.1. ATTRAKDIFF STANDARDIZED QUESTIONNAIRE - PRAGMATIC AND HEDONIC QUALITIES

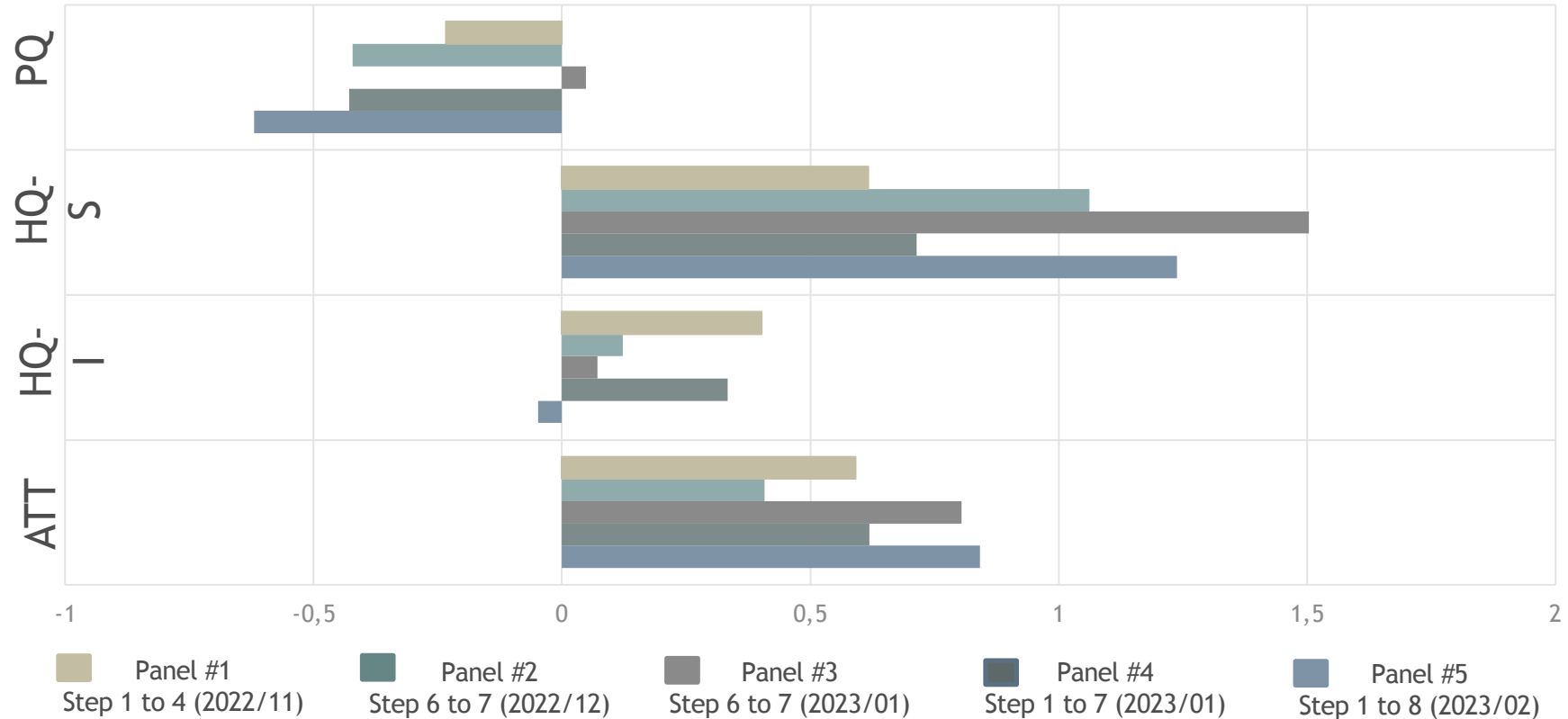
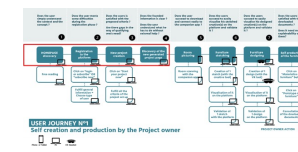


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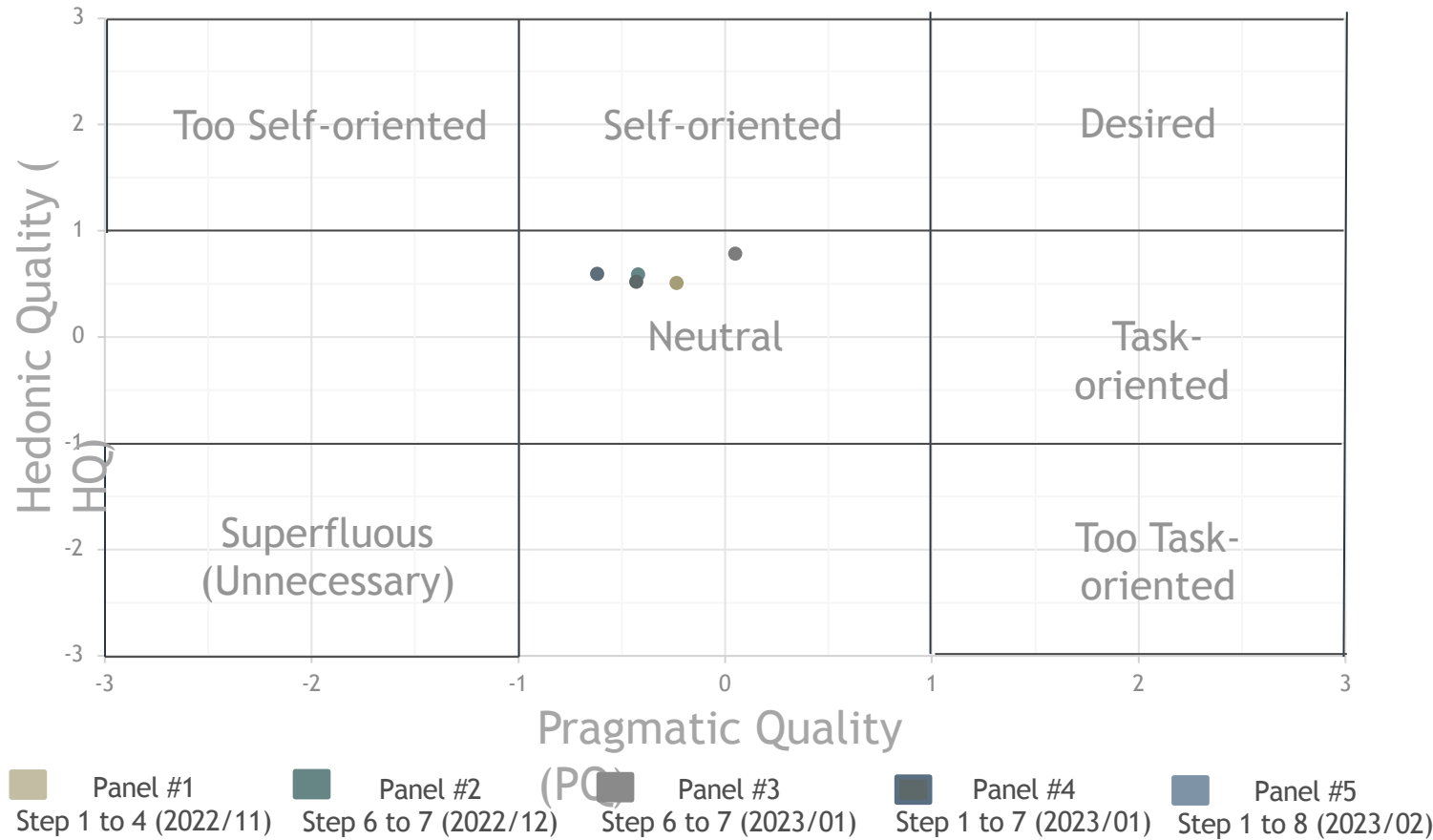
4. FINDINGS

4.3.2. ASQ - MEAN BY DIMENSION



4. FINDINGS

4.3.3. ASQ PORTFOLIO - PRESENTATION



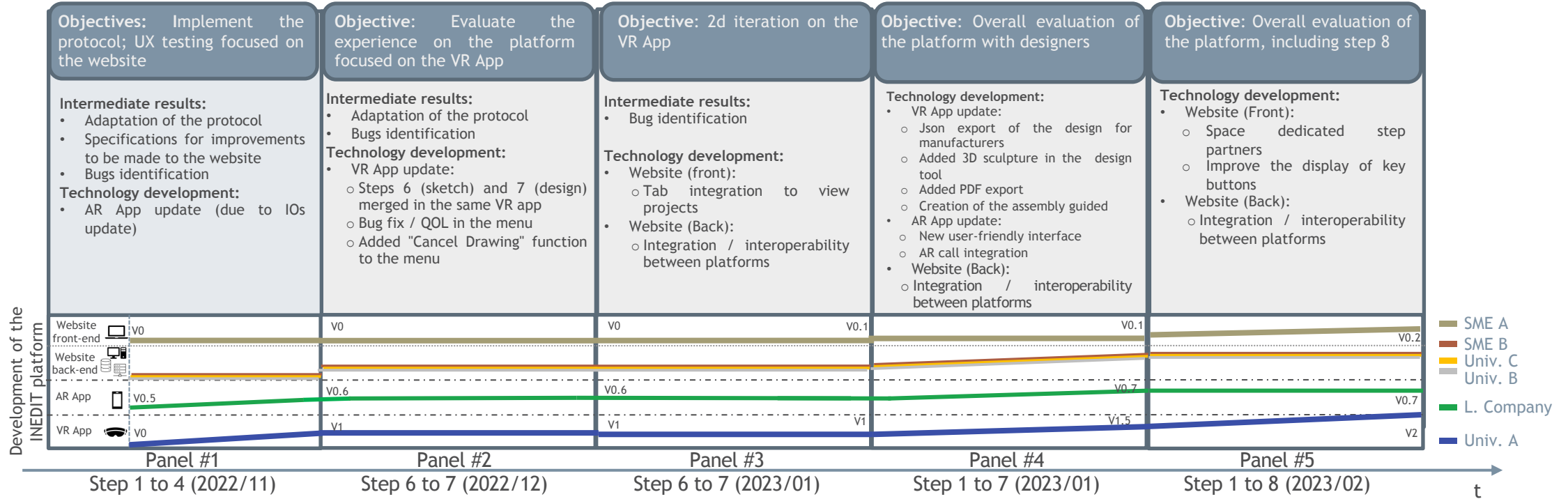
4. FINDINGS

4.4. INFLUENCE OF THE UX DESIGN PROCESS ON THE MULTI-SIDED PLATFORM DEVELOPMENT



between Oct. 2022 and Feb. 2023.

Beyond the UX interfaces



4. FINDINGS

4.5.1. ANALYSIS OF COLLECTED DATA



RQ1: Should each technology (platforms or interfaces) be measured individually or only the overall experience?

RQ1-a: Each technology (platforms or interfaces) should be measured individually, under two conditions:

- 1) The developers are actively involved in the process of measurement and are able to analyze the collected data;*
- 2) Only if it is possible to mobilize the relevant participants.*

RQ1-b: Measuring both the parts and the whole makes it possible to assess the novelty effect of a certain technology, to compare the technologies with each other and with the whole process.



4. FINDINGS

4.5.2. ANALYSIS OF COLLECTED DATA



RQ2: How does the measurement of technology usability feed into the overall analysis?

RQ2-a: Identification of priorities in terms of tool improvement

RQ2-b: Better understanding of the possible reasons for rejecting the overall system



4. FINDINGS

4.5.3. ANALYSIS OF COLLECTED DATA



RQ3: How can an agile process be deployed in such a distributed team so that developers can benefit from the results as quickly as possible?

RQ3-a: Share collected data as soon as possible and organize focus group with developers and participants

RQ3-b: Organize capacity building in UX for developers (train the developers) and work with open-minded developers



4. FINDINGS

4.5.4. ANALYSIS OF COLLECTED DATA



RQ4 :What can we learn from designing a user experience based on multimodal interfaces and digital multi-platform?

RQ4-a: An approach merging Action Research and Living lab is relevant for a very operational context as argued by (Hily, 2022)

RQ4-b: The research team must be agile, admit starting with fuzzy parameters and have technology skills (background in engineering)

RQ4-c: Given the complexity of the project, UX allows the coordinator/developer to feed their decision making and arbitrate more quickly

RQ4-d: It is necessary to have clearly identified technologies and stakeholders at the beginning (schedule regular meeting with consortium to iterate)

RQ4-e: It is relevant to develop a Multi-UX scale (Fleury & Chaniaud, 2023)



5. CONCLUSION



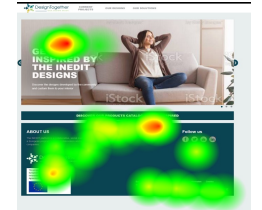
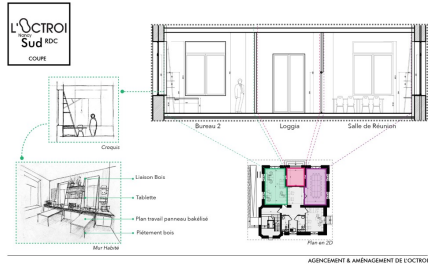
Shaping the future of I5.0 and EU project?

- Include manufacturers and designers in a next research
- Provide a more comprehensive view by measuring acceptance
- A first exploration for a Multi-UX design of a multi-sided platform
- **Data-driven Engineering, Innovation and Entrepreneurship based on Multi-UX approach (Qualitative & Quantitative Data)**
- Customer-driven production (DIT process) requires the convergence of a Living Lab approach and collaborative engineering
- Relevant to transfer our protocol to others EU project



5. CONCLUSION

LIVING LAB MODE: REGULAR INTERACTIONS WITH COMMUNITIES



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 869952



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31

