Exclusion Rates among Disabled and Older Users of Virtual and Augmented Reality

Professor Vanja Garaj
Director of Research and Professor of Design
Brunel Design School
Brunel University London

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Inclusive Immersion

Inclusive Immersion: Project Info

A research and development project funded by the Engineering and Physical Sciences Research Council (EPSRC), Digital Economy Theme.

Inclusive Immersion: Project Info

Project Duration: 01/07/2019—30/06/2023.

Project Value: ca. £700k.

Inclusive Immersion: Project Info

Project Partners:

Brunel Design School, Brunel University London
Engineering Design Centre, University of Cambridge
Open Inclusion
Royal National Institute of Blind People (RNIB)
Games London, To Play For and Virti Health


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A research group at Brunel Design School, focusing on:

Design-led technology innovation for digital and digital-physical systems, products, services and experiences.

URL: <https://www.brunel.ac.uk/bddl>

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Engineering Design Centre

For more than twenty-five years the Cambridge Engineering Design Centre (EDC) has undertaken fundamental and applied research to generate knowledge that improves the design process.

URL: <https://www-edc.eng.cam.ac.uk/>

Inclusive Immersion: Completed Work

4 user studies:

01) A questionnaire survey involving 101 users with access needs;

02) A series of focus groups with ca. 30 users with access needs;

03) A series of in-depth interviews with 20+ XR designers and developers;

Inclusive Immersion: Completed Work

04) A detailed usability study with 41 users with different access needs, which is the main focus of today's talk + 10 "Just Older" users (65+) + Control Group of 10 students (20-25 years old) + Pilot User Group.

The study adopted an inclusive design approach and involved users across the disability spectrum.

Inclusive Immersion: The Usability Study

The Overall Study Aim:

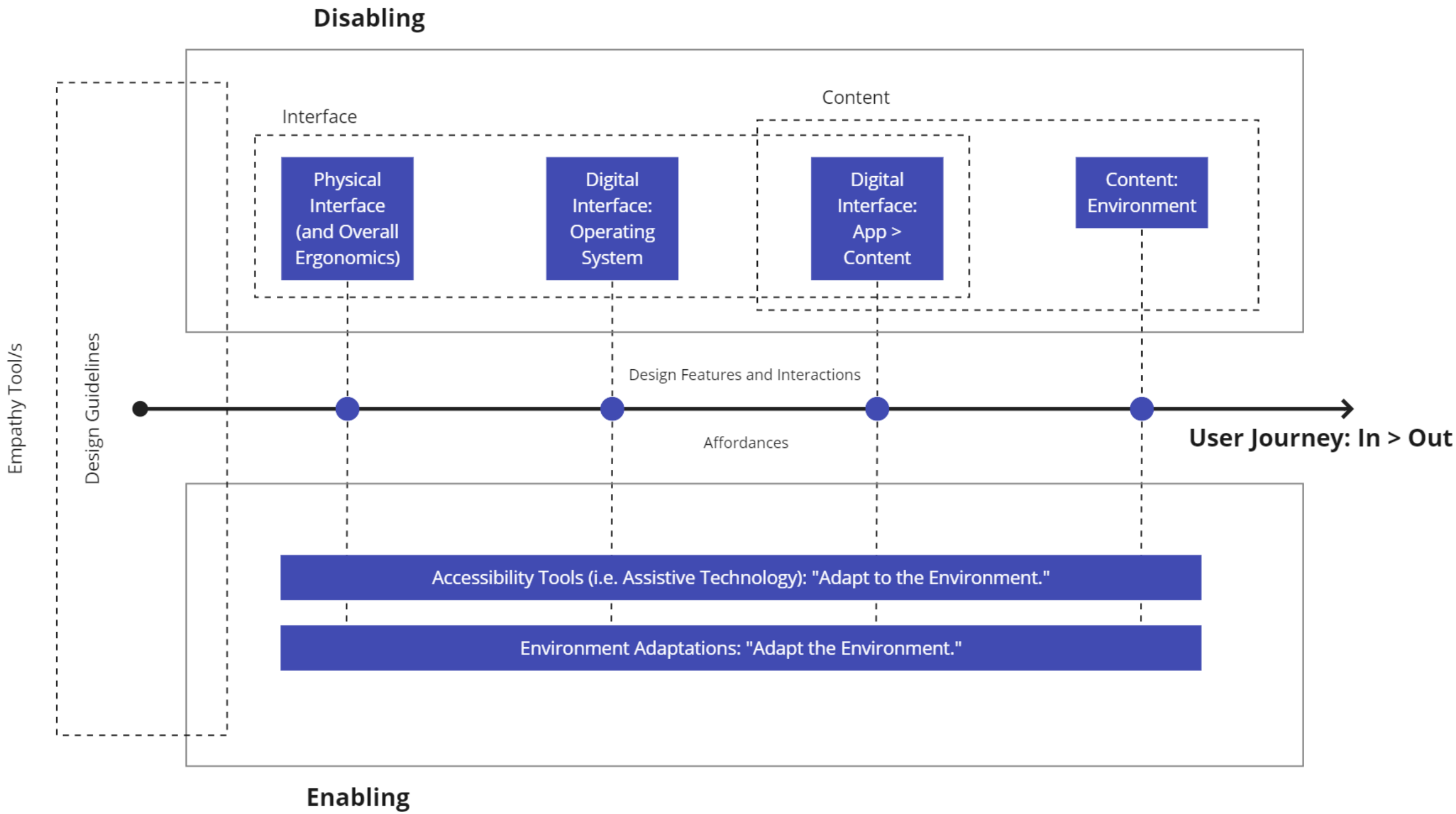
To develop a detailed specification of the use barriers in VR and AR and a catalogue of the user requirements to improve the design of immersive experiences.

Inclusive Immersion: The Usability Study

We also plan to structure a human performance model linking different types of disability and access needs with the use barriers and potential solutions to improve the accessibility.

Inclusive Immersion: The Usability Study

To understand the exclusion rates...


Disabling
Content
Interface
Physical Interface (and Overall Ergonomics)
Digital Interface: Operating System
Digital Interface: App > Content
Content: Environment
Empathy Tool/s
Design Guidelines
Design Features and Interactions
Affordances
User Journey: In > Out
Accessibility Tools (i.e. Assistive Technology): "Adapt to the Environment."
Environment Adaptations: "Adapt the Environment."
Enabling

Inclusive Immersion: Participants Sample Guide

Capability Loss - Control and Usability (Friction)

A) PERCEPTION			B) COGNITION (i.e., Neurodiversity, Learning Difficulties)	C) COMMUNICATION	D) MOVEMENT (Lower Body, Upper Body, Neck and Head, Dexterity, Touch)				E) NON-DISABLED (Age Groups)
A1) Sight - 5 complete (Capability Loss)	**A2)** Hearing - 3 complete	**A3)** Touch - 1 of 3 complete	**B)** Understanding Content/Using Navigation and Menus/Decision Making (Short Term Recall, Processing and Decisioning)| - 5 complete	**C)** Voice - 4 of 5 complete	**D1)** Physical Mobility through Space - 3 of 4 complete	**D2)** Use of Arms/ Controllers/Ability to Put Headset On - 3 complete	**D3)** Use of Hands/Controllers/ Physical Buttons and Switches/Charging Device/Fitting Headset - 4 complete	**D4)** Movement of Head/Headset - 4 complete	**E)** No Disability/Mild Age-related Declines/Differences in Human Factors
A1.1) Visual Acuity (Clarity and Distance), Binocular Vision	**A2.1)** Hearing Acuity (Clarity and Distance), Binaural Hearing	**A3.1)** Touch Perception in Hands/ Upper Limbs	**B1)** Understanding/ Comprehension	**C1)** Non-Vocal	**D1.1)** Positional Mobility	**D2.1)** Speed and Power	**D3.1)** Hand Flexibility	**D4.1)** Speed and Power	**E1)** 18-25
Difficulty seeing objects clearly at a distance; difficulty focusing on near objects; issues with one eye only; difficulty seeing objects using both eyes; difficulty seeing stereo images (3D images). **P21, P41**	Difficulty hearing sounds using both ears; difficulty hearing stereo sounds. **P07**	Insensitive to haptic stimulus in hands/upper limbs; difficulty discriminating different haptic stimulus in hands/upper limbs. **P06**	Difficulty understanding information such as written and spoken language. **P17**	Unable to speak. **P12**	Moving in space (including scooter/ wheelchair); difficulty walking, jumping, running or rolling; difficulty moving from bed to the floor or moving from a chair to another chair. Also includes height (e.g., short stature). **P02**	Difficulty moving arms quickly; difficulty accelerating/ decelerating arm movement when waving; difficulty initiating movements fast. **P15**	Difficulty bending, rotating and/or twisting wrist; difficulty flipping object upside down. **P22**	Difficulty moving neck quickly; difficulty accelerating/ decelerating neck movement. **P39**	
A1.2) Visual Field	**A2.2)** Hearing Field	**A3.2)** Touch Perception in Lower Limbs	**B2)** Concentration/ Attention (Short Attention Span)	**C2)** Phonation	**D1.2)** Legs Flexibility and Strength	**D2.2)** Arms Flexibility and Strength	**D3.2)** Fingers Flexibility and Strength	**D4.2)** Head/Neck Flexibility and Strength	**E2)** 26-35
Difficulty seeing the full and static visual field; difficulty seeing details directly in front or on the side of the visual field; obstructions (e.g., black spots) in the visual field. **P04**	Difficulty hearing full auditory field; obstructions/ distractions (ringing, buzzing and whistling sound in the ears - tinnitus); deaf in one ear. **P19**	Insensitive to haptic stimulus in lower limbs; difficulty discriminating different haptic stimulus in lower limbs.	Problems with concentrating on daily tasks such as reading a short paragraph or hearing a short talk; difficulty re-orienting attention from distraction. **P25**	A breathy, hoarse, wavering or jerky voice; difficulty speaking words beginning with two consonants; difficulty pronouncing the sounds of "p", "k", "g" or "r" in the word or pronouncing a different sound instead, e.g., "friend" becomes "fiend". **P30**	Difficulty maintaining position, lifting, bending or rotating; limited endurance to stand/move; difficulty squatting or crouching; difficulty sitting down. **P03**	Difficulty lifting, bending or rotating arms and upper body; limited degree of arms movement; difficulty scratching back; difficulty pulling or pushing objects. **P28**	Difficulty flexing, opening and straightening fingers; difficulty making/clenching a fist; difficulty making the whole palm touch the table surface. **P27**	Limited range of rotation and bending in neck/shoulders; difficulty holding up the head. **P16**	
A1.3) Sensitivity to Colour	**A2.3)** Deaf	**A3.3)** Touch Perception on Torso	**B3)** Decoding Language, Numbers and/or Emotional Meaning	**C3)** Stutter/Stammer	**D1.3)** Stability (Balance)	**D2.3)** Arms Coordination	**D3.3)** Fingers Coordination	**D4.3)** Dizziness and Vertigo	**E3)** 46-55
Reduced colour perception; difficulty differentiating hues, tones or shades of colours; difficulty perceiving colour saturation (colour seems faded). Crossover to Cognition: Certain colours cause pain (autism). **P10**	British Sign Language (BSL) fluent; BSL occasional; lipreader; touch sign user; written alternatives. **P11**	Insensitive to haptic stimuli on torso; difficulty discriminating different haptic stimuli on torso.	Dyslexia; Dyscalculia; Autism (difficulty understanding facial expressions, gestures and feelings). **P20**	Speaking with repetition; speech blocks; prolonged sounds; difficulty finishing a sentence smoothly; trailing off.	Difficulty controlling stability or correcting the loss of balance; difficulty keeping balance when swaying. **P13**	Difficulty coordinating upper limbs (making left and right limbs do different tasks simultaneously; difficulty coordinating upper limbs with lower body. **P24**	Difficulty with fine motor performance (e.g., writing or sewing, buttoning and picking up safety pins from a table and pressing a button press); difficulty moving fingers in sequence. **P29**	Due to neurological conditions, lower blood pressure, dehydration and other factors. **P36**	
A1.4) Sensitivity to Shape and Size	-	-	**B4)** Spatial Understanding/ Navigation	**C4)** Unconscious Vocalising (e.g., Tourette)	**D1.4)** Control of One Side of Body Only	-	**D3.4)** One-Handedness	**D4.4)** Variations in Head Size and Shape	**E4)** 56-65
Double vision (seeing two images of one object); perceiving straight lines as waved; difficulty perceiving the correct size of objects **P26**			Dyspraxia (difficulty learning spatial layouts and/or orientating in and navigating new environments; difficulty judging distance: near (e.g., when pointing and reaching to objects in the near vicinity) and far). **P18**	Cannot help to sniff, clear throat, click tongue, grunt and/or speak out inappropriate language loudly in the public. **P33**	Limited mobility and strength on one side only. **P41**		Only have fine motor skills in one hand. **P14**	Very large; very small; shape differences. **P37**	
A1.5) Eye Tracking/ Movement			**B5)** Reaction/Response	**C5)** Expression (e.g., Aphasia)	**D1.5)** Lower/Upper Body Coordination		-	-	**E5)** 66-75
Difficulty detecting motion; difficulty tracing motion of objects. **P40**			Difficulty responding quickly to real stimuli such as touch and/or virtual stimuli such as an approaching bike; difficulty responding quickly to associated stimuli among multiple (e.g., choosing red items among black). Includes sensory overwhelm/overload. **P23**	Unable to speak accurately and consistently; have problems with vocabulary; difficulty using correct words; problems using grammar; difficulty finding words randomly when speaking; difficulty finding connecting words to compose appropriate sentences. **P05**	Difficulty coordinating between upper and lower body parts.				

Inclusive Immersion: Participants Sample Guide

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The pan-disability user study

Defining pan-disability

We recruited real-world participants with multiple access needs. We matched primary needs to categories in our matrix.

The pan-disability user study

Methods

We ensured that testing conditions were right for all of our participants, for:

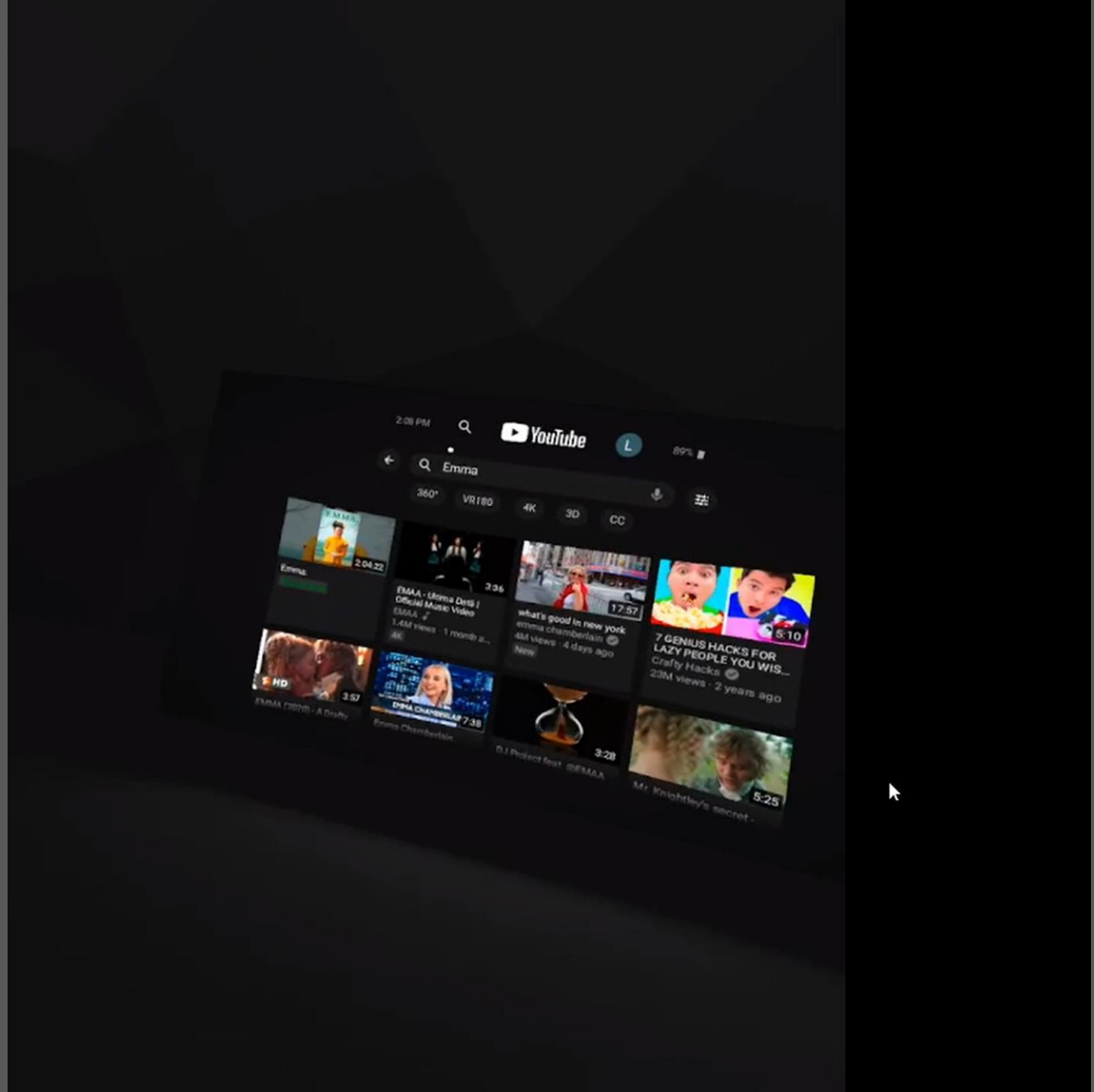
- Planning;
- Travelling to us;
- Navigating on-site;
- Working in our testing space;
- Taking breaks;
- Recovering from sickness;
- Returning home.

We chose XR experiences that had a wide variety of UI and interaction elements.

Oculus Quest 2 VR set, Meta

YouTube VR

YouTube VR, Google



“as it is” documentary, 360 Labs

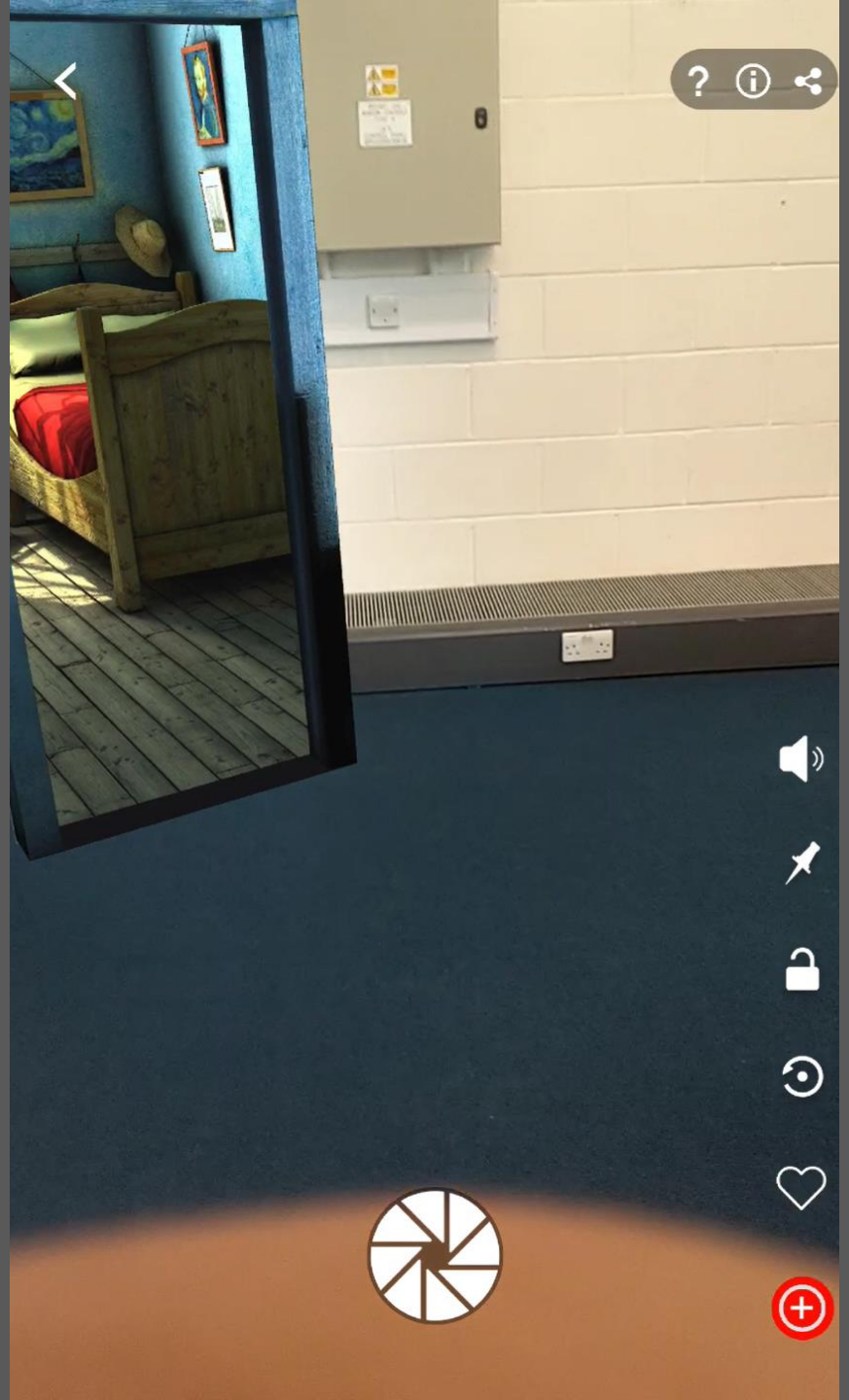
Job Simulator, Owlchemy Labs

Moss,
Polyarc

Elixir,
Reality Labs

Amazon Shopping, Amazon

Van Gogh Room, ruslans3D



We created a protocol that was flexible enough to support user testing even when poor design caused friction.

A 3-hr time window to test 8 experiences allowed for:

- 3 mandatory breaks;
- More breaks as needed;
- Creative problem-solving, at length.

A separate note-taker freed our researcher for:

- Visual observation;
- Full engagement during problem-solving.

Thinking ahead about the friction points.

The pan-disability user study

51 tasks across 7 experiences.

We coded our data in a way that would distinguish friction points and make design solutions stand out.

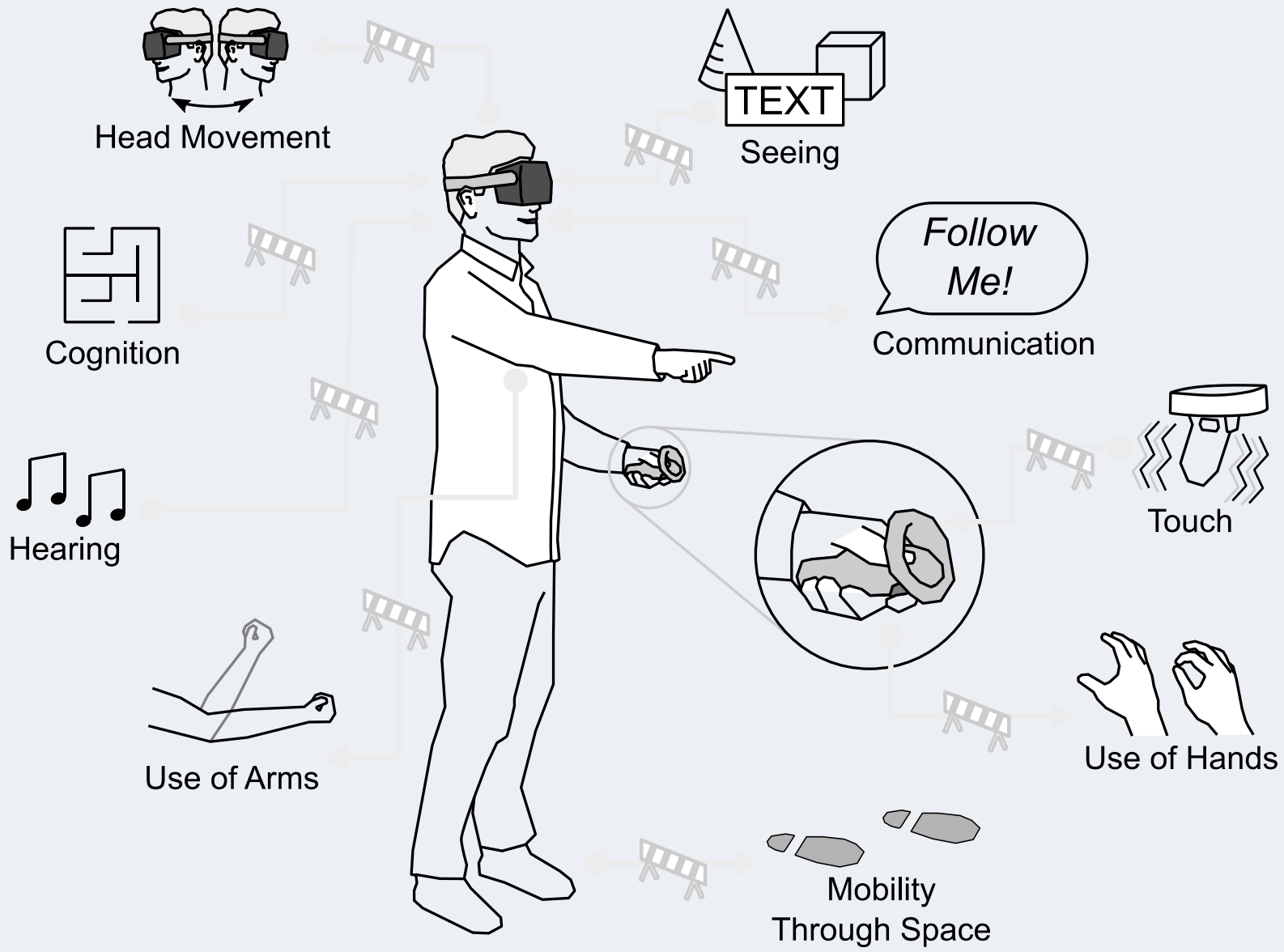
Scores	Description
0	It was impossible to start or complete a task, even when adaptations and/or assistance were provided.
1	The participant could start the task with adaptations, but could not complete the task with adaptations and/or assistance.
2	The participant could both start and complete a task with adaptations and/or assistance.
3	The participant could start and complete a task with the out-of-the-box configuration, and no adaptations or assistance were necessary.

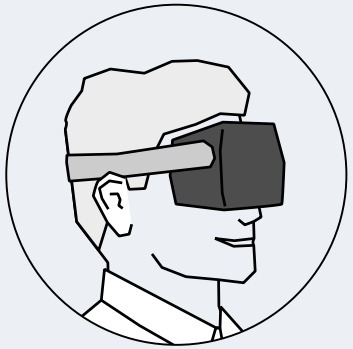
"adaptations"

"assistance"

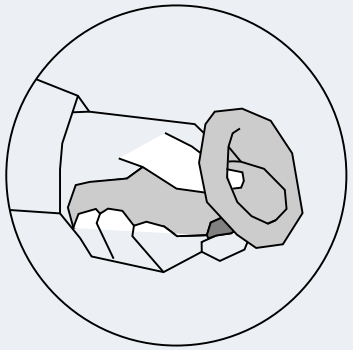
The pan-disability user study

Results (Preliminary)


Head Movement
TEXT
Seeing
Cognition
Follow Me!
Communication
Hearing
Touch
Use of Arms
Use of Hands
Mobility Through Space



Headset



Controllers

Access Need	P#	Headset				Controllers					
		T01	T02	T03	T04	T05	T06	T07	T08	T09	T10
Cognition	P17	3	3	3	3	3	3	3	3	3	3
	P08	3	3	3	3	3	3	3	3	3	3
	P23	3	3	3	3	3	3	3	3	3	3
	P18	3	3	3	3	3	3	3	3	3	3
	P25	3	3	3	3	3	3	3	3	3	3
	P20	3	3	3	3	3	3	3	3	3	3
Communication (Voice)	P05	3	3	3	3	3	3	2	2	2	3
	P12	3	3	3	3	3	3	3	3	3	3
	P35	3	3	3	3	3	3	3	3	3	3
	P30	3	3	3	3	3	3	3	3	3	3
Movement of Head	P34	0	0	0	0	2	2	2	2	2	2
	P16	2	2	2	2	3	2	3	3	3	3
	P33	3	3	3	2	3	3	3	2	3	3
	P32	3	3	3	3	3	3	3	3	3	3
Movement: Physical Mobility through Space	P03	3	3	3	3	3	3	3	3	3	3
	P02	3	3	3	3	3	3	3	3	3	3
	P13	3	2	3	2	3	3	3	3	3	3
	P39	2	2	3	2	3	3	2	3	3	3
Movement: Use of Arms	P15	2	1	3	1	2	2	2	2	2	2
	P28	3	3	3	3	3	3	3	3	3	3
	P24	3	3	3	3	3	3	3	3	3	3
Movement: Use of Hands	P22	2	2	2	2	2	2	2	2	2	1
	P27	2	2	3	3	2	2	2	2	2	2
	P14	3	1	3	1	3	3	3	3	3	3
	P29	3	3	3	3	3	3	3	3	3	3
	P40	3	3	3	3	3	3	3	3	3	3
Perception: Hearing	P07	3	3	3	3	3	3	3	3	3	2
	P11	3	3	3	3	3	3	3	3	3	3
	P19	3	3	3	3	3	3	3	3	3	3
Perception: Sight	P36	3	3	3	3	3	3	3	3	3	3
	P09	3	3	3	3	3	3	3	3	3	3
	P01	3	3	3	3	3	3	3	3	3	3
	P04	3	3	3	3	3	3	3	3	3	3
	P26	2	2	2	2	3	3	3	3	3	3
	P38	3	3	3	3	3	3	3	3	3	3
	P21	3	3	3	3	3	3	3	3	3	3
	P10	3	3	3	3	3	3	3	3	3	3
	P31	3	3	3	3	3	3	3	3	3	3
Perception: Touch	P37	2	2	3	2	3	3	3	3	2	3
	P06	3	3	3	3	3	3	3	3	3	3
	P41	3	3	3	3	3	3	3	3	3	3

Scores	Description
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1	The participant could start the task with adaptations, but could not complete the task with adaptations and/or assistance.
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3	The participant could start and complete a task with the out-of-the-box configuration, and no adaptations or assistance were necessary.
	Gap in data (either not applicable or not yet transcribed)

- 26.8% of participants required at least some bespoke adaptations and/or assistance to complete the task of putting on the headset.
- 24.4% of participants required at least some bespoke adaptations and/or assistance to hold and use the controllers.

Access Need	P#	VR Exp. 1						VR Exp. 2							VR Exp. 3				VR Exp. 4					VR Exp. 5	
		T11	T12	T13	T14	T15	T16	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31	T32	T33	T34	T35	T36	T37	T38	T39
Cognition	P17	3	3	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3	2	2	2	2	2	2	3
	P08	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3
	P23	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	2	3	3	2		
	P18	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3	3	3	3	3	3	2	3
	P25	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
	P20	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3		
Communication (Voice)	P05	3	3	3	3	2	2	0	3	3	3	3	3	3	3	2	2	3	2	2	3	2	2	2	2
	P12	3	3	3	3	3	3	3	3	0	3	3	3	3	3	3	3	3	2	2	3	3	2	2	3
	P35	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2	2
	P30	3	3	3	3	3	3			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Movement of Head	P34	2	2	2	2	2	2	3	3	3	3	3	3		2	1	1	3	1	3	3	3	3	3	2
	P16	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3	3	3	3	1	1
	P33	3	3	3	3	3	3			3	1	3	3	3	3	3	1	3	3	2	2	2	2	2	2
	P32	3	3	3	3	3	3			3	1				3	2	2	3	3	3	2	2	2		
Movement: Physical Mobility through Space	P03	3	3	3	3	3	3	3	3	3	0	0	0	0	3	3	2	3	2	2	2	2	2	0	0
	P02	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2
	P13	3	3	2	3	3	3	3	3	3	3	3	3	3	2	2	3	3	2	2	2	2	2	2	2
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Movement: Use of Arms	P15	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3	2	2	3	3	2	2
	P28	3		3	3	3	3	3	3	3	3	3	3	3	2	3	3	2	3	2	2	2	2	2	2
	P24	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3	3	2	3	2	2	2	2
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	P27	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3	3	2	2	2	2	2	2
	P14							3	3	3	3	3	3		2	3	3	3							
	P29	3	2	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	2	2	2	2	2	2
	P40	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3
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	P11	3	3	2	3	3	3	3	3	0	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2
	P19	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3
Perception: Sight	P36	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2					2	2
	P09	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	2	3	2	2	2	2	2	1	1
	P01	0	0	1	2	0	0	2	0	0	3	0	2	0	0	1	1	1	2	1	1	1	1	1	1
	P04	3	2	2	2	0	0	0	3	3	3	3	3	3	2	3	1	3	2	2	2	3	3	2	3
	P26	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	1	3	2	2	2	2	2	2
	P38	3	3	3	3	3	3	2	2	3	3	3	1	1	2	3	3	3	3	3	2	2	2	2	2
	P21	3	3	3	3	3	3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	2	2	2	2
	P10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
	P31	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Perception: Touch	P37	3	3	3	3	3	2	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2		1	1
	P06	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	2	2	3	3	3	2	3
	P41	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	2	2	2	2	2	2
		30.0%						31.7%							75.6%				75.6%					86.1%	

VR Experience 1
Interacting with OS menus

VR Experience 2
Passive 360 video

VR Experience 3
Moss: Predominantly seated and controller-based

VR Experience 4
Job Simulator: Embodied interaction with controllers

VR Experience 5
Elixir: Embodied interaction with hands

Scores	Description
0	It was impossible to start or complete a task, even when adaptations and/or assistance were provided.
1	The participant could start the task with adaptations, but could not complete the task with adaptations and/or assistance.
2	The participant could both start and complete a task with adaptations and/or assistance.
3	The participant could start and complete a task with the out-of-the-box configuration, and no adaptations or assistance were necessary.
	Gap in data (either not applicable or not yet transcribed)

Participants requiring at least some non-standard adaptations and/or assistance to complete the tasks

Access Need	P#	AR Exp. 1						AR Exp. 2					
		T40	T41	T42	T43	T44	T45	T46	T47	T48	T49	T50	T51
Cognition	P17	3	2	2	2	3	3	3	2	2	2	3	3
	P08	3	3	3	3	3	3	0	3	3	3	3	3
	P23												
	P18	3	3	3	3	3	3	3	3	3	3	3	3
	P25	3	3	3	3	3	3	3	3	3	3	3	3
	P20	3	3	3	3	3	3	3	3	3	3	3	3
Communication (Voice)	P05	3	3	3	3	3	3	0	3	3	3	3	2
	P12	3	3	3	3	3	3	3	3	3	3	3	3
	P35	3	3	3	3	3	3	3	3	3	3	3	3
	P30	3	3	3	3	3	3		3	3	3	3	3
Movement of Head	P34	2	2	2	2	2	0	2	0	2	0	0	0
	P16	3	2	3	3	3	3	0	2	3	3	2	2
	P33												
	P32												
Movement: Physical Mobility through Space	P03	3	3	3	3	3	3	0	3	3	3	3	3
	P02	3	2	2	1	3	1	3	2	1	1	1	1
	P13	3	3	3	3	3	3	3	3	3	3	3	3
	P39												
Movement: Use of Arms	P15	3	3	3	3	3	3	3	3	3	3	3	3
	P28												
	P24	3	3	3	2	2	3	3	3	3	3	3	3
Movement: Use of Hands	P22	3	3	2	2	2	2						
	P27	3	3	3	3	3	3		3	3	3	3	3
	P14	3	3	3	3	3	3	3	3	3	3	3	3
	P29	3	2	3	3	3	3	3	3	3	3	3	3
	P40	3	3	3	3	3	3	3	3	3	3	3	3
Perception: Hearing	P07	3	3	3	3	3	3	0	3	3	3	3	3
	P11	3	3	3	3	3	3	3	3	3	3	3	3
	P19	3	3	3	3	3	3						
Perception: Sight	P36	0	0	0	0	0	0	0	0	0	0	0	0
	P09	0	2	2	2	2	0	0	0	0	0	0	0
	P01	0	1	1	1	1	1	0	1	1	1	1	1
	P04	0	3	3	3	3	3	0	3	3	3	3	3
	P26	3	3	3	3	3	3	3	3	3	3	3	3
	P38	3	3	3	3	3	3						
	P21	3	3	3	3	3	3	3	3	2	2	3	3
	P10	3	3	3	3	3	3	0	3	3	3	3	3
	P31	3	3	3	3	3	3						
Perception: Touch	P37												
	P06	3	3	3	3	3	3	0	2	2	3	3	3
	P41	3	3	3	3	3	3	3	3	2	3	3	3

AR Experience 1

Passive in-room augmentation

AR Experience 2

Interactive augmentation

Scores	Description
0	It was impossible to start or complete a task, even when adaptations and/or assistance were provided.
1	The participant could start the task with adaptations, but could not complete the task with adaptations and/or assistance.
2	The participant could both start and complete a task with adaptations and/or assistance.
3	The participant could start and complete a task with the out-of-the-box configuration, and no adaptations or assistance were necessary.
	Gap in data (either not applicable or not yet transcribed)

31.4% 51.6%

Participants requiring at least some non-standard adaptations and/or assistance to complete the tasks

Exclusion Rates

*Percentage of participants who could not complete the tasks **without** some bespoke adaptation and/or assistance.*

Access Need	Headset	Controllers	VR1	VR2	VR3	VR4	VR5	AR1	AR2
Cognition	0%	0%	17%	0%	67%	33%	75%	20%	40%
Communication (Voice)	0%	25%	25%	50%	50%	50%	75%	0%	25%
Movement of Head	75%	75%	25%	50%	100%	75%	100%	100%	100%
Movement: Physical Mobility through Space	50%	25%	25%	25%	75%	75%	100%	33%	67%
Movement: Use of Arms	33%	33%	0%	0%	100%	100%	100%	50%	0%
Movement: Use of Hands	60%	40%	50%	20%	80%	80%	100%	40%	0%
Perception: Hearing	0%	33%	33%	33%	33%	100%	67%	0%	50%
Perception: Sight	11%	0%	44%	67%	78%	89%	78%	44%	86%
Perception: Touch	33%	33%	33%	0%	100%	100%	100%	0%	100%
Across All Participants	27%	24%	30%	32%	76%	76%	86%	31%	52%

*Percentage of participants who could not complete the tasks **with** some bespoke adaptation and/or assistance.*

Access Need	Headset	Controllers	VR1	VR2	VR3	VR4	VR5	AR1	AR2
Cognition	0%	0%	0%	0%	17%	0%	0%	0%	20%
Communication (Voice)	0%	0%	0%	50%	0%	0%	0%	0%	25%
Movement of Head	25%	0%	0%	50%	75%	25%	33%	50%	100%
Movement: Physical Mobility through Space	0%	0%	0%	25%	0%	0%	25%	33%	67%
Movement: Use of Arms	33%	0%	0%	0%	0%	0%	0%	0%	0%
Movement: Use of Hands	20%	20%	0%	20%	20%	40%	33%	0%	0%
Perception: Hearing	0%	0%	0%	33%	0%	0%	0%	0%	50%
Perception: Sight	0%	0%	44%	56%	44%	11%	22%	44%	71%
Perception: Touch	0%	0%	0%	0%	0%	0%	33%	0%	50%
Across All Participants	7%	2%	10%	29%	22%	10%	17%	17%	42%

Inclusive Immersion: Project Info

The Overall Aim:

To design tools to improve the accessibility and inclusiveness of XR.

The idea is to replace the user-led adaptations and researcher’s assistance with IUI solutions.

Towards an Equitable Social VR

Towards an Equitable Social VR

A new project, also funded by the Engineering and Physical Sciences Research Council (EPSRC), Digital Economy Theme.

Towards an Equitable Social VR

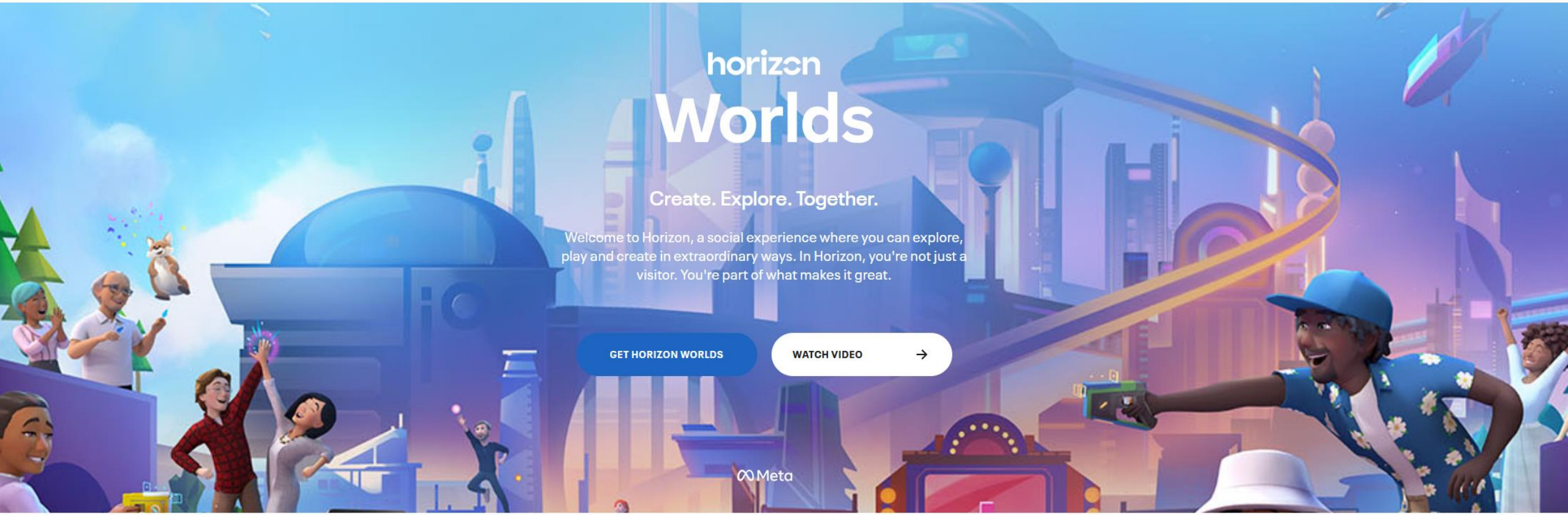
New Project Partners: Digital Catapult and Meta

Towards an Equitable Social VR: Project Info

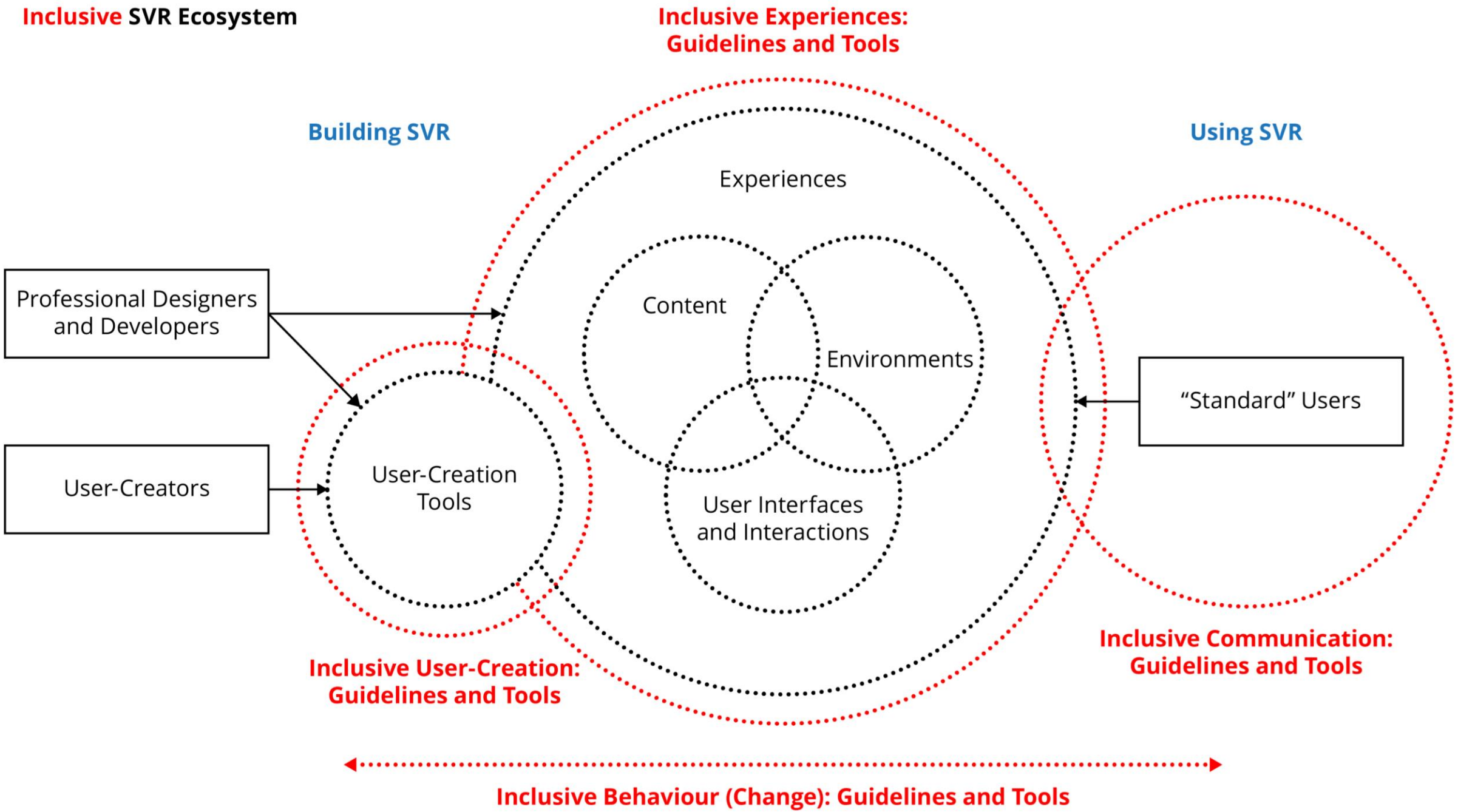
Project Duration: 01/01/2023—31/12/2025.

Project Value: ca. £1 million

Focus on Social VR and the Metaverse.



CALLING ALL CREATORS


Inclusive SVR Ecosystem
Inclusive Experiences: Guidelines and Tools
Building SVR
Using SVR
Experiences
Content
Environments
User Interfaces and Interactions
Professional Designers and Developers
User-Creators
User-Creation Tools
"Standard" Users
Inclusive User-Creation: Guidelines and Tools
Inclusive Communication: Guidelines and Tools
Inclusive Behaviour (Change): Guidelines and Tools

Towards an Equitable Social VR: Project Info

Investigating both the functional and psychosocial aspects.

Why do all this?

Quality of Life

We believe that XR and various experiences it enables have a strong potential to contribute to the quality of life for disabled and older people.

The quality of life contribution can be explained by the construct of Virtual Mobility.

Social Life, Education, Employment, Entertainment, etc.

Five ways the metaverse could be revolutionary for people with disabilities

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Frame Stock Footage

Authors

Vanja Garaj
Director of Research and Reader in Design, Brunel University London

John Dudley
Research associate, University of Cambridge

Per Ola Kristensson
Professor of Interactive Systems Engineering, University of Cambridge

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Partners

The Conversation UK receives funding from these organisations

View the full list

The invention of the world wide web in 1989 eventually brought about life-changing tools for everyone who can access it. Some of these tools – such as online banking, shopping and communication – have vastly improved the accessibility of daily life for people with disabilities, as well as older people.

The concept of virtual mobility has long been used to describe how the internet can provide an accessible alternative to activities that usually require physical mobility. Virtual mobility was in full swing during the pandemic, as work,

Questions?