

Exploring User Experience in Extended Reality

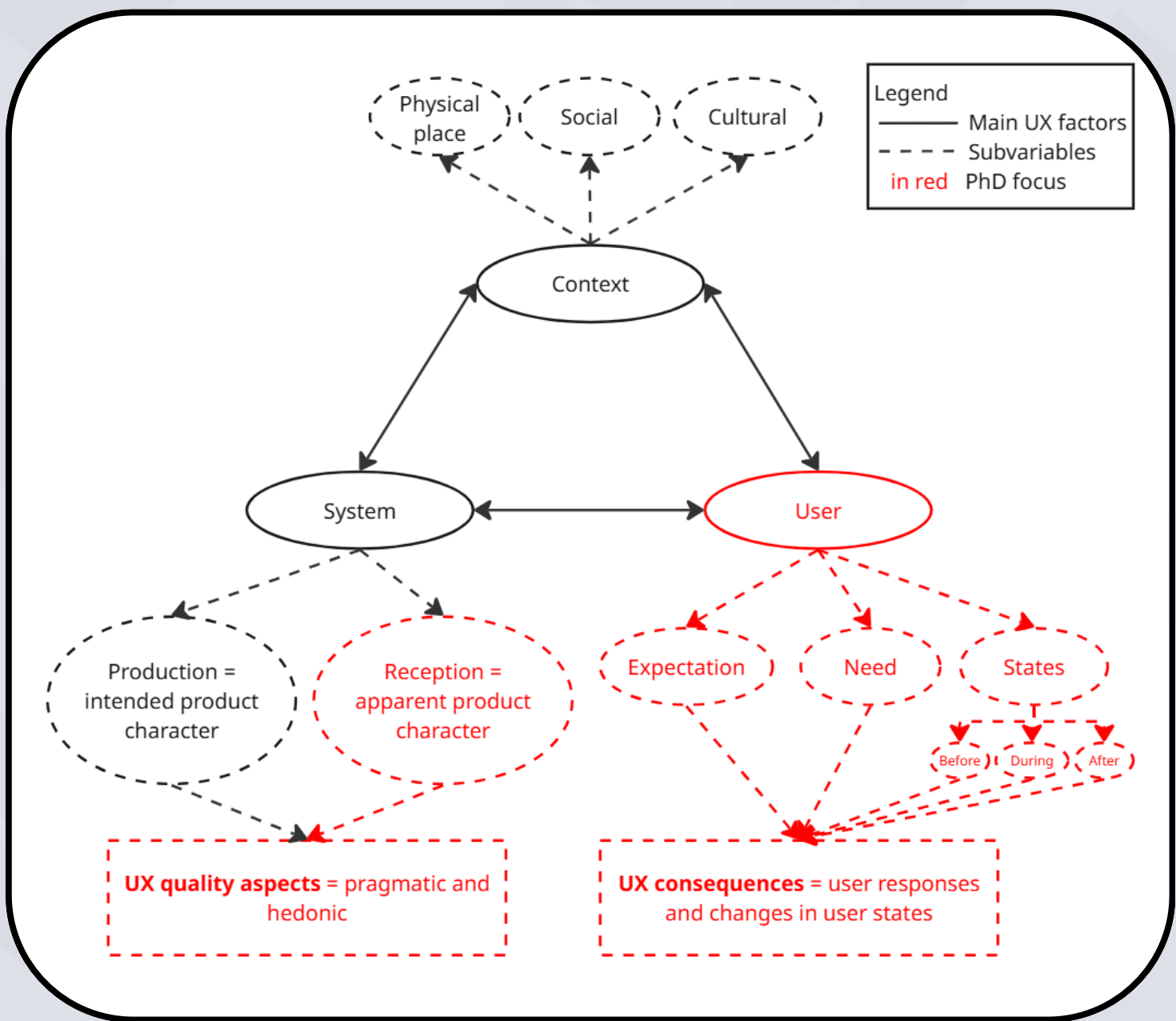
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Background

User experience (UX) refers to a person's perceptions and responses to a product, system, or service (International Organization for Standardization [ISO], 2019)

- Influenced by 3 main factors user, system and context.
- Manifest in user responses: emotional, cognitive, physiological/physical and behavioral.
- Dynamic, situated and temporally distributed (Roto et al., 2011): anticipated UX, momentary UX, episodic UX and cumulative UX.
- UX quality aspects and UX consequences:
 - A UX quality aspect reflects users' subjective perception of a specific, well-defined product character (Schrepp et al., 2023),
 - A UX consequence refers to changes in user states, whether emotional, cognitive, physiological/physical or behavioral, following the encounter with the system.



Our UX graphical representation, inspired by Hassenzahl (2018), Roto et al. (2011) and Schrepp et al. (2023)

Problematic and research objectives

1

XR unique technological features (contextuality, spatiality, multisensoriality, environmental occlusion, new interaction and locomotion paradigm, wearability/portability, intertwining) reshape UX quality aspects and consequences.

2

Existing UX research in XR focus on:

- isolated UX quality aspects or consequences,
- isolated mediated reality and system (VR or AR, not both and mostly head-mounted display),
- similar context (entertainment or edutainment).

3

Research question: how do virtual reality (VR) and augmented reality (AR) systems unique features reconfigure UX?



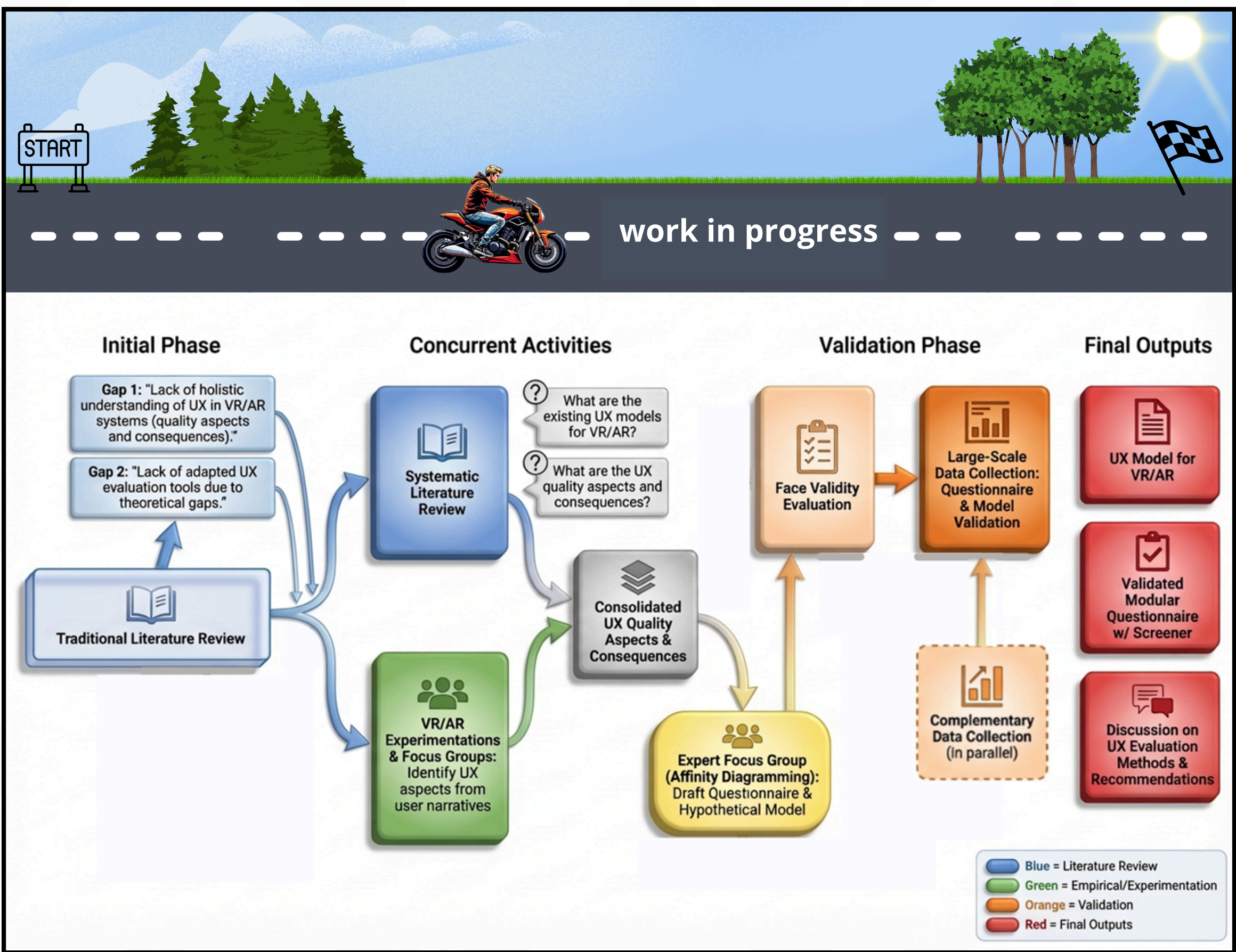
What's new with our approach to understand UX with VR and AR compared to existing contributions?

User-reception focus	How it differs
User-reception focus	Prioritizes user reception over system/contextual variables.
Holistic user reception integration	Combines UX quality aspects and UX consequences in a unified framework.
Cross-system framework	Integrates VR/AR mediated realities and various systems within a single theoretical framework.
Activity and context diversity	Accounts for varied activities and contexts in VR/AR use.
Interdisciplinary foundation	Integrates insights from multiple scientific fields and related theories.



- the development of a **modular questionnaire** combined with a **screening** to select the **relevant dimensions** to be administered based on various variables (type of mediated reality, system used, activities performed, or purpose of using an XR system).
- the development of a **holistic model** that integrates **UX quality aspects**, **UX consequences**, and the **variables** mentioned above.

PhD methodology: focus on systematic literature review, experiments & focus groups



Following Kitchenham's (2007) systematic review guidelines.

What are the existing models and frameworks of UX in XR?
Which UX consequences result from interactions with XR systems and their mediated virtual environments, and what UX quality aspects influence them?

Scopus[®] 640 records extracted.
10 duplicates removed → 630 records.
245 papers rejected → 385 papers retained.
45 papers rejected → 340 papers retained.
5 papers added → 345 papers total.

Eligibility Criteria

Form Criteria:

- Language: English or French
- Publication type: journal articles only

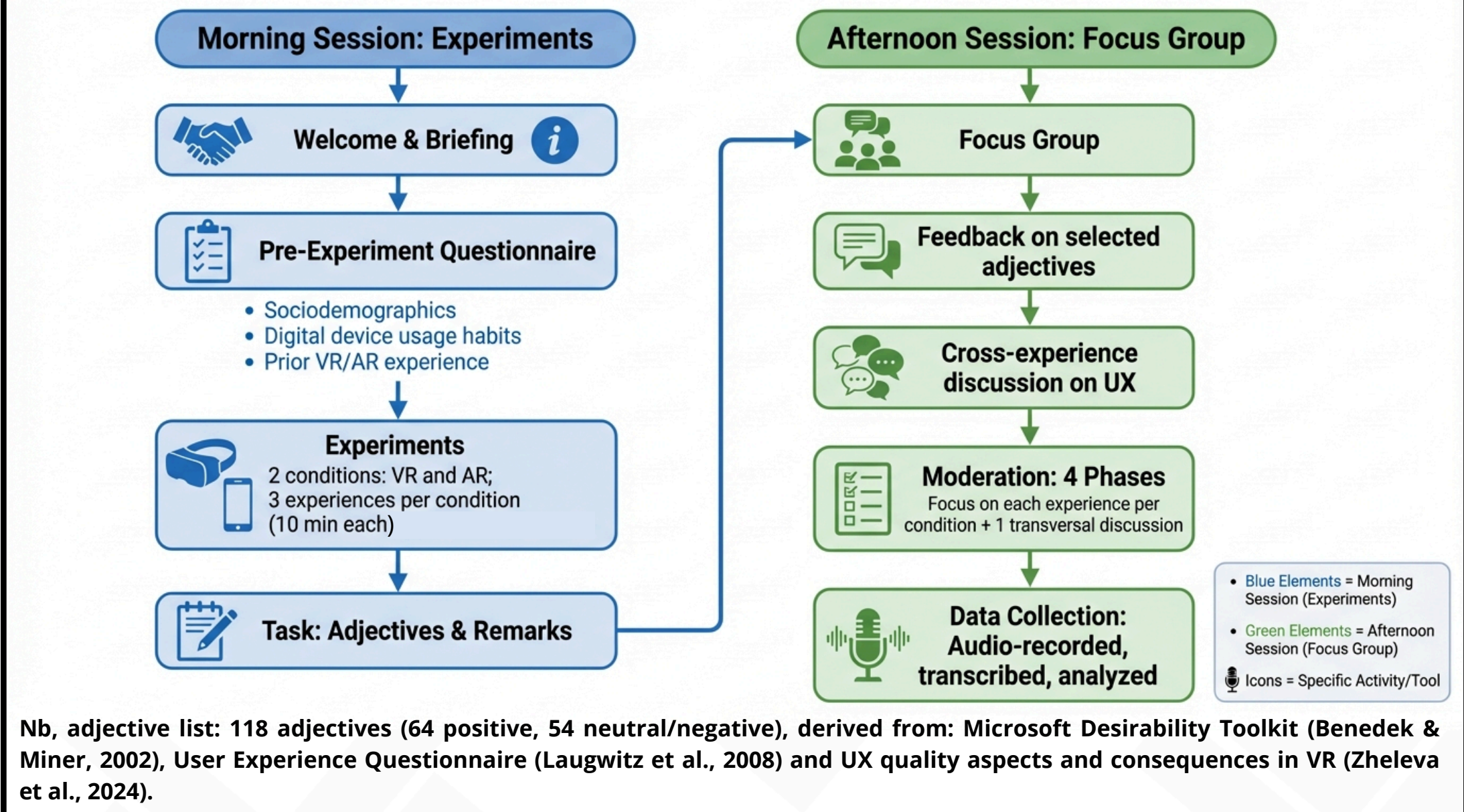
Content Criteria:

- Identification of UX consequences or quality aspects
- Presentation, evaluation, validation or application of a UX model or framework
- Empirical, review or theoretical papers
- Studying VR, AR, XR or Metaverse (Rauschnabel et al., 2024)

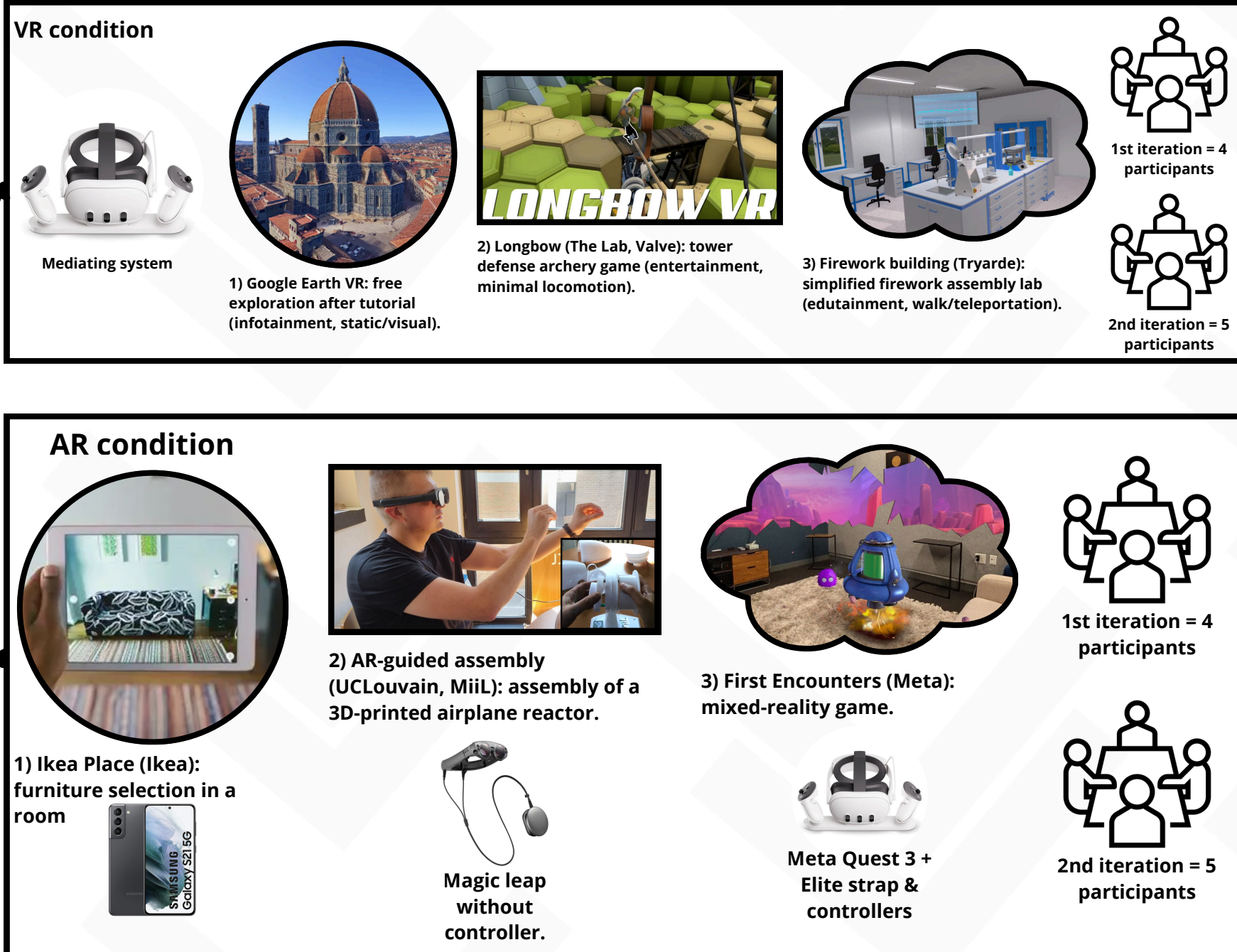
Data Analysis in Progress (345 papers)

- UX models applied to VR or AR.
- Type of mediated reality (VR, AR, or XR if not identifiable).
- System used in the study.
- Activity performed with the system or its intended use.
- Domain of activity (e.g., education, healthcare).
- Underlying theory (if applicable).
- XR-specific features (e.g., spatiality, contextuality, multisensoriality) → 18 identified.
- UX quality aspects (e.g., learnability, aesthetic, interaction realism) → 202 identified.
- UX consequences (e.g., presence, flow, cybersickness) → 243 identified.

Study Overview



Nb, adjective list: 118 adjectives (64 positive, 54 neutral/negative), derived from: Microsoft Desirability Toolkit (Benedek & Miner, 2002), User Experience Questionnaire (Laugwitz et al., 2008) and UX quality aspects and consequences in VR (Zheleva et al., 2024).



This table presents the preliminary result from the first iteration of VR experimentations & focus group (n of participants = 4). Underlined terms are new findings compared to Zheleva et al. (2024) and Cheiran et al. (2025).

UX quality aspects	UX consequences
attractiveness, <u>authenticity</u> , clarity, comfort, controllability, easiness of use, efficiency, interaction realism, intuitiveness, learnability, <u>navigability</u> , novelty, pleasantness, plausibility, realism, <u>relevancy</u> , reliability, responsiveness, <u>richness</u> , safety, usefulness, visual realism	Emotional: affect, <u>appeasement</u> , arousal, <u>captivation</u> , disappointment, fascination, frustration, fun, stress Physical: eye strain, fatigue, headache, muscular fatigue Cognitive: <u>altered self-awareness</u> , cognitive load, disorientation, embodiment, involvement, spatial presence, temporal dissociation Conative: intention to use

Our biggest challenge? The questionnaire and model validation phase

We're looking for partners using VR/AR systems in real-world settings and to collect data.

- Why? To test all dimensions and variables in real-world settings and to collect data.
- How? Scan the QR code to share details about your activities and contact info—we'll follow up!

Thank you very much!



References

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