



# Why, When and How to use VR in Maritime Training

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By

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# About the Presenter

**Salman Nazir**

**Professor, University of South-Eastern Norway**

- Adjunct Professor (Professor II)  
Nord University, Business School
- Head of the **Training and Assessment Research Group (TARG)**, focusing on enhancing human performance in complex socio-technical systems.
- Expertise in **human factors, virtual reality training simulators, situational awareness, autonomous systems and performance management.**
- Coordinator of the **EU Horizon 2020 ENHANCE Project**, which advances human performance in critical operations.
- Scientific leader at **Center of Excellence in Maritime Simulator Training and Assessment (COAST).**
- Author/co-author of over **120** peer-reviewed articles, conference papers, and book chapters in prestigious international platforms.
- Research highlights include work on **human factors, cognitive task analysis, Maritime, Training Simulators, VR, Performance Assessment, and enhancing trust in autonomous systems.**



Our aim is to Improve Human Performance within  
modern complex systems



## Training

Simulator Training  
Assessment and Evaluation  
Integration of Emerging  
technology



## Pedagogy

Pedagogy for MET  
Socio-cultural perspective  
Assessment Methods



## Human Factors

Human Performance  
Situation Awareness  
Human Error  
Human-Machine Interaction



## Safety

Accident Analysis  
Safety Training  
Safety Management



## Autonomous System

Transparency  
Automation  
Human-Automation teaming

Established in **2020**, **COAST (Centre of Excellence in Maritime Simulator Training and Assessment)** enhances maritime training through innovative simulation-based methods. It is a consortium of **four** Norwegian institutions:

1. **University of South-Eastern Norway (USN)** - host institution
2. **Western Norway University of Applied Sciences (HVL)**
3. **Norwegian University of Science and Technology (NTNU)**
4. **UiT The Arctic University of Norway (UiT)**

### Objectives:

1. **FA 1 Synergistic Simulation Curriculum.**
2. **FA 2 Innovation in Simulator Training and Assessment**
3. **FA 3 Student Engagement**
4. **FA 4 Organizational Development**



LinkedIn



## Centre of Excellence in Maritime Simulator Training and Assessment



Western Norway  
University of  
Applied Sciences



CENTRE FOR  
EXCELLENCE  
IN EDUCATION

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# Projects

## Current Projects:



### COAST

Centre of Excellence in Maritime Simulator Training and Assessment (COAST)

94,000,000 NOK

2020-2026



Enhancing Human Performance in Complex Socio-Technical Systems

1,080,000 NOK

2018-2024



### BZERO

Periodically Unattended Bridge

28,000,000 NOK

2025 - 2028

## Completed Projects:



### HUMANE

Human Maritime Autonomy Enable

11.83M NOK

2018 - 2021



### OpenBridge

Improving digital user interfaces of ships' bridges through open innovation

14,742,000 NOK

2019-2021



### IAMU

Investigating Seafarer Training Needs for Operating Autonomous Ships

612,900 NOK

2018 - 2019



### MARKOM2020

Workshops

16,296,000 NOK

2014 - 2019



### InnoTraining

Innovating maritime training simulators using Virtual and Augmented Reality

12,860,000 NOK

2017-2021



# Overview

# What is a Simulator?

## Definition

A simulator is a device or system that mimics real-world processes or environments to enable learning, training, or research without the risks or costs associated with actual scenarios. Alessi and Trollip (2001)

## Examples of Simulators

- ❑ **Flight Simulator:** Trains pilots in a replica cockpit with controls and scenarios for safe practice.
- ❑ **Driving Simulator:** Helps learners or researchers study driving skills and behavior without actual road risks.
- ❑ **Medical Simulator:** Allows healthcare professionals to practice surgeries or medical procedures in a controlled, virtual environment.
- ❑ **Maritime Simulator:** Trains seafarers on ship navigation, emergency protocols, and equipment handling in a realistic virtual ocean setting.



Image Credit: iStock

# Science of Training

- Training Needs Analysis
- Task Analysis
- Cognitive Task Analysis
- Learner Characteristics
- Learning Objectives
- Training Method Analysis
- Team vs. Individual Training
- Facilitator Role
- Feedback and Debriefing
- Transfer of Training
- Error Analysis
- Performance Metrics



**Image Credit:** Centre of Excellence in Maritime Simulator Training and Assessment (COAST)



# Applications of VR in different sectors

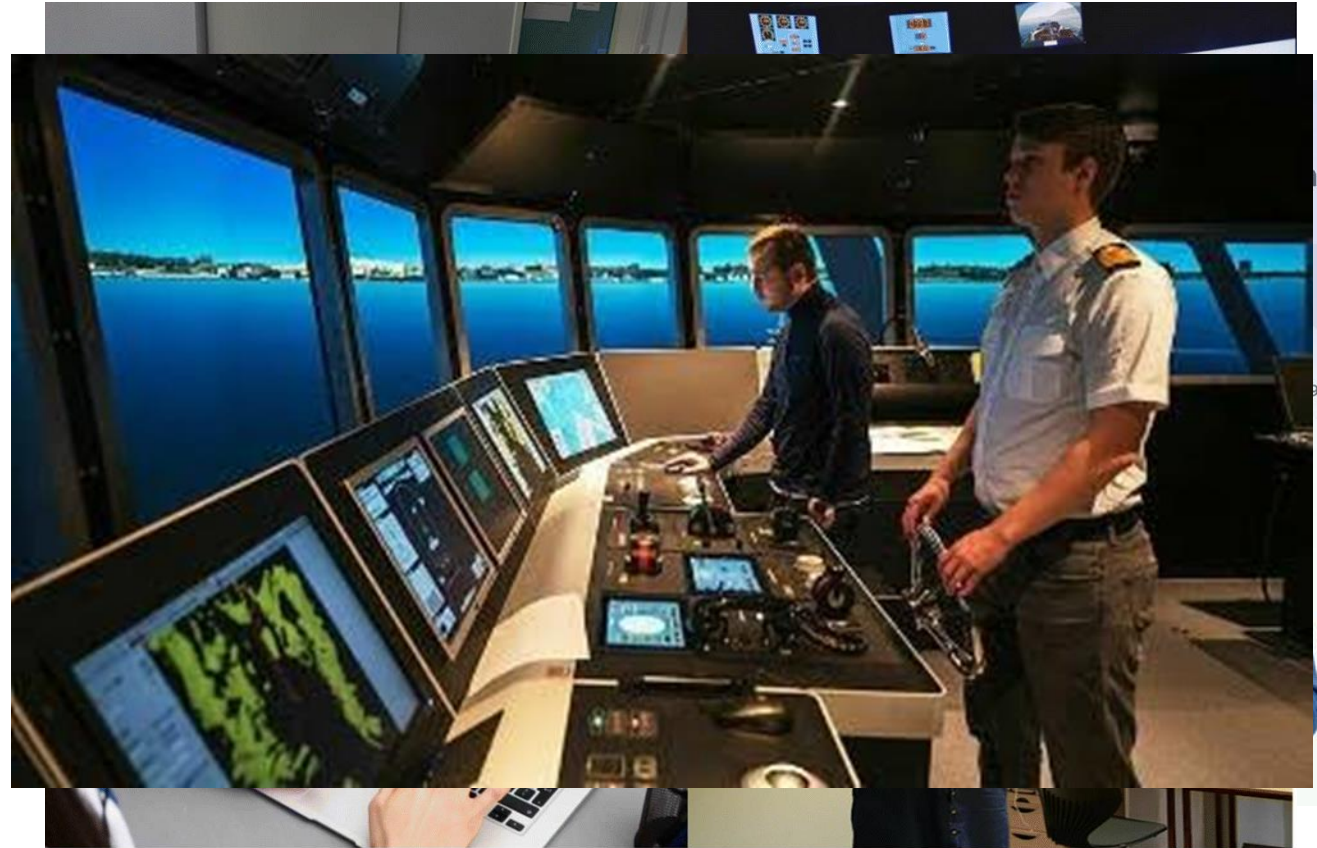
- ✓ **Maritime:** Immersive Navigation & Safety Training
- ✓ **Military:** Combat & Tactical Simulation
- ✓ **Manufacturing:** Assembly & Process Training
- ✓ **Process Industry:** Safety & Operations
- ✓ **Health:** Medical Training & Therapy
- ✓ **Aviation:** Flight & Maintenance Training



# Why Use VR in Maritime Training

# Why Use VR in Maritime Training

- Safety
- Cost Efficiency
- Realistic Scenario-Based Learning
- Enhanced Learning & Retention
- Flexibility & Accessibility
- Motivation and Engagement
- Immersion and Presence
- On board Training
- Our experiments



c)

d)

# When to Use VR in Maritime Training



# When to Use VR in Maritime Training

- Complimentary
- Safety and Emergency Drills
- Navigation and Bridge Operations
- Engine Room Training
- Soft Skills & Team Coordination
- Onboarding New Crew Members
- Education?





ARTICLE







## An evaluation of maritime simulators from technical, instructional, and organizational perspectives: a hybrid multi-criteria decision-making approach

Hasan Mahbub Tusher<sup>1</sup>  · Ziaul Haque Munim<sup>1</sup>  · Salman Nazir<sup>1</sup> 

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- What **factors** influence the selection of simulator modalities for maritime training, and how can their **importance rankings** be used to evaluate simulators?

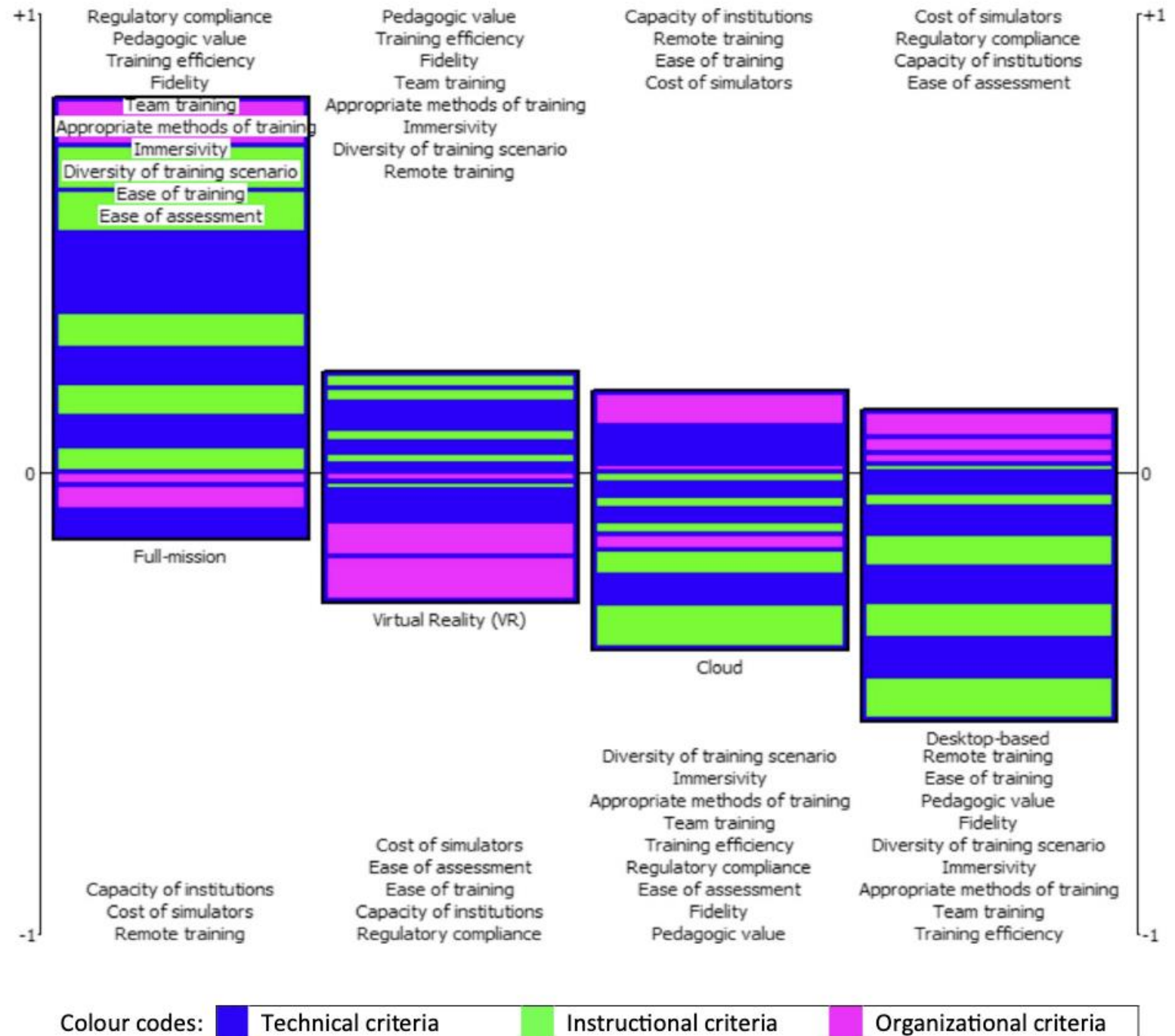
# Goal of the study

LEVEL 1: PURPOSE	Evaluation of Maritime Simulators			
LEVEL 2: CRITERIA	Technical	Instructional	Organizational	
	C1: Fidelity, C2: Immersivity, C3: Possibility of remote training C4: Possibility of team training C5: Ease of training	C6: Ease of assessment, C7: Pedagogic value C8: Appropriate methods for training C9: Diversity of training scenario C10: Training efficiency	C11: Regulatory compliance, C12: Cost of training, C13: Capacity of institutions	
LEVEL 3: ALTERNATIVES	 A1: Full-mission simulators	 A2: Desktop-based simulators	 A3: Cloud simulators	 A4: Virtual Reality (VR) simulators



# Results

## Simulator ranking with criteria

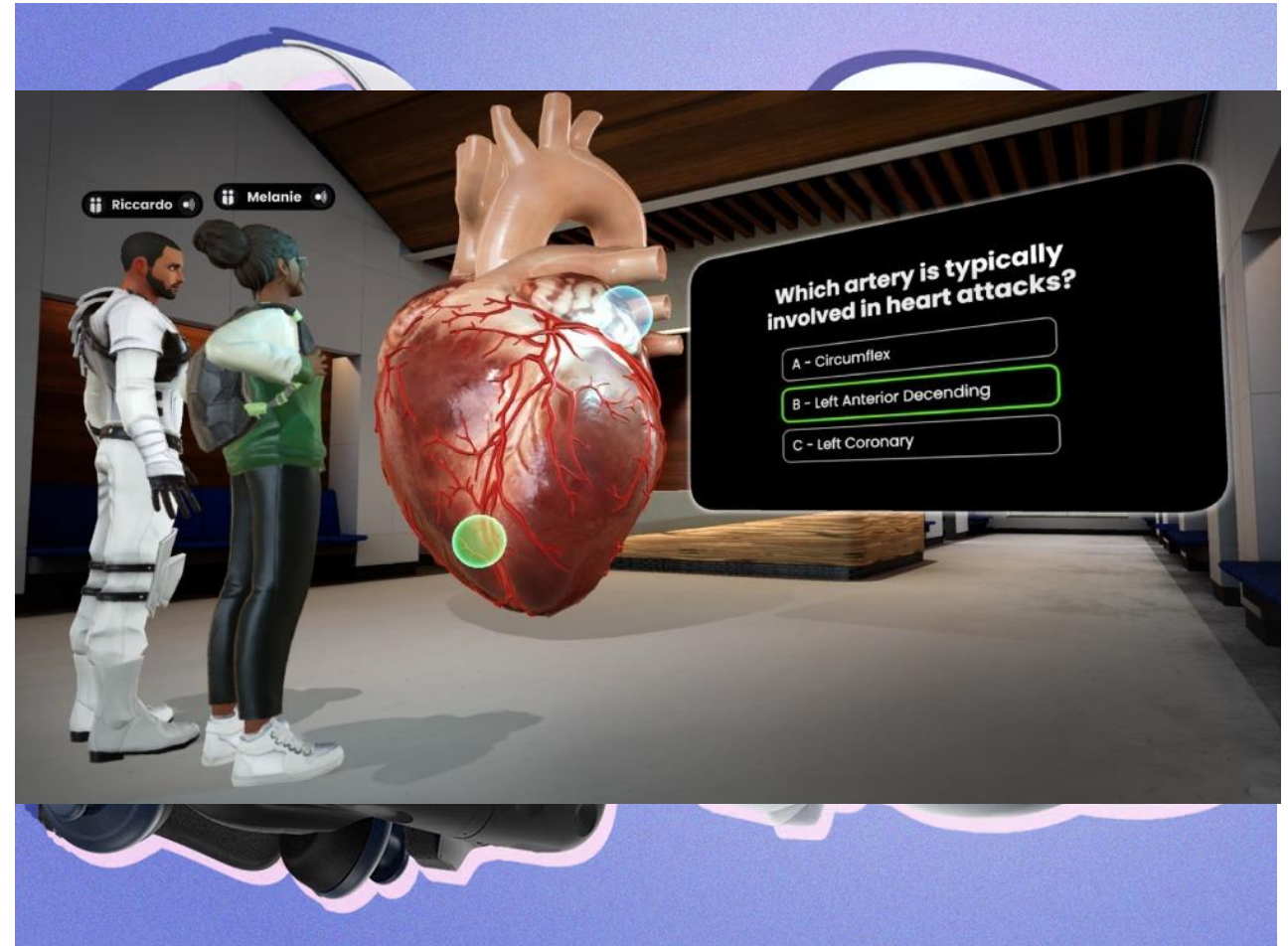




# How to Use VR in Maritime Training

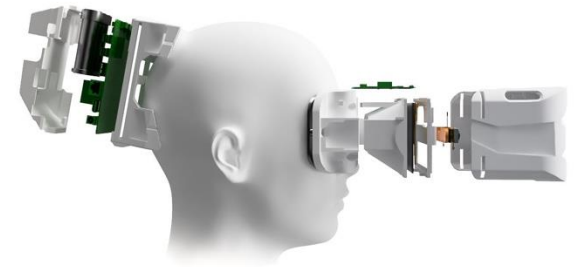
# How to Use VR in Maritime Training

- **Choose the Right VR Platform**
  - Standalone VR headsets
  - High-end VR simulators
- **Develop Realistic Scenarios**
- **Integrate with Traditional Training**
- **Interactive Assessment**
- **Continuous Updates & Customization**

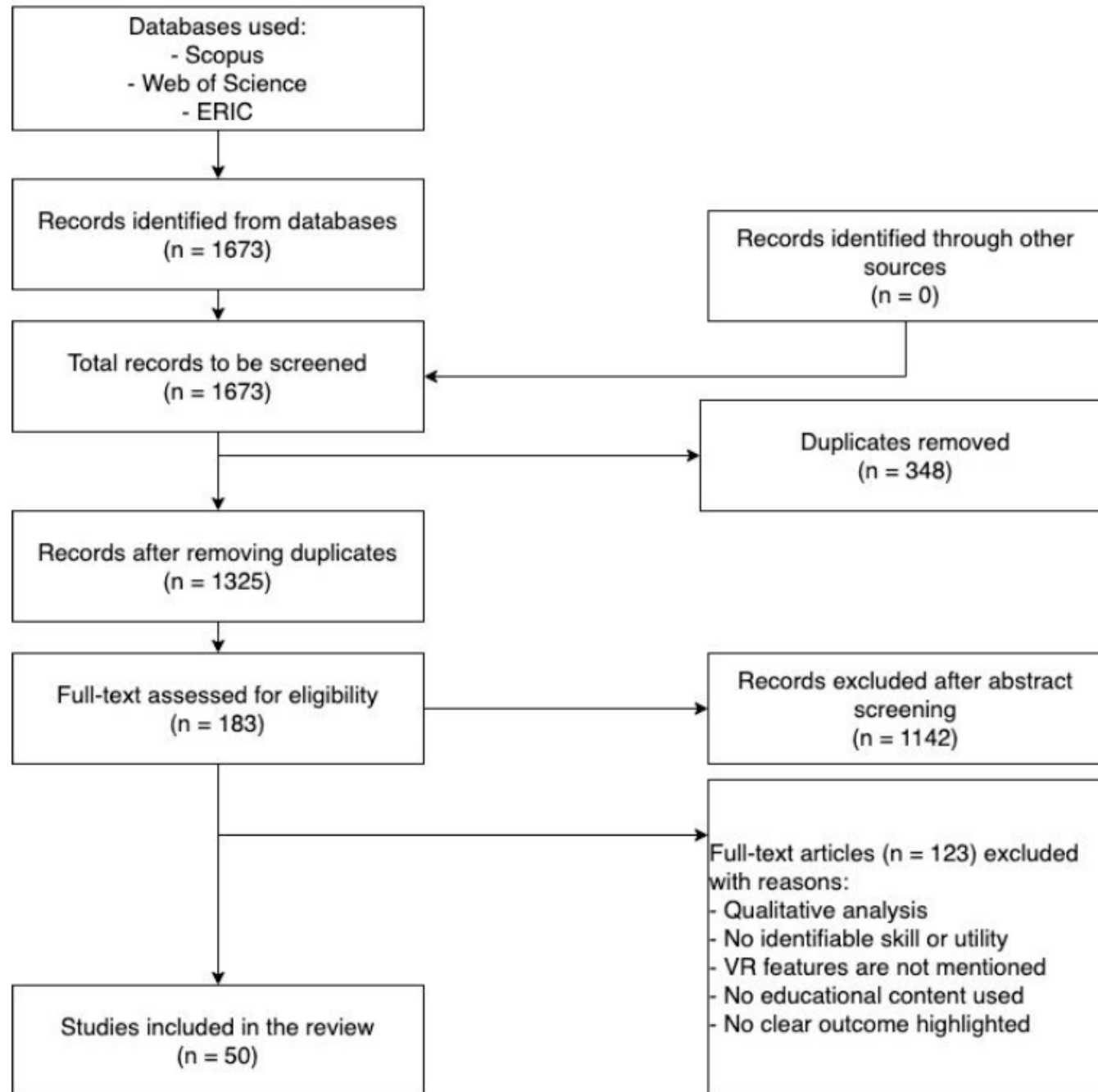


# *A systematic review of Virtual Reality features for skill training*

- Which **technical and experiential VR features** are operationalized in a professional training context?
- How do **VR features influence skill** development and different **learning outcomes** within various professional training contexts?
- Which **assessment methods** are used to measure the learning outcomes in VR training?



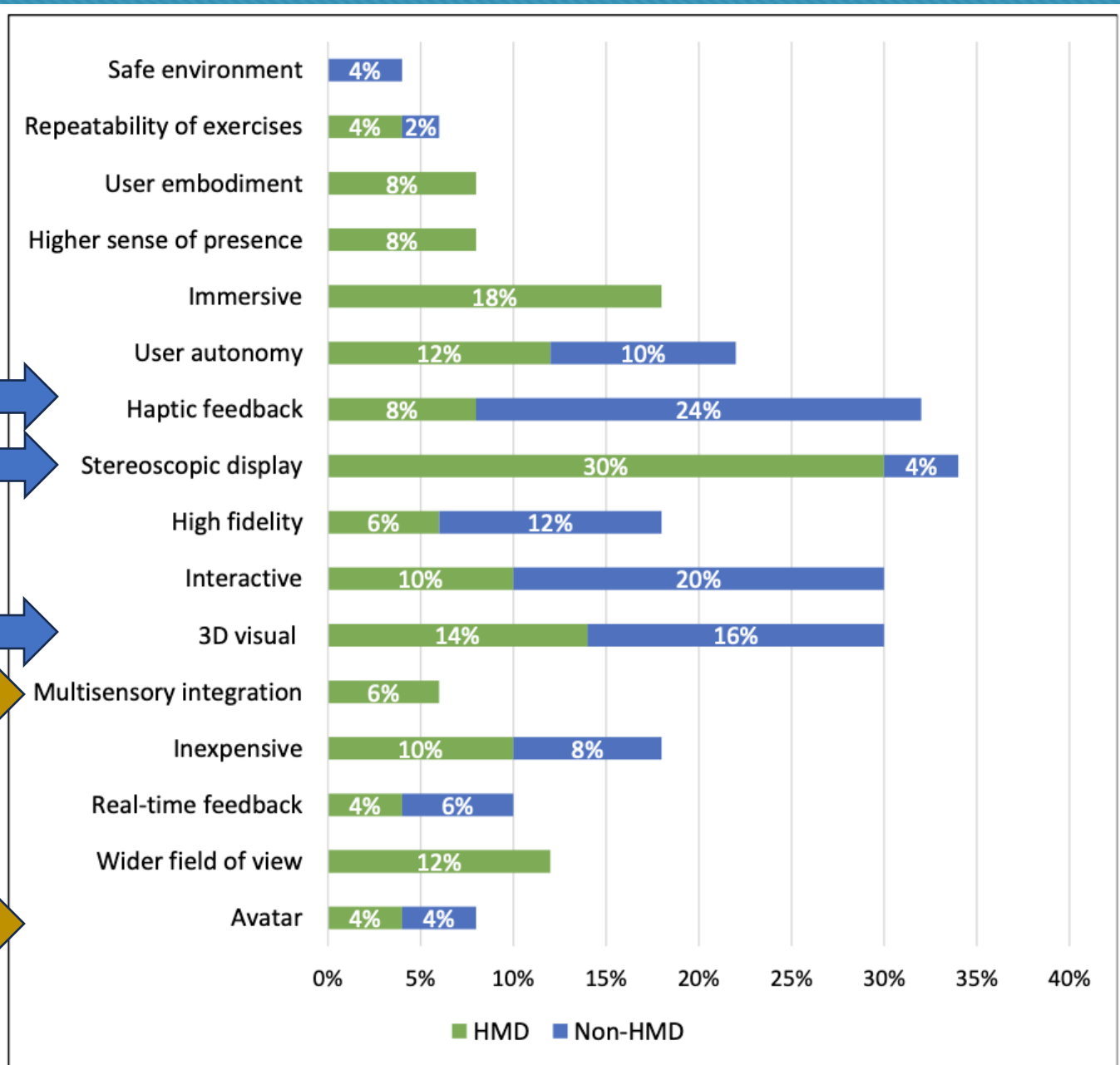
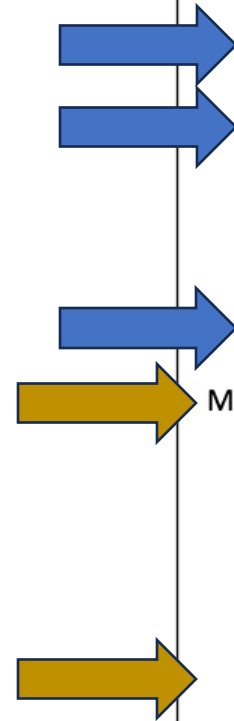
# Methods





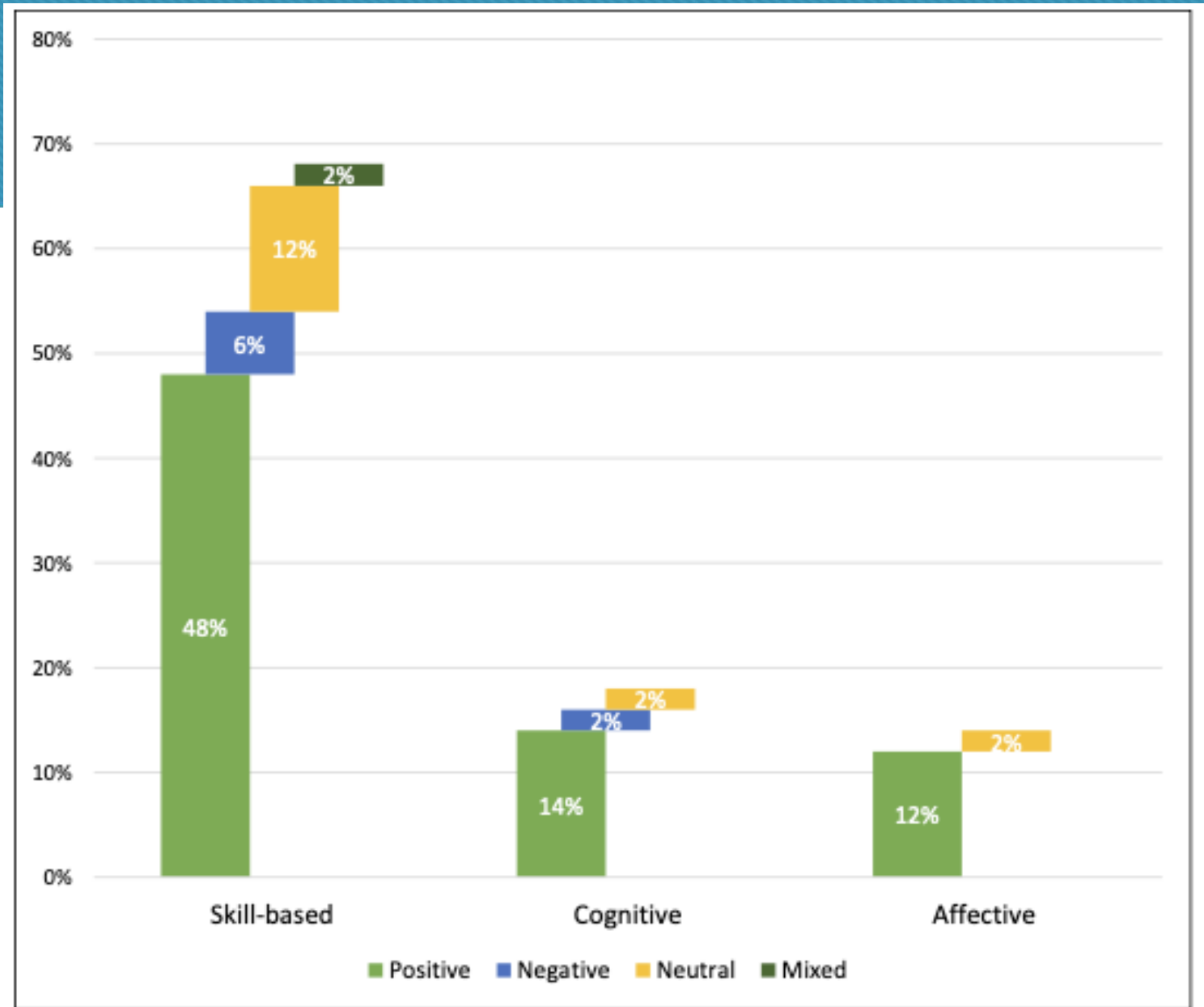
# Results

## VR Features



# Results

## Learning outcomes



## Assessment methods In VR

### Most used

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- Self-rated scores,
- Open-ended questions,
- Likert scale surveys,
- Psychological measures

### Least used

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- Response time,
- Movement data (e.g., eye-tracking),
- Rate of completion

# Thank you

**LinkedIn**



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# Reference List

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