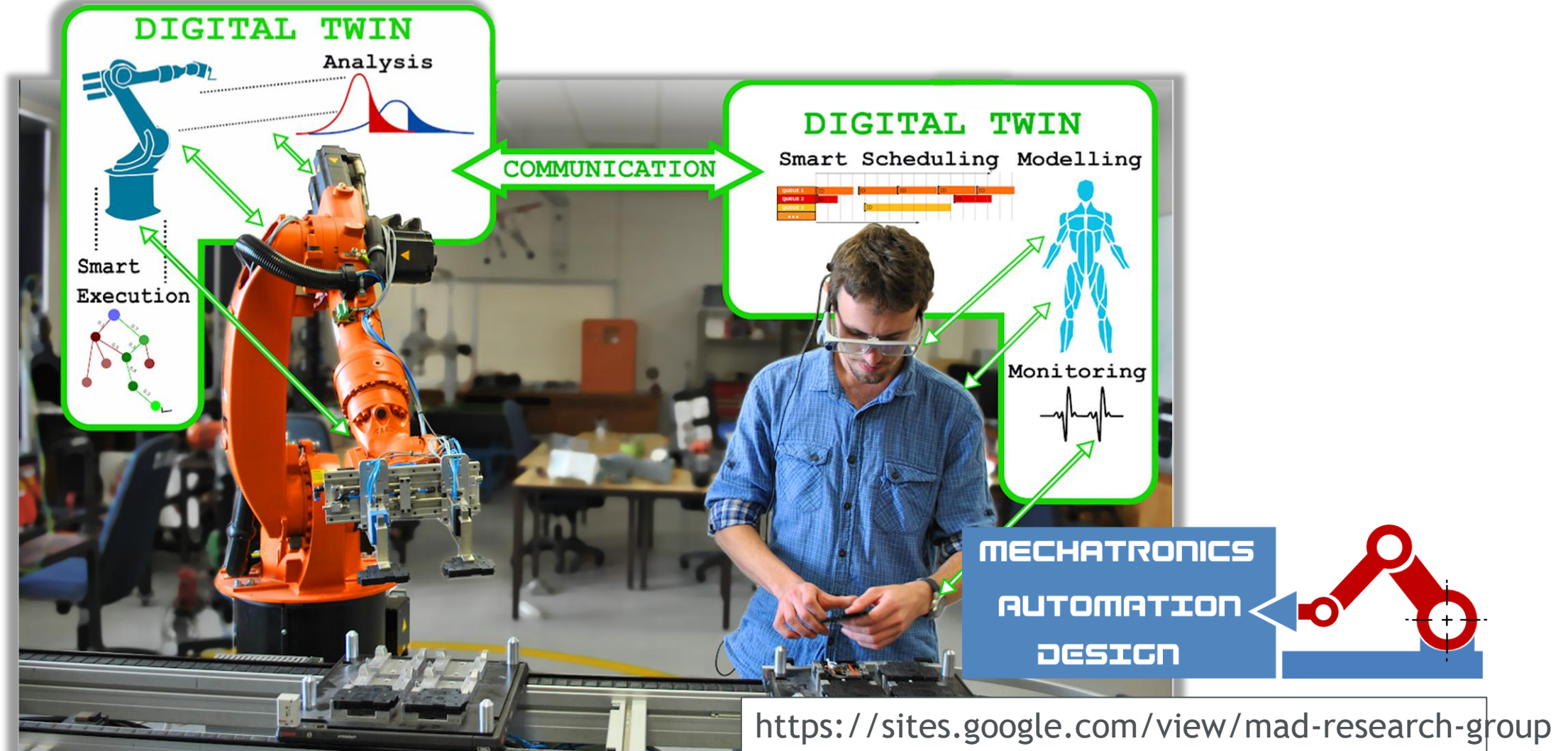


Engineering Human-Autonomy Integration in Industrial Systems

by Nicole Taylor
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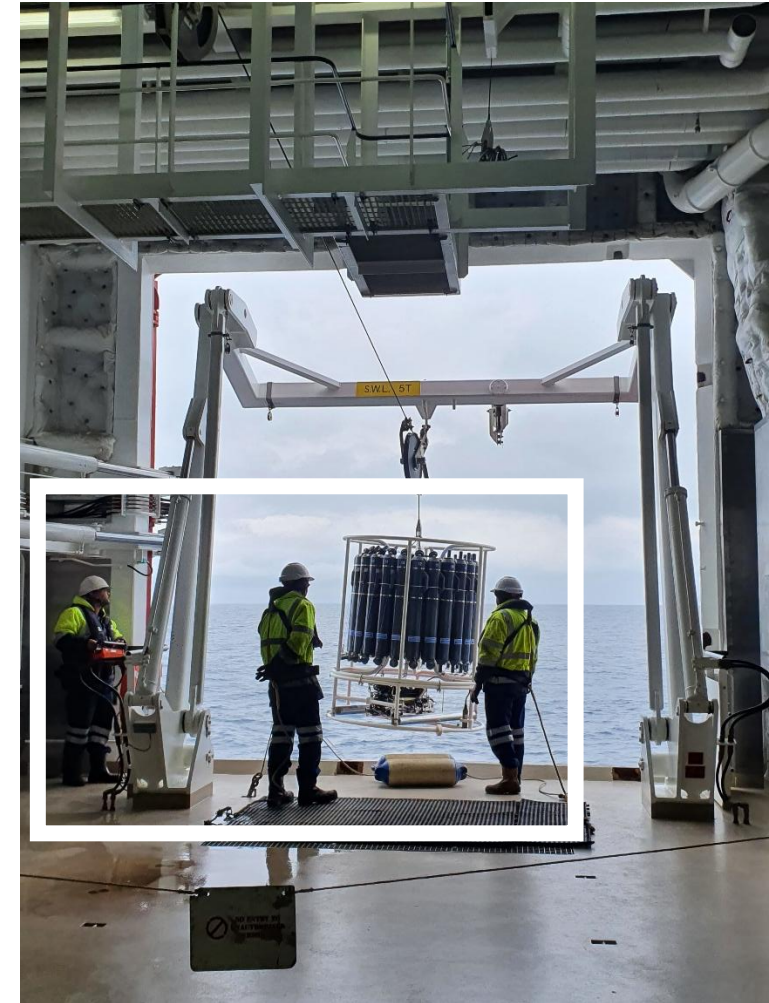
Background



Background



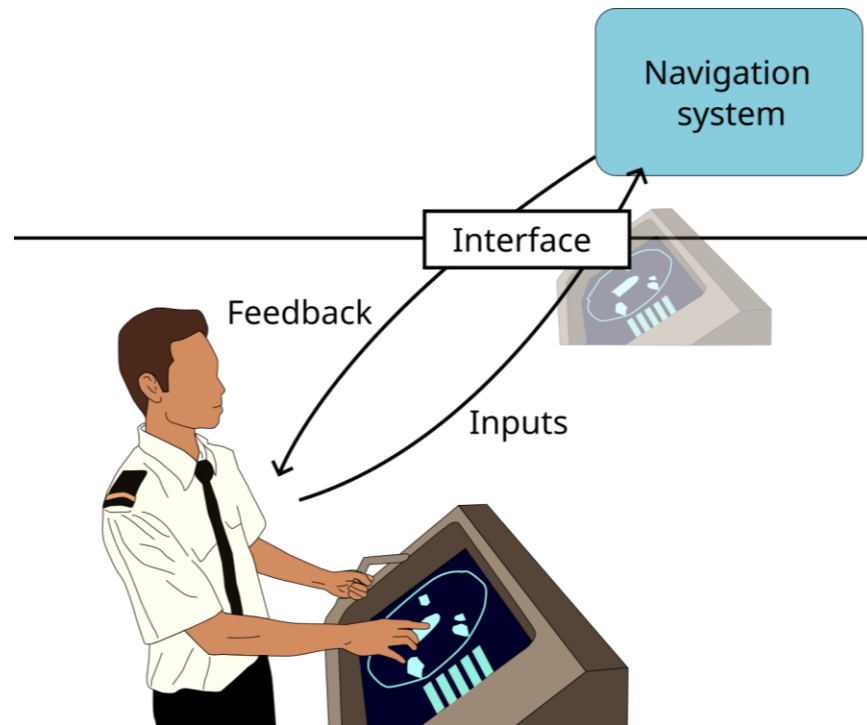
Background



- Sophisticated technologies exist (including AI)
- Working with different levels of autonomy
 - From completely manual
 - To autonomous
- Reducing human involvement
 - Automated systems - designed to execute defined tasks previously performed by people
 - Autonomous systems - designed to define their own tasks and execute them independently without human intervention
- What about human autonomy?

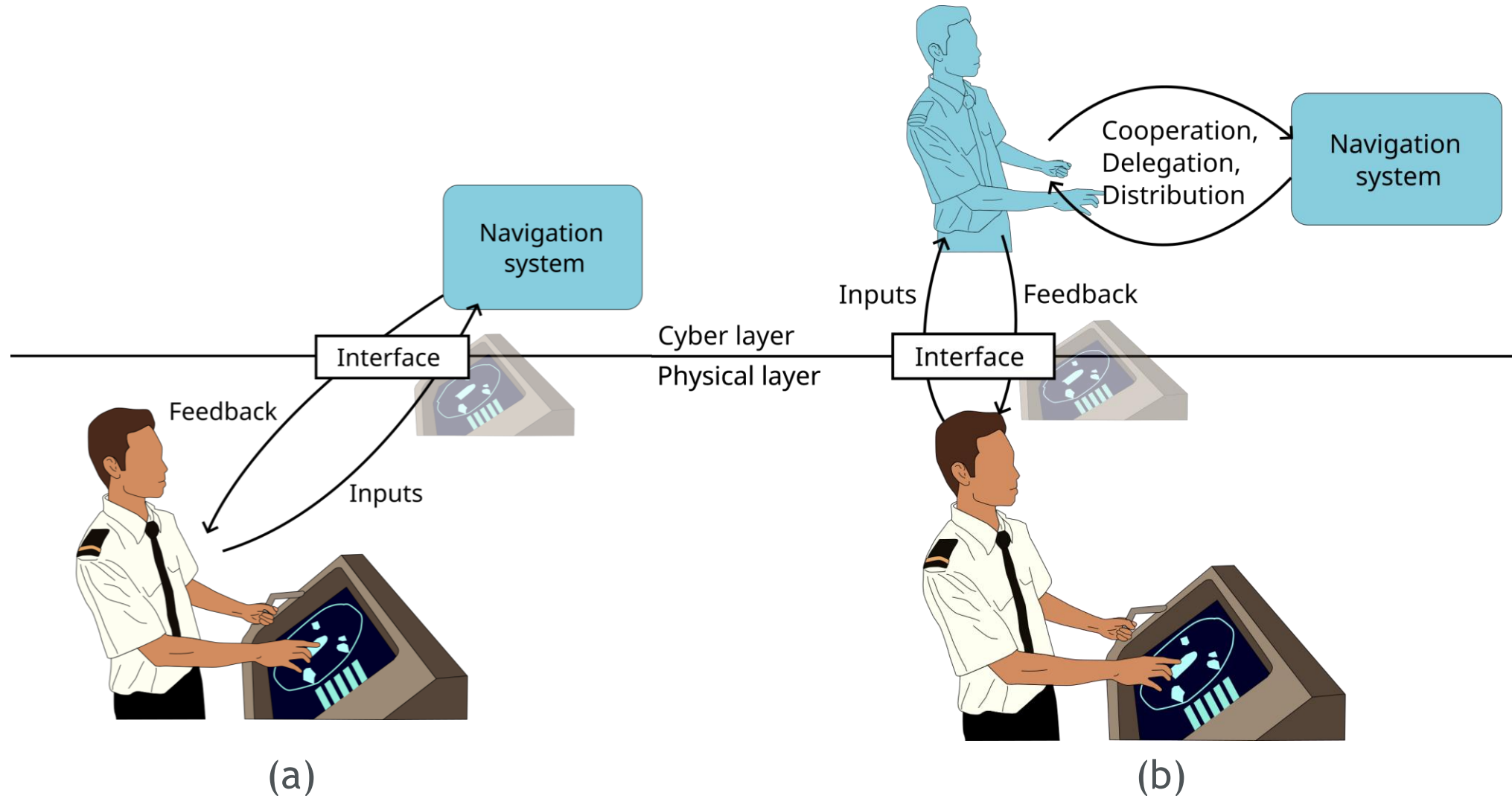
- Engineer human-autonomy integration
 - “Play towards strengths” of human and system autonomy
 - Human factors engineering
- Develop human cyber-physical systems
 - Information and communications technology that incorporates human factors
 - Cyber layer with software, computation, etc.
 - Physical layer with infrastructure, equipment, etc., including people

Research developments



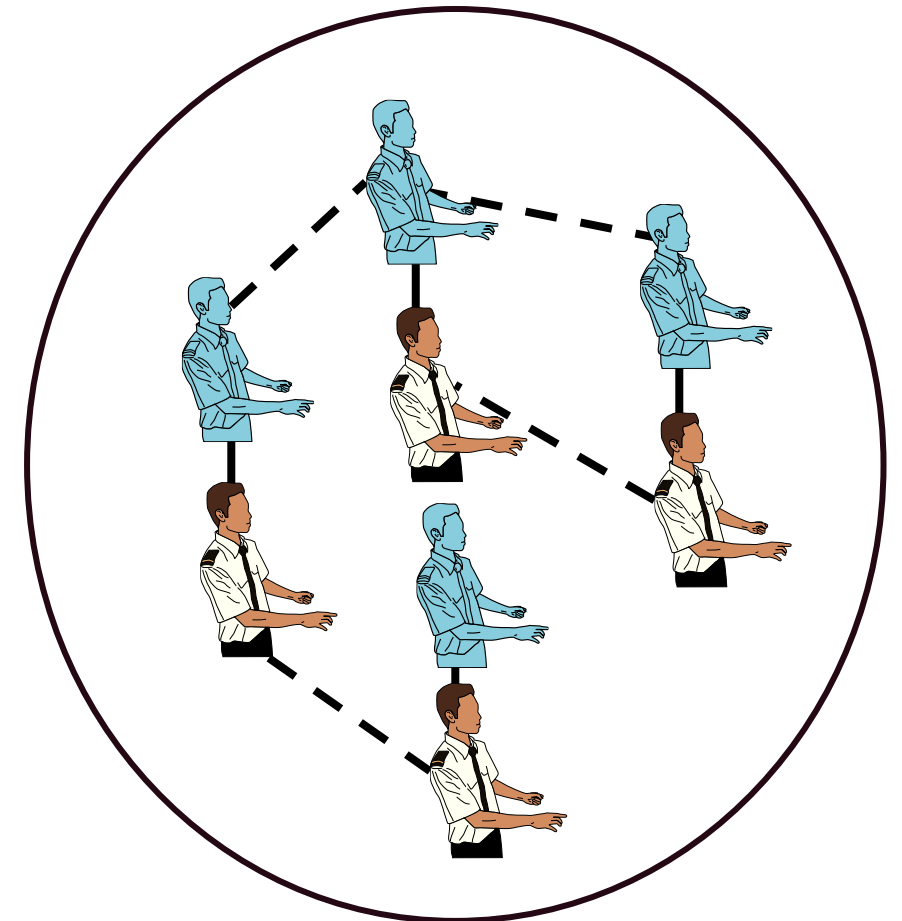
(a)

Research developments



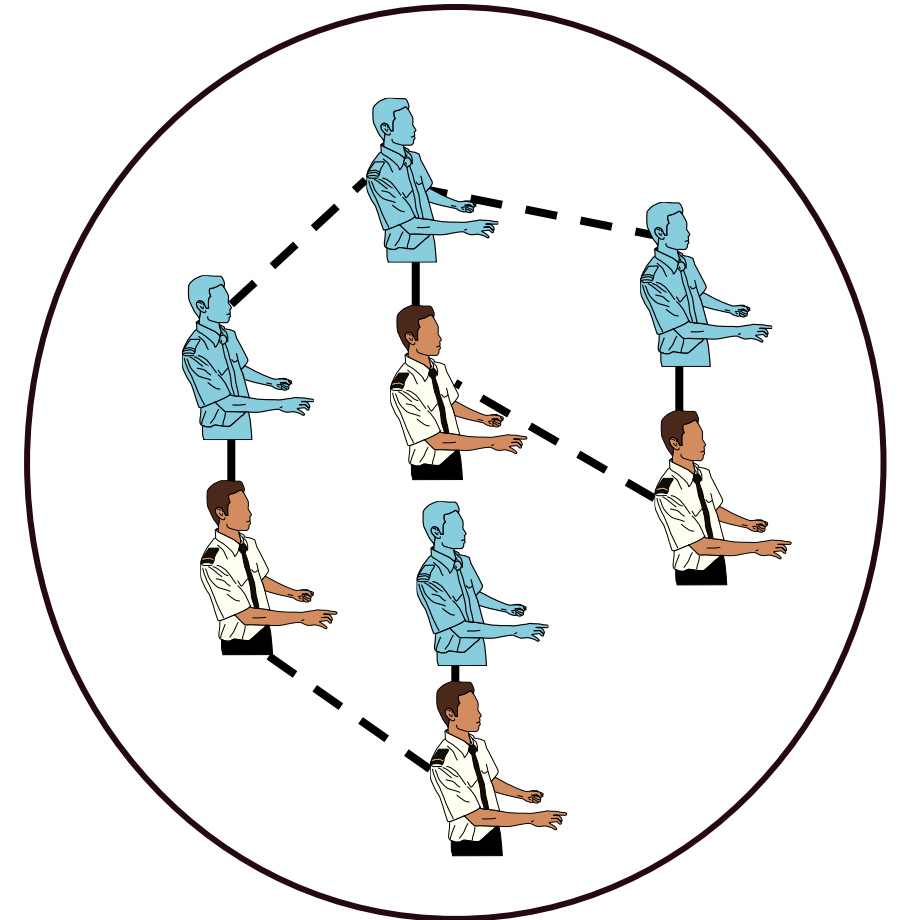
Research developments

- Step 1: Formulate requirements
- Define functions to perform
 - Collect/process data
 - Make informed decisions
 - Execute/implement tasks
- Tailored to a specific context



Research developments

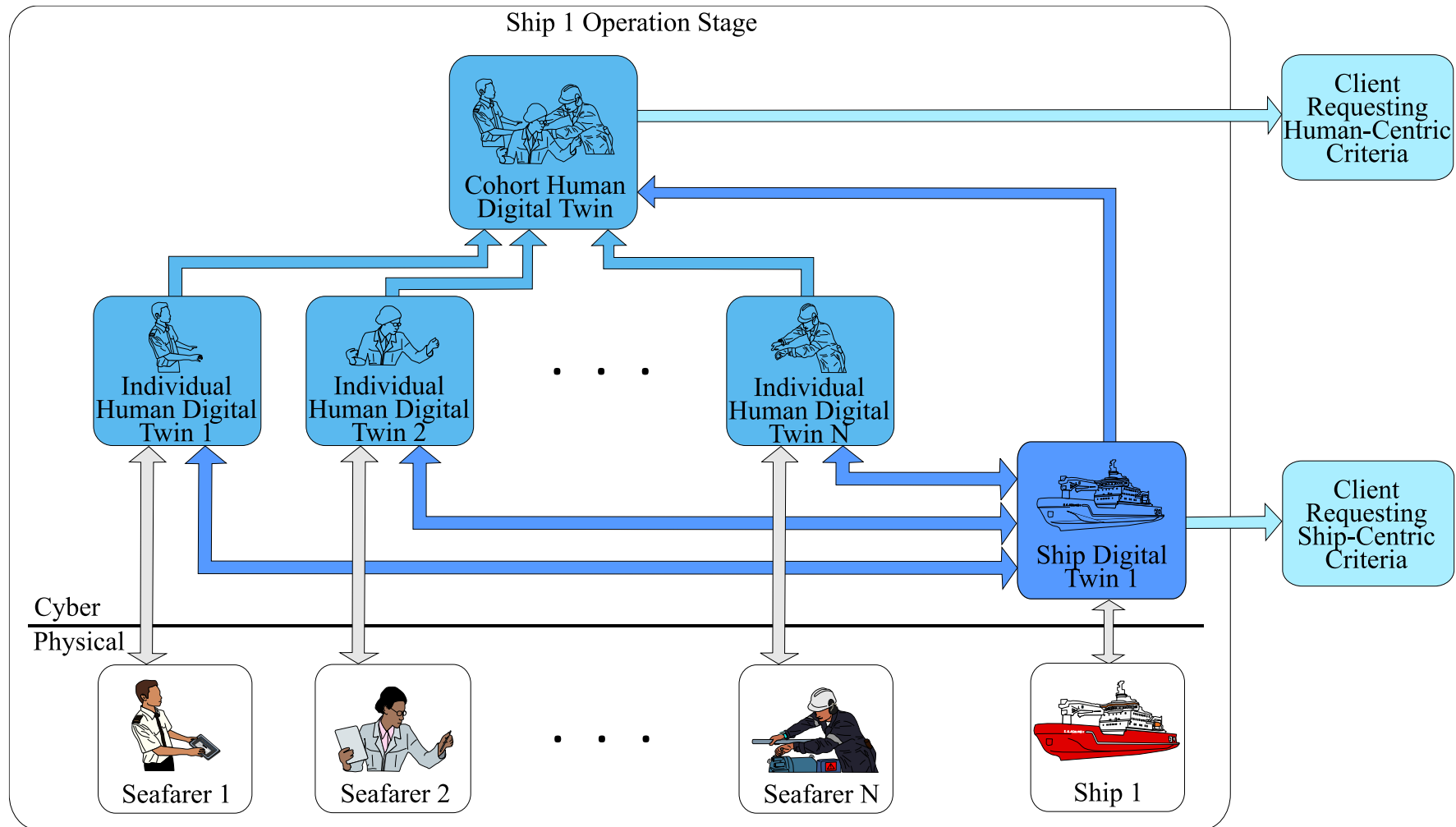
- Step 2: Design architecture
- Identify necessary cyber/physical entities
- Reflect physical reality when organising cyber entities



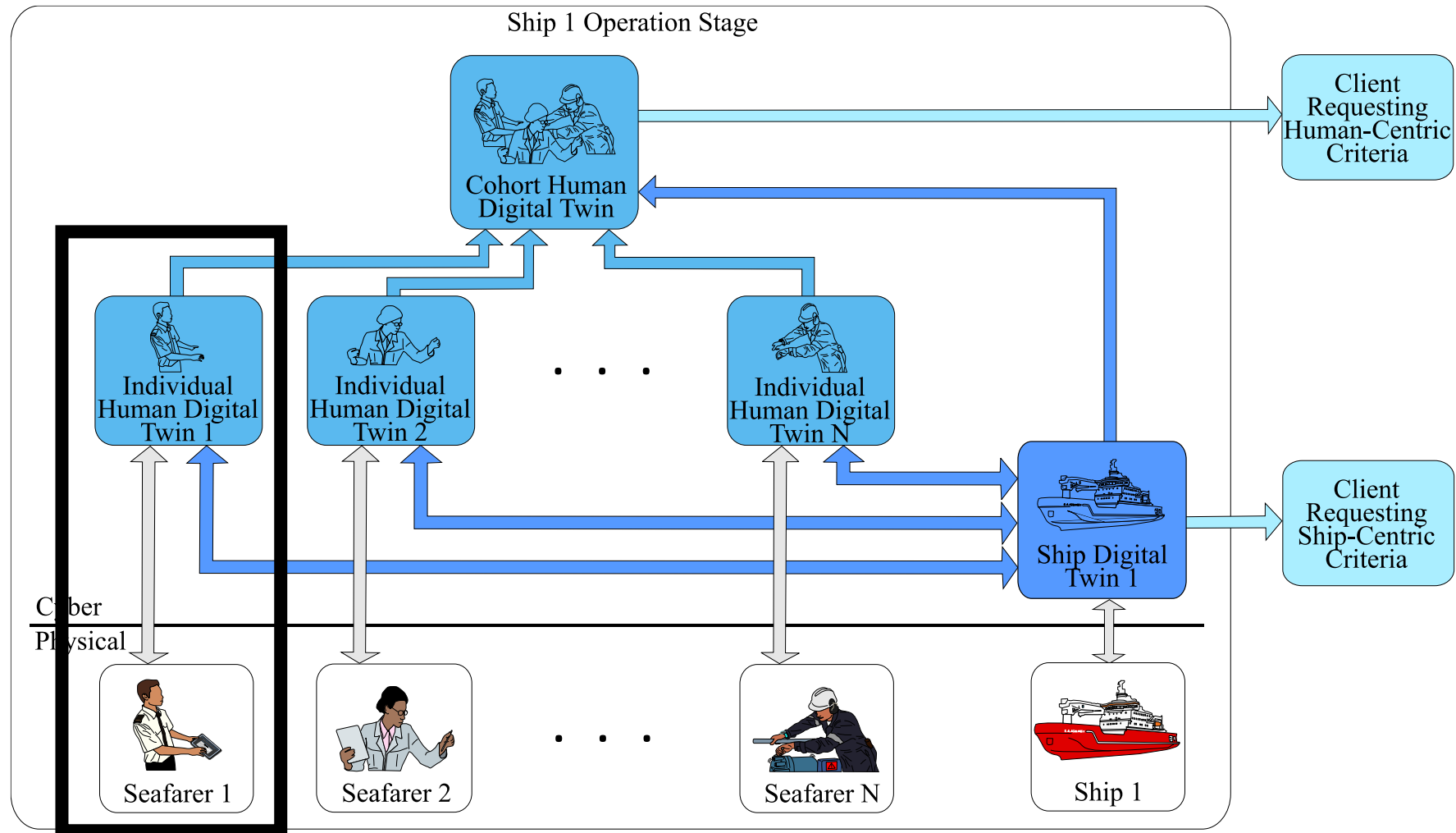
Research developments

- Step 3: Implement
- Human cyber-physical system to study motion sickness

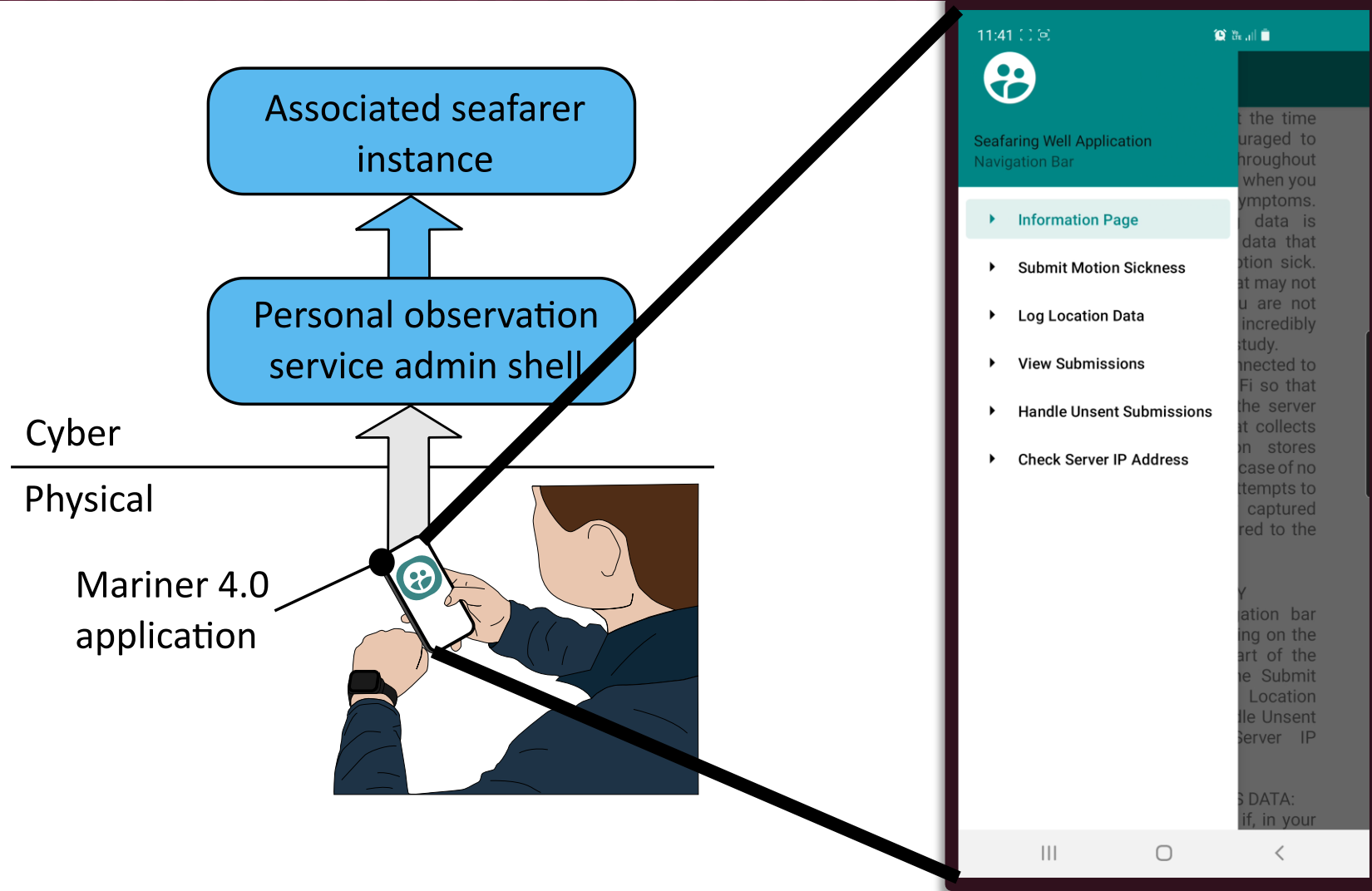
Research developments



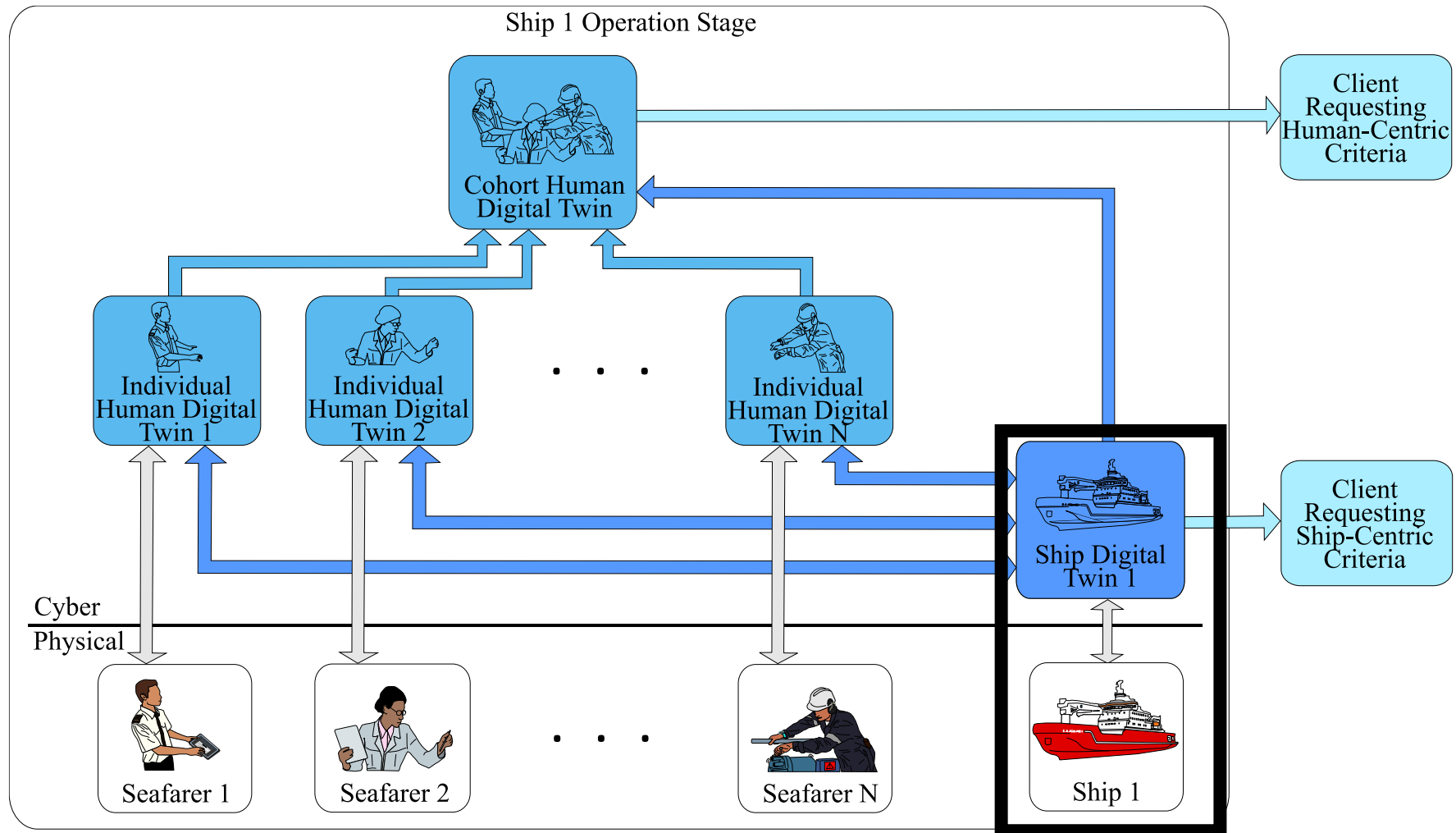
Research developments



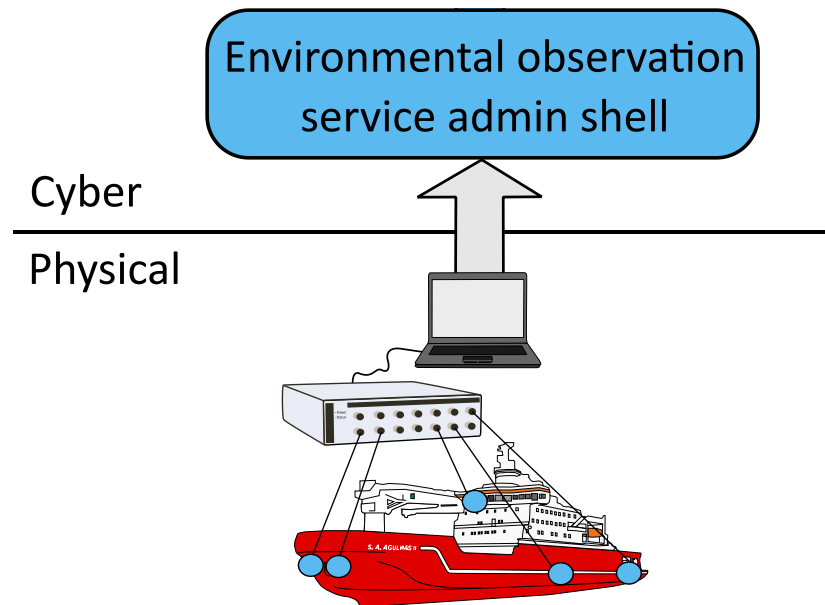
Research developments



Research developments

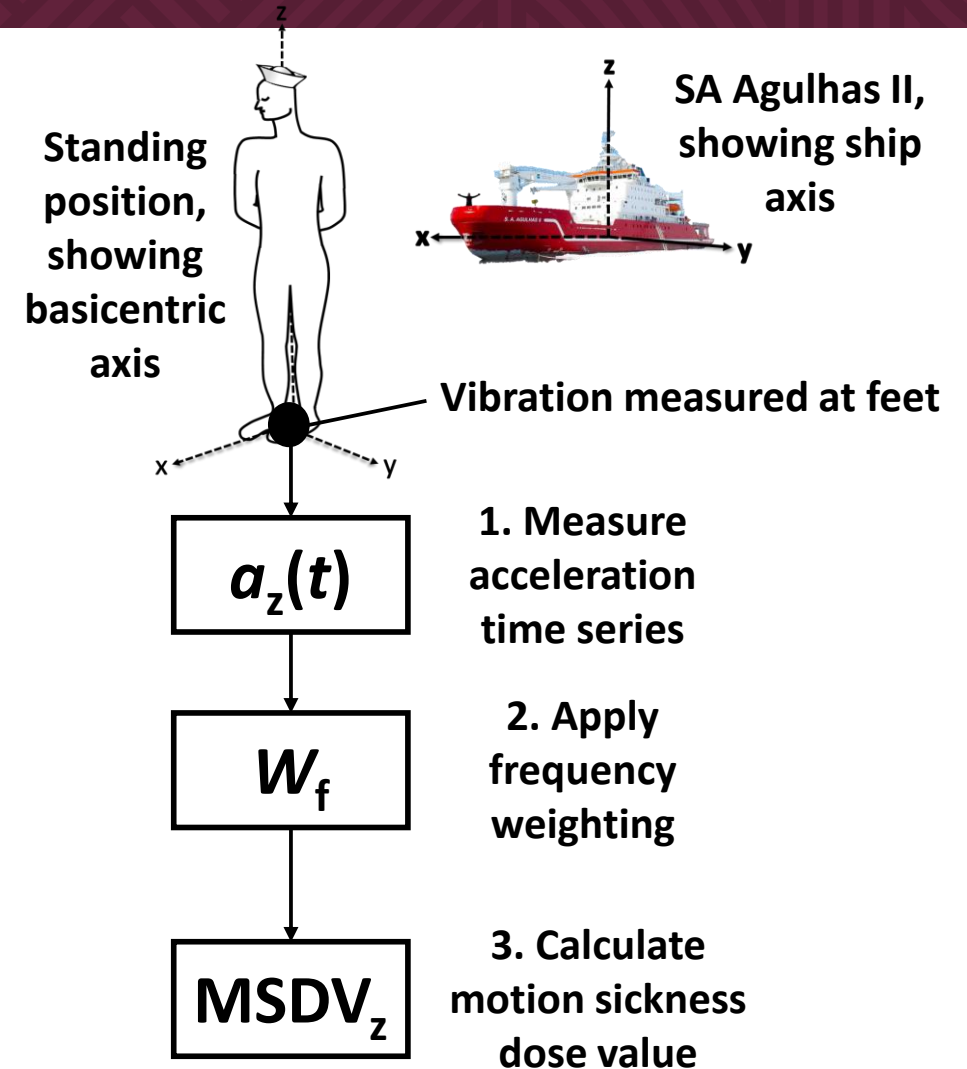


Research developments

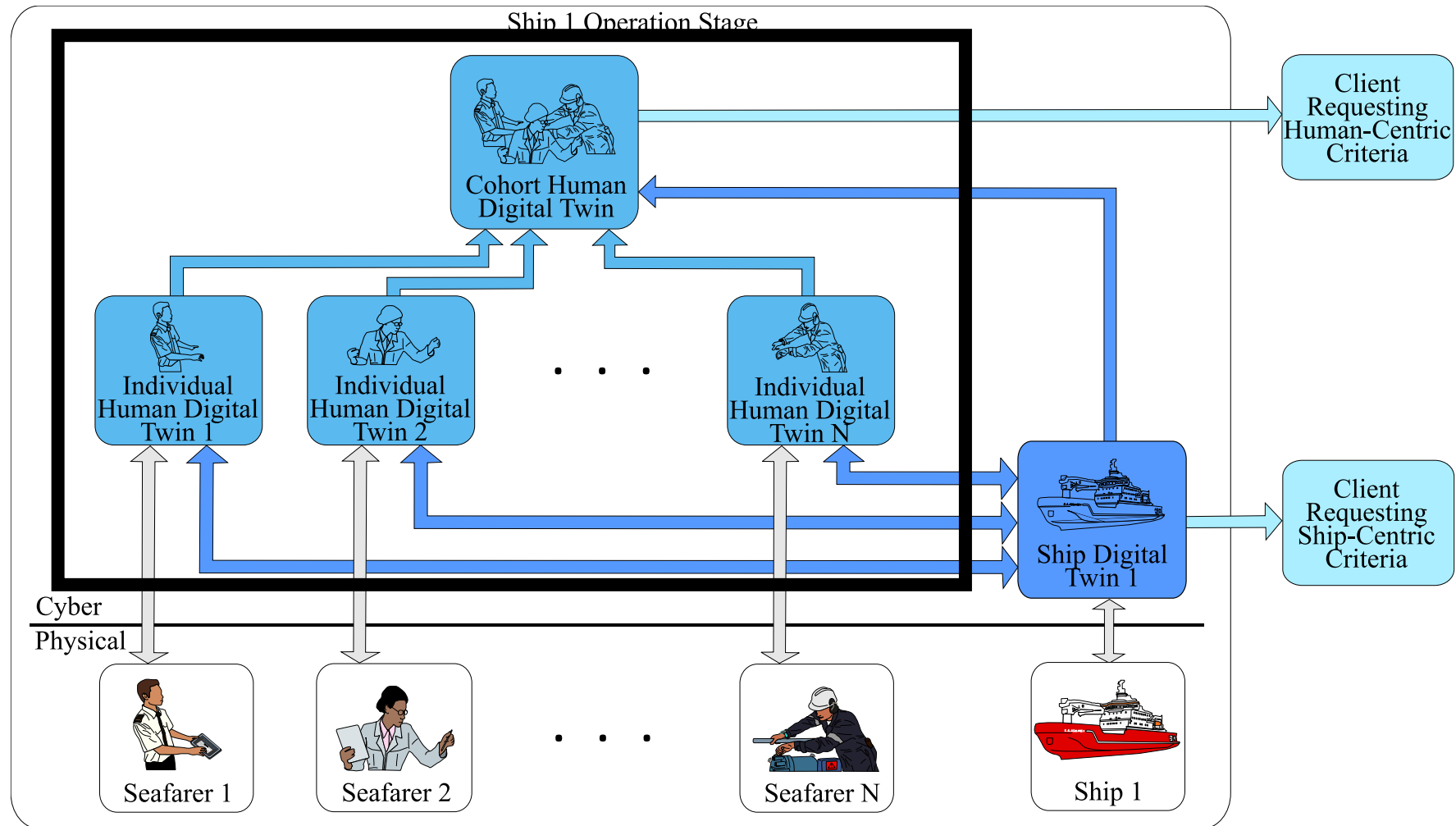


$$\text{MSDV} = \left(\int_0^T a_w^2(t) dt \right)^{1/2}$$

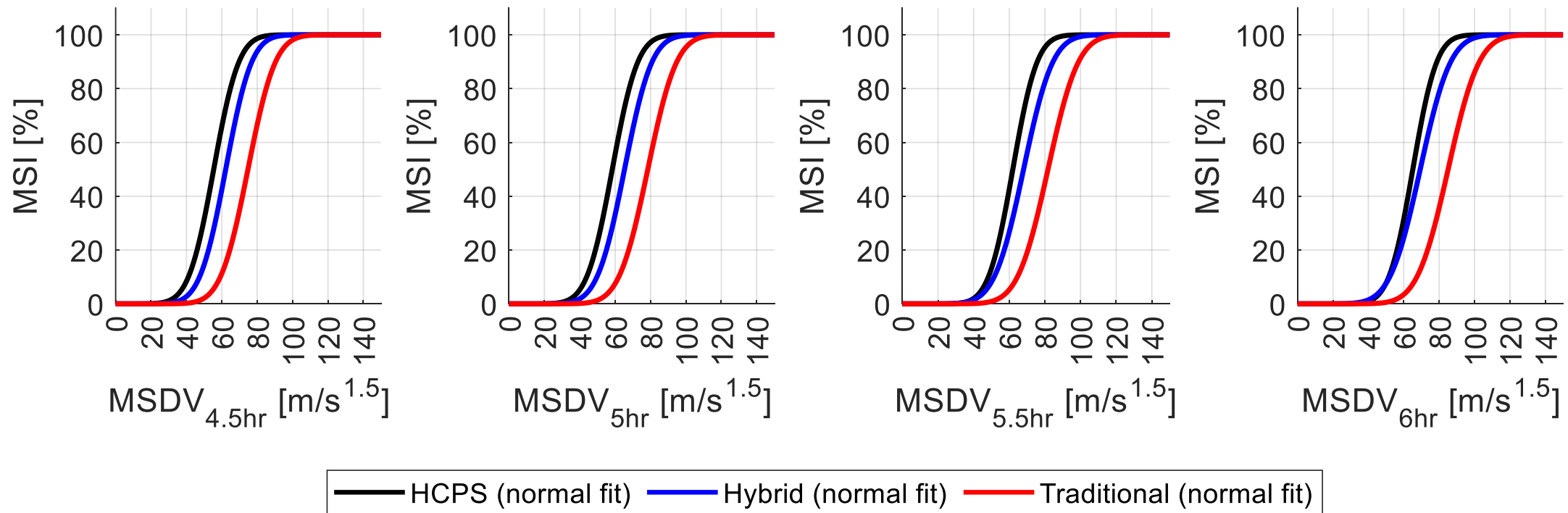
(ISO 2631-1, 1997)



Research developments



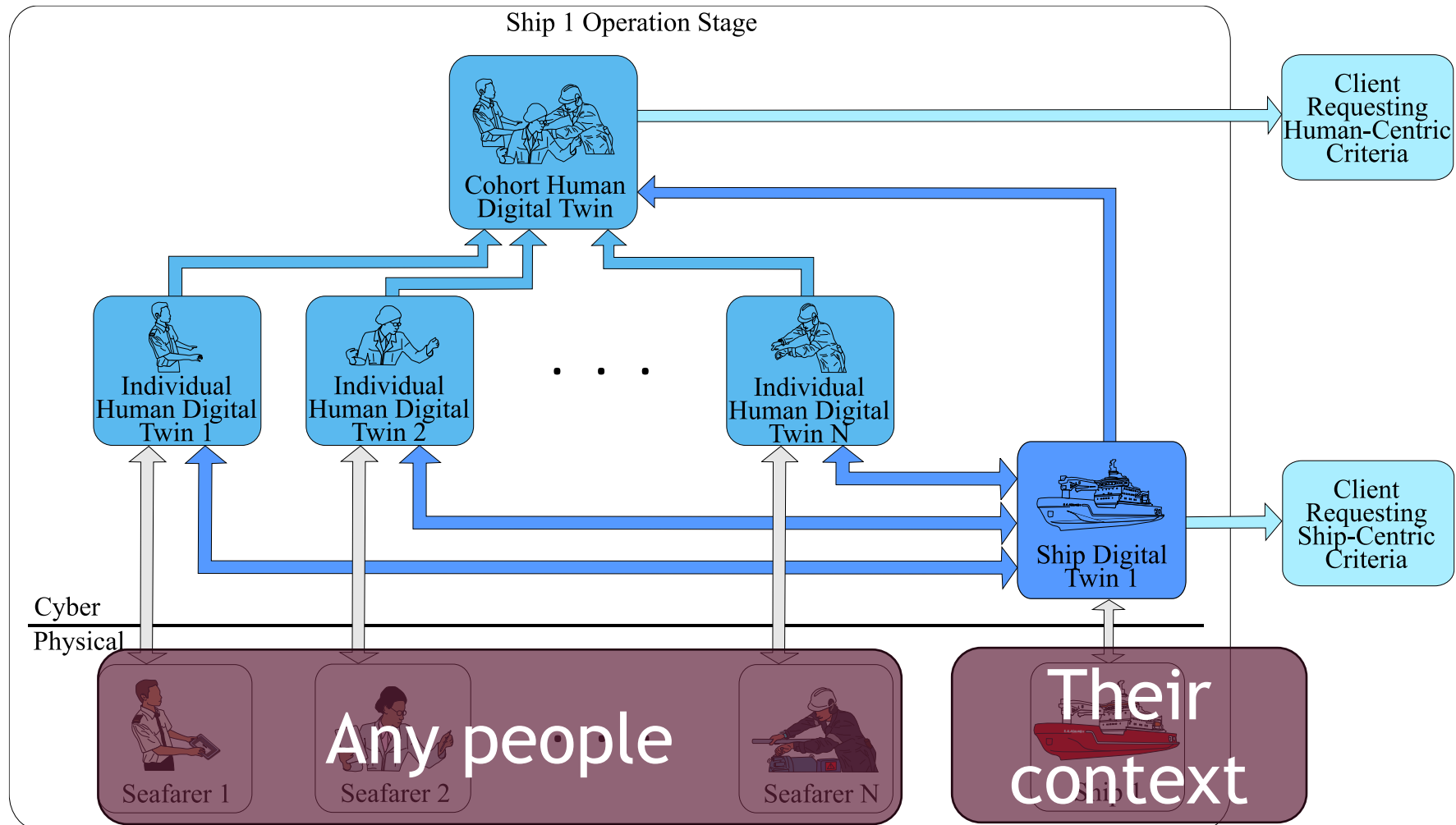
Research developments



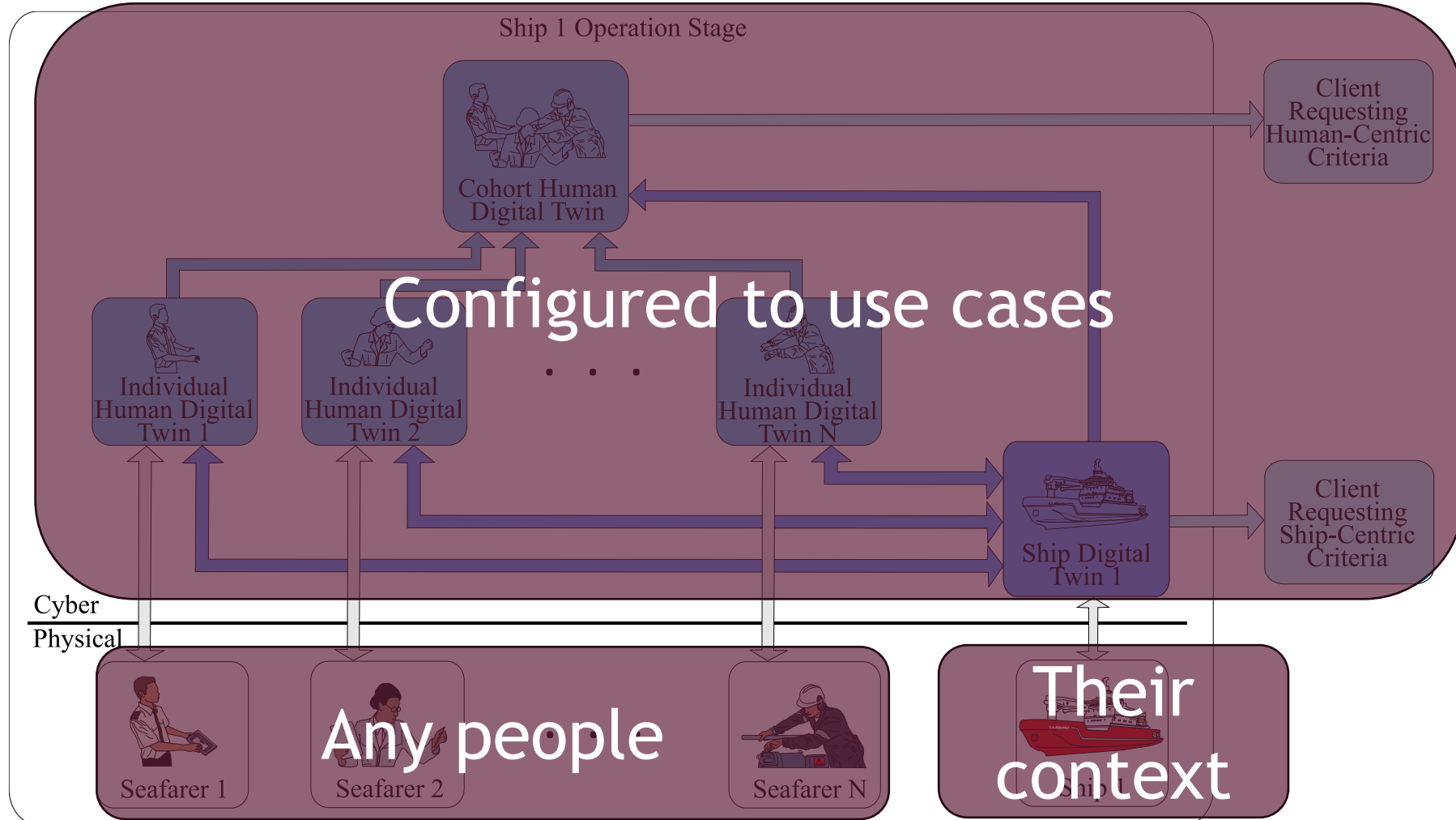
Research opportunities

- Studying motion sickness served as proof of concept
 - Successful real-world deployment
 - Focussed on data collection and analysis
- Blueprint for human cyber-physical system development

Research opportunities



Research opportunities



- Positioned for engineering human-autonomy integration
 - Develop personalised models to enrich cyber entities
 - Delegate and distribute tasks/decision making according to capabilities
- Relevant to emerging paradigms
 - Human-autonomy teaming
 - Agentic AI
 - Industry 5.0

Thank you
Enkosi
Dankie