# Lessons Learned and Implementation Strategy for the Pilot Project 1

## Pilot 1 – VR Fire Evacuation Model for Ship Engine Rooms

## Implementation

The implementation of Pilot Project 1 focused on the development of an evidence-based Virtual Reality (VR) firefighting training model for ship engine rooms. The pilot brought together industrial, academic, and research partners to create a realistic and immersive training environment that combines scientific modelling, virtual simulation, and user validation activities.

## VR Firefighting Model Development

The core implementation activity involved the development of a realistic VR firefighting simulation based on ship engine room environments. The pilot integrated advanced modelling approaches and immersive VR technologies to provide users with a safe and realistic training environment for emergency response and evacuation scenarios.

The implementation process included the development of the virtual environment, integration of firefighting and evacuation scenarios, technical testing, and validation with maritime professionals and project partners. The resulting system enabled trainees to experience realistic emergency situations while improving preparedness, decision-making, and operational awareness.

## Technical Adaptation and Problem Solving

A significant implementation challenge was the limited availability of detailed engine room technical drawings due to industrial intellectual property restrictions. To overcome this constraint, PFRI relied on its internal expertise and maritime knowledge to reconstruct a realistic and functional engine room environment suitable for VR simulation.

This approach enabled the project to maintain development continuity and achieve its objectives despite the absence of complete industrial documentation. The experience demonstrated the importance of organizational flexibility, technical expertise, and adaptive problem-solving capabilities during project implementation.

## Testing, Validation and Knowledge Exchange

The implementation phase included extensive testing and validation activities involving consortium partners and external stakeholders. Partners participated in demonstration sessions, testing events, and validation workshops where feedback on realism, usability, and educational value was collected and integrated into the final solution.

Knowledge exchange was supported through annual consortium meetings, WP3 meetings, technical discussions, and demonstration events, enabling partners to share experiences and contribute to the continuous improvement of the VR model.

## Academic and Industrial Collaboration

The implementation benefited from strong collaboration between academic and industrial partners. In particular, the Antwerp Maritime Academy (HZS) contributed valuable expertise in maritime operations, emergency response procedures, and training methodologies. Their involvement strengthened the scientific validity and educational relevance of the developed solution.

The collaboration between academic partners and industry stakeholders ensured that the VR model remained both scientifically rigorous and operationally relevant.

## Lessons Learned

The pilot project generated several important lessons regarding collaboration, technology development, stakeholder engagement, and project management.

## Intellectual Property and Data Availability

One of the most important lessons learned concerns the need for early communication and alignment with industrial partners regarding intellectual property, data access, and technical requirements.

The pilot demonstrated that industrial partners may face restrictions related to intellectual property, confidentiality obligations, and copyright protection that can limit access to technical information required for development activities. This highlighted the importance of establishing clear data-sharing agreements, confidentiality arrangements, and technical expectations during the project preparation phase.

Early clarification of data access requirements can significantly reduce delays and improve project efficiency.

## Academic and Research Collaboration

The pilot highlighted the value of strong collaboration with educational and research institutions throughout the entire project lifecycle.

The participation of Antwerp Maritime Academy (HZS) provided significant benefits during testing, validation, and methodological discussions. The experience showed that academic institutions contribute not only technical and scientific expertise but also ensure that developed solutions remain educationally relevant, pedagogically sound, and aligned with emerging research developments.

The project demonstrated that closer integration of academic partners during design, implementation, validation, and dissemination activities can further improve project outcomes.

## Technical Focus and Collaborative Inclusiveness

Another important lesson concerned the balance between technical efficiency and broader stakeholder involvement.

The project successfully achieved its technical objectives through a focused and task-oriented implementation approach. However, this efficiency occasionally limited broader co-creation opportunities and wider stakeholder participation.

Future projects could benefit from introducing structured knowledge exchange activities, thematic workshops, user-driven design sessions, and open innovation initiatives that facilitate creative input, interdisciplinary learning, and stakeholder engagement beyond immediate technical requirements.

## Flexibility and Internal Expertise

The pilot reinforced the importance of internal expertise and organizational flexibility.

The ability of PFRI to develop a realistic engine room environment despite limited access to industrial documentation demonstrated the value of strong internal competencies. The experience showed that organizations with sufficient internal expertise can adapt more effectively to unforeseen challenges and reduce dependency on external inputs.

Building technical capacity within project partners therefore represents an important factor for long-term project resilience and sustainability.

## Communication and Project Management

The pilot emphasized the importance of structured communication and proactive project management.

Regular WP3 meetings, Project Management Board (PMB) meetings, systematic progress monitoring, and transparent information exchange proved essential for maintaining partner alignment and ensuring successful project delivery.

These communication mechanisms supported accountability, strengthened trust among partners, and facilitated efficient problem-solving throughout the implementation process.

## Partnership Building and Trust

The pilot demonstrated that successful collaboration depends on trust, transparency, and clearly defined responsibilities.

Early communication with industrial partners, stable points of contact, clear documentation practices, and structured handover procedures were identified as critical success factors for maintaining continuity and preserving institutional knowledge throughout the project lifecycle.

The experience confirmed that strong relationships and trust-building activities significantly improve collaboration quality and project effectiveness.

## Recommendations

Based on the lessons learned from Pilot Project 1, several recommendations can be made for future research and innovation initiatives.

## Early Alignment on Data and Intellectual Property

Future projects should establish clear agreements regarding data sharing, intellectual property rights, confidentiality obligations, and technical requirements during the proposal preparation and project initiation phases.

Early alignment can reduce uncertainty, prevent delays, and ensure that partners fully understand project expectations and data availability constraints.

## Stronger Academic Integration

Future initiatives should engage academic and educational partners throughout all project phases, including design, implementation, validation, and dissemination.

This approach can strengthen scientific quality, improve educational relevance, and increase opportunities for knowledge transfer and innovation.

## Co-Creation and Stakeholder Engagement

Future projects should integrate structured co-creation activities, thematic workshops, user-centred design sessions, and open innovation events.

These activities can facilitate broader stakeholder participation, encourage interdisciplinary learning, and improve the overall impact and sustainability of project outcomes.

## Communication and Governance

Future collaborations should continue using structured communication frameworks supported by regular coordination meetings, transparent reporting mechanisms, clear responsibilities, and formalized documentation practices.

Maintaining stable communication channels and formal handover procedures can help preserve continuity and reduce the impact of organizational changes.

## Capacity Building and Organizational Resilience

Organizations should continue investing in internal expertise and technical competencies. Strong in-house capabilities increase flexibility, reduce dependency on external resources, and improve the ability to respond effectively to unexpected challenges during project execution.

## Scalability and Long-Term Sustainability

Future implementations should focus on developing transferable VR methodologies and scalable training solutions that can be adapted to different maritime environments, industrial sectors, and emergency-response applications.

The experiences gained through Pilot Project 1 demonstrate that immersive technologies such as VR can significantly enhance training effectiveness, operational preparedness, and safety awareness. Expanding these approaches

into additional applications and domains offers substantial potential for future research and innovation activities.

Overall, Pilot Project 1 demonstrated that successful technology development requires not only strong technical implementation but also effective communication, early stakeholder alignment, academic-industry collaboration, and organizational adaptability. The lessons learned provide a valuable foundation for future collaborative research and innovation projects while supporting the broader adoption of immersive training technologies and digital solutions.