B2B Excellence Unveiled:
Navigating AR/VR Innovations at Thermo Fisher Scientific

AR/VR for Space Programs 2023

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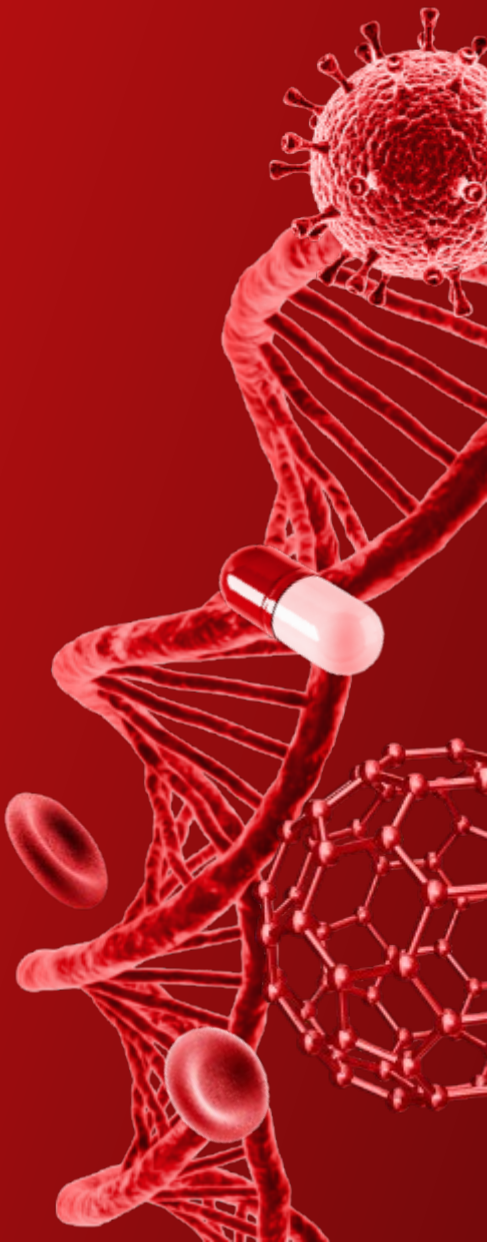
The world leader in serving science

Topics

- Thermo Fisher Scientific
- Technology Landscape
- Commonalities
- Applications and Use Cases
- Impact & Success Stories
- Challenges and Learnings
- Takeaway
- Q&A

Thermo Fisher Scientific

Introduction



 | mahdi.gerailoo@thermofisher.com | 11-December-2023

We take pride in our Mission:

To enable our customers to make the world healthier, cleaner and safer

World leader in serving science

ThermoFisher SCIENTIFIC

thermo scientific | applied biosystems | invitrogen | fisher scientific | unity lab services | patheon | PPD

Industry-leading scale

- Exceptional commercial reach
- Unique customer access
- Extensive global footprint

Unmatched depth of capabilities

- Leading innovative technologies
- Deep applications expertise
- Premier productivity partner
- Comprehensive pharma services offering

Note: '23 revenue

Unsurpassed and evolving portfolio mix

Immunodiagnostics

Clinical Diagnostics

Microbiology

Transplant Diagnostics

Clinical Oncology

Genetic Analysis

Reproductive Health

Mass Spectrometry

Human Identification

Cell Analysis Cell Culture

Electron Microscopy

Chemical Analysis

Chromatography

Lab Equipment

Lab Consumables

Laboratory Chemicals

Scientific Supplies

Bioproduction

API

Formulation

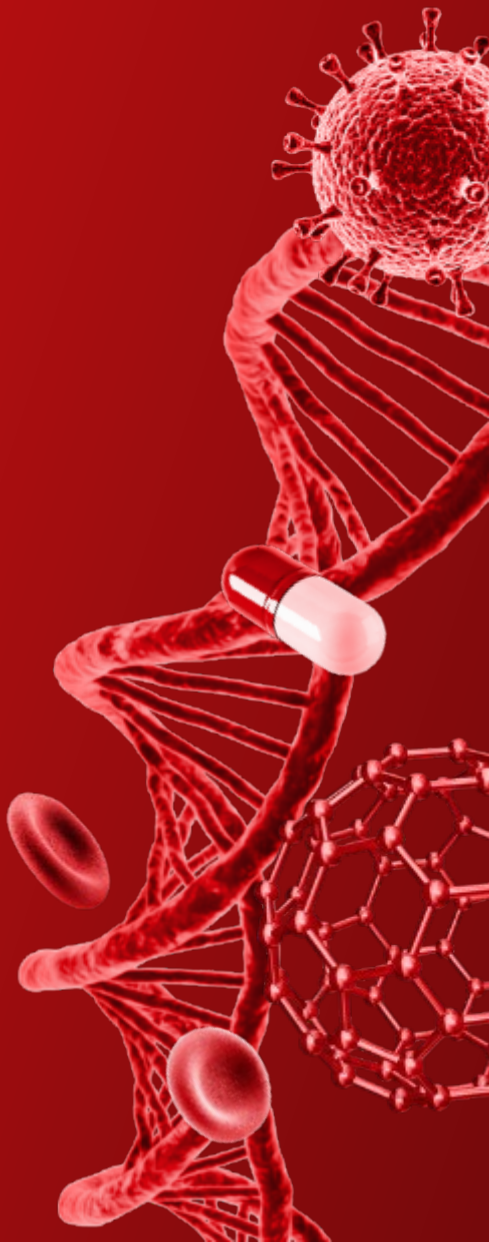
Manufacturing

Clinical Trials

Healthcare	Life Sciences	Applied Markets	Lab Equipment, Chemicals and Scientific Supplies Channel	Pharma and Biotech

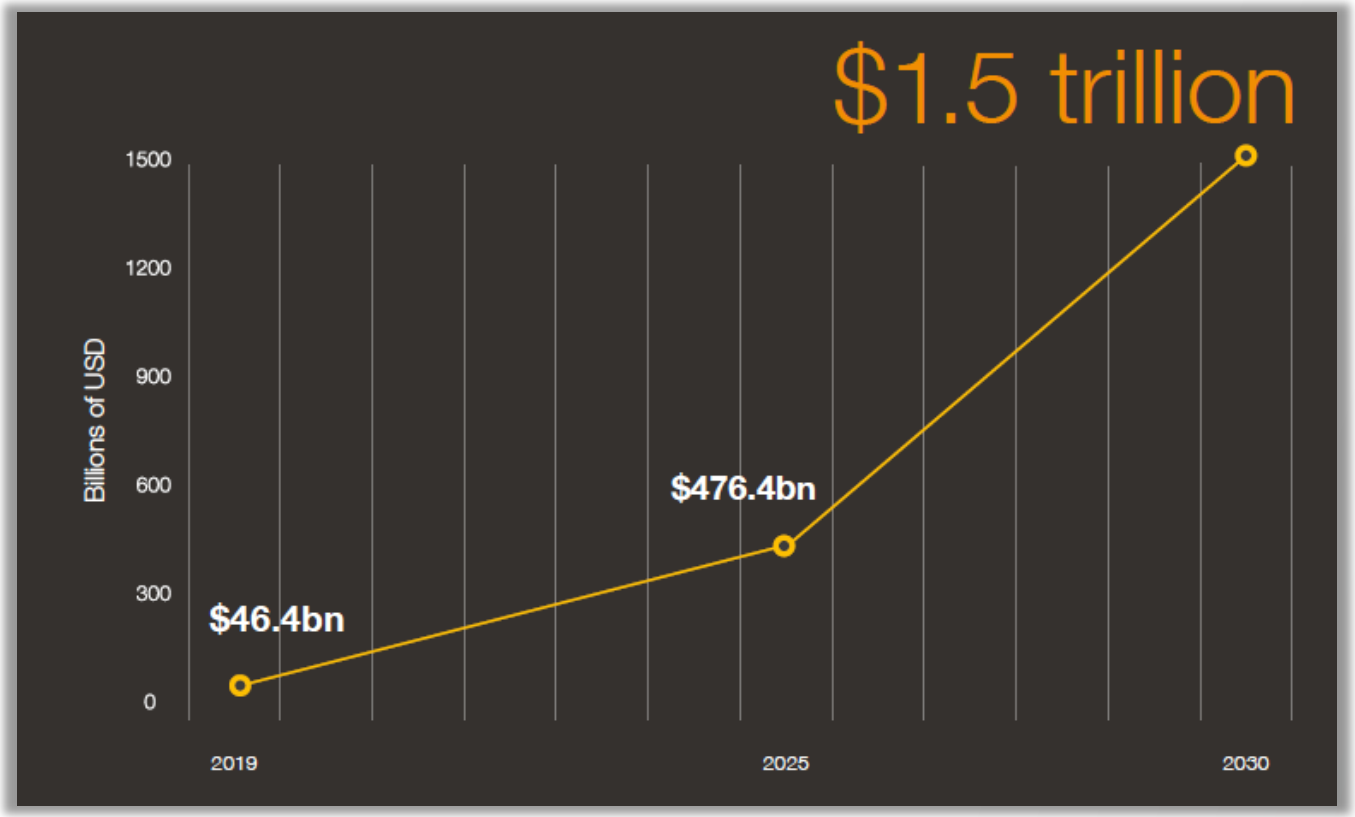
Enterprise-wide services and digital science solutions

Technology Landscape



Rise of VR and AR

VR and AR have the potential to boost GDP globally by 2030 by up to $1.5 Trillion.

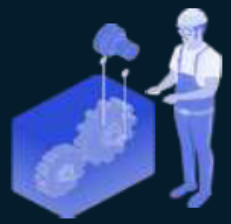
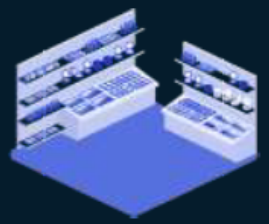
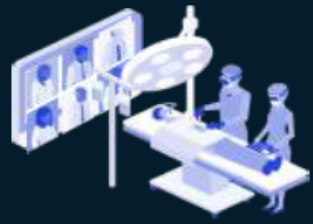


From creating new customer experiences to speeding up product development and improving workplace safety, there are many compelling uses for these technologies that promise to drive growth from the current GDP contribution of $46.4 billion.

Seeing is believing: PwC

Ready for Industry

Use cases are emerging both horizontally and vertically across industries

Industry	Education	Automotive and assembly; aerospace and defense	Retail	Healthcare systems and services
Example use cases	Learning and development Remote collaboration Field-worker assistance Conferences and events	Digital twins/operations Factory design Product design Training Remote assistance Safety	3-D catalog Virtual store/digital showrooms Interactive try-on Store layout and design Warehouse optimization	Surgical assistance (AR) Telemedicine (mental health, pain management, etc) Imaging/pathology Training R&D/simulations
				
Signifi-cance	**63%** of companies that are metaverse adopters have undertaken learning and development for employees in the metaverse	**~100%** of design of physical products/spaces (eg, factories, warehouses) could be simulated in a synthetic environment	**~33%** of customers who are active on the metaverse have purchased real-world items there	**Increasing efficacy** of immersive-reality solutions in treating mental disorders

Source: McKinsey Technology Trend Outlook 2022 analysis

Ready for Industry (Cont'd)

Immersive reality could change the way energy and materials industries operate

Construction and building materials

Creating immersive, virtual environments, giving architects a better sense of a space before it physically exists

Real estate

Designing interior spaces along with floor and furniture planning, and providing virtual tours of properties to enhance customer experience

Electric power, natural gas, and utilities

Using AR to view overlaid visualization of underground assets and complex components for improved operational safety (eg, advising field technician on what actions to take)

Aviation, travel, and logistics

Diagnosing flow constraints in warehouses and managing vehicle fleets

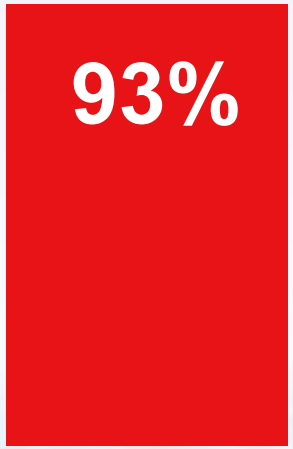
Media and entertainment

Participating in virtual events mimicking real-life experiences such as concerts, conferences, sporting events, and fashion shows

Source: McKinsey Technology Trend Outlook 2022 analysis

Adoption of VR and AR Technology

Many organizations feel unprepared for digital transformation



agree their industry will be **disrupted at some point in the next five years.**

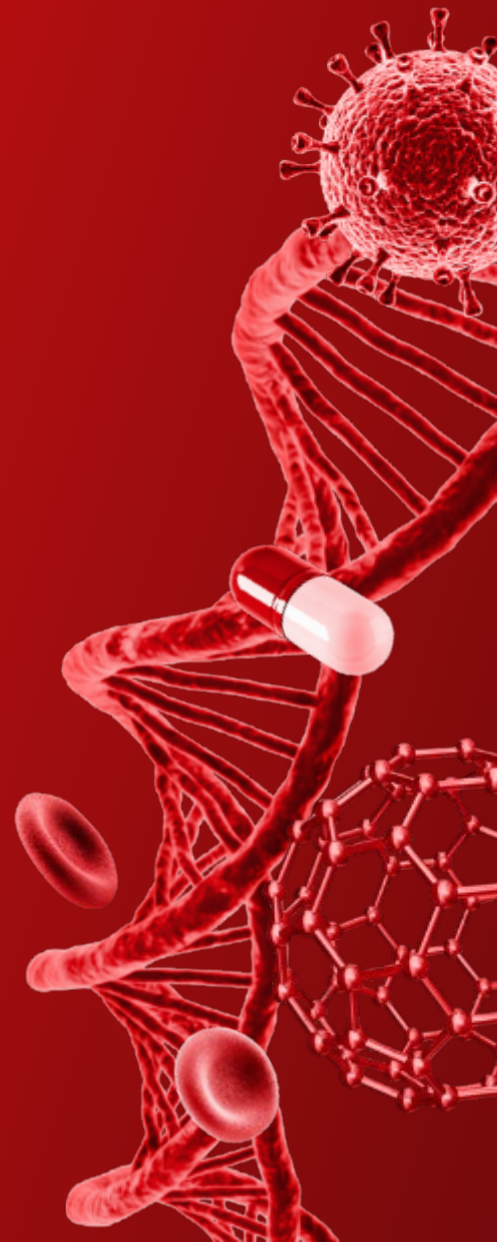
Feel they are highly **prepared for disruptive innovation.**

Digital technology helps you to **drive productivity while controlling costs** enabling organizations to survive in today's rapidly changing environment

https://www.accenture.com/us-en/insight-leading-new-disruptability-index

ESA & Thermo Fisher

Commonalities



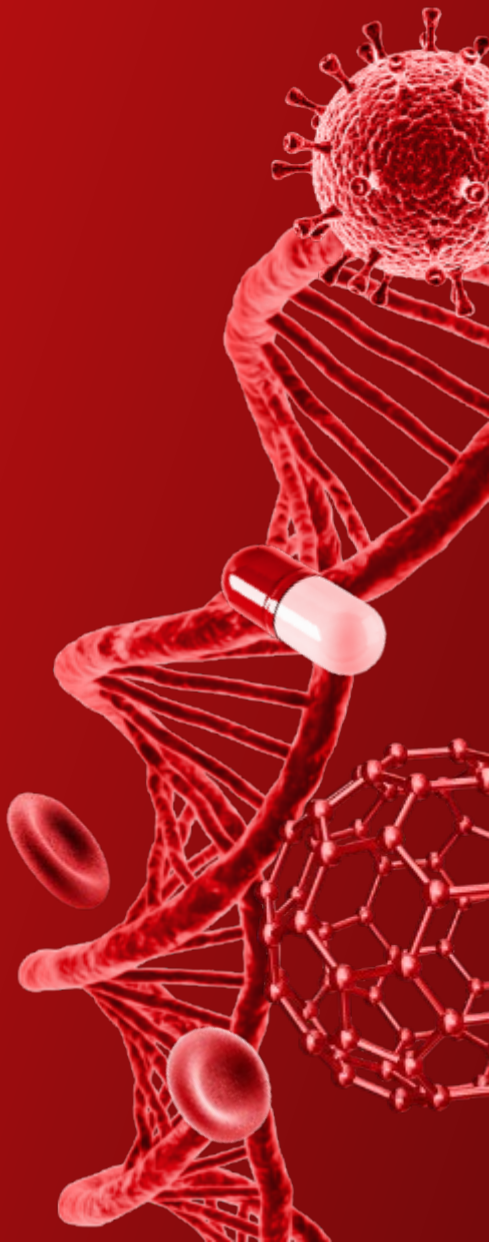
Space and Science

The commonalities between the space domain and Thermo Fisher Scientific with regards to AR/VR technologies are primarily rooted in their shared objectives and challenges in utilizing these technologies.

Commonalities	ESA	Thermo Fisher
Enhancing Operational Efficiency and Accuracy	Spacecraft manufacturing, remote supervision, and mission control.	Manufacturing, lab operations, ensuring data integrity, and facilitating hands-free and accurate lab work.
Facilitating Training and Expert Guidance	Astronaut training and operations support, providing immersive and realistic training environments.	Training lab personnel, enabling them to practice complex procedures virtually, which is cost-effective and efficient.
Improving Remote Collaboration and Support	Remote operations and supervision, allowing experts to guide, support and collaborate from a distance.	Allowing lab operators to receive real-time assistance from SME's, enhancing collaboration and support.
Addressing Unique Environmental Challenges	Missions requiring AR/VR solutions to be adapted to extreme and variable-gravity environments.	Sterile and clean environments, BSL, or where wearing PPE is needed.
Innovating For Specific Use Cases	Earth observation, space science data exploration, and spacecraft flight operations.	Design for laboratory settings, addressing SOP compliance, automatic instrument readings, and data capture.
Technological Integration and Standardization	Both domains face challenges in integrating AR/VR technologies with existing systems and in standardizing protocols across various equipment and procedures.	
Pushing for Digital Transformation	Driving the digital transformation in both the space sector and in scientific research environments, marking a shift from traditional methods to more advanced, digital solutions.	

Thermo Fisher Scientific

Applications & Use Cases



Interactive Product Demonstration

Lab Design

Advance Training and Simulation

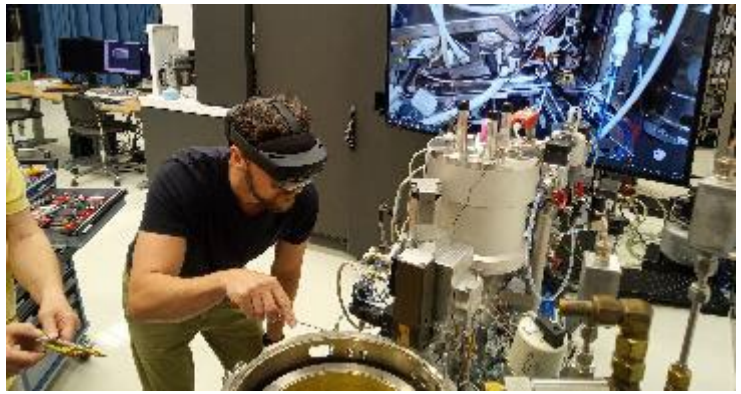
Remote Technical Support and Diagnostics

Process and Regulatory Compliance

Workflow Instruction and Support

Remote Technical Support and Guided Instructions

Remote Assist and Guides



Overview

Combining remote support with augmented reality to provide hands-free assistance and step-by-step instructions to customers and engineers in various fields.

Use Cases & Functionality

- Remote Tech support
- Remote Customer application support
- Remote Customer application training
- Mentoring and knowledge sharing
- Handsfree work instructions

Customer's Benefits

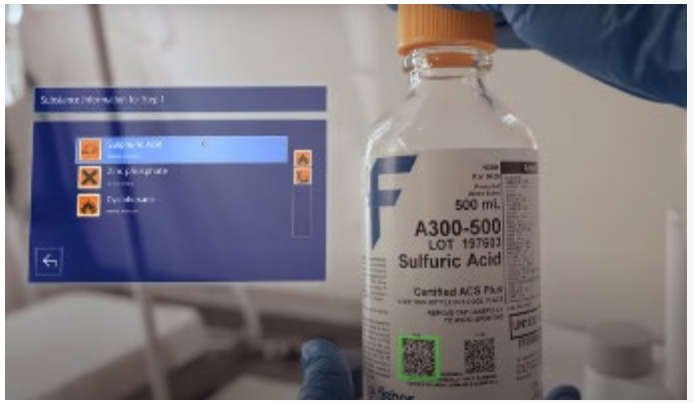
- Increased uptime
- Faster response time
- Improved system utilization

ThermoFisher's Benefits

- Reduced T&E cost for 2nd and 3rd line support
- Reduced MTTR
- Multidisciplinary SME's collaboration
- Improved learning curve
- Improved safety

Process and Regulatory Compliance

SampleManager™ XR Software; Driving process compliance, repeatability and Integrity



Overview

Enhancing lab efficiency with extended reality and Microsoft HoloLens, providing in-vision instructions through the lab execution system.

Use Cases & Functionality

- Constant access to SOPs and actions
- Regulatory compliance in challenging environments
- Capture and track data in real-time
- Automated instrument readings
- Voice-to-text, and OCR for precise data recording

Customer Benefits

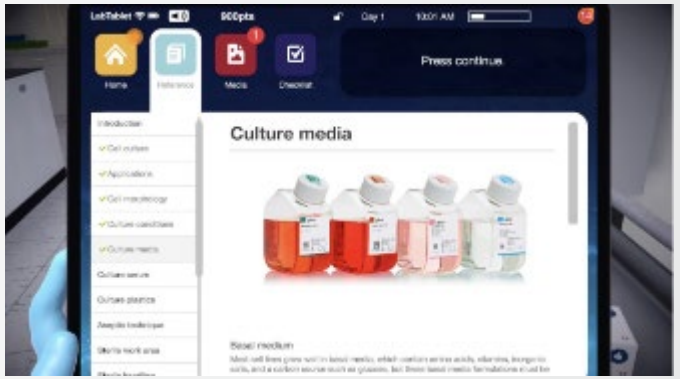
- Improved accuracy, efficiency, and safety
- Handsfree access to LIMS
- Access to previously Inaccessible Areas
- Deviation reduction
- Secure and personalized access

Thermofisher's Benefits

- Competitive edge
- Increased customer satisfaction
- Reduced support demands
- Additional revenue opportunities
- Data analytics opportunities

Advance Training and Simulation

Cell Culture Basics Virtual Lab



Overview

The Thermo Fisher "Cell Culture Basics Virtual Lab" is an interactive digital platform for learning cell culture fundamentals, covering cell line upkeep, media preparation, cell passaging, and assays, simulating actual lab practices virtually.

Use Cases & Functionality

- Interactive learning experience
- Guided, step-by-step experience for various cell culture procedures
- Educational content and quizzes
- Access to additional resources

Customer's Benefits

- Practical learning experience
- Skill development
- Convenience and accessibility
- Interactive and engaging content
- Resource for best practices
- Cost reduction

ThermoFisher's Benefits

- Comprehensive educational ecosystem
- Increased customer engagement
- Enhanced brand reputation
- Data analytics opportunities

Interactive Product Demonstration

KingFisher Apex System Product Tour; Providing a realistic, interactive, and immersive exploration

Overview

Revolutionize customer engagement with VR and touchscreen tech, offering self-guided tours and interactive demos to improve understanding and decision-making.

Use Cases & Functionality

- Explore a 3D model interactively with rotation, zoom, and multi-angle inspection
- Realistic simulations
- Scale visualization
- Touchscreen interaction
- On-screen guidance
- Workflow preview

Customer Benefits

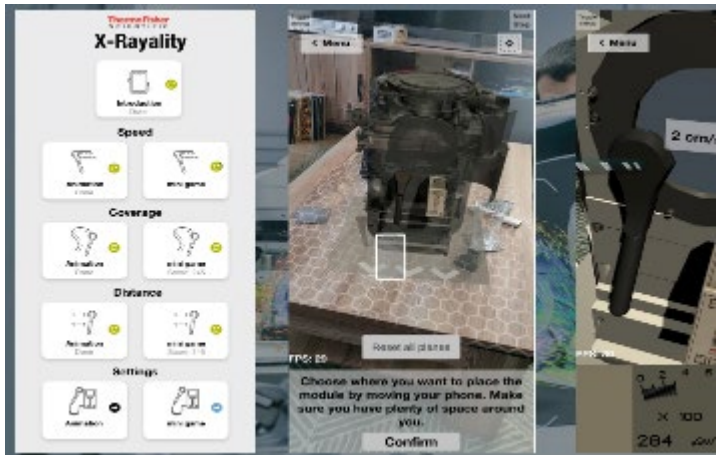
- Increased engagement with customized assessment
- Reduced purchasing cycle time
- Easy and on-demand access

Thermofisher's Benefits

- Reduced sales cycle time
- Cost reduction
- Strengthening market positioning
- Data analytics opportunities

Advance Training and Simulation

X-Rayality; Ultimate Safety Training



Overview

The Thermo Fisher ”X-Rayality" is a digital training tool designed to provide interactive learning experience for X-Ray safety measurement.

Use Cases & Functionality

Engineers X-Ray measurement training with focus on:

- Correct probe and microscope settings
- Correct speed probe during scanning
- Correct distance probe during scanning
- Full coverage of the scan

Customer’s Benefits

- Practical learning experience
- Skill development
- Real-time feedback
- On-demand learning

ThermoFisher’s Benefits

- Comprehensive educational ecosystem
- Efficient training delivery
- Increased engineer’s engagement
- Data analytics opportunities
- Training cost reduction

Build and Optimize the Operation of Your Laboratory

LERN; Laboratory Essential Resource Network

Overview

Bridge time and space with digital tools and resources to help build and optimize the operation of your laboratory.

Use Cases & Functionality

- Lab workflow solutions and trainings
- Lab design and configuration
- 3D product catalogue
- Smart product selection assistance
- Seamless purchase integration
- 3D interactive lab of the future exhibit
- Virtual event hub
- Access live support from local and global SME's

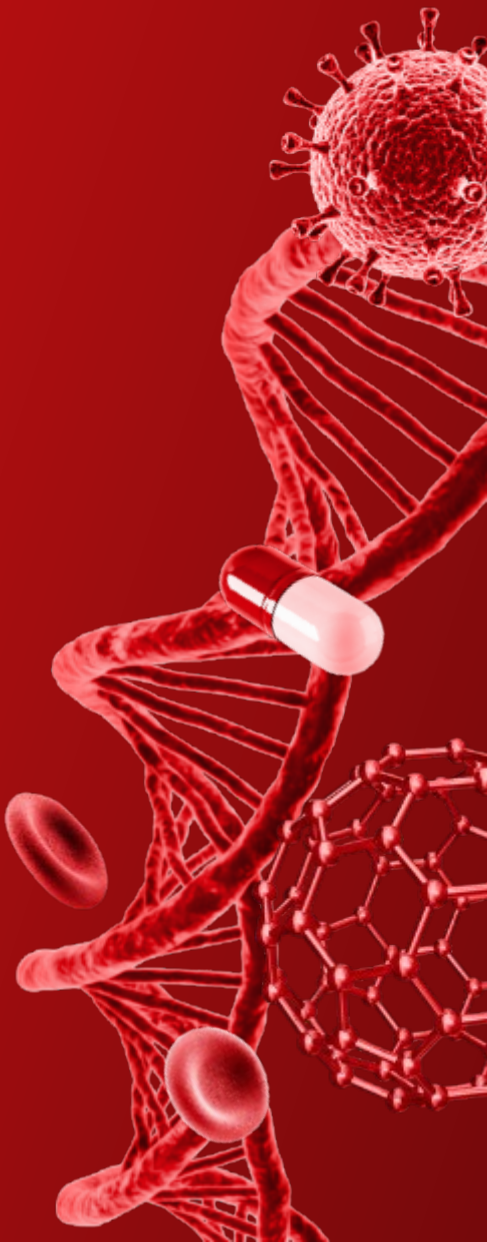
Customer's Benefits

- Enhanced decision-making
- Tailored solutions for success
- Time and resource savings
- Global collaboration convenience

ThermoFisher's Benefits

- Increased customer engagement & satisfaction
- Streamlined decision making process
- Driving product adoption
- Additional revenue opportunities

Impact & Success Stories



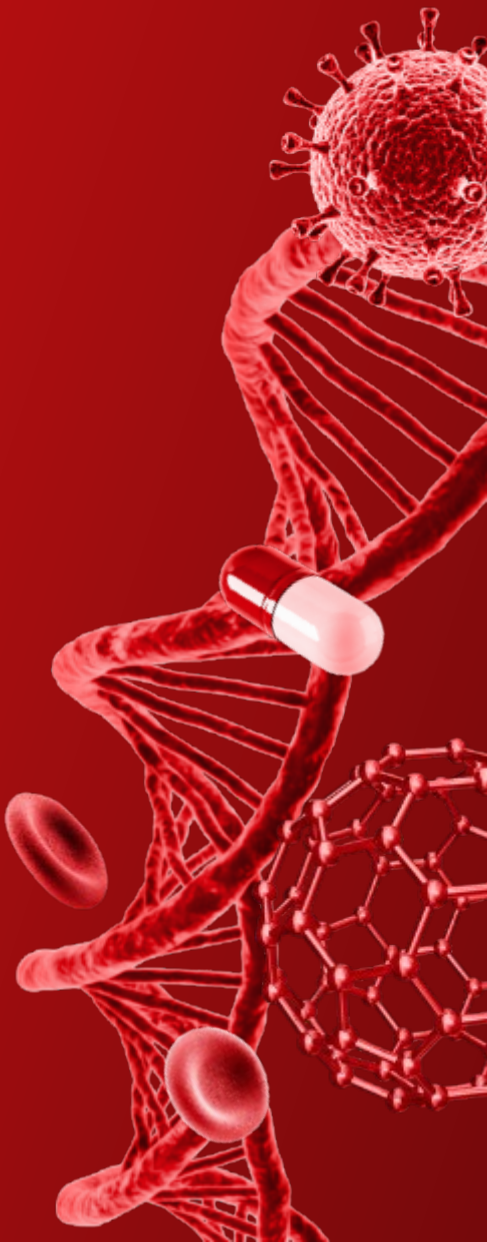
Enabling Our Customers with Better, Faster, and More Creative Technology

Charting Success

Demonstrating the Impact of AR/VR on Training and Tech Support KPI's

	Training	Tech Support
Cost Savings	25%-45%	28%-81%
ROI	5 Months	2 Months
Productivity	>50%	35%-80%

Challenges & Learnings



High Investment

Technical Expertise

Cultural Concerns and User Experience

Content Management

Security, Privacy and Data Ownership

High Investment

The successful deployment of AR/VR technology requires managing high investment challenges and balancing innovation, cost-effectiveness, and partnerships

- **Models creation**
  Designing and creating realistic and effective 3D models for VR/AR applications can be complex and time-consuming
- **HW and SW**
  Ensuring seamless integration between different HW components and software systems can be challenging, requiring careful planning and compatibility checks..
- **Staffing**
  Acquiring skilled professionals with expertise in VR/AR development, including designers, developers, and engineers, is a persistent challenge.

Focus on ROI rather than Cost

Cost perception may hinder adoption until deployment. Conduct thorough analyses to understand the long-term benefits and ROI of AR/VR investments.

Phased Implementation

Start with pilot projects or smaller-scale implementations to manage costs and demonstrate value.

Partnership and Collaborations

Forming strategic partnership with AR/VR solution providers or other businesses to share costs and resources.

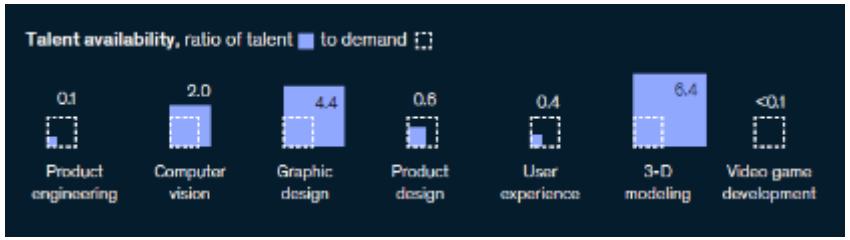
Seeking Funding and Grants

Explore grants, subsidies, or funding opportunities specifically aimed at technological innovation.

Technical Expertise

Success in AR/VR technology hinges on acquiring skilled talent, fostering continuous learning, and emphasizing collaboration to keep pace with technological advancements.

- Skill Shortages while Rapid Technological Evolution



While skills such as graphic design, computer vision, and 3D modeling are more plentiful in the market, product design, product engineering, and video game development professionals are in shorter supply.

Training and Upskilling	Hiring Specialists	Outsourcing	Academic Partnerships
Invest in training programs for existing staff to build in-house expertise in AR/VR technology.	Bring on board individuals or teams with specialized skills in AR/VR development and implementation.	Collaborate with external agencies or consultants who specialize in AR/VR solutions for development and integration.	Partner with universities or research institutions that have expertise in AR/VR for knowledge exchange and development support.

Source: McKinsey Technology Trend Outlook 2023 analysis

Cultural Concerns and UX

- Apathy or distrust on new technologies
- Physical symptoms like claustrophobia and nausea
- Cultural Barriers
- Need for improvement of visual quality, field of view, and accessibility

If technology fails to deliver on its promise, it is often because an implementation was planned without people in mind or a plan to engage them. Start with the people and communicate clearly what the ambition is, what the benefits will be, what changes will be made and what the business case is.

Alexa Foden
Director, Change Comm. And Culture, PwC UK

Cultural Awareness Initiatives

Educate employees and users about the benefits of AR/VR, emphasizing its cultural relevance and positive impact. Incorporate diverse perspectives into the development process to create inclusive experiences.

Transparency and Education

Clearly communicate how AR/VR technology works and provide educational resources to address misconceptions and build trust within the organization and the wider community.

User-Centric Design and Comfort Features

Design interfaces and experiences that prioritize user comfort, minimizing factors that contribute to claustrophobia and nausea. Incorporate features like adjustable settings, breaks, and warnings to enhance the overall experience.

Continuous Improvement and Inclusive Design

Consider diverse user needs in the design process, ensuring that AR/VR experiences are comfortable and inclusive for users with varying abilities and preferences.

Content

Creating and managing engaging and relevant content that is adaptable to the evolving hardware and software capabilities of AR/VR

- Data Conversion and Generation
- Revision Control Complexity
- Lack of Standard Procedures
- Drawing Formats for Diverse Content Types
- Costs of Content Creation
- Infrastructural Integration

Structured Revision Control System

Establish versioning protocols and a revision control system to track changes in CAD drawings, realistic renders, and metadata. This ensures that content can be efficiently updated and managed throughout the development cycle.

Holistic Data Strategy

Categorize and prioritize existing data for conversion, ensuring a seamless transition to AR/VR applications. Simultaneously, create a framework for generating new content based on specific use cases.

Standardized Drawing Formats

Enforce standardized formats for drawings up to FRU level. Define and communicate standardized formats for CAD drawings, ensuring consistency in structure and compatibility across different applications.

Cost-Efficient Modeling Strategies

Optimize content creation costs through efficient modeling strategies. This may include leveraging existing assets, utilizing modular design principles, or employing advanced modeling techniques that maximize value for the budget allocated

Security, Privacy and Data Ownership

Policies and regulations struggle to keep pace with technological advancements

- Data Connectivity
- Data Privacy Concerns
- Intellectual Property
- Cybersecurity Vulnerabilities
- Regulatory Compliance
- Misinformation and Manipulation

Robust Cybersecurity Measures

Employ robust cybersecurity measures, such as encryption, firewalls, and intrusion detection systems. Regularly update security protocols to address emerging threats and vulnerabilities.

Implement Content Verification Mechanisms

Real-time monitoring to detect and counteract misinformation. Encourage users to verify information independently to enhance overall system integrity.

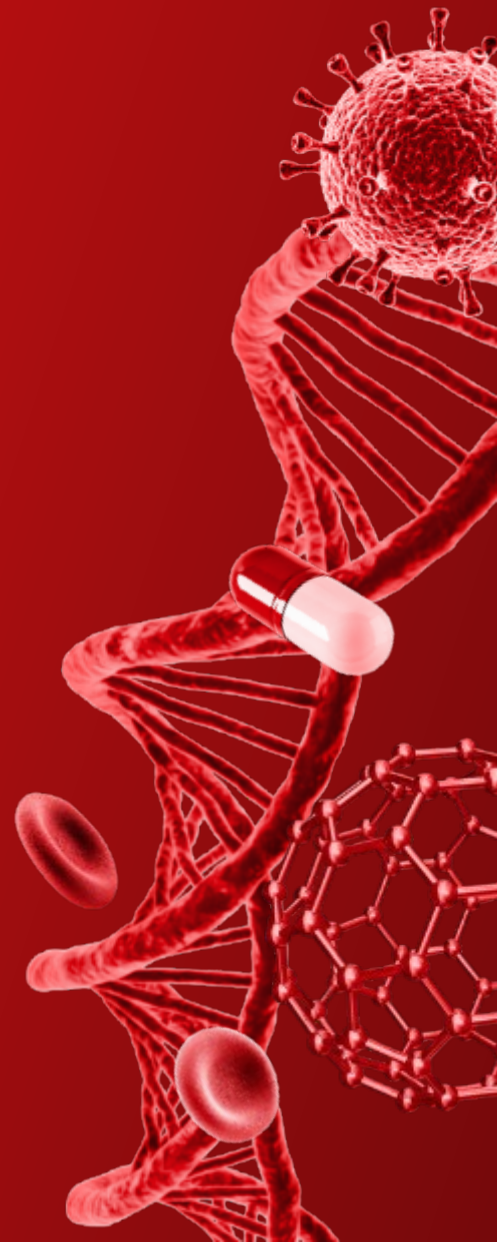
Strong Authentication Auditing Access Points

Encourage users to maintain strong security practices for linked accounts. Regularly update software and firmware to patch security loopholes and enhance system resilience.

Regulatory Compliance

Adhere to and enforce privacy regulations and standards governing AR applications. Maintain compliance with data protection laws to ensure user rights and mitigate legal risks.

Takeaway



Where to Focus

Integrating AR/VR with other cutting-edge technologies can significantly enhance their capabilities and drive adoption in B2B Services and the Space domain.

Artificial Intelligence (AI) and Machine Learning (ML)	**Internet of Things (IoT)**	**5G and Advanced Networking**	**Cloud Computing**	**Blockchain**
Advanced Sensors and Wearables	**Big Data Analytics**	**Haptic Technology**	**Digital Twins**	**3D Printing**

Thank you

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