# Mixed Reality Enhanced Healthcare Operations And Expanded Clinical Toolsets With Microsoft HoloLens 2

Healthcare providers' top focus is on providing the best care to the most people in need. In service of this pursuit, they must first optimize efficiency and ensure continuity of operations while also upskilling their workforce and innovating for the future. Standing in the way of operational success are inefficiencies in speed, knowledge, and labor; inefficient training; and staffing shortages and turnover — all exacerbated by the COVID-19 pandemic. Healthcare providers must juggle several employee needs: minimizing viral exposure; learning new skills and new equipment; and providing adequate education, installation, and support. And they must do this all while bound by limited personnel, widening training and support gaps from rapidly evolving data, travel restrictions, and an increasingly overworked and burnt-out workforce.

Healthcare organizations view Microsoft HoloLens 2 as an opportunity to ensure continuity, protect health and safety, train staff more quickly, grow revenue, and strengthen provider prestige and competitiveness.

Microsoft HoloLens 2 is an untethered, self-contained holographic headset that allows users to leverage enterprise-ready mixed reality (MR) applications while working "heads-up" and "hands-free." An immense breadth of MR use cases across industries and roles are possible with HoloLens 2, powered by a comprehensive ecosystem of applications and services from Microsoft and myriad third-party partners.

To better understand the benefits, costs, and risks associated with mixed reality using Microsoft
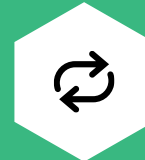
Reduction in training time:
30%

Reduction in personal protective equipment (PPE):
75%

HoloLens 2, Microsoft commissioned Forrester Consulting to interview 23 decision-makers from 21 organizations that are customers of Microsoft HoloLens 2 and conduct a Total Economic Impact™ (TEI) study.[1]

This abstract will focus on healthcare providers' use of Microsoft's HoloLens 2 devices to leverage mixed reality applications and its value to their organizations, drawing from the experiences of interviewed decision-makers from three healthcare organizations.

CHALLENGES

Healthcare providers face many challenges in their pursuit to ever-better care. Staffing shortages, legacy technologies, and burdensome processes hold providers back from the scale, efficiency, and quality of care they wish to achieve. Remote locations particularly struggle to provide the same level of care as major health centers due to gaps in specialization and technology. At the same time, expectations for

READ THE FULL STUDY HERE →

care and service continue to rise, and providers must continue to educate themselves, deploy new technologies, and innovate for the future of care.

As 2020 began, the COVID-19 pandemic exposed these and other operational weaknesses and turned them into crises, while changing the very nature of work. Staffing shortages that already plagued organizations were exacerbated by long pandemic work hours, safety risks, and the subsequent resignation trends. Meanwhile, many critical services were jeopardized — especially those that supported patients offsite or in remote locations. Providers struggled to learn new skills and deploy new technologies without the luxury of time and without in-person assistance. Further, providers had no choice but to limit use of supplies — from personal protective equipment (PPE) to devices to medicines — due to critical shortages.

Decision-makers within healthcare investigated how mixed reality could solve key challenges, including:

- Providers needed to minimize viral exposure and work with extremely limited PPE.

- Providers needed to learn new skills and new equipment due to the pandemic, but travel restrictions, overwhelmed staff, and quickly evolving data from the novel virus created a training and support gap.

- Medical device and product manufacturers could not provide adequate education, installation, and support due to pandemic travel restrictions.

- The pandemic limited field providers' ability to care for patients, especially for home visits and assisted living.

- Staff training and continuing education faced the same limits described for education providers.

OPPORTUNITIES.

Enhance clinical care. Organizations are beginning to investigate how HoloLens 2 and mixed reality can be used to provide better medical care. Interviewees shared a remarkable breadth of scenarios they are currently testing, which offer significant potential to improve patient care management. Key use cases under investigation include visualization of scans and procedures and remote support for clinical emergencies or for collaborative diagnosis. Organizations are also investigating using mixed reality to educate patients in their decision-making to improve comprehension and informed consent. The scenarios currently being tested span many clinical segments, and the interviewed decision-makers have already made surprisingly notable achievements in their testing. Decision-makers also investigated mixed reality to seize new opportunities, including:

- Enable and enhance training with experts around the world.

- Collaborate with remote experts for diagnoses.

- Install and support equipment faster and at lower cost.

- Boost efficiency of care, such as with ward rounds.

- Provide better remote care, such as specialists supporting a general practitioner at a nursing home.

- Investigate long-term innovation in healthcare, such as visualization

> **"We would not be able to offer the help to [remote sites] that we are offering with the HoloLens without it. It would not be replicable."**
>
> *Global health program manager, healthcare provider*

INVESTMENT OBJECTIVES

Decision-makers hoped to achieve the following goals with mixed reality, including:

- Ensure continuity, especially during the pandemic.

- Protect health and safety.

- Minimize exposure risk to diseases, including COVID-19.

- Train staff more quickly.

- Improve knowledge retention for training.

- Improve patient care management.

- Reduce costs for training consumables and PPE.

- Increase staff efficiency and capacity.

- Support more locations.

- Boost community impact.

- Grow revenue.

- Strengthen provider prestige and competitiveness.

SOLUTION CRITERIA

After identifying challenges and opportunities, decision-makers evaluated many different technology categories and ultimately selected Microsoft HoloLens 2 devices based on the following criteria:

- **Heads-up, hands-free work and collaboration with robust capabilities and dependability.** Mixed reality enabled use cases typically possible with AR and VR while providing significant additional value at their intersection. HoloLens 2 enabled accurate real-world overlay of 3D assets, instructions, and collaborative markup while leaving workers free to see their surroundings and use both hands — providing a vast array of use cases with the trustworthiness, safety, and efficiency workers needed.

> **"I am completely convinced that mixed reality has a critical part to play in healthcare. I believe it's going to grow exponentially. It will be a vital tool in the clinician's armory, with real applications where it's going to have a really, really big impact. I honestly can't think of a clinical specialty where it wouldn't be useful."**
>
> *Clinical scientist and professor, healthcare and education*

- **Simplicity to embed within Microsoft's ecosystem including Azure, Intune, Active Directory, Dynamics 365, Office, and Teams.** Decision-makers selected HoloLens 2 to accelerate time-to-value and reduce operational overhead with established ecosystems of Microsoft services, avoiding major customization, coding, or investment in other new tools.

- **Robust partner ecosystem of independent software vendors (ISVs) and systems integrators (SIs), many with highly specialized industry expertise and offerings.** The large and growing selection of locations and SI expertise for mixed reality on HoloLens 2 enabled customers to accomplish a vast array of industry-specific use cases while lowering risk, accelerating deployment, and reducing costs.

- **Breadth and growth of mixed reality platform capabilities.** The availability and continuing advancement of application and Microsoft Azure capabilities for mixed reality allowed decision-makers to accomplish today's use cases while providing flexibility for those in the future using the same underlying technology.

- **Successful proofs of concept (POCs).** Decision-makers ran small POCs for mixed reality applications and HoloLens 2 to test the

concept and gain buy-in from key stakeholders with fast results

- **Market recognition and growth of HoloLens 2.** Decision-makers viewed HoloLens 2 as a category leader in extended reality given its significant market adoption and growth, which minimized concerns of risk.

KEY BENEFITS FOR HEALTHCARE

Through the adoption of HoloLens 2 devices, the interviewed decision-makers at healthcare firms were able to address organizational challenges that had previously impacted safety, efficiency, operational cost, and business growth. Empowered by the robust capabilities of HoloLens2, mixed reality services, and partner applications, organizations achieved several benefits, including:

Training efficiency. Mixed reality increased training efficiency, saving trainee labor while improving knowledge acquisition and retention.

- **Healthcare providers reduced 80 hours of training time by 30%, at an average savings of $63 per labor hour.** Building self-guided mixed reality training for healthcare was particularly challenging due to high complexity, nuance, variation, and need for professional judgment. However, mixed reality significantly improved visualization and enabled users to practice skills — significantly enhancing knowledge acquisition and retention. Most of today's mixed reality healthcare trainings were primarily focused on observation rather than self-guided trainings, which provided less trainee efficiency but significant learning value.

- **A healthcare and education organization used HoloLens to enable live observations.** The surgeon and medical education director shared: "We are streaming tutorials live with the HoloLens via Remote Assist to users watching on Teams, which allows students and practitioners who are not physically present to dial in and

interact with tutors and patients as they learn." Remote viewers can see what the clinician wearing HoloLens is doing from a first-person perspective, deepening their understanding of the procedure.

> **"HoloLens has significant advantages for technical skill acquisition over simple video, two-dimensional digital technologies, or standard adaptive learning."**
>
> *Clinical scientist and professor, healthcare provider and education*

Field healthcare worker productivity. Mixed reality improved field task efficiency and reduced rework, saving field task worker labor.

- **Healthcare providers were investigating fieldwork opportunities.** Leaders were evaluating the potential to provide or enhance care for field sites (primarily with specialists) like assisted living, general practitioner offices, and rural practices.

- **A healthcare provider piloted collaboration between a general practitioner in the field with specialists from a hospital.** Together, they provided visualization-aided consultation and collaborated on decisions. The pilot was well-received, as the doctor and chief clinical information officer shared: "Citizens, relatives, nursing home staff, hospital staff, and the general practitioner all really liked our field tests."

Task worker productivity. Mixed reality increased task efficiency and reduced rework for onsite task workers.

- **Healthcare providers improved efficiency by 30% to complete ward rounds and by reducing staff in rooms, saving $41 per hour while also aiming to improve quality of care.**

Healthcare workers used MR instructions, visualization, and remote collaboration to complete ward rounds more quickly and efficiently and reduce staff in rooms, boosting capacity in the face of staff shortages and overwhelmed systems while minimizing exposure to infectious diseases.

- **A healthcare and education organization used HoloLens to streamline clinical care by 30% while slashing PPE use by 80% and reducing risk of COVID-19 exposure.** The clinical scientist and professor shared: "We had teams of doctors supporting COVID wards, but by putting a HoloLens on one clinician, only one needed to go into the risky environment instead of three to five. We immediately reduced exposure risk and PPE consumption, while the teams could still see and understand what was happening and communicate effectively. Our rooms became 30% more efficient, and we reduced COVID exposures and PPE usage by 80%."

Leader productivity. Mixed reality recaptured leaders' time for training, instruction, project coordination, planning, and customer enablement, driving significant labor costs per leader.

- **Healthcare providers improved supervisor and leader productivity by 25% for instruction and patient support workloads, saving $195 per hour.** Clinical site supervisors and other site and practice leaders reduced time needed for instruction and patient support while streamlining capacity and coordination for care.

- **A healthcare and education provider scaled care and training with improved operations.** Leaders streamlined management, contingency training, instruction, planning, budgeting, and grant writing with MR. Leaders also tapped mixed reality as they scrambled to enable remote education and observation during the pandemic. Looking forward, leaders saw the potential of MR to shape the future of healthcare, as the clinical

scientist and professor shared: "Mixed reality fits in the evolution and reconceptualization of healthcare systems as we recover from COVID-19. It will be part of the future vision of digital healthcare and pathways of care as we investigate redistributing diagnostic centers, pushing care out of hospitals into the community, and scaling and distributing specialist services."

Specialized expert productivity. Mixed reality increased expert work efficiency and prevented major work trips, saving annual labor costs per specialized expert.

- **Healthcare providers reduced 520 annual hours of training per expert by 10%; they also prevented two out of four trips per year and avoided 75% of labor per trip, saving $195 per hour.** Healthcare experts rely less on process standardization and cannot easily offload work, although MR can still drive benefits at the margins. Travel is infrequent, but savings are significant: When time is saved, the recouped value is very high due to their salaries.

- **A healthcare provider and education organization enabled crucial remote patient care during the pandemic.** The doctor and chief clinical information officer shared: "We were looking to avoid nonessential travel and infection contact for patients and practitioners. HoloLens supported remote visual patient assessment with access to electronic records and promoted confidence and reassurance for families."

> **"We are pretty convinced that the HoloLens and mixed reality is going to be a major, major field in the future of healthcare, not just in image guidance but in the overall integration of data and how we actually perceive data within the hospital."**
>
> *Surgeon and medical education director, healthcare provider and education*

Travel and incidentals savings. Mixed reality reduced annual travel and incidentals costs for specialized experts and field task workers.

Healthcare providers saved an average of $4,500 per avoided expert trip. Expert travel in healthcare was particularly expensive as it often involved multiweek international affairs for very senior employees. However, travel was much less common in healthcare than in manufacturing or AEC, and therefore total expert cost savings are lower for the industry in total.

Operational cost savings. Mixed reality minimized consumables usage for instruction and training; materials costs for design, testing, and enablement; and PPE usage. MR also trimmed total business operating costs through better processes, quality, and maintenance.

- **Healthcare providers reduced PPE and consumables costs by the most but found lower operating margin savings overall.** Organizations reduced: 1) average consumables by 80%, saving $4,000 per trainee; 2) average consumables for design, testing, and demonstration by 10%, saving $10,000 per expert and leader; 3) average annual PPE cost by 75%, saving $954 per employee; and 4) total operating costs by 0.1%.

- **A healthcare and education organization is projecting long-term cost savings with HoloLens.** The surgeon and medical education director shared: "We see this as a portable computer with a holographic visor. It's not a pure use case device — it's an infrastructure investment for the entire hospital. This will drive cost savings because it's not a machine for a specific purpose; rather, it can be used for essentially anything within the hospital."

Business growth. Business units leveraging mixed reality increased annual revenue.

- **Healthcare providers increased revenue by up to 1% with mixed reality.** Providers increased capacity to care for more patients, ensured continuity during the pandemic, and bolstered brand image with leading-edge technology. They were also working to develop and commercialize custom-coded healthcare applications to drive new revenue.

OPERATIONAL COST SAVINGS

Reduced average expert and leader consumables for design, testing, and demonstration by **10%**

Reduced average trainee consumables by **80%**

Reduced average annual PPE costs by **75%**

TOTAL ECONOMIC IMPACT RESULTS

Forrester aggregated customer data into a single industry-agnostic composite organization with a representative financial analysis.

Composite description. The composite organization is a global for-profit business based in North America that sells complex services and supports customers globally. It earns at least $1 billion in total revenue per year and employs more than 5,000 FTEs globally.

Deployment characteristics. A team of nine technologists deploys 105 Microsoft HoloLens 2 with apps for instruction, visualization, and remote collaboration over a one-year period. These devices are used regularly by 200 users and are leveraged to train up to 1,000 additional general workers per year.
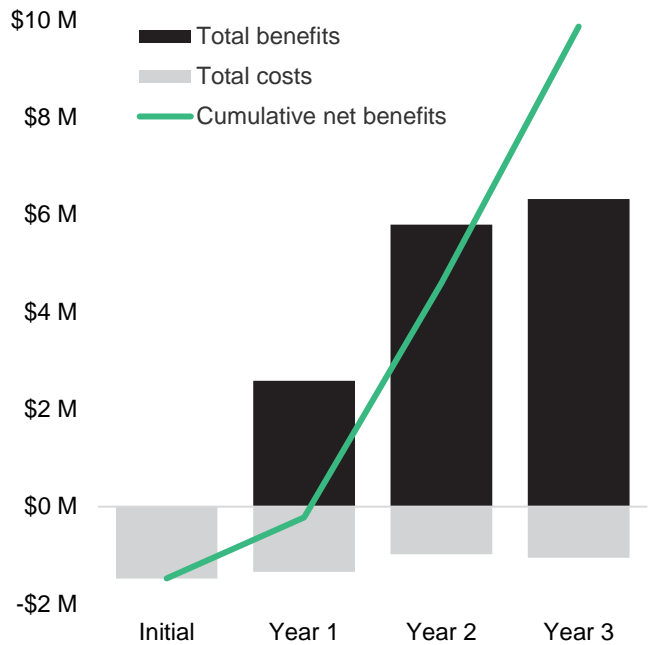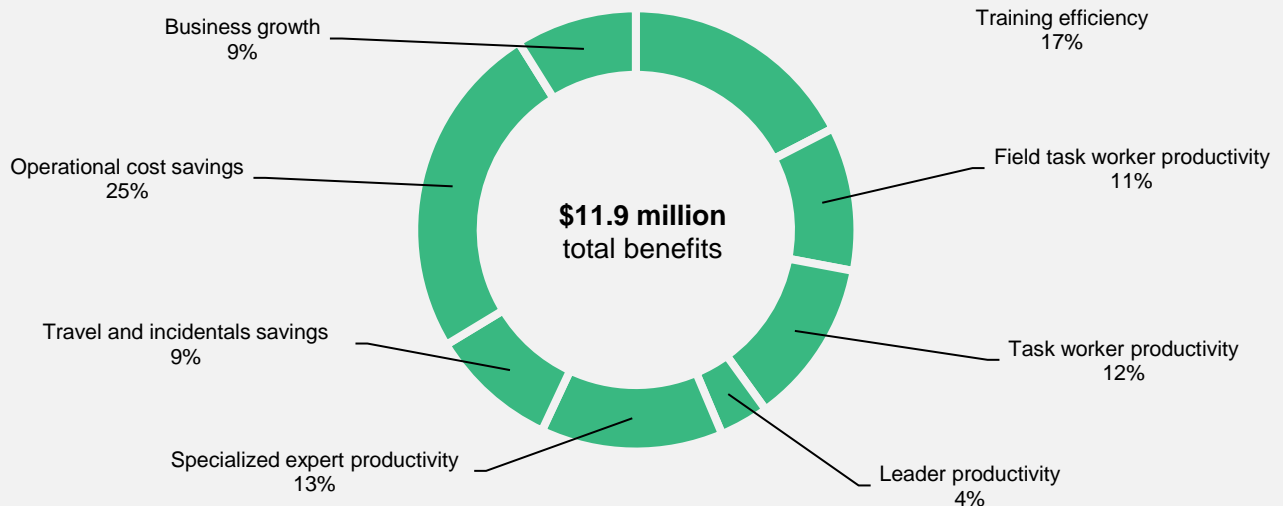
ROI
177%

NPV
$7.6M

PAYBACK
13 months

Results. Forrester's risk-adjusted financial analysis for a composite organization shows a three-year ROI of 177%, an NPV of $7.6 million, and a payback period of 13 months with $11.9 million in total benefits versus $4.3 million in total costs.

Three-Year, Risk-Adjusted Cash Flows

Three-Year, Risk-Adjusted Total Benefits, By Category

$11.9 million total benefits

Business growth 9%

Operational cost savings 25%

Travel and incidentals savings 9%

Specialized expert productivity 13%

Training efficiency 17%

Field task worker productivity 11%

Task worker productivity 12%

Leader productivity 4%

MORE INFORMATION ABOUT THE TEI STUDY

For more information, download the full study conducted by Forrester Consulting on behalf of Microsoft: "The Total Economic Impact™ Of Mixed Reality Using Microsoft HoloLens 2," November 2021.

DATA COLLECTION FOR THE TEI STUDY

Forrester interviewed 23 decision-makers from 21 organizations representing diverse roles, industries, and regions that have deployed a range of mixed reality applications via Microsoft HoloLens 2 devices:

- Off-the-shelf applications from Microsoft, including Dynamics 365 Remote Assist and Guides.

- Off-the-shelf applications offered by partner independent software vendors.

- Custom-built or highly-customized applications built by partner systems integrators.

- Custom-built applications by internal teams.

Forrester also interviewed leaders from 13 ISVs and eight SIs that offer mixed reality solutions for HoloLens 2, along with Microsoft stakeholders representing HoloLens 2, Azure, and Dynamics 365. Forrester enhanced and validated the analysis using analyst expertise, Forrester research, third-party research, and public market data.

Data Demographics

Interviews conducted by Forrester:

- Interviews with 23 decision-makers from 21 organizations using Microsoft HoloLens 2
- Interviews with 13 leaders from mixed reality ISVs and eight leaders from mixed reality SIs

Primary industries:

- Manufacturing
- Architecture, engineering, and construction
- Healthcare
- Education

Organization sizes:
Enterprises with between $500 million and $100 billion in annual revenue

Regions:
Organizations with global operations based in North America, Europe, and Asia

Mixed reality deployment size:
Deployments ranged from five to 400 Microsoft HoloLens 1 and 2 devices, with between 10 and 3,000 mixed reality users

---

[1] Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

ABOUT TEI

Total Economic Impact™ (TEI) is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders. The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility.

FORRESTER®