

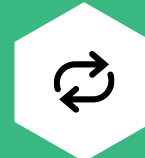
Mixed Reality Using HoloLens 2 Empowers Educational Innovation And Transformation

Educators are working to transform their industry with technology to prepare their students to be ready to join the tech-enabled workforce. As the nature of work changes, educators must transform their programs with technology to help students embrace the new world. And educators can use future of work technologies to improve learning outcomes in the classroom.

Educators have turned to HoloLens 2 to augment their programs to enable teaching scale, support remote teaching and observation, and improve students' learning and knowledge retention. Mixed reality is particularly useful for teaching complex yet repeatable tasks in lab work and observation that virtual classrooms and collaboration technology could not replicate.

[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.” Microsoft boasts a vast ecosystem of applications and services in addition to solutions from third-party partners that enable industry-specific use cases. HoloLens 2 enables educators to strengthen learning and teaching, improve knowledge sharing and retention, increase productivity, reduce operational costs, bolster recruiting, strengthen brand image, increase safety, and improve the student experience.

To better understand the benefits, costs, and risks associated with mixed reality using the HoloLens 2, Microsoft commissioned Forrester Consulting to interview 23 decision-makers from 21 organizations



Reduction in training time:
30%



Decrease in instruction time per instructor:
15%

that are customers of Microsoft HoloLens 2 and conduct a Total Economic Impact™ (TEI) study.¹

This abstract will focus on the education industry's use of Microsoft's HoloLens 2 to leverage mixed reality applications and its value to their organizations.

CHALLENGES

Understanding the drivers and objectives for mixed reality solution investments is crucial in evaluating their financial and qualitative impact on a business. Decision-makers at educational institutions investigated how Microsoft HoloLens 2 could solve key challenges, including:

- The pandemic forced classes to operate remotely, but virtual classroom and collaboration technology could not replicate lab work and observation.



[READ THE FULL STUDY HERE](#)

- Scarce and expensive lab materials limited students' ability to try and practice tasks (especially in medical education).
- Live observation had limited capacity and was limited to on-site expertise and students.
- Video streaming and recordings had limited educational value.
- Institutions sought to lessen travel expense and time limitations from in-person research collaboration between sites and universities, conference participation, and other use cases.
- Competition pushed schools to teach technology skills and demonstrate innovation.

OPPORTUNITIES

Mixed reality technology is changing how students, teachers, and participants in the education space teach, learn, and interact with each other. Education organizations utilized HoloLens 2 across a variety of use cases, including: enabling remote education and assessments to save time, increase productivity, and avoid travel costs; replacing class time with self-guided teaching using HoloLens guides to improve learning, measure performance, and increase in-class time allocated to complex training; and using HoloLens 2 in research, lab work, and medical training to improve speed, collaboration, and quality while reducing consumable costs.

Decision-makers investigated Microsoft HoloLens 2 to seize new opportunities, including:

- Growing research collaboration with other sites and institutions.
- Teaching new skills not possible with current educators, labs, and resources.
- Enhancing Q&A and feedback during demonstrations.
- Enabling mixed reality skill assessments.

INVESTMENT OBJECTIVES

Decision-makers hoped to achieve the following goals as they investigated Microsoft HoloLens 2, including:

- Ensure continuity, especially during the pandemic.
- Enable remote learning.
- Increase knowledge retention.
- Improve student experience.
- Enhance student outcomes in the workplace.
- Increase professor capacity for students and research.
- Reduce operating costs for consumables and lab space.
- Increase research quality.
- Strengthen university 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 users needed.

“We have lots of grants, and this is a great opportunity to show that we know what we’re doing and we can be more competitive than other universities.”

Associate dean of professional and graduate programs, 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 ISV applications 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 applications 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

Voice Of The Customer

“I think the Microsoft HoloLens and mixed reality are amazing. There are tons of use cases, and we’re just scratching the surface at our institution and externally at companies.”

Associate dean of professional and graduate programs and head of center of excellence, education

“[Mixed reality] is the future of learning technology. I just can’t imagine a university campus that will not have XR technologies in the future. This is coming, this is effective, and this is going to be the way we do work. The future of work needs to be part of the future of education. It’s transformative.”

Executive director of innovation, education

“The value of mixed reality is pretty huge even if you just think about the capabilities in just Guides and Remote Assist and the amount of time that can be saved in teaching and research. I envision scenarios where a professor is traveling across the world and the postdoc needs to do something, and they can just put on the headset and walk through it together to solve a problem in minutes and move research forward rather than wait weeks.”

Associate dean of professional and graduate programs and head of center of excellence, education

“We were building a new healthcare education campus and wanted to make sure we integrated future-focused technology.”

Executive director of innovation, education

category leader in extended reality given its significant market adoption and growth, which minimized concerns about risk.

KEY BENEFITS FOR EDUCATION

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

Training efficiency. Mixed reality increased training efficiency while improving knowledge acquisition and retention.

- **Educators reduced training time by 30%, driving qualitative benefits for students.** Educators primarily used mixed reality training for healthcare instruction, with the same benefits and trends as for providers. However, time saved cannot be monetized as students are not paid — rather, time saved instead boosted student engagement, performance, and placement, as well as enabling more learning opportunities.
- **An education organization showed that medical students learned twice as fast with mixed reality compared to traditional methods, and it enhanced long-term knowledge retention.** The executive director of innovation shared: “The visual quality of mixed reality makes it easier to discern anatomical structures, see where they are located, and understand how they relate to each other within the human body. It’s so much easier to visualize and comprehend in this 3D, digital way.”
- **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.”

“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 task worker productivity. Mixed reality provides opportunities to increase field researcher and traveling educator efficiency. Education providers were investigating fieldwork opportunities. Future opportunities could include field researchers aided by visualizations or collaboration apps, or traveling educators teaching advanced concepts with mixed reality.

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

- **Education providers hope to improve efficiency of research with mixed reality.** Task work conducted as part of university research may be able to benefit from mixed reality for quality, efficiency, or data capture.
- **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 observation, driving significant labor costs per leader.

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

- **Education providers reduced 520 annual hours of instruction per instructor by 15% and prevented two out of four trips per year, with 75% of labor per trip avoided, saving \$58 per hour.** Educators have slightly more standardized work that can be addressed with mixed reality than in healthcare; however, travel remains infrequent and cost savings are lower due to their salaries.
- **An education organization used self-guided instruction to reallocate time for professors to teach advanced content and enabled remote**

instruction during the pandemic. The associate dean of professional and graduate programs shared: “Students need to know how to do both the basics and advanced work.

University faculty are well-trained PhD scientists, so it’s a better use of our experts’ time to focus on advanced content. Students can instead learn the basics through mixed reality instructions. For one skill, we reduced lab time from many hours to just 30 minutes with mixed reality and allowed students to practice without restricted time or cost.” The dean continued, “When the world closed and it became clear we couldn’t execute in-person labs, we looked to HoloLens with Remote Assist to supplement and keep the coursework running.”

Travel and incidentals savings. Mixed reality reduced annual travel and incidentals costs for specialized instructors.

- **Education providers saved an average of \$2,500 per avoided instructor trip.** Instructor travel costs were lower than average in education as instructors typically booked longer in advance and did not fly first class, and instructors often did not travel nearly as frequently as those in manufacturing or architecture, engineering, and construction (AEC). However, education organizations may see particularly significant variation depending upon the instructor’s role and the institution’s scale.
- **An education organization saved \$50,000 in average annual travel costs per professor and expects to permanently reduce trips by 50% with HoloLens.** Some instructors traveled almost 200,000 miles per year, driving large savings by using mixed reality without sacrificing the research and collaboration value of the trips. Cost savings were particularly important in academia due to funding limitations, as the associate dean of professional and graduate programs shared: “We’re all poor in the academic

space. Using the HoloLens to interact with colleagues across the globe is way cheaper than flying there for two weeks and staying in a hotel — let alone the effects long trips have on your body and family.”

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

- **Education providers achieved significant operating cost reductions via lab and consumables efficiencies.** Organizations reduced: 1) average consumables by 80%, saving \$1,000 per trainee; 2) average consumables for design, testing, and demonstration by 10%, saving \$15,000 per educator and leader; 3) average annual PPE costs by 75%, saving \$201 per user; and 4) total operating costs by 0.5%.
- **An education organization projects that HoloLens will improve work quality to reduce the cost and impact of waste in life sciences.** The associate dean of professional and graduate programs shared: “Improving productivity is good, but it’s even better to improve the quality of work with better training and work instructions. That way we won’t have to throw away as many batches of a drug and waste those costs. We could avoid the environmental downsides too.”

“We use HoloLens to recruit students into our life sciences program. Mixed reality is an important skill for our students to bring to the workforce and know how to use when they go to work. This technology does help attract students.”

Associate dean of professional and graduate programs and head of center of excellence, education

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%**

Business growth. Business units leveraging mixed reality increased annual revenue by 4%.

- **Education providers hope to increase program demand, and therefore, revenue.** Interviewees believed that leading-edge MR technology made their programs more prestigious and compelling to prospective students, driving competitive advantage. Educators bettered knowledge acquisition and retention with MR, improving learning outcomes. Students also learned to use this leading-edge technology. Interviewees believe this will drive better career placement and success for students, increasing program competitiveness.
- **An education provider recruited students with HoloLens.** The executive director of innovation shared: “Many students are choosing our program because it is innovative. We have amazing student testimonials explaining how valuable [MR instruction] was to clearly see and understand materials and continue their learning. The students are very passionate about it.”

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%



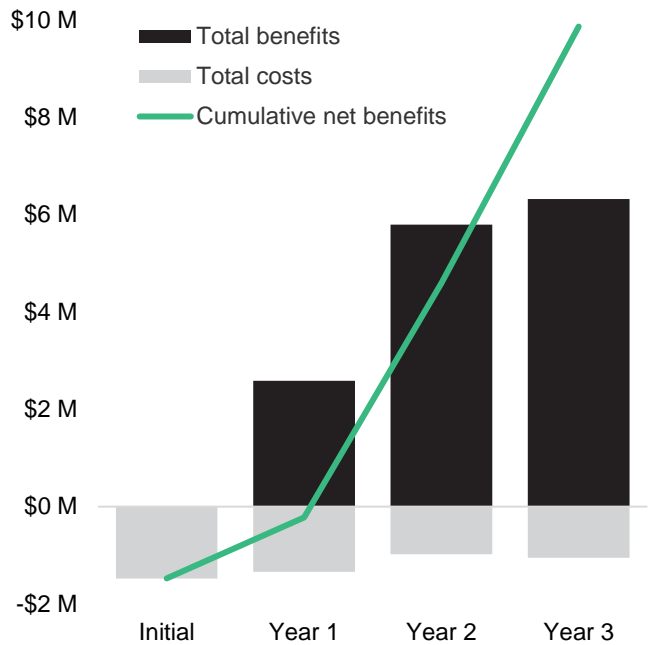
NPV
\$7.6M



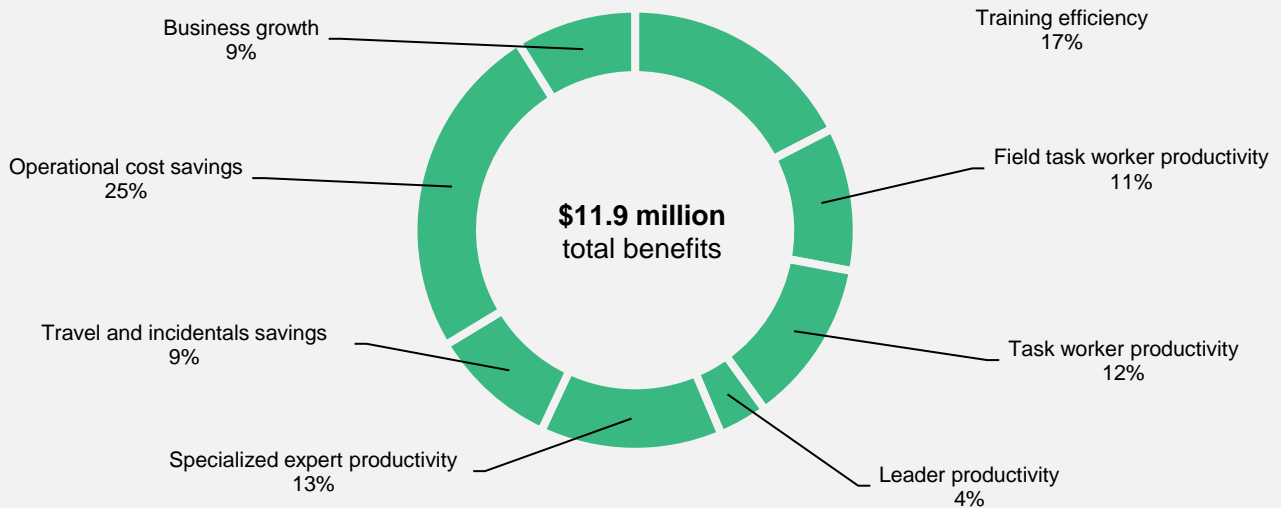
PAYBACK
13 months

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



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 (SIs).
- 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.

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.

DISCLOSURES

The reader should be aware of the following:

- The study is commissioned by Microsoft and delivered by Forrester Consulting. It is not meant to be a competitive analysis.
- Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the report to determine the appropriateness of an investment in HoloLens 2.
- Microsoft reviewed and provided feedback to Forrester. Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning.
- Microsoft provided the names for the customer and partner interviews but did not participate in the interviews.

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.

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

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