ENTERPRISE AUGMENTED REALITY MEETS A MARKET IN NEED OF SOLUTIONS

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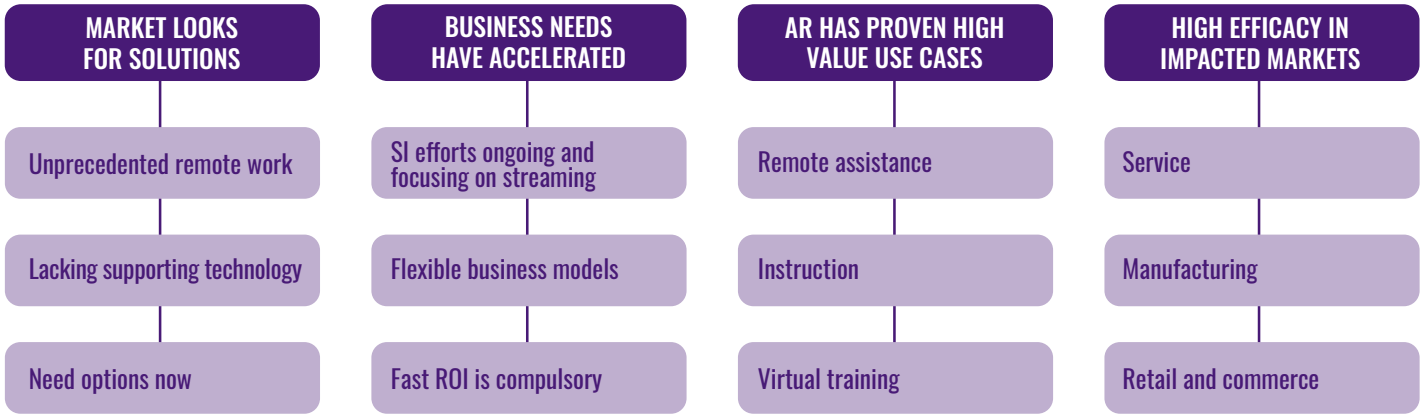
INCREDIBLE CIRCUMSTANCES, BUT PREDICTABLE NEEDS

Circumstances are extreme in today's economy. COVID-19 has forced sweeping and significant changes for everyone, with forced adaptation being an immediate business result. Few solutions exist to help keep employees safe and employed in the face of this disruption, without requiring significant upfront investment or a long implementation time unfit for the rapid change needed in response to the current global climate. A solution to keep employees healthy and productive, while improving operational efficiency and being quick to implement and simple to maintain, is a necessity.

The disruption caused by the pandemic has accelerated the need for businesses to adopt new strategies, and the benefits of digitally transforming frontline operations are undeniable. Augmented Reality (AR) as an enabling technology has been delivering on Key Performance Indicators (KPIs) and use cases for years, strongly aligning with today's needs as well. The future of work remains somewhat uncertain, so highly effective knowledge transfer and communication leading to straightforward Return on Investment (ROI) positions AR favorably both today and in the future.

Figure 1: Augmented Reality Meeting Needs for Years

(Source: ABI Research)



AR is positioned as a powerful solution in today's enterprise environment due to its spectrum of offerings and ability to scale as things return to normal.

FILLING GAPS IN BUSINESS CONTINUITY

The impact from COVID-19 has truly been universal, but some standout markets and verticals have been hit particularly hard. Most workplaces have been forced to adhere to mandatory remote work and social distancing measures. Frontline workflows are impacted by this in different ways. While some workflows have been maintained with existing remote work and collaboration tools, many are crippled by these new limitations, and each plays off the other:

- **On-Site Requirements**: The most obvious gap is where a workflow requires humans on-site. Depending on the environment and number of employees required, this can mean skeleton crews are mandated to keep operations going, or even a complete stoppage of a workflow due to an inherent environment or workflow limitation.
- **Downtime**: Fewer workers mean a greater risk of machine or general workflow breakdowns. Lacking properly trained or expert workers on-site compounds downtime.
- **Complexity**: The more complex a workflow is, the more that can go wrong when there are forced changes. Downtime potential increases and complex workflows often mean more costly downtime.

Manufacturing and service models, and more broadly the industrial enterprise, stand out when examining this list of current business challenges. Complex and costly machinery and workflows, with strict operating requirements and significant downtime impact, leave the door open to considerable disruptions with current work requirements.

Avoiding these disruptions means maintaining as much operational efficiency as possible, while also adjusting to recent remote work requirements. The pre-existing solutions for remote work made this nearly impossible, stretching the capabilities of email and phone systems to handle both a higher quantity and greater variety of collaboration needs. Until AR, there have not been appealing options for

most frontline workers, and operational disruptions sometimes prevented work outright. On-site maintenance may be impossible with today's crew limitations, and downtime is detrimental. This is most often cited as a workflow disruption costing time and money, both in decreased production and service/support. In industries like health sciences or medical devices, downtime can also cost lives—medical imaging and machinery uptime can directly be traced to saved lives, and the global climate putting additional stress on healthcare systems exacerbates this.

AR can address these challenges by enabling real-time remote assistance and support. Unique approaches, such as guided Three-Dimensional (3D) self-service instructions for customers, are possible through AR with a level of efficiency that was previously unachievable. Traditional means like a phone call can be inefficient and cumbersome without the means to share a live view or annotate on the user's environment.

Employee training and onboarding has been a similar story. Traditionally, training has relied on physical documents, binders, lengthy PowerPoint presentations, and one-size-fits-all training videos, often in conjunction with an on-site training requirement to finalize completion of the training program. Given the significant on-site training limitations, these standard methods fall flat and leave trainees without the required knowledge once they enter the production environment. This problem is obviously exacerbated today, as a ramp up of new employees or upskill of existing employee, is even more critical as companies return to capacity. AR improves traditional types of training, enabling better visualization of and interaction with real-world environments. Clear visual instructions enable quicker knowledge gain and overall higher retention. This can be true for both on-site and remote training situations. On-site, real-time training with AR guidance enables instant ramp up and parallelizes workflow completion and training. Off-site, virtual training enables employees to recreate real-world workflows (using captured environment data, digital twins, Computer-Aided Design (CAD), 3D models, etc.) to maintain and expand on training time, despite current limitations.

Knowledge capture is a critical component to improving training methods and has been compounded by increasing employee retirements in the workforce, which has created a gap in knowledge and skills. Forced absences due to COVID-19 leaves an even greater gap in knowledge and increased difficulty in accessing the expertise that remains. AR can play a role here in capturing, distributing, and scaling knowledge and expertise. Real-time capture of a workflow enables critical procedures to be seamlessly captured once, with the potential to distribute that content infinitely. Additional capabilities that come with AR, such as digital annotations and spatial awareness, create further value and promise more seamless knowledge transfer and ramp up.

Value in service support, product/customer experience, and sales and marketing is also present when combining remote work opportunities and data visualization capabilities. Companies can lean on AR for product visualization, virtual try-ons, and digital product interaction in place of in-person opportunities. Post-sale support of products can be improved with AR, with similarities to remote assistance in terms of value proposition that include: eliminating in-person expert requirements for service/maintenance and maintaining operational efficiency. Allowing hands-free data access, of course, has significant safety benefits in many environments today as well, not only from an efficiency standpoint, but also a hygiene and safety standpoint.

AR CAPABILITIES AND GLOBAL NEEDS ALIGNED

AR can address both the existing and novel needs of a business, with equal or greater efficacy than traditional methods. However, this is harder if the implementation is prohibitively expensive or complex. A new technology needs to be easy to implement and quick to ROI. This is as true of any deployment as it is for AR. COVID-19 has created immense additional stress here, with any investment being perilous and buried in uncertainty.

Looking back to the three primary needs that companies are struggling with today—on-site requirements, downtime, and complexity—AR has been catering to these for years.

Figure 2: Prominent Augmented Reality Use Cases and Benefits
(Source: ABI Research)

REMOTE ASSISTANCE

— Efficient communication

— Clear collaborative visuals

— Easy session access

TRAINING

— Clarity of content

— Supports necessary interaction

— Clear feedback and confirmation

KNOWLEDGE CAPTURE

— Streamlined capture

— Unobtrusive when not in use

— Clear feedback and confirmation

Remote assistance has been a powerful use case for AR. Allowing instant access to an expert off-site can reduce machine downtime dramatically for those complex use cases. Travel costs can be reduced and often eliminated outright. These two ROI metrics are easy to understand, which facilitates initial investment, and they are easy to prove, which facilitates ongoing investment and scale. The supporting AR platform can add value across use cases through visual improvements like annotations, data overlay, and spatial registration, as well as streamlining sessions and easing barriers to use.

Allowing users to accomplish tasks in real time is another component. High-accuracy, spatially-aware instruction and training is possible with Mixed Reality (MR) devices and hardware with appropriate sensor capabilities, offering a level of immersion and knowledge retention not possible with other training methods. This translates directly to training off-site for efficiency and user safety. Knowledge capture can also be done in real time, parallelizing task accomplishment and simultaneous procedure documentation. In a training paradigm, capturing step-by-step expert guidance can be done on the spot and then scaled across the workforce or to customers.

Hands-free use has been a primary value add for smart glasses from the beginning; in the past, it was been for efficiency and ease of use. Today, hands-free is often a forced requirement for employee safety. Enabling employees to work hands-free, while following visual and voice navigated instructions improves their safety and accelerates tasks completion, which decreases the likelihood of slowdowns or prolonged

downtime. Mobile devices, while missing hands-free value, also fill an important role, enabling widespread AR usage across an enterprise; many use cases not requiring a head-worn device benefit from AR visualization, knowledge capture, and peer-to-peer interaction.

FLEXIBILITY IN PLATFORM USAGE AND FUTURE SCALE IS KEY

Unexpected shifts in business models and go-to-market motions require fast action. In the past, these shifts have been brought on in the search for a better bottom line, or a new merger or partnership, but today, these shifts are driven by global affairs. Either way, the need is there.

COVID-19 has demanded incredibly unique and challenging shifts, sometimes very drastic shifts away from existing business models. Examples are plentiful in the manufacturing space, with plant and assembly floors shifting from their traditional product to manufacturing Personal Protective Equipment (PPE) and even ventilators. Retooling at this scale and severity is unheard of, and yet there has been success. Companies on their own, as well as through organizations and consortia like VentilatorChallengeUK, have highlighted both the challenges with hard pivots like this and the possibility of success.

AR again serves as a crucial tool in these efforts, where training, digital data accessibility, visualization, and collaboration are paramount to success. In the ventilator challenge, knowledge capture and distribution through PTC's Vuforia Expert Capture tool was pivotal, allowing rapid training and ramp-up without endangering workers. The companies involved in the initiative achieved a higher degree of efficacy and efficiency by using AR to augment more traditional collaboration and training tools—be they videos, documents, or live phone calls—and adding value through streamlined AR content and expertise access.

Rapid pivots are only one part of the equation; many manufacturers and operators have seen intense spikes in demand and/or usage in the second quarter of this year, whether for the product/service pivoted to or for standard offerings. Of course, combining a rapid increase in demand with a rapid decrease in personnel and efficiency do not mix. AR can offset some of that difference by keeping the employees that are active efficient, reducing downtime through remote assistance, and keeping training rapid and effective (and off-site whenever possible).

Demand for flexibility in software and application needs is seen in existing monetization strategies and business models, as quick implementation and time to ROI starts at the business model and initial customer relationship. Numerous AR platforms and services are offering expanded trials and reduced/no-cost demo opportunities during the pandemic. Any losses tied to these changes can be easily made up as the world returns to normal, while the value and ROI of AR remains consistent. Without a flexible option to enter the AR market, investment does not happen in a pandemic-impacted ecosystem.

AR vendors that can deliver value for numerous use cases and elements of workflows are best positioned when the return to normalcy occurs. Remote assistance, knowledge capture and transfer, virtual collaboration, and experiential training are heavy hitters in the AR space. These capabilities are

increasingly important during a pandemic and hold value post-pandemic as well. A selection of quick to implement, fast ROI services with longer-term, complex, and capable offerings ready to scale is the best combination. PTC, as one example, covers a broad range of needs: quick and easy to implement remote assistance with Vuforia Chalk, real-time knowledge capture with Vuforia Expert Capture, content authoring with Vuforia Studio that can leverage existing CAD data, and end-to-end AR integration and content creation combining these solutions with ThingWorx IoT, Windchill PLM, and other enterprise offerings.

Given this level of flexibility, further value is gained as things return to normal. Those that are hesitant to invest today, for valid reasons, can look to proven short-term ROI and these flexible business models going forward. Hardware investment can be a difficult pill to swallow, especially in the head-worn market, but these devices are usable for years and begin showing returns immediately with first use. Of course, most AR platforms allow the customer to scale at their own pace; the freedom to only leverage a single offering, or integrate end-to-end with a full suite of microservices, is a boon to attracting customers in a difficult investment environment, and keep them long term.

MORE VALUABLE THAN EVER

While AR has proven value across use cases and industries, hesitation around investment is still to be expected in today's economic environment. COVID-19 has forced the hand of many companies, but a new way of working does not need to be a detrimental situation. Understanding all options available, both within AR and without, paints a clearer picture of where value will lie for digital investment. It just so happens that the requirements of enterprise AR over the past 5 or so years have aligned precisely with the requirements of companies operating in a COVID-19 economy. Both the abilities to implement AR and see value quickly, as well as scale that initial investment over time and at a custom pace, align with the fast bounce back predicted by many. The way value is derived from AR has not changed, but the positive impact of that value has been heightened.

Behind all this needs to be a cohesive platform, that accounts for hardware, software, and users, and can shift in engagement, capability, and scale depending on the customer's need. The best platforms offer a portfolio strong both in parts and as a whole; valuable components that, if desired, can combine to be greater than the sum of the individual components. Visualization, collaboration, and data interaction can be combined in use cases for remote assistance, training, workflow creation and instruction, verification, and more. In a world that necessitates a hands-off approach (literally) for day-to-day activity, head-worn devices and personal AR-enabled mobile devices can bridge that gap.

Ultimately, the right combination of use case and hardware with a supporting platform varies dramatically by company. Rather than investing and hoping for success, identify where the value of AR fits by directly addressing specific business needs and shortcomings.

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