
Innovation Spotlight Report: CareAR and Alto AI

December 2021



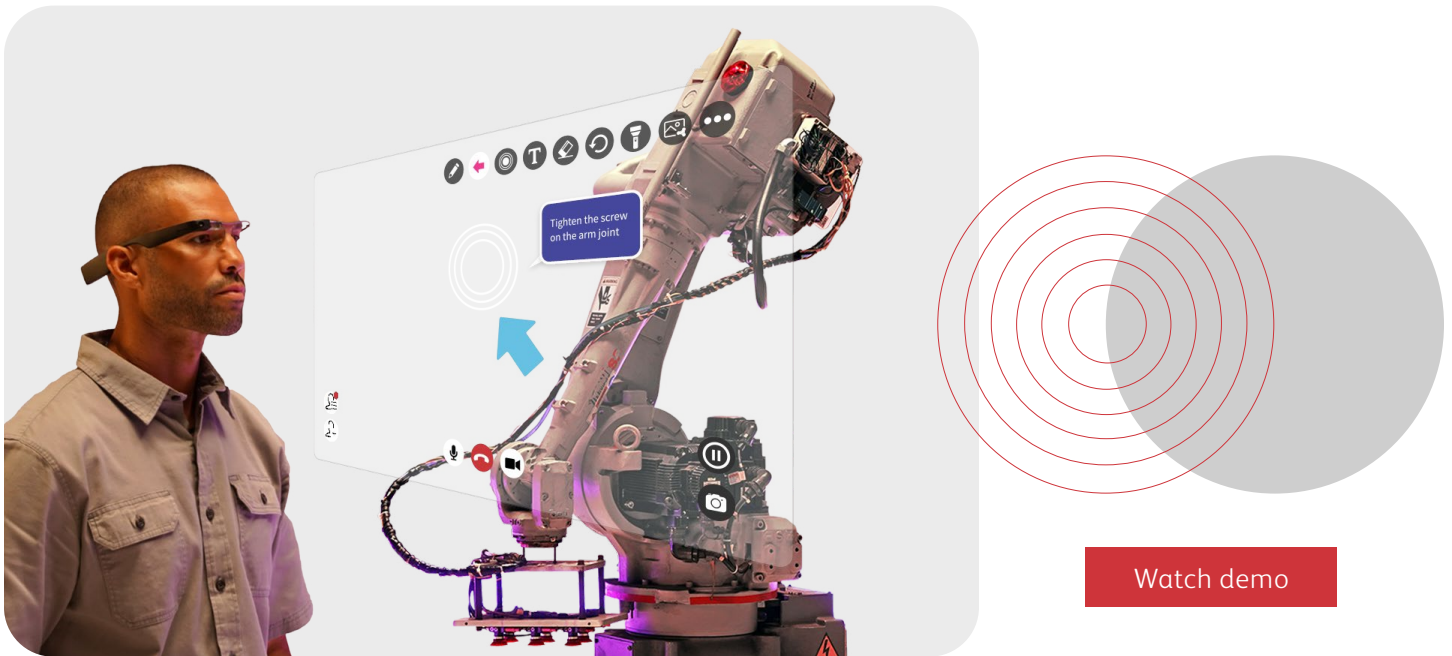
CareAR and Alto AI

This is the second in a series of Innovation Spotlight Reports that provide deep dives into Xerox's investments in disruptive technologies across software, augmented reality (AR), artificial intelligence (AI), additive manufacturing, industrial Internet of things (IoT), and cleantech. In this Spotlight report, we focus on Xerox's newly formed Software business, CareAR Holdings ("CareAR"), which utilizes Xerox's recently acquired AR technology and PARC's extensive research in the field of AI.

CareAR was officially formed in September 2021 as part of Xerox's plan to stand up three new businesses: Software (CareAR), Xerox Financial Services (XFS) and Innovation (PARC, or Palo Alto Research Center). CareAR is a service experience management platform that supports service workforces with AR-driven visual tools and access to data that are needed to consistently deliver high quality service experiences.

CareAR leverages leading AR technology and PARC's AI capabilities to differentiate and extend its platform. PARC's AI efforts date back to the 1970's, when PARC helped pioneer the development of natural language processing (NLP), which was later applied to semantic search to improve query responses. CareAR utilizes PARC's semantic search technology as well as PARC's research in computer vision, object detection, system models, and intelligent assistant capabilities, which is collectively referred to as "Alto AI".

This report will provide an overview of CareAR, its unique value proposition and its market opportunities. The report will also highlight the importance of PARC's AI in the development of CareAR's product capabilities.



A significant market opportunity in search of a solution

Even before the pandemic and ensuing “great resignation”, the team at CareAR, Inc. (acquired by Xerox in 2020) and researchers at PARC understood the need among service companies for scalable technology solutions that can facilitate knowledge transfers between seasoned and newer employees. According to a survey conducted by the Service Council¹, workforce and talent issues – including a rapidly retiring workforce – were cited as the top two business challenges faced by large service organizations.

That need has only grown since the pandemic began. A recent Federal Reserve study² estimates that 2-3 million “excess” retirements took place in the 18 months immediately following the onset of the pandemic. Further, a robust labor market has led to what market observers are calling the “great resignation”. Since July 2021, 17 million workers in the U.S. have quit their jobs³ - 19% more than the same time in 2019, which was itself an abnormally high period of resignations.

CareAR’s Service Experience Management Platform bridges the worker knowledge gap and promotes sustainable business practices

Early retirements and employee turnover have resulted in a systematic drain of institutionalized knowledge at service organizations. CareAR’s augmented reality-based remote and self-solve capabilities address this problem by leveraging and optimizing seasoned employees’ time and allowing inexperienced workers to draw on a repository of knowledge curated by CareAR’s content creation tools and predictive AI capabilities.

For example, with CareAR, a field or customer service worker with 30 days of experience can be guided remotely during a service call by a technician with 30 years of experience, using 3D, AR-based annotations. Or, instructional content from manuals and videos, along with machinery specifications and maintenance history, can be loaded into the CareAR platform to deliver an AR-driven self-solve solution, guiding newer employees (or customers) through a complex service task.

CareAR’s augmented reality platform is also more intuitive to younger workers than paper-based manuals, handbooks and even one-on-one instruction. CareAR’s organically intuitive interface and interactive, 3D visual training allow for instructional content delivery that is more aligned to the learning styles of digitally native workers.

CareAR also supports service employers’ sustainability and social responsibility efforts by facilitating remote service, which reduces truck rolls (and therefore carbon emissions) and supports worker safety.

Quality field service and self-solve solutions for customers will increasingly set the bar for customer and services experience success. To address this growing need, CareAR is helping define a new category of service delivery software, called Service Experience Management, which can improve service delivery outcomes and create favorable customer experiences. CareAR expects Service Experience Management will grow to a total addressable market (or TAM) of \$80 billion by 2028, a 14% CAGR from 2020 levels⁴.

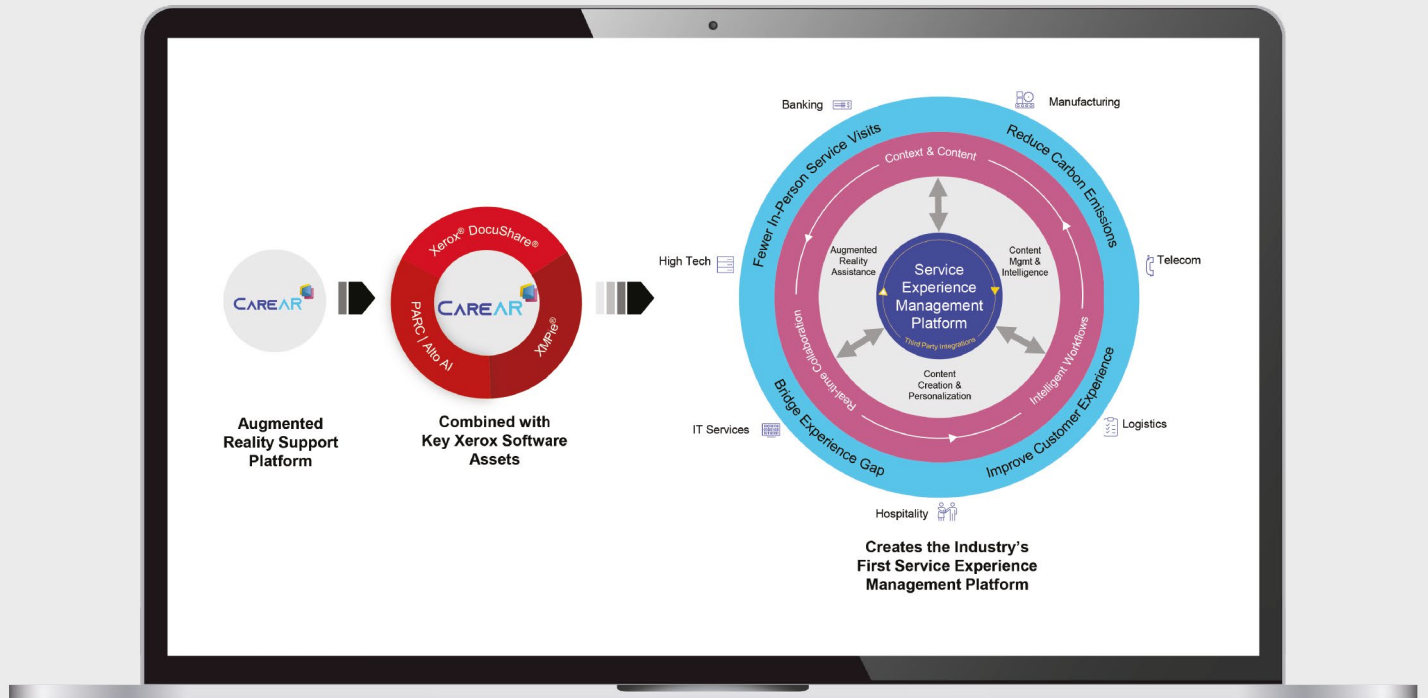
What is CareAR?

CareAR offers an end-to-end platform that delivers contextual knowledge to service employees and end-users of products, enabling better service performance outcomes. It draws on several proprietary software assets at Xerox, including CareAR's augmented reality platform, DocuShare's content management system, XMPie's customer content creation tools, and AI from PARC. The CareAR platform is designed to transform service and customer experiences with live, visual AR and AI-driven interactions, instructions, and insights as part of a seamless digital workflow experience.

Each component of software that comprises CareAR is integral to the success of the overall platform. DocuShare stores and retrieves content that is curated and/or contextually retrieved using Alto AI. XMPie will be used to produce customized instructional content. And CareAR's AR-based technology is the interface through which customers interact with the broader platform.

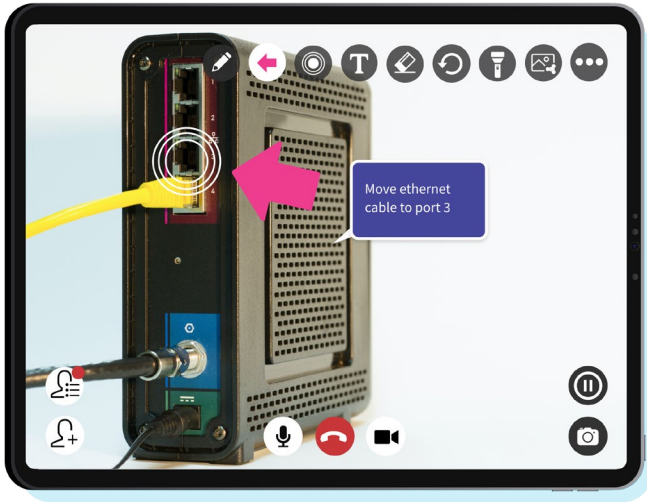
PARC is working with CareAR to extend the existing capabilities of the platform and deliver advanced and differentiated capabilities - through Alto AI. PARC's AI-based research agenda long envisioned a future where an AR-driven, intelligent assistant platform can recognize a scene, understand what needs to be done, and guide users' step by step, validating work before moving on to the next task. The initial components of this vision are being integrated into the CareAR platform to improve the process of AR content creation and object detection. Additional advanced capabilities will be integrated over time to deliver a rich, interactive self-solve user experience. PARC has also developed semantic indexing and search technology to deliver more relevant text and video content to users.

The CareAR platform can be used independently or as an integrated service delivery toolkit. For example, CareAR partnered with a leading digital workflow solutions provider, ServiceNow, to connect seamlessly to enterprise service data and workflows and help CareAR capitalize on the Service Experience Management opportunity. This partnership was solidified in September 2021 with a \$10 million investment in CareAR by ServiceNow, valuing CareAR at \$700 million on a post-money basis.



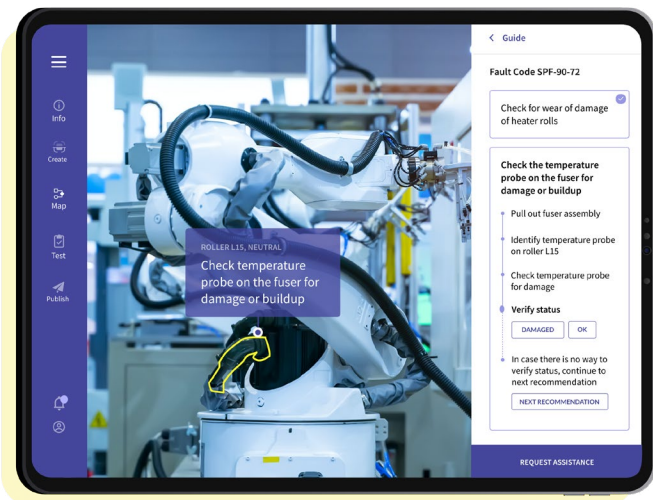
How CareAR Solves Problems

CareAR has three primary means of making expertise more broadly available: Assist, Instruct, and Insight.



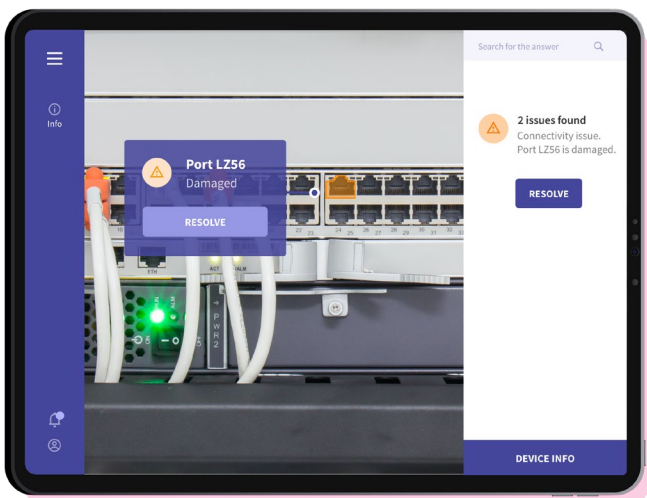
Assist

CareAR Assist uses live, visual interaction to solve problems remotely, drawing primarily on the expertise of another human. Assist combines real time video with augmented reality-based and geo-spatially fixed annotations to help field service agents and customers more accurately and quickly solve field service problems. Integrations with workflow solutions like ServiceNow allow the convenient capture of remote service interactions for record-keeping and compliance purposes.



Instruct

CareAR Instruct uses an augmented reality overlay and an AI-based virtual expert to provide users with self-solve capabilities. Instructional content can be curated and/or transformed into AR applications using CareAR's proprietary authoring tools. After the equipment's technical and usage specifications are captured by the platform, data-rich interactive features such as equipment state detection and contextual search are enabled using Alto AI. Users can access contextual video and interactive guides based on the condition of the equipment, or using a self-guided, intuitive search module.



Insight

Imagine a future where a piece of machinery can tell you when it is broken (or about to break) and how to fix it. CareAR Insight aims to deliver on that vision by combining the AR interactivity of Instruct with operating information specific to a particular machine. Insight draws on Internet of Things (IoT)-based sensor data, service history data (for an individual machine or all machines in use) and machine learning to provide accurate, useful diagnoses when machines encounter problems. Insight can also help equipment owners avoid downtime by predicting potential breakdowns and malfunctions.

Going Forward

CareAR. CareAR is helping define the future of Service and Experience Management (SXM) by leading the industry through some of the technological challenges standing in its way. Customer and field service managers need solutions to bridge the knowledge gap created by accelerating retirements and resignations. End-use customers increasingly want on-demand service and self-solve capabilities. CareAR believes augmented reality experiences, combined with reactive and predictive maintenance capabilities, is where SXM and on-the-job training is heading.

As CareAR moves further into curated content development and predictive solutions, analytics will become an increasingly important contributor to CareAR's product roadmap. Using analytics, CareAR can learn from past experiences to make predictions, recommend actions, and refine content, all leading to improved service outcomes.

Alto AI. One of the key challenges to scaling intelligent AR applications is the time and expertise required to create the content enabling AR-driven insights. PARC is working to solve this scalability challenge by developing technologies that accelerate the creation of AR-based content. The first is a technology that accelerates the process of training a computer vision system to recognize objects, then display relevant AR annotations on those objects. The second is a technology that accelerates the process of creating a 3D model of a system, including its parts (i.e., a "digital twin"), to guide users through a series of steps with animated service actions.

A third challenge is extracting knowledge from available instructional content, such as product or service manuals and videos, to drive intelligent AR applications. And a fourth challenge is to understand the user's context, including level of expertise, to customize the knowledge being delivered to a user.

These last two challenges were also recognized by DARPA, the Defense Advanced Research Projects Agency, when they created their Perceptually-enabled Task Guidance program, which solicited research from leading technology providers to help create AI technology that is perceptual, and can provide relevant information in context, as well as instruct when necessary. DARPA [recently awarded](#) PARC a \$5.8M contract under this program to address challenges in knowledge extraction and tailored assistance to users, thereby validating PARC's proposed approach and capabilities associated with scaling knowledge delivery services. The results from this work will address both DARPA's needs in field service and inform future product development for CareAR.





Footnotes

- ¹ [A Sustainable Field Service Workforce - Service Council](#)
- ² <https://research.stlouisfed.org/publications/economic-synopses/2021/10/15/the-covid-retirement-boom>
- ³ US Bureau of Labor Statistics, Job Openings and Labor Turnover Study, July to October 2021 vs 2020
- ⁴ Calculations & Extrapolations performed by Xerox based on Gartner Forecast Enterprise Application Software, Worldwide 2019 – 2025 1Q21 Update and Data from GrandviewResearch.com



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