Cognizant

The *Real* Reality of Augmented Reality

AR promises to make all the world – including work – a stage for immersive experiences. But balancing ROI and FOMO is critical; our latest study shows how businesses are already capitalizing on AR's ability to deliver improved business outcomes.

Center For
The Future of Work

At long last, the AR market seems ready to break out of the seemingly interminable stage of pilot-only projects. One-third of our study respondents have already scaled their AR initiatives into full implementations and captured substantial value.

August 2019

Executive Summary

With apologies to director Christopher Guest, today's market for augmented reality (AR) can feel a bit like *Waiting for Guffman*. In this 1996 mockumentary, aspiring performers bide their time for a Broadway theater reviewer who – they think – will make them stars.

After witnessing years of AR pilots and false starts, plenty of observers think AR won't really come of age until Tim Cook or Mark Zuckerberg (or Magic Leap's Rony Abovitz … or Microsoft's Satya Nadella …) unveils a head-mounted display (HMD) that's as sleek, elegant, interoperable, affordable and untethered (with a battery that lasts all day) as the iPhone was in the mobile phone market of 2007. It's no wonder that market analysts have AR positioned at the nadir of their market timing cycles.

However, it's getting more difficult to ignore the growing number of companies with AR implementations generating real results. So which view is the *right* view? What's the real reality of augmented reality, and how will it affect the future of work?

To analyze the state of AR, Cognizant's Center for the Future of Work partnered with Oxford Economics to ask 300 senior leaders about their views on the current and expected dynamics of the AR market. We also conducted a focused, half-day roundtable session in partnership with the Haas School of Business at UC Berkeley to gather anecdotes and lessons learned from industry practitioners and academics looking at the business impacts and potential pitfalls of AR. (For more on how the study was conducted, see methodology, page 32.)

One-third of our study respondents have scaled their AR initiatives into full implementations and are already capturing substantial value and accelerating their AR future plans. This suggests that, at long last, the AR market is ready to break out of the seemingly interminable stage of pilot-only projects and that it's time to prepare for work, play, business processes and even entire business strategies to be altered by AR in the 2020s.

Key findings of our study include:

- **AR is happening fast, it's happening now, and timing is everything.** Half of respondents think AR will be considered a mature technology that is accepted, established and in widespread use in 18 months to three years, while the other half believe it will be in three to five years. But of those respondents already realizing value from scaled AR implementations, the vast majority side with the near-horizon group; it's today's priority, not tomorrow's.
- **AR is bringing massive change to a process near you.** Of major significance to business operating models in the near future, 82% of respondents expect substantial AR-driven redesign of business processes. Rewiring business processes as "journeys" will become a key competency for organizations in the near future.
- **Brand reputation and equipment utilization are two of the biggest AR benefits so far.** Respondents with scaled AR implementations anticipate 8.2% average top- and bottom-line growth from these initiatives by 2022. Even greater are the gains in soft benefits, such as improved brand reputation, equipment utilization, speed and agility, and customer experience.
- **AR concerns – while significant – aren't showstoppers.** Of our respondents, those who've already scaled AR implementations expressed the highest degree of concern about a range of AR challenges, especially technology readiness. However, these same businesses are finding ways to forge ahead anyway; while emerging, the technology is not too immature to stand in the way.
- **Engines built for gaming will be serious drivers of AR's future.** Some observers associate AR not with serious business intent but with the seemingly goofy (read: *Pokemon Go!*). But for 65% of respondents, the "fun and games" aspect of AR is serious business – they believe gaming engines will be the external suppliers of choice for needed AR capabilities. The standardization and back-end computing power of gaming engines (like Unity or Epic's Unreal) are what's needed to drive beautifully rendered, immersive 3-D content in AR.

Armed with fresh insight from AR pioneers on the state of the industry, we offer guidance to all businesses on how to prepare for this vital technology in the future of work, including the challenges your organization is likely to encounter and the skills it will need to nurture. Consider it as your field manual on how to connect AR to your business strategy, and inform and guide your next steps on the journey.

IN THEIR OWN WORDS

We asked study respondents to briefly describe the new experiences they'd like to create with AR, for work, play or customer engagement. The responses — which appear throughout this paper — reveal what's on the minds of enterprise leaders on the cusp of this shift.

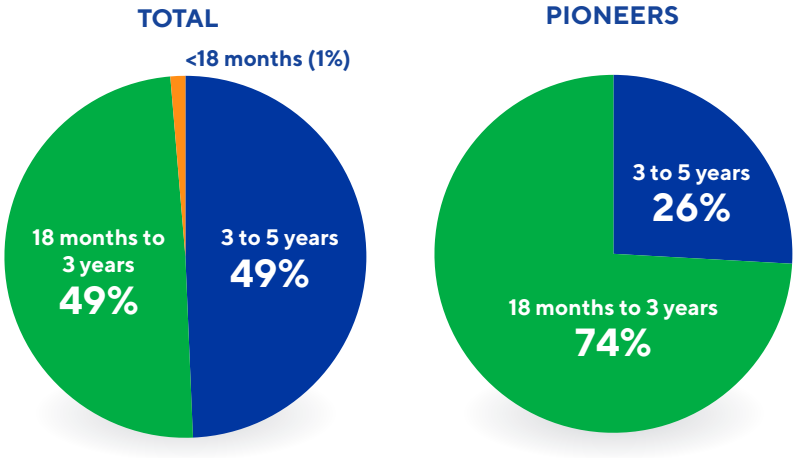
PRIME-TIME AR IS IN SIGHT

If you've been paying attention to the AR market for any length of time, and it feels like the world is divided into two camps of AR "believers" and "non-believers," then you're probably right. In our study, business leaders were evenly split as to when they foresaw AR becoming a mature technology that is accepted, established and in widespread use (see Figure 1). Just about half (49%) think it will be within 18 months to three years, and the exact same percentage think it will be in three to five years. Breaking the tie, the remaining 1% think it will be in less than 18 months.

But while that might make it seem safe enough to "wait it out," a closer look reveals the near-horizon camp has a distinct edge. Of all 300 respondents, one-third (a total of 106) have already implemented an AR initiative at scale, a group we call the "experts." Of that group, 80% (a total of 85) have not only implemented AR but also expect to be ahead, or far ahead, of their competitors in three years' time. We call this group the "pioneers." For these companies, waiting around for AR's version of "an iPhone moment" isn't enough. They're already activated, have gathered momentum, and – when it comes to augmented reality – their reality equates to real results.

AR: a technology whose future is fast approaching

Respondents were asked when they expect AR to be considered a mature technology that is accepted, established and in widespread use.



Note: Total percentage in the left-hand chart doesn't sum to 100% due to rounding.
Response base: 300 senior executives; 85 "Pioneers."
Source: Cognizant Center for the Future of Work
Figure 1

BUSINESS PROCESSES BECOME "AR-IZED" AS IMMERSIVE JOURNEYS

A huge impact of AR will be how it changes internal business processes. Conceptually, AR has the technological power to meld people, places, time, space, things, changes of events, A/B choices and next-best-actions into a fusion and flow we call a "journey" (a concept we explored in our 2017 report "Augmenting the Reality of Everything"[1]). The advent of high-speed, low-power 5G in the next couple of years will only accelerate efforts to take AR experiences to the next level.

AR will pick up where earlier digital technologies – aka the "SMAC Stack" (social, mobile, analytics and cloud) – left off.[2] SMAC technologies have made great headway over the last decade in digitizing clunky, manual, paper-based and rote-and-repetitive work processes, but there's still plenty of hands-on work that takes place today, particularly where legacy systems of record and systems of engagement stop. (And these work tasks are typically executed with a still shockingly high amount of old-school paper forms as the interface. Just ask your nearest doctor's office about their stack of faxes from the hematology lab.[3])

Applied astutely, the increasingly sophisticated technologies of AR can reshape this type of rote work by "melting" SMAC-based business processes and re-forging them as immersive AR journeys. Consider fulfillment center workers doing pick-pack-ship or service technicians conducting field maintenance work. These activities involve information exchanged while on the move (or "on the wait").

Simply put, rewiring business process journeys will be your new key competency for applied AR. It promises to remove last-mile, "look-away" processes that involve checking information and toggling between multiple documents. For example, doctors are using a system that combines natural language processing, AR software from Augmedix and Google Glass to auto-populate electronic medical records, reducing paperwork burnout.[4] Factory workers can use AR to display construction schematics, assembly or repair instructions in front of their eyes rather than having to check and recheck a static document. Boeing says its wiring technicians' use of Upskill's Skylight platform has cut production time by 25% and improved first-pass accuracy 80%.[5]

AR will reshape work by 2025

It's no wonder that of all the ways AR will impact the workplace, substantial redesign of business processes is far and away the most notable, according to 82% of respondents in our study (see Figure 2 , next page). This isn't just a case of employees being able to work more quickly. By reforming business processes into AR journeys, respondents also believe workers will be empowered to take a more analytical approach to work (56%) and make better decisions (48%).

AR will pick up where earlier digital technologies – aka the "SMAC Stack" (social, mobile, analytics and cloud) – left off.

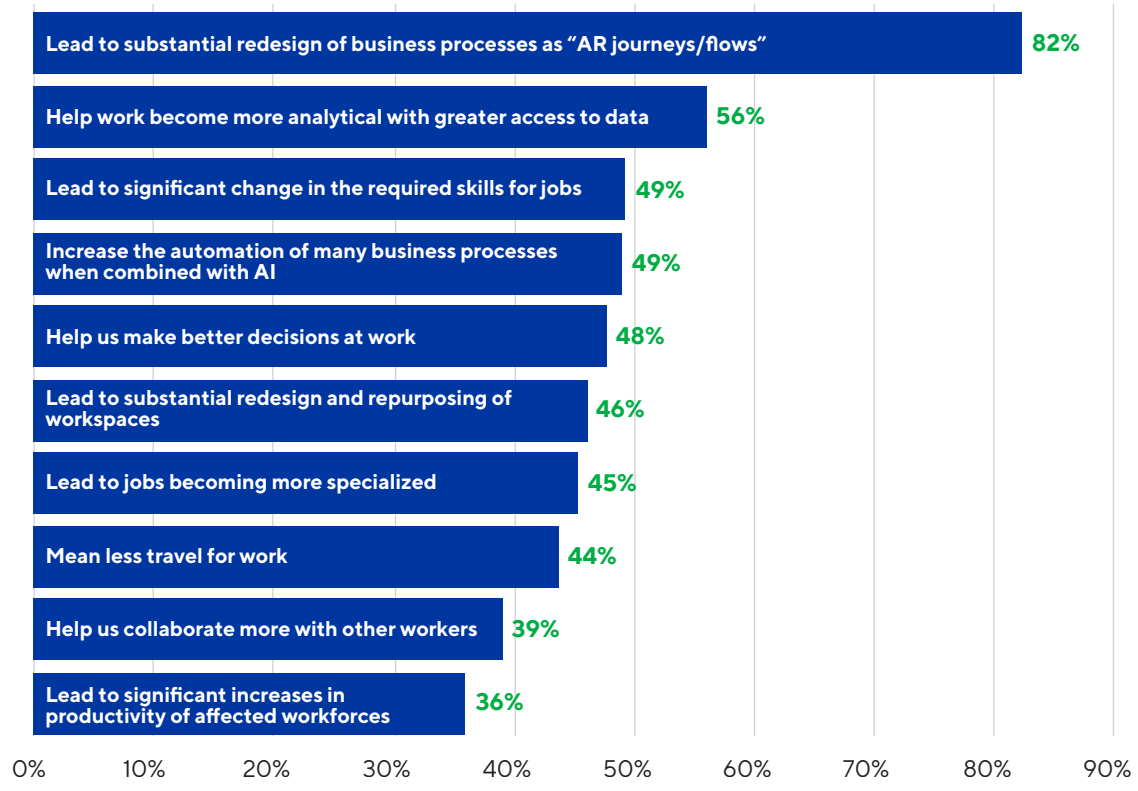
THE FUTURE OF WORK FOR TRUCK DRIVERS

"AR has the power to turn ordinary truck drivers into maintenance and logistics experts."— ***Managing Director, Life, Property & Casualty Insurance, Germany***

Our findings suggest that the use of AR for business processes will gain more attention over time. So far, the "experts" in our study (those who've successfully scaled an AR implementation) have focused mainly on business-to-consumer (43%) AR applications (e.g., virtual try-on and product education) and consumer-to-consumer (38%) applications (e.g., the filters and overlays embedded in social media tools like Snapchat and Instagram).

Processes become AR journeys

Respondents were asked to assess where AR would have the biggest impact.



(Percent of respondents who agree or strongly agree that AR will impact each area.)
(Multiple responses permitted)
Response base: 300 senior executives
Source: Cognizant Center for the Future of Work
Figure 2

This reflects the reality of what's already playing out among early adopters:

- Makeup maker Sephora enables customers to virtually try out 20,000 of its cosmetics either in-store or via its app, using its AR tool Visual Artist. So far, the capability has garnered over 8.5 million visits and 200 million product try-ons.[6]
- With its AR-augmented mobile app barcode scanner, Walmart enables customers to more quickly compare product prices and also see product reviews and ratings. The technology has reduced the time it takes to scan multiple items by 50%, according to Walmart.[7]
- Houzz enables home buyers to redecorate homes with AR, letting them see 3-D spaces and visualize furniture (e.g., size, colors, shape, weight, etc.) in their own rooms before they buy, heightening the probability of a purchase by 11 times.[8]
- Enough with the (repeated) poking! Phlebotomists are finding veins using AccuVein, an AR device that can "see" subcutaneously through the patient's skin to find a vein, leading to a 45% reduction in escalations.[9]

Looking at the three-year plans of the entire group of study repondents, there will be a continued emphasis on B2C applications of AR; however, interest is growing in focusing AR on internal work and business processes. While just 19% of "expert" respondents are currently targeting business processes and operations for AR, one-quarter of the full respondent base plans to in the next three years. Coca-Cola, for example, is using AR to help its retail partners visualize how beverage coolers would look in their stores, Caterpillar is reducing the significant cost of downtime by using AR for servicing its on-site portable generators,[10] and Walmart is leveraging the technology for employee training.[11]

While just 19% of "expert" respondents are currently targeting business processes and operations for AR, one-quarter of the full respondent base plans to in the next three years.

AR QUANTITATIVE BENEFITS ARE GOOD; QUALITATIVE ONES ARE GREAT

Over the next three years, brand reputation is anticipated to be the top qualitative benefit, according to 62% of the full respondent base.

The value of AR implementations is both quantitative and qualitative in nature. But while the quantitative benefits of AR are good, the qualitative outcomes are great. At present, the "experts" in our study report tepid quantitative results of just 1.4% revenue gains and 1% cost savings. But these same respondents are much more optimistic about financial returns over the next three years, collectively anticipating 8.2% average top- and bottom-line growth by 2022 (4.3% increase in revenue and 3.9% cost savings).

However, all our respondents believe the biggest outcomes will be more qualitative in nature. Over the next three years, brand reputation is anticipated to be the top qualitative benefit, according to 62% of the full respondent base (see Figure 3 , next page). Not only does this finding correspond with the prevailing focus on B2C applications of AR, but it also underscores how companies see AR technologies as a way to ensure their brand stays up to date with emerging consumer demographics – or simply tells a good story. The AR-enabled "talking felons" label affixed to bottles of 19 Crimes wine,[12] for example, helps foster a brand connection with customers. Or, as master sommelier Fred Dame put it in the documentary film *Somm III*, "[The all-important millennial demographic for wine] wants something more, something exciting and different. And they want to pair it with a bedtime story."[13]

In short, seeing is believing. When it comes to achieving something as inherently intangible as brand reputation, AR can be a highly effective tool that provides real outcomes, right in front of your eyes.

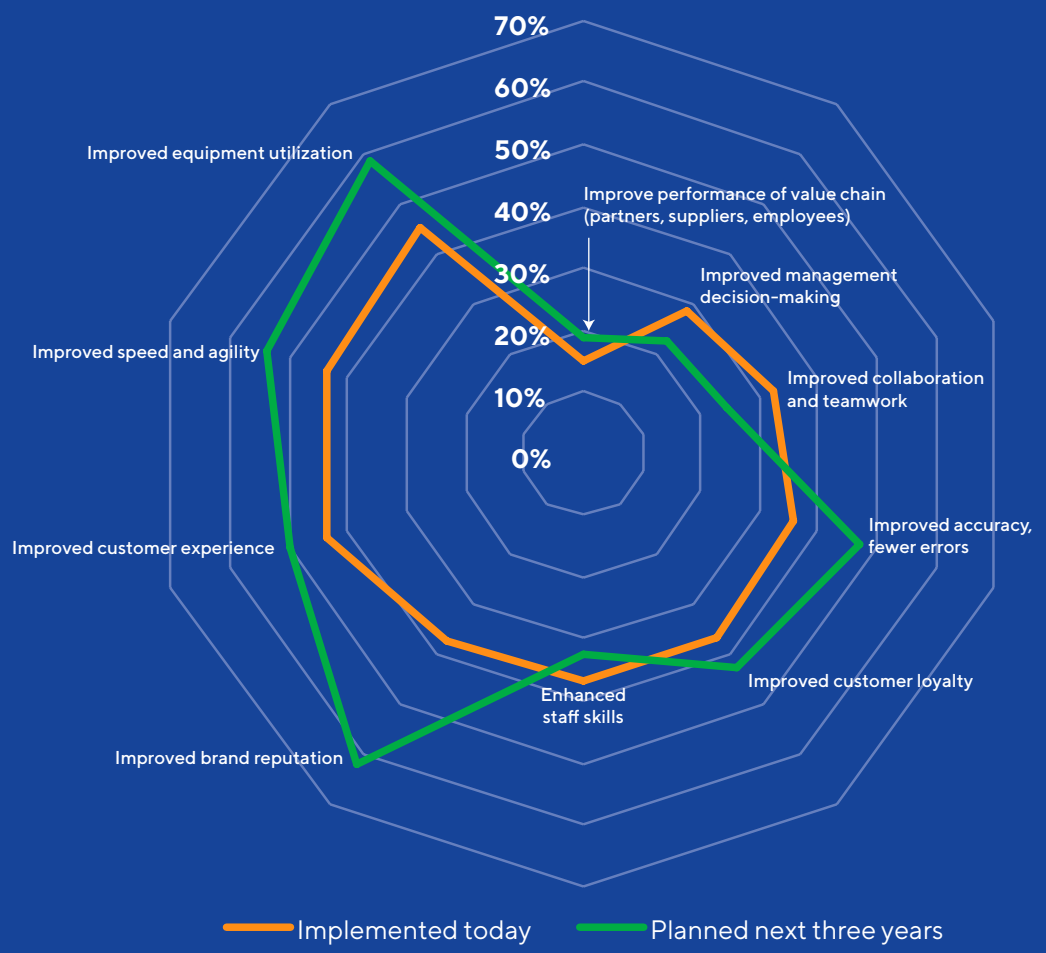
Other qualitative outcomes of AR are more tangible, like better equipment utilization, which was named by "expert" respondents as the top current AR benefit (it's also cited by the full respondent base as a top-two benefit over the next three years). This finding aligns with the increased interest in applying AR to internal business functions. By retrofitting existing equipment in manufacturing plants with AR platforms, businesses can increase speed, accuracy and throughput volumes. Witness the initiatives that Atheer has enabled for step-by-step task guidance for manufacturers[14] or the AR systems developed by the U.S. Marine Corps for repairs to light armored vehicles.[15]

AR TECHNOLOGY MOLDS, SHAPES AND REFORMS PROCESSES

"In our industry, it's very helpful to have augmented reality, as it's having vast applicability to things like digital catalogs, virtual test drives and many more. So we are trying our best to mold our business models to accept these changes."
— Chief Technology Officer, Retail, Sweden

AR delivers many qualitative benefits

Respondents were asked to name the top expected benefits of AR. *(Percent of respondents)*



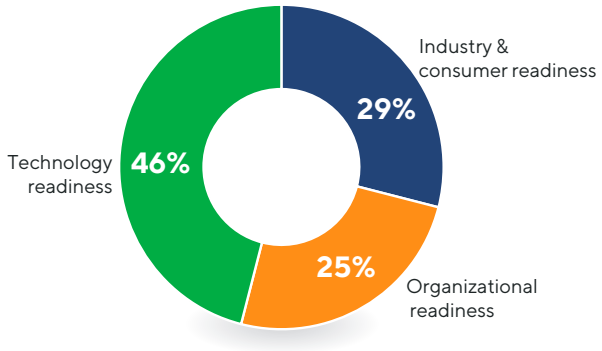
(Multiple responses permitted)
Response base: 106 "implemented today;" 300 "next three years."
Source: Cognizant Center for the Future of Work
Figure 3

AR CHALLENGES: SIGNIFICANT BUT SURMOUNTABLE

For many, "the waiting" for AR is primarily a matter of technology readiness, particularly when it comes to AR software (see Figure 4). Respondents cited concerns ranging from software maturity (including software development kits), to communications (interoperability and communication speeds between AR devices) to the user interface (headsets, eyewear, smartphones, consoles, etc.).

Technology readiness is the leading concern

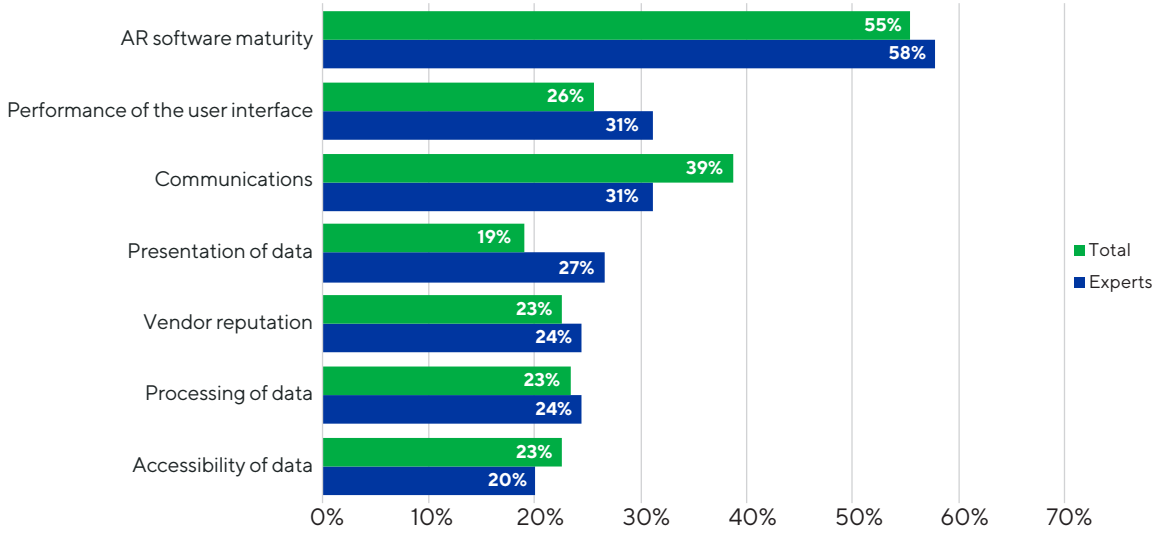
Which of the following represents the greatest challenge to AR adoption over the next three years?



Note: ***Technology readiness****: AR technologies are not yet providing the performance, at the right price, to convince users to invest in AR.* ***Industry and consumer readiness****: There are not enough convincing use cases, and consumers are not convinced of the value of AR solutions.* ***Organizational readiness****: We don't have access to the skills and expertise needed for successful AR implementations.*

Response base: 300 senior executives

Specific technology challenges



(Percent of respondents naming each as a "large" or "very large" obstacle)

(Multiple responses permitted)

Response base: senior executives who prioritized technology readiness as the top challenge = 137; Experts = 45

Source: Cognizant Center for the Future of Work

Figure 4

However, it's important to note that while the "expert" grouping of respondents expressed even higher concern about these technology aspects, they're finding ways to forge ahead anyway; while emerging, the technology is not too immature to stand in the way.

For example, the slow data speeds that can lead to latent image rendering and non-fluid AR experiences could bring back jaded memories of the web's "World Wide Wait" of yesteryear; however, the advent of 5G will help; 91% of our respondents felt it would help accelerate AR adoption over the next five years.

The twin challenges of consumer and industry readiness

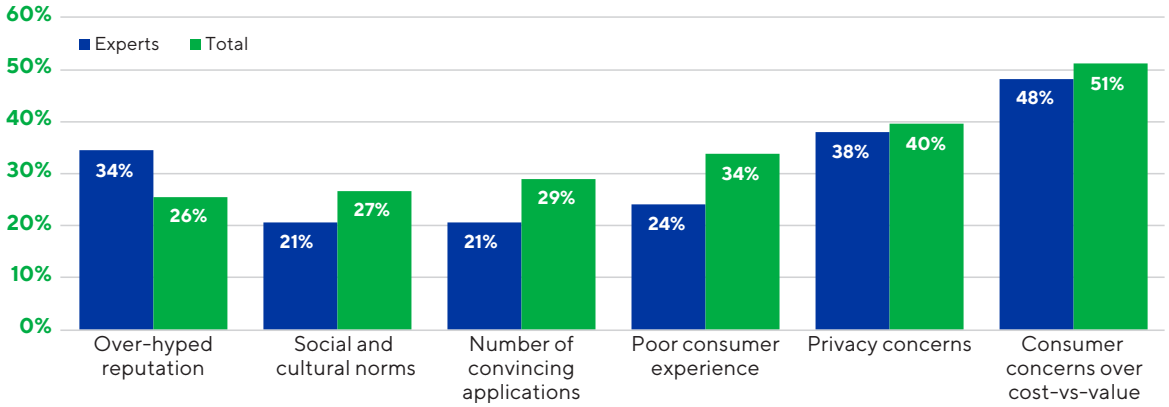
A secondary challenge is related to the gnawing concern that AR is a "solution in search of a market," a "diminished reality" in which glitzy possibilities get lost in a speculative buzz

"Expert" respondents were particularly sensitive to the over-hyping of AR, with well over one-third citing this concern vs. 26% of the full respondent base (see Figure 5). Of anyone, these early implementers are well aware of the need to manage expectations of mainstream adoption in a world of over-promised solutions.

All respondents were also uncertain as to whether consumers would be amenable to the cost vs. value equation. (Maybe it would be cool to look like a character from *Toon Town*, or have a velociraptor randomly roar across their vision, but would they pay for – or spend time on – the privilege? Yet as millions of teenagers already using the lolling dog-tongue overlay on Instagram suggest, the answer is "yes!"). On a positive note, only 40% of respondents see having a convincing business case for AR investments as being anything more than a "slight obstacle."

It's also a clear sign of the times that respondents key in on privacy as a key concern – both current and future implementers alike. It's essential that privacy and ethical use of the medium get the utmost consideration, given the serious consequences at stake (see Quick Take, next page).

Top industry & consumer challenges



(Percent of respondents naming each as a "large" or "very large" obstacle)
(Multiple responses permitted)
Response base: senior executives who prioritized industry and consumer readiness as the top challenge = 86; Experts = 29
Source: Cognizant Center for the Future of Work
Figure 5

Quick Take

Eyeballs: the window into the soul

It's understandable that in today's post-Cambridge Analytica world, when arcane technological discussions around AR elicit phrases like "eyeball tracking," people get nervous (perhaps leading your Chief Trust Officer to do a verbal double take: "Excuse me... did you just say 'eyeball tracking'?" <*Needle scratches off record....*>)

Microsoft, for example, maintains that its latest versions of HoloLens use on-device eyeball tracking as a way to compensate for the otherwise herky-jerky, and nausea-inducing, latency of centralized servers rendering images to the device.[16]

Perhaps some of these fears are overblown; however, users' comfort about engaging in these experiences is essential, as is the responsibility of businesses to protect customers from exploitation. As one Berkeley professor of bioethics and medical humanities stated during our roundtable session, "Experiences in AR will be compelling, but they also need to provide a level of comfort and a lessening of notions that it's a 'scary' technology."

In the end, AR "works" by having real humans (with thoughts, feelings, desires and reactions) looking around inside the medium, as fast as their mind can go. As the saying goes, the eyes are the windows into the soul. End users of the technology need to feel safe when they're using it, so privacy and ethical guardrails of use are both necessary, proper and essential concerns that are everyone's responsibility.

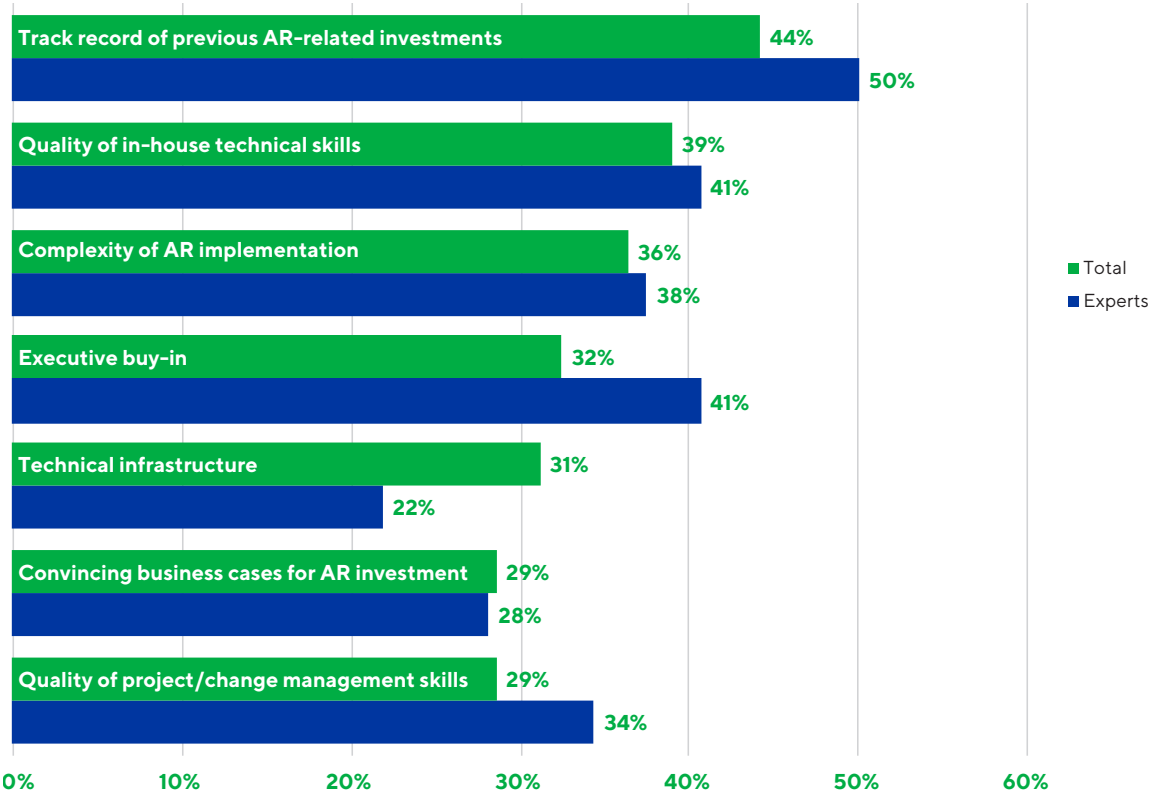
Be ready for the challenge of organizational change

Nobody wants new technologies landing inside their organization like a damp squib. Roughly 25% of our respondents said structural challenges were the biggest AR concern for their organizations over the next three years. The "experts" in our study tend to be more concerned about almost all organizational challenges, particularly citing the track record of past projects, executive buy-in and the quality of technical and project/change management skills (see Figure 6, below, and Quick Take, next page).

Given the importance of rewiring today's business processes as AR journeys, organizational change management will be essential. Employees will naturally be concerned about how AR will help them do their jobs better, or how it might affect tasks or roles that constitute their jobs.

An AR CEO at our Berkeley roundtable counseled organizations to prepare for questions like: "At what point does AR make me a robot? Am I allowed to turn AR off?" AR should be seen as adaptive to "you," and AR journey flows must adjust to circumstances in the work environment – including how tools like AR make us feel or how to avoid the risk of their eroding essential skills like empathy and communication. (For more on this topic, see our recent report "The Culture Cure for Digital."[17]).

Top organizational challenges



(Percent of respondents who named each as a "large" or "very large" obstacle)
(Multiple responses permitted)
Response base: senior executives who prioritized organizational readiness as the top challenge = 77; Experts = 32
Source: Cognizant Center for the Future of Work
Figure 6

Quick Take

Investing in the skills needed for AR success

Given the current talent shortage in many digital skill areas, many companies are – rightly – concerned about their ability to acquire the needed skills to make AR a success.

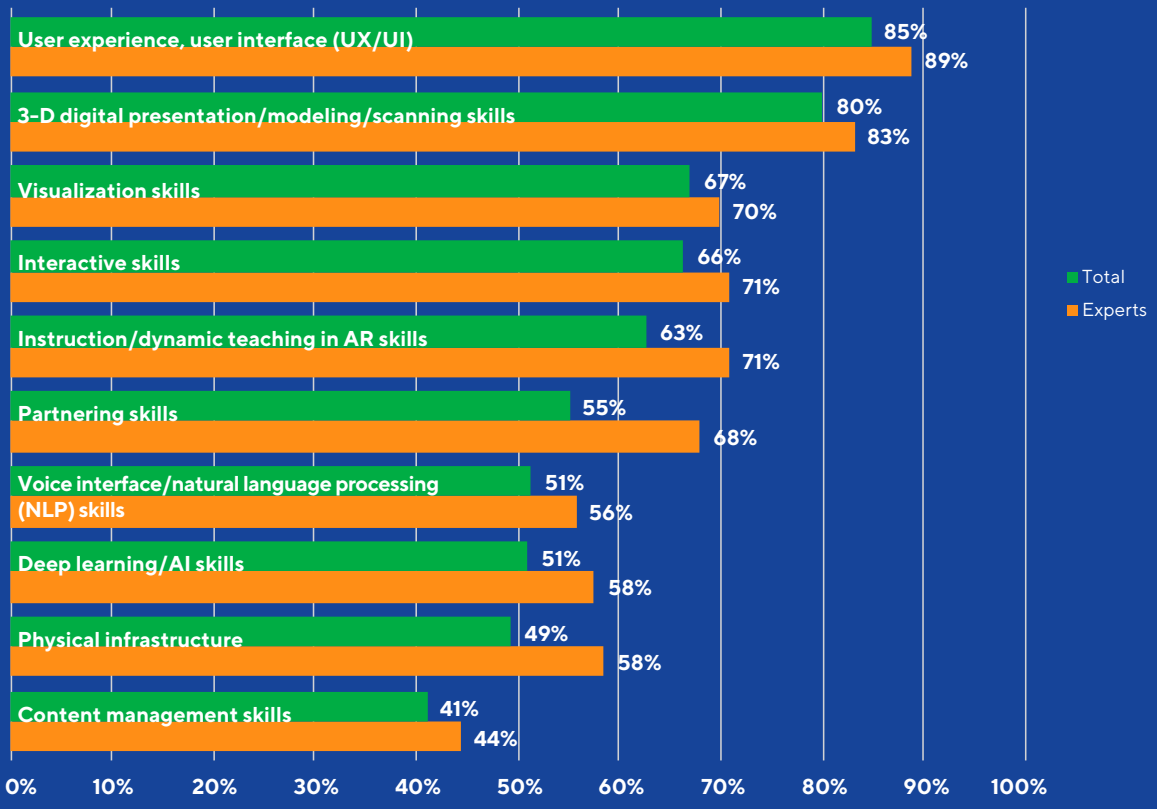
Chief among the skills respondents believe they should emphasize is UX/UI (see Figure 7, next page), which isn't surprising given the highly interactive nature of AR as a medium (where answering questions like "How's it look?" and "What's it do?" are critical). But demand for UX/UI, especially people who are experienced in this field, is already high, even without the influx of AR initiatives. The same is true for other top AR skills, such as natural language processing and other forms of AI, both cited by over half of respondents.

Expert respondents in our study placed greater emphasis across the board on the need for all skills as a determinant of success but particularly accentuated the importance of partnering skills. When it comes to AR, those who know what "good" looks like are clear: you can't always do it alone, and specialist and generalist partners alike will usually be needed (see Figure 9, page 26).

Chief among the skills respondents believe they should emphasize is UX/UI, which isn't surprising given the highly interactive nature of AR.

The good news is that many of the essential skills may already exist inside many organizations, including people with backgrounds in computer-aided design (CAD) or 3-D modeling. A wide diversity of backgrounds in skills like animation, marketing design and even psychology will not only "make AR work" but will also be essential to helping new jobs of the future, such as AR journey builders, reach their full potential.

Skills needed for the success of AR projects



(Multiple responses permitted)
Response base: 300 senior executives; 106 Experts
Source: Cognizant Center for the Future of Work
Figure 7

THE ROAD AHEAD: AR PLANS BY 2025

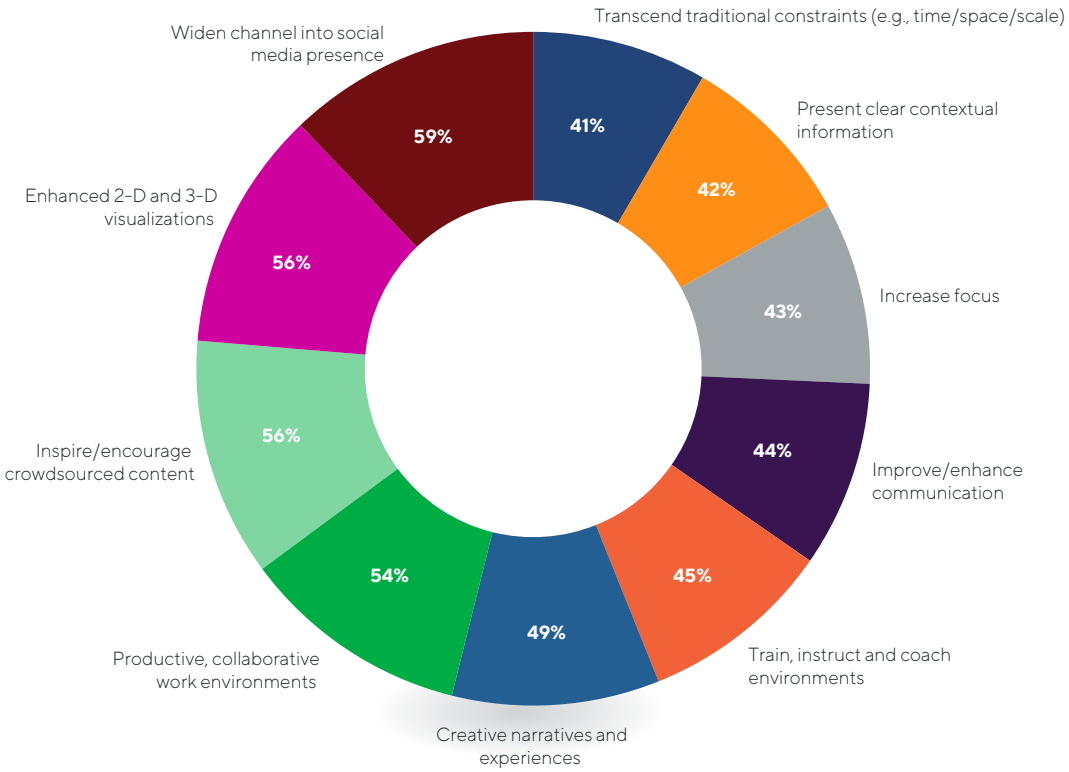
The next decade will see a maturing AR industry spur a shift from today's services economy to the so-called "experience economy," in which businesses use AR, virtual reality and AI analytics to turn services into immersive experiences. Consumers will increasingly look for – and, soon enough, demand – content catalyzed by AR to deliver creative, self-actualized and immersive experiences. So how can businesses ensure they are accentuating "the experience" rather than leaving the impression that AR is just a fiddly gimmick?

AR for us, by us ... and by others

As Figure 8 reveals, one of the greatest expected impacts of AR is its ability to help businesses fortify their social media presence. Clearly, the early AR moves of social media giants (i.e., Facebook, Instagram, Snap, etc.) present a platform to be built upon. But the crowdsourced, consumer-to-consumer "lolling tongue dog face" of teenagers everywhere will likely give way to far richer, more meaningful content specifically created "for us and by us," by family or friends based on shared interests.

Enhanced AR features will drive adoption

Which of the following AR features do you expect to have the greatest impact on your industry by 2025?



(Multiple responses permitted.)
Response base: 300 senior executives
Source: Cognizant Center for the Future of Work
Figure 8

For example, Crayola successfully used a platform from Vivoom to enable consumers to upload their own holiday videos and overlay graphics, holiday music and the Crayola logo to share with family and friends. The campaign resulted in an 8% click-through rate and 62% view-to-completion rate for videos shared across users' social channels.[18] For some brands, having millions of customers driving content is undeniably attractive; 56% of our respondent base felt it would be important over the next five years, as was the creation of creative narratives and experiences (49%).

OFF THE SCREEN, INTO THE (AUGMENTED) REAL WORLD

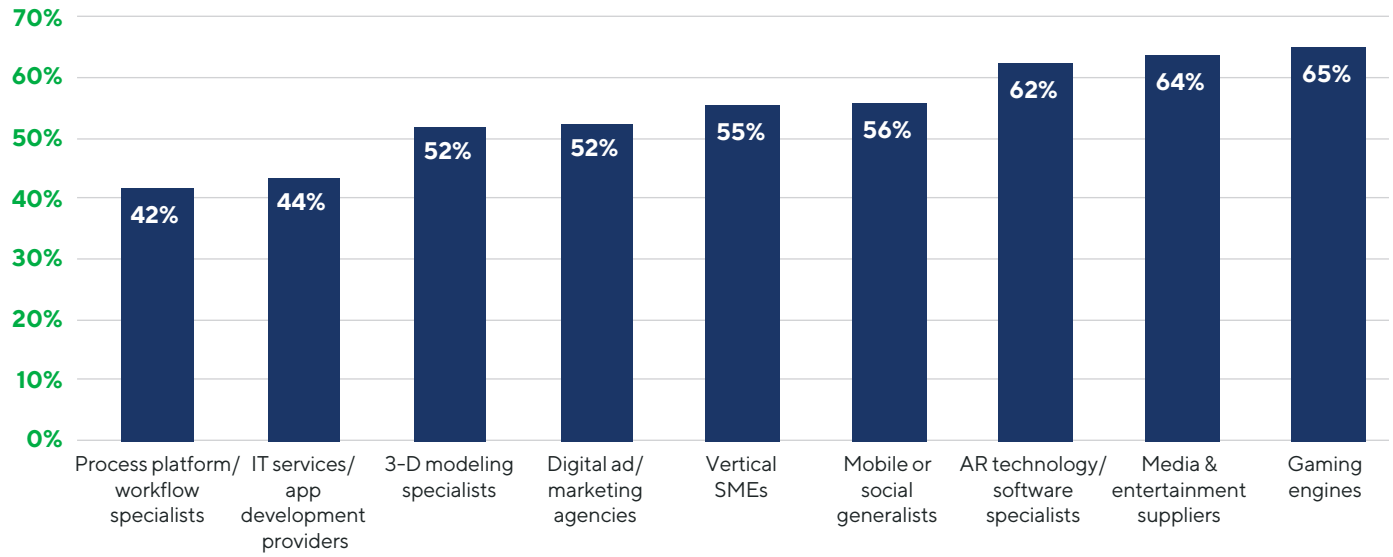
"Augmented reality can be used to bring films entirely off the screen, extending the visual story into the real world."— *CFO, Media & Entertainment, UK*

Not just "a game thing" (or is it?)

So where will business turn for AR inspiration – and execution? It might come as a surprise to see both gaming and the media and entertainment industry (e.g., Disney/Lucasfilms' ILMxLab and Peter Jackson's Weta Workshop) at the top of the list (see Figure 9). Yet a big avenue for the AR-fueled experience economy might best be described as being "the pursuit of happiness." New, big-budget initiatives such as "Vader Immortal" and "Project Porg" from Disney Lucasfilm's ILMxLab are banking that the power of

Specialist AR suppliers will drive progress

How important will the following types of AR suppliers and partners be in moving AR forward in the next five years?



(Percent of respondents naming each as important or very important)
(Multiple responses permitted)
Response base: 300 senior executives
Source: Cognizant Center for the Future of Work
Figure 9

presence in storytelling will give way to "story living."[19] Additionally, media heir James Murdoch just pumped millions into Utah's Void LLC, which operates spaces for immersive entertainment experiences (like *Star Wars: Secrets of the Empire*) in a number of cities worldwide.[20] (Imagine the opportunities to transform dying retail malls into safe AR immersion centers – experience economy arise!)

For AR adoption to grow, the massive compute power of gaming engines that already undergird the wildly successful online video games market will be a critical ingredient. Consider this observation from Unity's Chief Executive Officer John Riccitiello: "We call it a game engine, but really it's an animation/interactive/lighting/physics/presence engine. And it happens to also be what Audi needs. And it happens to be what the guys at the Large Hadron Collider also need."[21]

Our respondents agree: 65% said that gaming engines (like Unity or Epic's Unreal engine) will have the biggest impact. As things like the AR cloud become important building blocks, gaming engines offer an unlikely source of inspiration for building out AR journeys. These platforms promise to transpose powerful ingredients from the online gaming world to AR, bringing standardization and huge amounts of back-end computing power needed to drive beautifully rendered, immersive 3-D content. For example, visualization specialist Theia Interactive used Unreal Engine to craft an AR demo for Harley Davidson where people can toggle between an old classic rusty "barn find" and a completely overhauled specimen of the same motorcycle overlaid for the user in real reality.[22]

Respondents were less impressed by the role of process platform/workflow specialists in the future of AR. However, companies like Upskill, which delivers just-in-time, step-by-step assembly instructions in manufacturing, and Augmedix, which provides automated note-taking in the medical profession, arguably have some of the best case studies on the AR market today. While this may seemingly contradict the undeniable importance of today's business processes becoming tomorrow's AR journeys, it may also simply reflect the limited "point solution" nature of this category of provider.

MEASURE TWICE (THRICE, MANY TIMES …), AND CUT ONCE

"When AR starts to combine with CT scans and MRIs, it will allow doctors to do trial runs of surgeries multiple times for the best possible outcome."— *Chairman, Life Sciences, UK*

Quick Take

The AR cloud, a 'workbench' for the future (of work)

Many aspects of work, life and play that involve us moving through time and space can benefit from AR. The so-called "AR cloud" is the connective tissue that will digitally encapsulate and enwrap the physical world we move through with layers of augmented, digital information that's presented to users as they need it. It will be a unifying infrastructure that pulls together all AR platforms, wearables, locations and information with persistent shareability.[23]

Said differently, if time and physical space are the canvas, the AR cloud is a digital "paint palette" that can be used to craft AR journeys layered with information, data and experiences in augmented layers. How? The AR cloud underpins the "genre" of the AR journey, or the context in which the journey takes place, be it work, personal, medical or something else. For example, are you walking the streets of New Orleans to learn about specific points of historical interest, or to dig up the street to fix a water main? Can you and a friend be walking together in AR, and see the same shared journey? Or two totally different genres, even if you're physically together in "real reality?"

The AR cloud is the difference maker. It also presents a workbench of potent tools for AR jobs of the future, such as AR journey builders: artists, scriptwriters, improv actors and others who upload their work onto AR cloud platforms, such as Google's ARCore, Facebook's Spark AR Studio or Apple's ARKit. From there, they can collaborate with engineering leads and technical artists to craft content by leveraging myriad permutations and possibilities.

In this sense, the AR cloud represents an opportunity for innovation. There are conceptual ideas for these creators to use content repositories that leverage "spatial Wikipedias" as an essential tool in their future of work.[24] Already, Facebook's Spark AR Studio – which has been used by more than a billion people, according to the company – enables AR journey builders to break their AR flows into reusable piece-parts, or "block," that they can use to better organize their own projects, jumpstart other projects or share with other journey builders.[25]

Anyone who's already used the "good old-fashioned cloud" as a mainstream component of their computing infrastructure should similarly look to the AR cloud as an important pillar of the future of (all) work involving augmented reality.

RECOMMENDATIONS: MAKING AUGMENTED REALITY A *REAL* REALITY

Business leaders everywhere are navigating the hype and the promise of augmented reality technologies. But as our study shows, with AR, it's all about timing (and today, it's more "near-term" than "far-term").

Like other IT initiatives, there's a certain amount of traditional blocking and tackling required to make AR "real" in an enterprise setting, such as identifying sponsors, running pilot initiatives in advance of full-scale roll-outs, etc. But based on our research, the following actions can help maximize real results:

- **Recognize that AR is a genuine game-changer for your business.** AR promises to be fruitful and beneficial to almost every industry. While the consumer market promises to yield a bonanza, it's currently happening on a (very) small scale. Meanwhile, real opportunities to transpose today's business processes as AR journeys will soon be – literally and figuratively – right in front of your eyes. So understand your target audience and their potential for scale, and adjust your goals accordingly. Past technology breakthroughs such as smartphones offer an instructive strategic roadmap to get the timing right.
- **Pick your target spots and rewrite the narrative journey with AR.** Now's the time to deploy internal and (trusted) outside resources onto AR experiments and proto-pilots throughout the organization. This is especially important, because when – finally – ubiquitous consumer-grade AR wearables are everywhere, expert developers and AR journey builders will be needed to supercharge valuable experiences for consumers. So starting now is a strategic imperative.
- **Help users help themselves – through iteration.** Small changes through iteration to journey flows matter – especially if you don't have to have someone guiding users through the flow every time. If users can navigate journeys by themselves, they're far more likely to become advocates, which will help scale adoption.
- **Make time for scale:** Take at least six months to prepare for scale; don't release a new AR journey at the last minute and expect it to take off like wildfire.[26] Focus on things like whether the right HMD technologies are being used, whether they're fit for purpose, whether journey intros and outros need refinement, etc.
- **Context – more than ever – matters in AR.** Magic moments in AR will happen when journeys are built to meet people where they are. For example, an AR CEO at our roundtable session noted that if you're in a museum looking at art, there's a strong possibility you'll want to know more about it or further interact with the artist's inspiration. All work processes will follow a similar logic, and creating AR journeys within the right context will make them far more impactful. From within that defined context, knowing what works and what doesn't, you can tap wider audiences, adjacent work streams or customer demographics.

- **Help employees avoid becoming "uncomfortably numb."** While it's true that AR can function as something of a Sherpa guide for your rote-and-repetitive work processes to be faster and more accurate, one of the AR CEOs at our roundtable cautioned that it can also "numb" users and prevent them from thinking critically about their work. Can you be too "prescriptive" in AR? Yes. That's why deep consideration given to the elements of flow within the AR journey as well as great organizational change management are of huge importance.
- **Adhering to privacy best practices is essential.** The use of AR only intensifies the need for data privacy, since wearables (as well as smartphones) are capable of tracking user behavior down to the most minute detail. In fact, AR (like AI) might one day understand us better than we know ourselves. As a professor at our roundtable noted, AR can be amazingly good for society (e.g., helping to educate us), but there's no reason for AR to track people's individual data. It will be essential to align with established norms, standards and (current or future) privacy laws.

Final Word

The characteristic elements associated with AR technologies – see-through, real-time, immersive and continuous access to data – need to be harnessed to recast today's business processes as tomorrow's AR journeys. Successful strategies and outcomes – better, faster, cheaper, more accurate, *more experiential* – will be amplified, and value realized with immersive, spatial computing ushered in by AR.

Expert respondents in our study are clear-eyed about the technology, consumer and organizational challenges but are forging ahead anyway to make augmented reality a *real* reality for their customers, suppliers, employees and partners.

All businesses require urgent action and assessment as to the applicability of AR – fast. Like the advent of the smartphone over a decade ago, this moment requires all of us to think differently, because with AR, the journey is the process.

Methodology

We conducted a study in North America and Europe between April 3, 2019, and April 30, 2019, with 300 senior executives (C-level or direct reports) across industries familiar with their organizations' progress and plans relating to AR technologies. The survey was run in 10 countries: Denmark, France, Finland, Germany, the Netherlands, Norway, Sweden, UK, Canada and the U.S. We used telephone interviews for executives, fielded in English, French or German. The survey was conducted by Oxford Economics, an independent research consultancy.

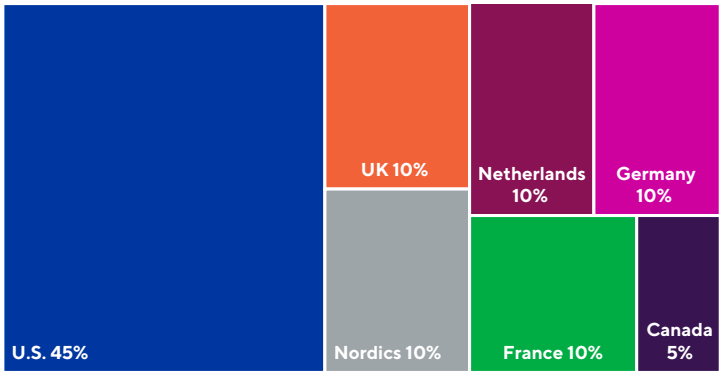
"Experts" & "Pioneer" Definitions

Among our respondent base of 300 executives, we segmented two groups: "Experts" and "Pioneers."

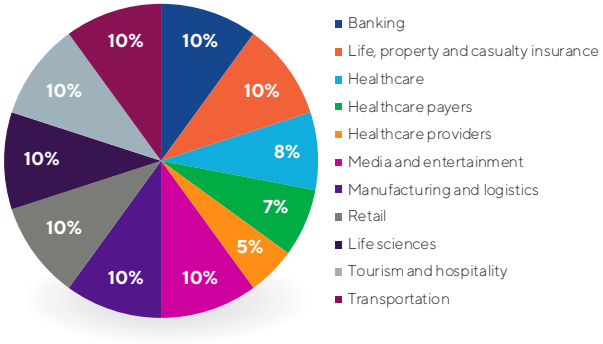
- **Experts** (n=106): Already implemented AR initiatives (at scale, beyond the pilot phase).
- **Pioneers** (n=85): A subgroup of experts who have both implemented AR and expect to be ahead, or far ahead, of their competitors in three years' time.

Overall sample demographics

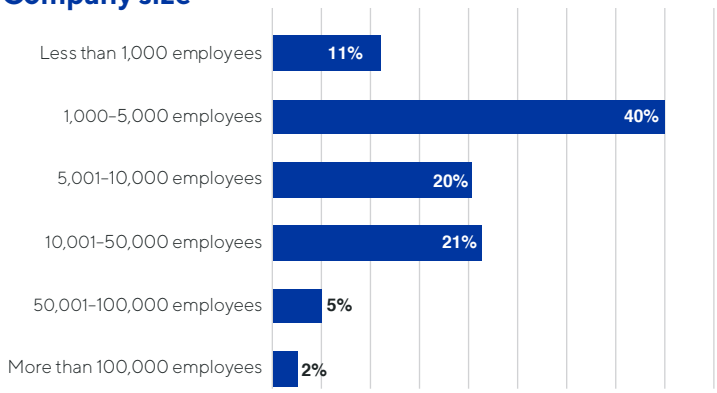
Region



Which of the following best describes your industry sector?

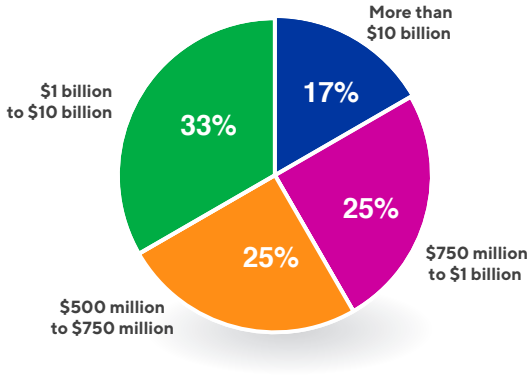


Company size



(Totals don't add to 100% because of rounding)

Company revenue



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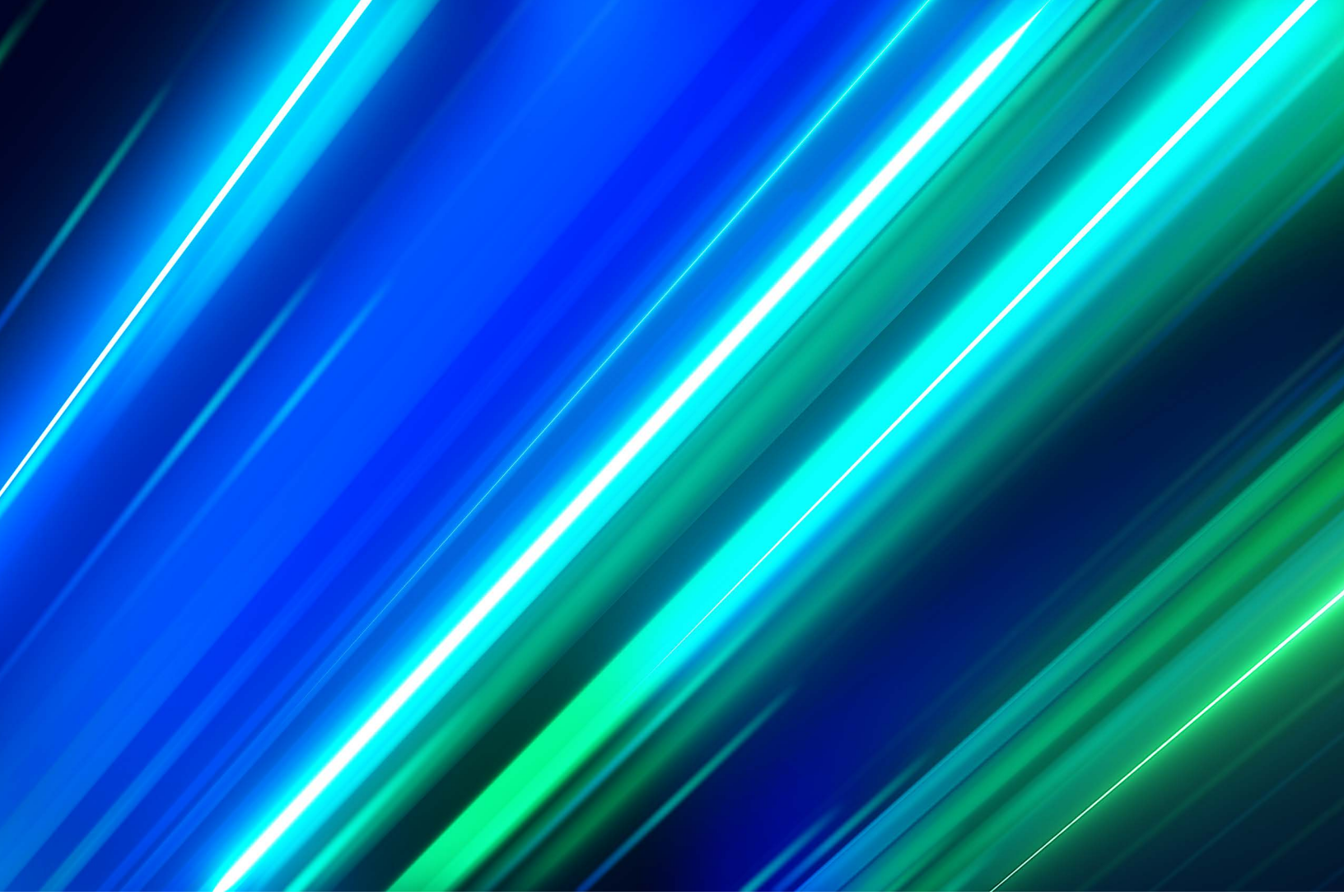

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Cognizant's Center for the Future of Work™ is chartered to examine how work is changing, and will change, in response to the emergence of new technologies, new business practices and new workers. The Center provides original research and analysis of work trends and dynamics, and collaborates with a wide range of business, technology and academic thinkers about what the future of work will look like as technology changes so many aspects of our working lives. For more information, visit Cognizant.com/futureofwork, or contact Ben Pring, Cognizant VP and Managing Director of the Center for the Future of Work, at Benjamin.Pring@cognizant.com.

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