

ARTILLRY INTELLIGENCE BRIEFING

MOBILE AR: APP STRATEGIES & BUSINESS MODELS

MARCH 2018





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Executive Summary

Augmented Reality (AR) comes in various forms, such as smartphones and smart glasses. Those are further segmented into consumer and enterprise uses. But the point along that spectrum that's gained the most traction is consumer-geared mobile AR, utilizing the smartphones we all carry.

Apple's ARkit and Google's ARCore have democratized mobile AR with app-building tools, while Pokémon Go and Snapchat put it on the map with mainstream-friendly AR features. Though these apps aren't "true AR," it doesn't matter: they've done AR a favor by supplying its gateway drug.

These early AR apps have also done the industry a favor by beginning to validate product and revenue models. What AR features do consumers want to use? And what will they pay for? Pokémon Go and Snapchat have already begun to answer these and other strategic questions.

Pokémon Go for example drove almost \$1 billion in revenue in the second half of 2016 alone. It did this through in-app purchases and brand-collaborations to drive local offline commerce. These are a just a few of many potential business models that will develop and drive mobile AR revenues.

Meanwhile, giants like Amazon, IKEA and BMW are pursuing AR strategies and likewise teaching us important lessons. For example, should AR live within standalone apps or be incubated as a feature within already-established apps? And what should AR features be called to attract mainstream users?

In terms of market size, ARtillry Intelligence projects consumer AR revenues to grow from **\$975 million** in 2016 to **\$14.02 billion** in 2021. Until 2021, most of that revenue will come from mobile AR apps, as smart glasses aren't yet viable for consumer markets due to cost and style.

But how will this revenue materialize and what product and revenue models will be best positioned? In addition to industry giants and early movers mentioned above, the ecosystem contains developers, startups, media companies and brands. How will they deliver content and build value with mobile AR?

The best way to answer these questions is to examine today's best practices, historical lessons and market trajectory. This report sets out to do that by surveying the landscape, and uncovering product and revenue strategies for anyone interested in tapping the mobile AR opportunity.

Key Takeaways

- ▶ **Smart glasses will dominate enterprise AR in the near term, while smartphones dominate consumer AR.**
 - ▶ As popularized by rudimentary AR like Snapchat and Pokémon Go, this involves graphical overlays that interact with the world seen through your smartphone camera.
 - ▶ Smartphone ubiquity and componentry – image processing, sensors, camera – position it well for AR.
 - ▶ ARkit and ARCore further democratize mobile AR through software that does the back-end heavy lifting.
- ▶ **There are 476 million AR-compatible smartphones today, growing to 3.8 billion by 2021.**
- ▶ **Consumer AR revenue will grow from \$975 million in 2016 to \$14.02 billion in 2021.**
 - ▶ Most of this derives from mobile AR, until 2021 when consumer smart glasses begin to gain traction.
 - ▶ Mobile AR revenue will be software dominant, including apps, in-app purchases and commerce.
 - ▶ Mobile AR strategies and differentiation therefore reside mostly at the app level.
- ▶ **Despite positive signals, mobile AR is still challenged**
 - ▶ Mobile AR resembles iPhone apps ten years ago: underdeveloped capability, standards and demand.
- ▶ **Product strategies will evolve natively with AR, but also include fundamental/historical app tactics.**
 - ▶ Native thinking (“AR-first”) should dominate app design, rather than porting existing media into AR.
 - ▶ Incubating AR features within established apps can be a stepping-stone to standalone native apps.
 - ▶ Consider alternatives to industry terms like “AR” (historical example: Snapchat)
 - ▶ Build AR experiences that happen in short bursts, due to arm fatigue and battery drain.
 - ▶ Successful apps will address real consumer utility and demand, rather than “tech-first” engineering feats.
 - ▶ “Solutions in search of problems” won’t succeed, such as apps that solve pain points that no one has.
 - ▶ Apps built solely around novelty could succeed in download volume but languish in active/repeat use.
 - ▶ Combining AR novelty with sticky behavior (e.g. social communication) is showing signs of success.
- ▶ **Business models will likewise follow a combination of native evolution and established principles.**
 - ▶ In-app purchases are proven in gaming and social apps, versus upfront purchases.
 - ▶ Visualizing large items will enable commerce-based monetization such as car and home shopping.
 - ▶ Commerce-based AR monetization success stories so far include BMW, IKEA, Amazon and Houzz.
 - ▶ Google will pursue visual search (Google Lens), including cost-per-action local commerce.
 - ▶ AR advertising could eventually drive revenue but doesn’t yet have meaningful reach and scale.
 - ▶ Forthcoming models to watch include Niantic’s Harry Potter AR game and Snapchat’s AR Geofilters.
- ▶ **Platform choice is important: Align goals with respective scale and strengths of ARCore and ARkit.**
 - ▶ ARkit has an early advantage in platform reach, but ARCore will achieve greater long-term scale.
 - ▶ ARkit has better software and hardware calibration, but ARCore could be more open and flexible.
- ▶ **Before any of the above, clearly defined ROI goals are a critical first step to AR product strategies.**
 - ▶ This will inform and dictate all other strategic directions, and make or break AR app outcomes.
 - ▶ Doing AR for AR’s sake – or to check an item of a list – will set any AR product up to fail.

Key takeaways are also highlighted throughout the main body of this report.

Introduction: The Right Vessel

Most people think of Augmented Reality (AR) as smart glasses that overlay graphics and information in one's immediate field of view, a la Google Glass. And that's certainly a form factor being deployed in enterprise environments, as examined in last month's ARtillry Intelligence Briefingⁱ.

But it's also a form factor with long-term consumer potential. Intel projects consumer smart glasses to inflect around 2027 with **50 million** annual unit sales, growing to **200 million** by 2031ⁱⁱ. The rationale is that smart glasses' consumer value and utility at that point could parallel that of today's smartphone.

But until then, AR glasses don't pass stylistic requirements for consumer markets (size, weight, cost etc.). So consumer AR's ruling form factor in the near term will be smartphones. You probably know the format: graphical overlays that interact with the world seen through your smartphone camera.

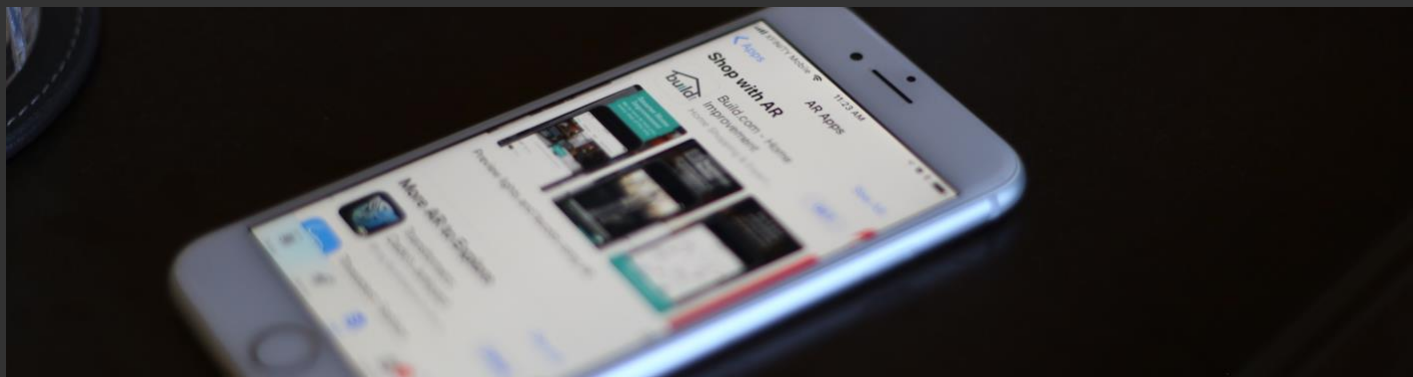
Further positioning the smartphone as a vessel for AR is its ubiquity and permanence as a fixture in our lives. And in addition to volume, smartphones have the goods when it comes to necessary hardware components to run basic AR, including image processing, sensors and camera.

Accelerating that capability, Apple's ARkit and Google's ARCore have standardized the development tools and democratized mobile AR app creation. And early apps like Pokémon Go and Snapchat – though they're not "true AR" – put mobile AR on the map and have acclimated consumers en masse.

Adding up all these factors, mobile AR is in a strong position for growth. But it also faces some challenges and is off to a slow start. In fact mobile AR today resembles iPhone apps ten years ago – underdeveloped in product capability, standards, consumer demand and several other factors.

That makes it an opportune but also challenging period. For developers, startups, brands, media companies or anyone else that wants to explore Mobile AR opportunities, the best thing to do is stay informed. That means examine today's best practices, historical lessons, and market trajectory.

We'll do just that in the following pages, with the goal of informing mobile AR business strategies. That will include surveying the landscape of current product and business models, and looking to historical lessons that still apply from the smartphone era. We'll start by quantifying the opportunity.



Mobile AR: By the Numbers

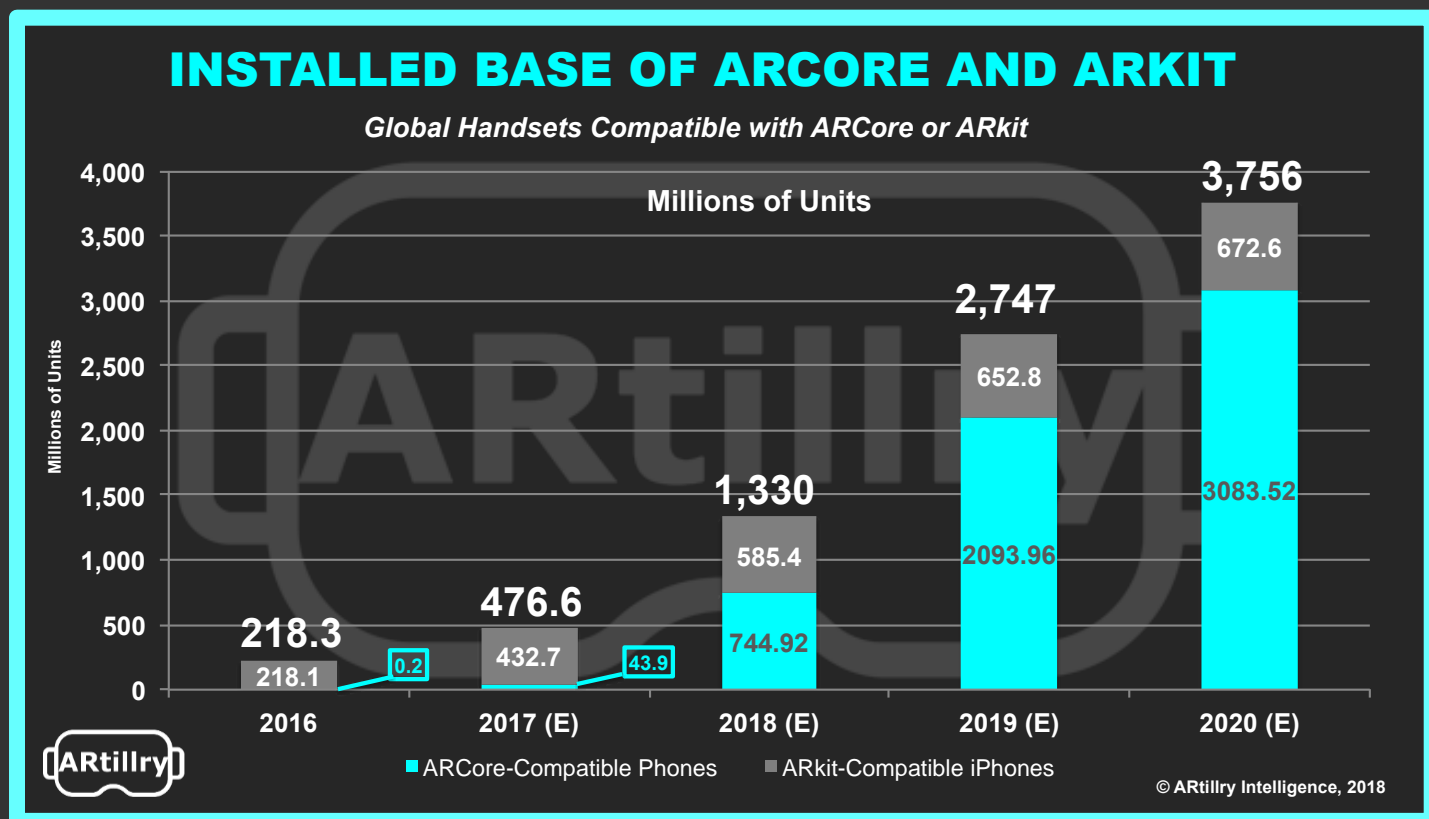
To put a number on claims made above regarding smartphone ubiquity, there are **3.5 billion** global units. But more relevant for this report, how many are AR-compatible? That figure is 476 million today, growing to **1.3 billion** by year-end, and **3.8 billion** by 2021 – a meaningful installed base.

This volume is mostly due to Apple's ARKit and Google's ARCore, which apply software to make AR possible on previously un-compatible hardware (such as standard RGB cameras). Between the two, ARCore has a minority share today but will eclipse ARKit soon, due to Android's larger installed base.

One question that arises from these figures is why are they growing so rapidly. They over-index for growth rates when compared to several growth-phase industries in the forecasting trade. For both ARCore and ARKit, they go from zero to billions over a five-year period, which should raise questions.

One reason is that the metric is unit-compatibility, not dollars. Another reason is average mobile hardware replacement cycles, which follow a set pace (currently 2.5 years). This will cause AR-compatibility – for example, A9 chips or greater in iOS devices – to cycle in rapidly.

As for the qualitative differences between ARCore and ARKit, we'll cover those later in this report. These differences and strategic positioning are important, as platform choice is a key consideration for mobile AR developers. This was also covered in a past ARtillry Intelligence Briefingⁱⁱⁱ.



Mobile AR: In Dollars

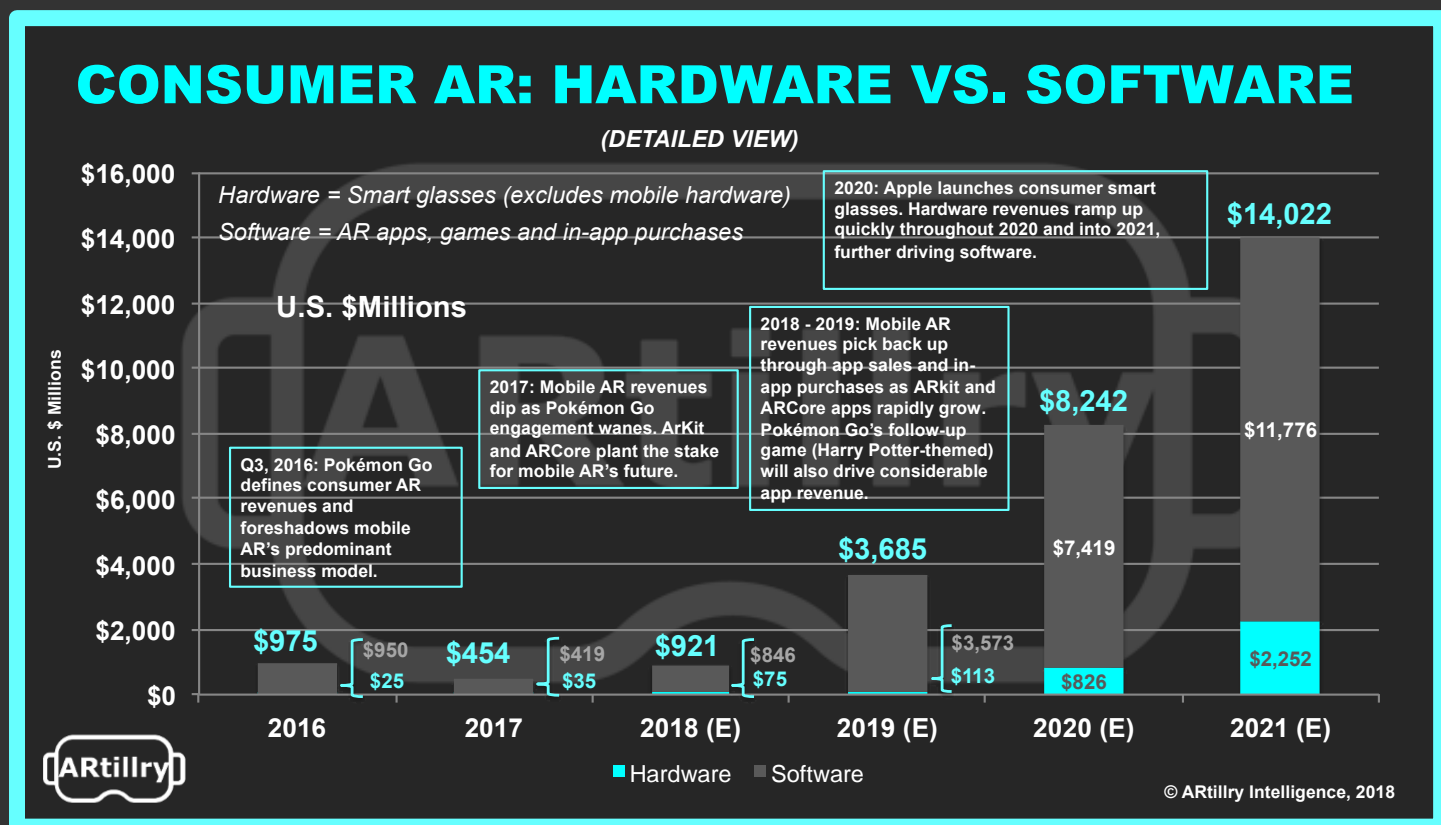
Beyond unit penetration, how does consumer AR stack up in dollars? According to our projections, it will grow from **\$975 million** in 2016 to **\$14.02 billion** in 2021. These figures include smart glasses, though it's important to note that mobile dominates near-term revenue, for reasons explored earlier.

Segmenting mobile's share – the focus of this report – It's represented by the software portion of the below projections. This is because smartphone hardware (e.g. iPhone sales) isn't counted in our forecast because it's an already-existing and ubiquitous consumer purchase.

Therefore, the near term opportunity for mobile AR is in software. That broad designation includes several components, including premium app sales, in-app purchases, micro-transactions, and several other things. These are broken down further in the "business models" section of this report.

Zeroing in on just that software portion of consumer AR revenues, it will grow from **950 million** in 2016 to **11.8 billion** in 2021. After 2020, AR hardware will start to grow in share, as smart glasses become more viable for consumer markets including cost, style, battery life and other technical specifications.

This could include Apple's rumored smart glasses in the late 2020 time frame. It will also include AR glasses in niche or enthusiast areas like cycling, skiing and other sporting/recreational areas. Notice that these are areas where glasses or goggles are already worn, forcing less of a behavioral shift.





But until then, the consumer AR sector will be dominated by mobile, with most of the strategy and differentiation happening within software (apps), rather than hardware. So what are those app strategies? We'll spend the rest of this report examining different versions of that key question.

Drilling Down on Product Strategies

Shifting gears from quantitative to qualitative analysis, what are the strategies developing in AR marketplaces? They include both product (UX, design, etc.) and business models (monetization, revenue sources, etc.). **The two should come together holistically and inform each other.**

We'll take those one at a time, starting with product models.

Think Native

When looking at AR product strategies – or any emerging tech product for that matter – it's important to consider “native thinking.” **This is the art of developing for the nuances of the form factor rather than shoehorning legacy formats. It's been an important lesson in past technological shifts.**

Early television ads for example often showed someone standing and reading a script for a given product – usually Ovaltine, Lucky Strike or other 1940's fare. The reason: that's the way it was done in radio. It took a while for TV ads to grow into their own skin and develop optimal formats.

Going back further, the telephone was first devised as a way for telegraph operators to talk to each other in real time. But its peer-to-peer orientation was eventually realized, thus replacing the telegraph medium it was designed to improve (then ironically reverting back to transmitting “texts”).

More recently, the smartphone era launched with a flood of low-quality apps that replicated websites. Similarly, ill-devised content formats — such as banners ads — even persist to this day. It took ten years to come up with truly native ad formats like Snapchat Stories or branded geofilters.

Native AR

This all leads up to the question of how products will develop in AR. Legacy formats like rectangular components that fit a smartphone screen could be out of place. **The three-dimensional world doesn't occur in rectangles. And in early days, we'll see misfires just like we saw with early iPhone apps.**

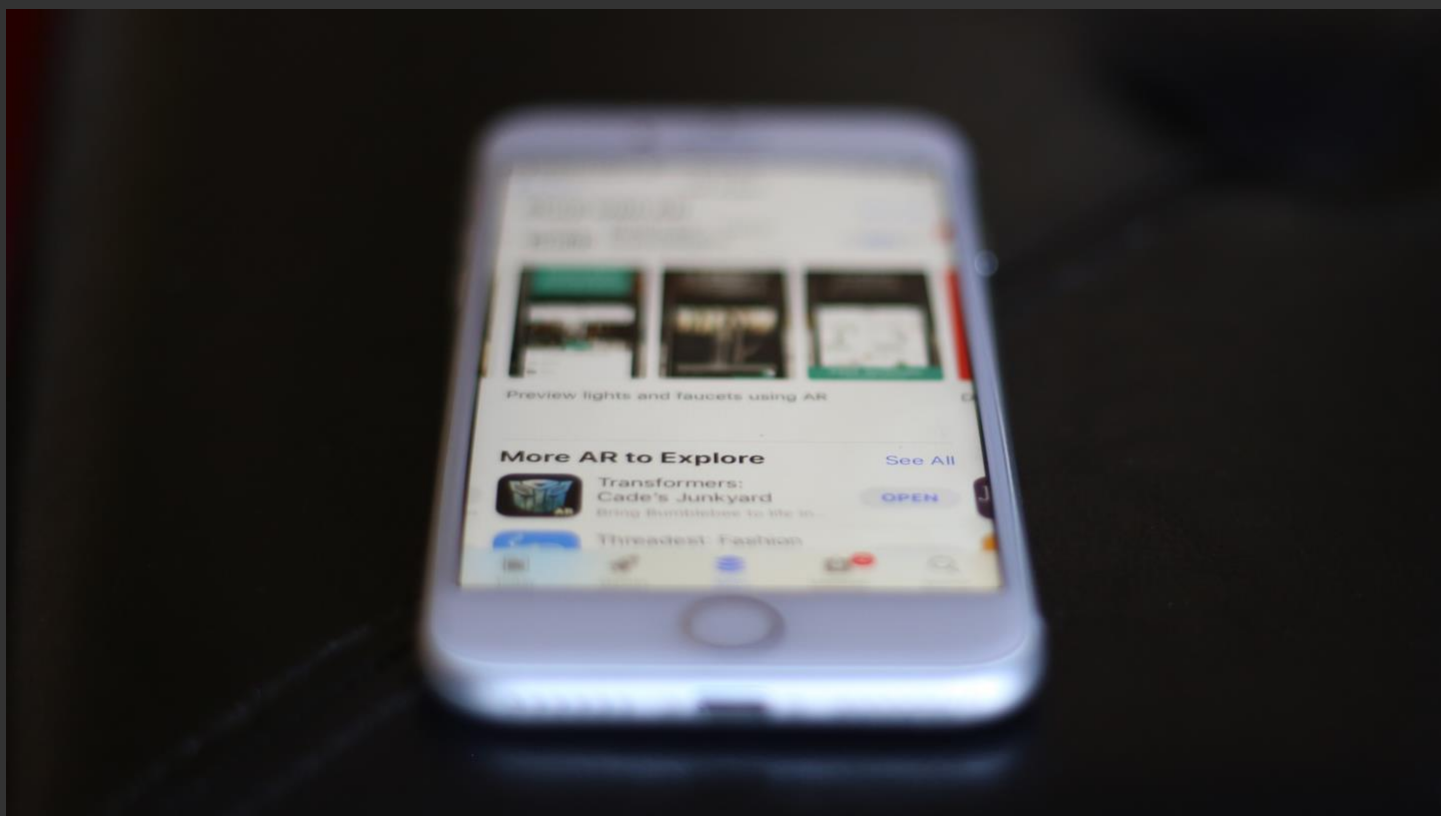
“In 2007 when Apple launched the iPhone, most of the apps were flashlights,” said Escher Reality CTO Diana Hu at TechCrunch Disrupt. “People didn’t know what to do yet. And there’s going to be this phase of learning. There’s a genesis of any technology when people need to experiment.”

The reason this is important is to not miss the unique opportunities that AR offers. **It has the potential to create truly novel search, discovery and social use cases that no one has thought of yet.** But before we see AR find that native footing, there will be lots of misfires.

“As far as AR apps and consumer-based products, I think you’re going to see a lot of crap over the next year or two,” said Niantic CTO Phil Keslin during the same Disrupt panel. “But you’ll see some nuggets of creative genuine things that will spark something that will truly be amazing.”

Relying once again on historical analysis, the native opportunity is perhaps best characterized by looking at successful mobile apps. **And there, we see the most notable examples such as Uber and Waze carry a common trait: they each wouldn’t have worked on the previous form factor, the PC.**

“You couldn’t make an Uber style app when it was on a PC,” said Escher Reality CEO Ross Finman on the same Techcrunch Disrupt panel. “It only made sense after a mobile platform came out. Now it’s about understanding what are the new things you can do with the mobile platform for AR.





AR-First and AR-Only

Native thinking in AR is also known as “AR-first.” And to once again apply historical lessons to this report’s analysis, we’ve learned a similar lesson in the smartphone era. This began about ten years ago when the term “mobile first” became a battle cry for reforming app design principles.

And the same benefits will apply to AR. But taking that a step further, as much success can flow from “AR-first” thinking, greater traction can result from “AR-only.” **In other words, questions should be asked of any AR app: Could it exist without AR? Is AR critical to its functionality or incremental?**

When applying this thinking to AR features and apps, there are examples that represent best and worst practices. **Furniture or car visualization apps such as BMW iVisualizer are examples of AR-only thinking: They solve a real pain point — personalizing large items — and are only possible in AR.**

On the other side of this spectrum is the NBA app that lets players flick their phone to shoot free throws at a graphical hoop superimposed on the floor. It’s moderately fun for a bit, but its functionality is based more in the phone’s accelerometer than AR. It doesn’t *need* to be in AR.

“When I saw Pokémon Go, I thought ‘great,’ my kids played it... but they turned off augmentation,” said Unternehmertum VC Partners’ Johannes von Borries at last Fall’s AWE Europe conference. “So it was not augmented reality, it was a GPS game. We have to think, ‘where’s the real value?’”

If It Ain’t Broke

Another form of AR-only thinking is what we like to call the “if it ain’t broke,” test. If an AR app fills a gap that wasn’t a pain point for anyone, it could be a solution in search of a problem. This principle killed many mobile payment apps because cash and credit cards aren’t a large-enough pain point.

Applied to AR, consider an app that displays karaoke lyrics at a bar — an app idea we recently heard pitched. The functionality could be additive in that it displays lyrics in front of one’s field of view, but only incrementally so. The current technology — a flat screen monitor — already does the job well.

At early stages of AR, there will be a lot of this incremental innovation. But we’ll eventually get to the true AR value when the first breakout AR-only app catches fire. It was that same thinking that brought us apps like Uber, which at the time was “mobile-only.” As explored above, it wouldn’t work on PCs.

Silicon Valley Effect

Part of the challenge also comes down to the classic “Silicon Valley effect.” Being immersed in a tech culture, it’s hard to detach and put ourselves in the shoes of mainstream consumers. But the challenge is to solve human problems and pain points, rather than engineering feats.

They aren't mutually exclusive, but the former should lead the latter. Put another way, don't be a "hammer searching for nails." AR should improve lives primarily and impress industry peers secondarily. We recommend season 3, episode 9 of HBO's *Silicon Valley*^{iv} for more on this principle.

"What are other problems where AR finally helps bridge the gap?" Samsung Next's Jacob Lowenstein posed at the AWE Europe conference last Fall. "Work backwards from there. Because if you're going technology-first you're going to end up walking into a door."



Image credit: BMW

Training Wheels

Though AR-first and AR-only approaches are smart, AR's early stages compel consumer acclimation and education. This means that before being deployed in standalone apps, AR features can sometimes gain momentum through "training wheels," such as incubation within established apps.

Three apps exemplify this strategy: Snapchat, Amazon and Pokémon Go. These have received considerable traction, and each did so by launching AR as a feature rather than a standalone app. Snapchat for example offers AR selfie lenses as a value-added feature, rather than a core function.

Amazon's AR View lets shoppers visualize products in-home. But rather than a standalone app, it's a feature in Amazon's app that has several launch points in the shopping flow, including product pages. As examined above, "AR-only" should be the end goal, but incubation could be a stepping-stone.



AR: What to Call It

The other element that's common to Snapchat and Pokémon Go is that they got nearly a billion people to use AR, without mentioning "AR." Of course, we all use tech jargon for reference in strategic discussions or news analysis. But consumers don't care about the alphabet soup.

"I just hate all these terms, and I can't wait for the moment in time where we just don't talk about this tech, we just use it," Super Ventures partner Ori Inbar said recently at an ARiA event. And that's what consumers have done with Pokémon Go and Snapchat AR lenses... they just use it.

Google uses "immersive computing" to invoke the XR spectrum, which isn't much better in terms of jargon, but it does trade acronyms for plain language. **Ultimately, consumers decide: the terminology that sticks is what the market will bear. People know "mouse" and "link"... not necessarily "GUI."**

As for whether or not Pokémon Go and Snapchat are really AR, it doesn't matter in a larger sense. Detractors aren't wrong when they say these apps aren't "true AR." **But they're still valuable, as they've done AR a favor by validating its mass-market appeal, and by warming people up to it.**

"I think one of the craziest debates of the past year was whether Pokémon Go was augmented reality or not," said Intel's Chris Croteau at an AR in Action event last year. "The [750 million] people that downloaded that app...none of them care."

The lesson: Take this to heart when building AR apps. For example, in retail, AR could add value to brand apps (think: in-store navigation, product details, etc.). **But in that context or in other business verticals/categories, think strategically about where AR features go and what they're called.**

VR Is a Meal, AR Is a Snack

Beyond where to put AR features and what to call them, there are deeper considerations for native user experiences. For example, switching briefly to VR to illustrate a point, Google has reported that VR session lengths are much longer than mobile apps^v. The takeaway: design for that reality.

Longer VR sessions stand to reason, as immersion compels sustained periods of play to build up a true sense of presence. That presence can't be achieved in the short bursts with which we associate mobile apps — things like checking email, news, social updates or scores (a.k.a. "content snacking").

Though this report isn't about VR, we bring up that example to compare AR's relative position in this experiential spectrum. **And within that digestive construct, it's becoming clear that AR — or at least mobile AR — is more of a snack. It often naturally happens in short bursts.**

This has a lot to do with mobile AR's drawbacks as well as its strengths. For example, the need to hold up a smartphone to experience mobile AR precludes long session lengths with extended arms. That burdens users with tired arms, dangerous (distracted) situations, or just a bad look.

"I can tell you from experience that people don't do this," Niantic CTO Phil Keslin said on stage at TechCrunch Disrupt last month. "It's very unnatural. It makes them look like a total doofus if they're doing it for an extended period of time."



Image credit: Amazon

Contextual Relevance

Other hardware realities likewise compel experiences that live in short bursts. These include battery life and heat issues from longer AR sessions. If you've played with ARkit apps, you may have felt this first hand. And one clear faux pas in mobile app product strategies is to kill users' batteries.

This boils down to designing app mechanics that involve holding the phone up for short segments. Snapchat and Pokémon Go are exemplars, with most of the AR value derived from media capture that happens quickly. The remaining in-app time involves sharing that media with the phone down.

"In Pokémon Go, the only time they really use it is to share their encounter with the Pokémon," said Niantic's Keslin. "To take that one picture is natural....Everybody takes a picture, and then they're done. It's not walking around the world with the phone in front of their face."

The main point is that the form factor should drive developers' design decisions for mobile AR apps. That will continue to be a moving target as we learn about user behavior, but we're seeing lessons already. And like with smartphone app tactics, the playbook will evolve rapidly.

Sticky Apps

Beyond native thinking it's important to be mindful of novel thinking, and to not rely too greatly on it. There are lots of low-value AR apps already populating Apple's app store, which have value that resides only in novelty. **The problem is that novelty wears off quickly and those apps languish.**

Examples include promotional apps like Patrón Tequila's AR app that lets users interact with a virtual plantation, overlaid on a nearby flat surface. The graphics and AR mechanics are sharp, but the experience itself wears off after a few minutes, with little reason to return to the app for repeat use.

This can be avoided in a few ways, many of which inherit best practices from the last decade in app development. **For example, game mechanics that balance challenging play with attainable goals perform well. Achievement-based rewards and social sharing can also cause repeat active use.**

Speaking of social, collaboration will be an important factor. Synchronous AR between friends – such as seeing the same positional-tracked graphics simultaneously on different devices – will be a key benefit of the AR cloud^{vi}. This multi-player support is expected in a future version of Apple's ARKit.

Meanwhile tools that engender ongoing utility can add stickiness, such as anything grounded in a frequent activity like communications. **Combining some of the above factors, AR apps that infuse or add value to communications and social interaction can have greater active use.**

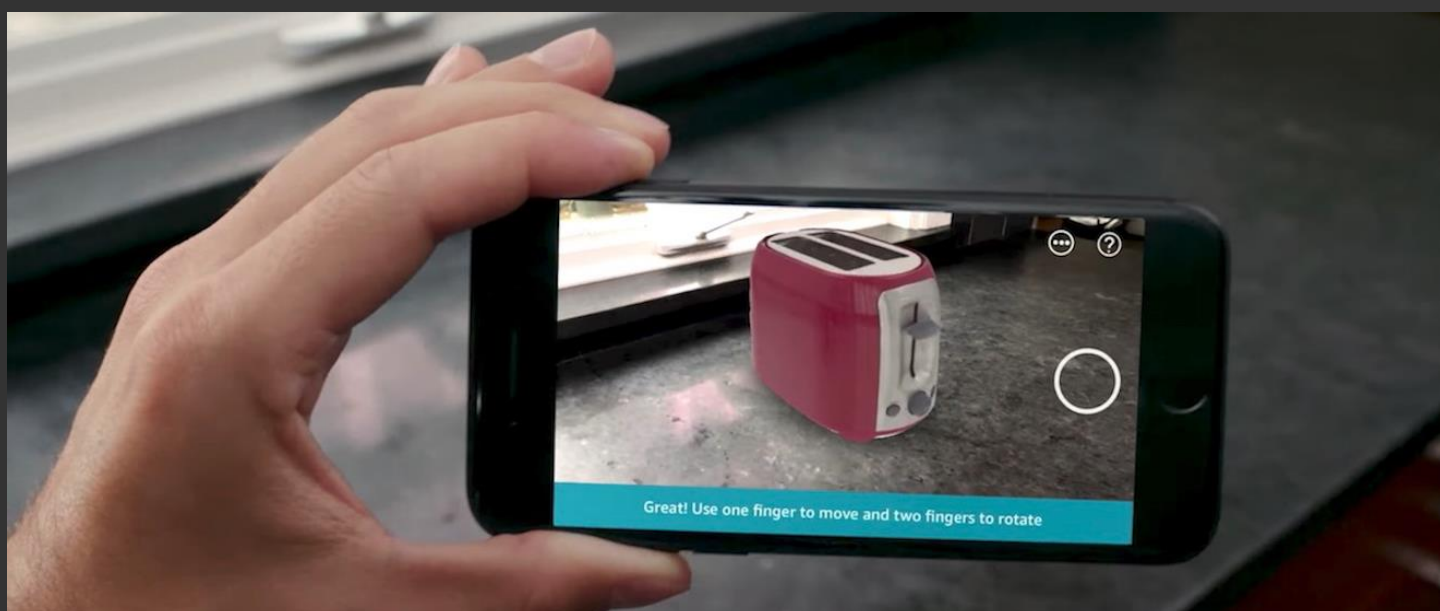


Image credit: Amazon

Mini-Case Study: Snappy

One example of that combination is Snaappy. It develops AR-animated characters that add dimension and meaning to social messaging. This not only carries the above traits but it does so on top of an increasingly-popular and frequently-used interface for millennials: messaging.

“Communication is good when it comes to retention but bad when it comes to wow effect and engagement,” Snaappy CEO Gal Shvebish told ARtillery. “On the other hand, AR is great for wow effect and engagement, but bad for retention. If you combine the two into one system, you can take advantage of both [and] really create something that will be here for the long run.”

So the name of the game is to design apps that have inherent re-playability, or some form of sustained value that drives repeat usage. This is an important historical lesson: a success factor in the smartphone era has been to prioritize active use over “vanity metrics” like app downloads.

Fortunately, that playbook has several chapters already written. Though mobile AR will require native thinking, some lessons can be inherited from non-AR apps. Best practices will evolve with AR user behavior, but it’s advisable to start with basic app-retention mechanics proven over the past decade.

Video Companion: App Demos Galore

(click URL to open)

<https://artillery.co/2018/02/02/friday-video-ar-app-demos-galore/>





Drilling Down On Business Models

Flowing from the product models and strategies examined so far, how are revenue models taking shape? Many will develop as consumer usage patterns evolve and inform revenue-generating tactics. Meanwhile, there are already signals that indicate where business models can develop.

Some models build on established app strategies. For example, [in anything gaming-related, it's been shown that in-app purchases are often more strategic than upfront app purchases](#). With utilities such as mapping and navigation, transactional or ad support to drive local commerce could be strategic.

In-App Purchases

Once again, a well-established app has many of the above properties: Pokémon Go. [Its revenue model mostly involves in-app purchases, which drove more than \\$1 billion in revenue in 2016](#). Similar impulse-driven revenue from competitive game mechanics could drive AR revenue in other apps.

Pokémon Go has also revealed the viability of location based promotions and sponsorships. That so far includes cost-per-action advertising for visits to McDonalds in Japan. [ARtillry Intelligence believes this will continue to evolve and gain share in Pokémon Go's revenue mix, and that of other apps](#).

Moving forward, Niantic's follow up game, *Harry Potter: Wizards Unite*, will likely utilize the same architecture and game mechanics as Pokémon Go. Its likely success makes it worth watching closely for additional signals for app strategies and business models that are working (or not working).

Snapchat meanwhile holds lessons for AR in-app purchases. It recently added AR to its popular geo-filters ad format. These allow anyone to pay for a customized filter that's available for Snaps in a defined timeframe and geo-fence – making it popular for events like conferences or birthday parties.

And across the board, we'll see revenue models that tap into similar AR-driven location-based discovery. [This has natural ties to promotions that are highly trackable, such as local commerce \(i.e. store visits\)](#). This is one reason why Snapchat acquired location analytics company Placed.

Local Advertising

Drilling down on location-based advertising as a speculative revenue model for mobile AR, it could hold lots of opportunity. But we remain cautiously optimistic — the caution coming from ARtillry's former-life analyst coverage in the mobile advertising sector. There are several challenges.

Before getting into those challenges, what are the bright spots? First, AR's use case correlates to location relevance and high engagement levels — two factors that create fertile ground for advertising. And AR's potential handoff to actionable local commerce is promising.

For example, object recognition and the AR cloud^{vii} will enable information retrieval in the physical world. And based on commercial intent when people are out of home, many AR use cases could drive local commerce, such as pointing your phone at a storefront to overlay business details.

This is precisely what Google is hoping for Google Lens. Given that Google's core business has been challenged in the smartphone era in terms of search volume and declining CPCs, it wants to boost activity with additional forms of search: voice and visual. The latter could involve AR-delivered ads.

This extends Google's mission statement to "organize the world's info and make it accessible"... but does so in a more visual context. So there will be lots of ways for Google and others to engage consumers in similar ways through AR, including various forms of ads and sponsored content.

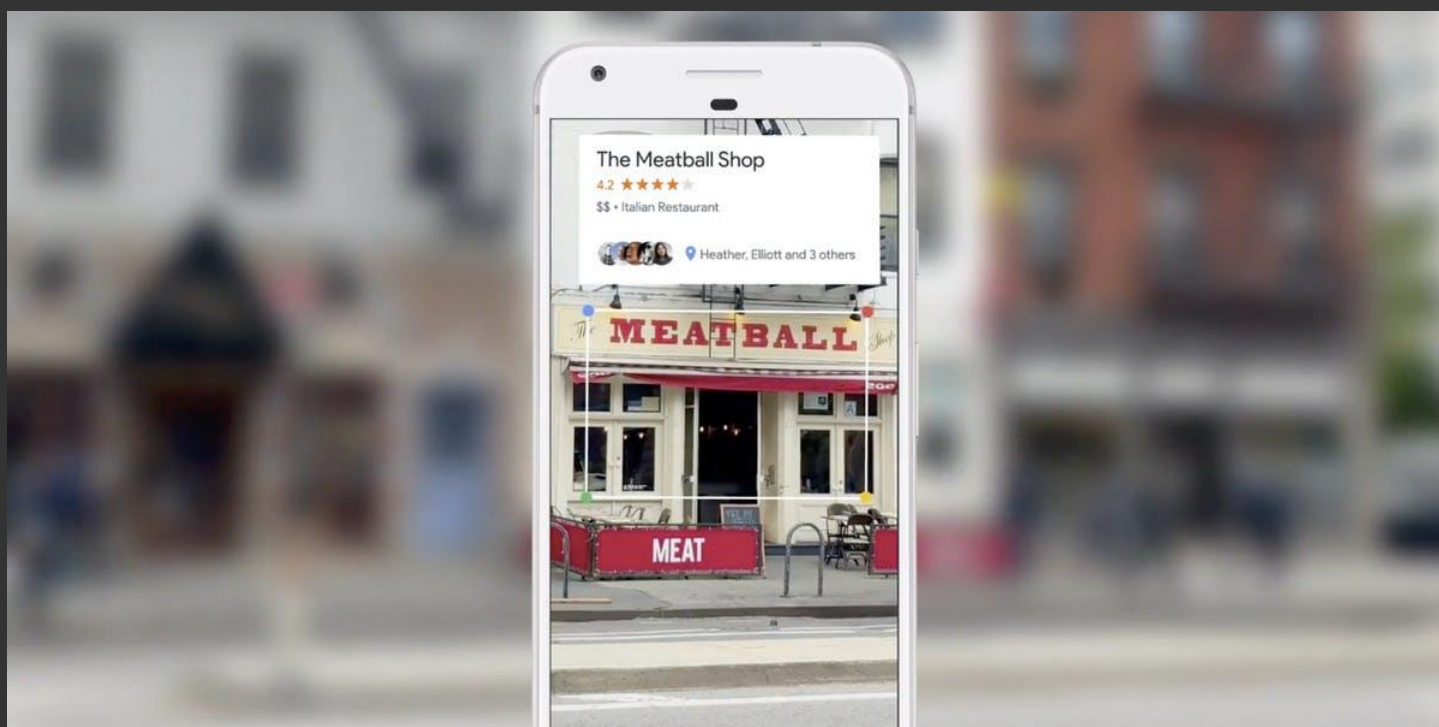


Image credit: Google

Not So Fast

When it comes to some of these AR ad scenarios, there are lots of potential strengths including high user engagement — a key advertising metric. But though that could be effective on an individual-impression basis, AR advertising could be challenged to scale in the aggregate.

In other words, AR in the next 18-24 months will continue to have relatively niche status in media and advertising terms. This diminishes reach, which is a primary objective of most brand advertisers and ad agencies. In other words, **there's simply not enough scale yet in AR to get them excited.**

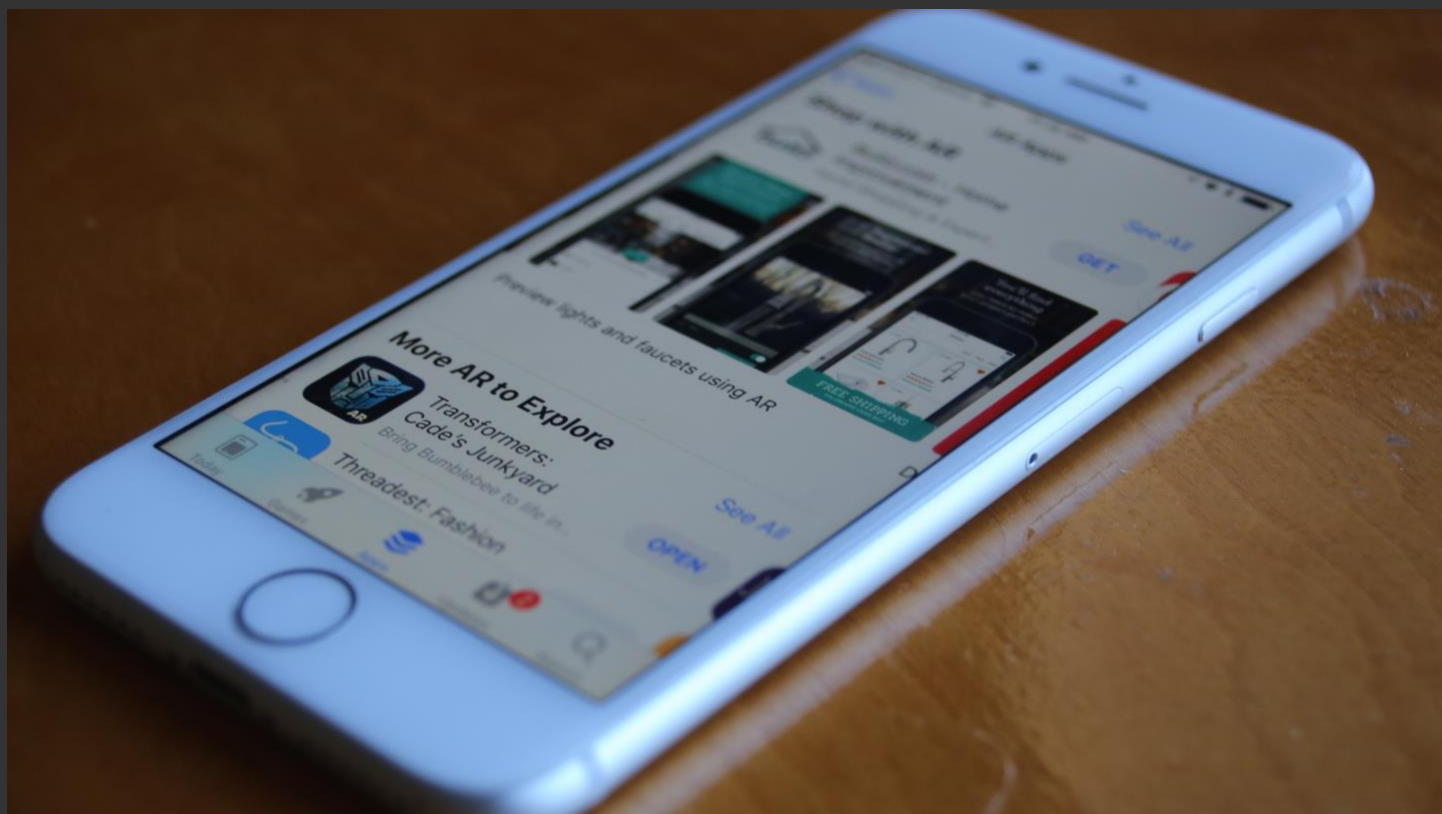
"Advertising is something we've thought of," Snaappy CEO Gal Shvebish told ARtillry recently. "At the moment, it won't be interesting enough for brands because there isn't enough muscle; there isn't enough user base and critical mass. How many people will see their ads?"

Quantifying that a bit, there are about **2000 ARKit apps** within a universe of about **2.5 billion iOS apps**. And as we know, downloads are a vanity metric: it's all about active use. **There, AR could be further challenged by short sessions. Again, it's a snack, not a meal... which could lessen ad inventory.**

Meanwhile, a metric referenced by AR ad proponents is the large installed base of AR-compatible phones — almost half a billion as quantified earlier. That's a strong proxy for market size and opportunity, but the relevant figure for advertising is much more granular: It's all about network reach.

In other words, ad networks, media companies and publishers don't sell ads based on hardware penetration (e.g. how many people own TVs). Ad sales happen based on specific and validated impressions or points of engagement (e.g. how many people watch CBS on Tuesday night).

Speaking of which, ad metrics will also need to transform. Just like AR app design will evolve in native ways, engagement analytics will have to evolve too. **Measuring mobile, desktop or television metrics (e.g. clicks or impressions) won't cut it in AR. New native metrics will have to develop.**





AR Commerce

One top AR app category so far is visualizing large items, such as a car in your driveway, a new couch in your living room or a flat screen TV on your wall. **It's about aiding the product consideration cycle in ways that are AR-first. And most of all, it's tied to commerce and therefore monetizable.**

So far, this includes apps like BMW's iVisualizer. Not only does it let you walk around a virtual car in your driveway, viewed through your smartphone's camera, but it lets you save customizations then research or purchase the car locally. **This brings it from novelty to attributable commerce.**

"You can configure the car however you want," Accenture XR go-to-market lead Raffaella Camera told ARtillry after working with BMW on iVisualizer. "And then you can move that exact configuration on the web to purchase, or see local dealerships and inventory that meet the configuration."

Amazon's app meanwhile houses an AR feature that lets you place graphical mockups of products around your house before ordering. This helps visualize stylistic as well as practical factors like if the TV will fit on the wall. Amazon also likes it because it reduces margin-depleting TV returns.

But most importantly, these apps are starting to show real signs of value through user behavior. For example, Houzz has announced that the AR features in its app (to visualize furniture like the above examples) **increase users' buying intent by 2.7x and increase the time spent in the app by 11x.**

Case Study: roOomy

Furniture visualization company roOomy is built on some of these AR commerce principles, but takes it a step further. It not only lets you visualize new furniture around the house, but it also wants to sell you the house. It ties AR furniture visualization to a logical context: real estate sales.

The three sides of its model involve furniture dealers, realtors and home buyers. Furniture dealers demo their products in a natural format, while real estate professionals can "stage," homes in a more effective (and cheaper) way. And consumers get a more realistic picture of both.

"We can showcase a property to its full potential," roOomy business development director Taylor Wilding told ARtillry recently, "and at the same time enhance the experience for the home shopper as they can furnish their new home right within the same context."

Combining all of these components has created a sort of Yin and Yang in roOomy's interlinked business model. Its diversified revenue stream includes 3D modeling and rendering technology, affiliate revenue for furniture sales, and fees from real estate agents.

To do all this, roOomy first converts furniture retailers' 2D catalogues into 3D graphics. Then realtors can stage empty rooms with its library of 120,000 pieces, which homebuyers view dynamically through its AR app. This natural habitat for furniture boosts conversions.



Image Credit: roOomy

“A differentiating piece for us is that we’re helping retailers intercept customers at an earlier part of the buying cycle, during a home purchase,” said Wilding. “Someone moving will spend on furniture upwards of 5x what someone who isn’t moving will spend.”

Of course, viewing a new home through the small window of your smartphone still needs time to develop as a consumer activity. But the Amazons and BMWs of the world could accelerate that learning curve, not to mention the muscle behind Apple’s ARKit and Google’s ARCore.

“As eCommerce sites launch ARKit apps, it’s becoming more and more familiar. People understand exactly how to use it,” said Wilding. “And since ARCore and ARKit have been released, our modeling business for home furniture retailers has taken off.”



Platform Choice: Stacking Up ARCore & ARkit

Related to the strategies covered throughout this report, developers, startups, media companies and brands entering AR will have to decide which platform to build on. Sometimes the answer may be “all” but limited resources can sometimes force a decision of where to develop first: ARCore or ARkit.

Besides scale (covered earlier), what are ARCore and ARkit’s qualitative attributes? Their biggest value is perhaps democratizing AR. **Developers don’t have to build AR technology from scratch, nor rely on physical barriers like markers or depth cameras. They can focus instead on user experience.**

ARCore and ARkit employ comparable computer vision technology for mapping, which is the process of scanning an area on which to integrate graphics. They also apply horizontal plane detection, localization, motion tracking and light metering. These work in tandem to achieve AR.

These methods approach the AR capability previously found in Google Tango (ARCore’s forbear), which required depth-sensing cameras. **ARCore and ARkit instead use surface detection software with single-lens RGB cameras, allowing them to reach the market scale explored earlier.**

In Their DNA

But perhaps more important than their similarities, how do ARCore and ARkit differ? That question applies to technical strengths, as well as go-to-market strategies and positioning. **On both counts, ARCore and ARkit each carry its parent’s DNA, and each advance its parent’s core business.**

For example, Apple’s app-centric paradigm is reflected in ARkit’s delivery, while Google’s web-orientation will shape ARCore’s stated web delivery goals. Meanwhile, Google has a technical head start with years of work invested in Tango, but Apple has more control over mobile hardware.

That software/hardware integration has always been Apple’s strength. In this case it directly governs camera optics and sensor calibration that support ARkit apps. Google is hoping baseline smartphone standards evolve, but for now it’s relying on a handful of high-end phones including its own Pixel 2.

The following sections detail these differentiating factors, touching on technical factors but focusing mostly on strategic market positioning. The analysis also sticks with ARCore and ARkit: It doesn’t cover Facebook’s Camera Effects platform to build AR experiences within Facebook’s walled garden.

Drilling Down on ARkit

On technical measures, ARkit's advantages include the vertical integration of hardware and software mentioned above. It can build hardware specifically to align with its software goals, and vice versa. It can also distribute software updates faster and to a smaller, more manageable range of devices.

This results in a greater portion of the iOS device base that runs the latest software, which has lots of advantages in terms of new feature adoption like AR, and security. That compares to the Android world, which is fragmented into several phones that rarely run the latest OS version.

Apple could also have greater appeal to AR developers due to ARkit's alignment with monetization strategies. This stems from Apple's app-approach. Compared to ARCore's forays in web AR, apps can provide a more structured revenue model, such as app sales, advertising or in-app purchases.

ARkit also has a speed advantage in being first to market. Its mid-year 2017 release predates ARCore's rollout by months. Though that may be diminished by the long life span of mobile AR, there will be a slight early-mover advantage in attracting developers that become invested in ARkit.

Apple also owns an integrated software stack. This can limit developers to specific tools (though Unity has announced ARkit support). That development stack – including Metal and Swift – can create more functional and elegant AR graphics and experiences that run on ARkit.

To be fair, Apple doesn't force these tools on developers but advises their use. This could slow down ARkit apps through a learning curve in the developer community. So a meaningful volume of ARkit apps could still be 12-18 months away, partly negating Apple's early-mover advantage.

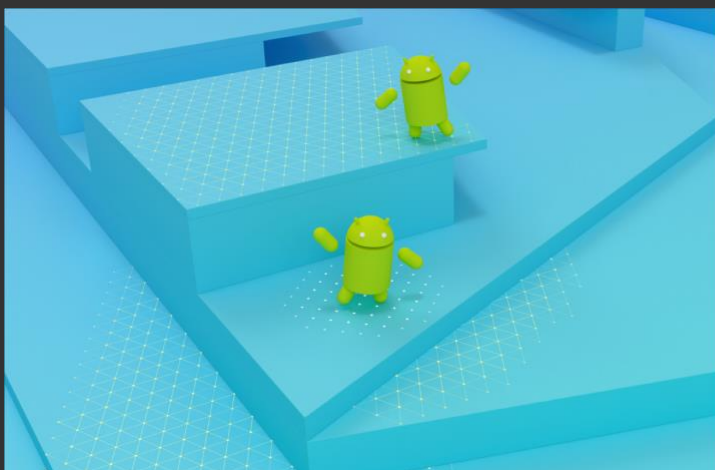


Image credits: Google, Apple



Drilling Down on ARCore

Though ARkit has a slight advantage in being first to market with developers' invested time as mentioned, greater developer attraction will ultimately come from platform reach. **There, ARCore has the long-term advantage. As quantified earlier, ARCore's installed base will start slow but grow fast.**

ARkit's aforementioned technical advantages likewise have a flip side. Though superior in several ways, ARkit's technical chops could be challenged by ARCore's flexibility. Importing graphical assets to ARCore will be easier, given a more open approach and arsenal of developer tools.

In addition to working with 3D modeling tools and game engines like Unity and Unreal, Google has internally built developer tools that will help populate its immersive computing product line (ARCore and Daydream). These include Tilt Brush and the low-friction 3D graphics engine Google Blocks.

Overall, the immersive computing assets Google has assembled — more extensive and tenured than Apple — will support ARCore. Its visual search tool Google Lens will assist in object recognition and computer vision, while its longstanding Tango AR software provides significant IP and human talent.

Speaking of Google assets, one of its biggest advantages goes back farther than the last few years of VR and AR development. It's the web itself, where Google has rooted itself for 15 years as the world's search engine. That includes building a knowledge graph and search index.

This could play into an AR strategy by creating capabilities that are grounded in — and delivered by — the web. As mentioned briefly above and explored more below, ARCore's will support WebAR, in which users don't have to download apps, but rather visit mobile websites to access AR experiences.



Image credit: Google Poly

Additional Considerations

Beyond platform choice, there are several other considerations for anyone that's looking at or acting on mobile AR strategies. These are mostly macro trends that are worth watching, as their impact will be felt in the longer-term future. They include [low-friction design tools](#), [webAR](#) and the [AR cloud](#).

Design Tools

3D graphics are literally the building blocks of immersive experiences. Game engines like Unity have already “democratized” 3D creations with tools and graphical elements for 3D worlds. Google Blocks has lowered the barrier even further for creating such assets with limited programming skills.

Google recently doubled down on Blocks with a shared repository for 3D graphics, known as Poly. This joins tools such as Sketchfab as a developer resource for shared graphical assets. And Facebook has more recently made its News Feed functional as a place to share 3D graphics for AR.

The goal in each of these moves is to push immersive computing forward by lowering its barriers to creation. [Though each of the above providers is doing this for selfish reasons \(to attract developers to their platforms\)](#), anyone building AR apps should take advantage of these tools when possible.



Image credit: Naomi Chen, Google Poly



Web AR

As introduced above in light of Apple vs. Google, many people believe that the app-heavy paradigm that rules the smartphone world isn't optimal for AR. Indeed, [some of AR's existing challenges of user adoption are exacerbated further by the friction of finding and downloading disparate apps.](#)

Beyond friction for users, apps are disadvantaged by their lack of interoperability compared to the link-structured web. This has always been the case in the app era, leading to movements like deep linking, [but it could really handicap AR functionality by forcing it into non-linked silos.](#)

"You effectively have all the same problems that a mobile app has," Presence Capital partner Amitt Mahajan told ARtillery recently. "You have to convince someone to download it, and convince them to come back every day. All of the friction to get to that experience is still pretty high."

This will be something to watch closely when deciding where to apply development resources and choosing which platforms and distribution methods are optimal. [Though Web AR is currently inferior to apps in terms of functionality, this could change over time and we'll be tracking it closely.](#)

The AR Cloud

Expanding on the above concept of AR app "interoperability," one thing that will add value and dimension to mobile AR experiences is social collaboration. In other words, AR apps with multi-player support (different devices can see the same positional-tracked graphics) will unlock lots of utility.

[In order for that to happen, apps have to be networked with each other and with a central repository of mapping and positional data that they can tap into from any location.](#) This theoretical repository is known as the AR cloud and is an immensely valuable and currently-missing piece of the AR puzzle.

Many of AR's promises that you may hear in industry coverage, op-ed articles or conference videos hinge on the AR Cloud. As it develops as a resource that AR apps can tap for necessary data, it will vastly improve AR app functionality and capabilities. So watch its progression carefully.

(We will focus specifically on the AR Cloud in an upcoming ARtillery Intelligence Briefing.)



Final Thoughts: “It Depends”

Several mobile AR app strategies were explored throughout this report. The breadth of these potential approaches should reflect the early stages of mobile AR, in which success factors are still being devised. These will evolve over time, as user behavior itself evolves and indicates demand.

As for which strategies are optimal for your business, the answer is “it depends.” That statement isn’t made as a cop-out, but to stress a key factor: **successful AR app strategies first require clearly-defined goals. AR should be done to accomplish something very deliberate and specific.**

Put another way, don’t build AR for AR’s sake. Among all of the tactics and success factors mentioned in this report, this point of advice hangs above all of them. Too many companies have and will continue to fail at AR app deployments because they did it simply to check an item off their list.

“Instead of wanting to do something in AR or VR, figure out the story you’re trying to tell and does that fit AR or VR?” Accenture XR’s Raffaella Camera told ARtillery. “And even within that, does it fit a computer graphics based experience or a 360 experience, and how do you want to build that out?”

Potential strategies can include new customer acquisition for retailers and brands. Or it could involve building deeper levels of engagement with existing customers in order to boost retention. **Ultimately, it’s about defining your ROI goals clearly, so that AR can be positioned to hit that target.**

For example, AR app Auredi lets restaurant diners visualize menu items before ordering. CEO Danny Gordon tells ARtillery that the company has made several design and positioning decisions based on a clearly-defined core mission: deepened relationships and repeat business for restaurant partners.

Similarly, Accenture XR’s Camera stresses that defining goals clearly is a critical success factor. This was shown through her work on BMW’s iVizualizer app, where the explicit goal was to engage millennials. An AR approach made sense, given the generation’s sentiments to traditional car buying.

“In the case of BMW iVisualizer, the issue was how do we get millennials, who don’t like going to dealerships and dealing with car salesmen, to interact with the model and configure the car?” said Camera. “And that was the way to do it...That’s the type of ROI they’re looking for.”



Video Companion: Mobile AR App Strategies

(click URL to open)

https://youtu.be/2fsyMHqR_Vw



Key Takeaways (redux)

- Smart glasses will dominate enterprise AR in the near term, while smartphones dominate consumer AR.
 - As popularized by rudimentary AR like Snapchat and Pokémon Go, this involves graphical overlays that interact with the world seen through your smartphone camera.
 - Smartphone ubiquity and componentry – image processing, sensors, camera – position it well for AR.
 - ARkit and ARCore further democratize mobile AR through software that does the back-end heavy lifting.
- There are 476 million AR-compatible smartphones today, growing to 3.8 billion by 2021.
- Consumer AR revenue will grow from \$975 million in 2016 to \$14.02 billion in 2021.
 - Most of this derives from mobile AR, until 2021 when consumer smart glasses begin to gain traction.
 - Mobile AR revenue will be software dominant, including apps, in-app purchases and commerce.
 - Mobile AR strategies and differentiation therefore reside mostly at the app level.
- Despite positive signals, mobile AR is still challenged
 - Mobile AR resembles iPhone apps ten years ago: underdeveloped capability, standards and demand.
- Product strategies will evolve natively with AR, but also include fundamental/historical app tactics.
 - Native thinking (“AR-first”) should dominate app design, rather than porting existing media into AR.
 - Incubating AR features within established apps can be a stepping-stone to standalone native apps.
 - Consider alternatives to industry terms like “AR” (historical example: Snapchat)
 - Build AR experiences that happen in short bursts, due to arm fatigue and battery drain.
 - Successful apps will address real consumer utility and demand, rather than “tech-first” engineering feats.
 - “Solutions in search of problems” won’t succeed, such as apps that solve pain points that no one has.
 - Apps built solely around novelty could succeed in download volume but languish in active/repeat use.
 - Combining AR novelty with sticky behavior (e.g. social communication) is showing signs of success.
- Business models will likewise follow a combination of native evolution and established principles.
 - In-app purchases are proven in gaming and social apps, versus upfront purchases.
 - Visualizing large items will enable commerce-based monetization such as car and home shopping.
 - Commerce-based AR monetization success stories so far include BMW, IKEA, Amazon and Houzz.
 - Google will pursue visual search (Google Lens), including cost-per-action local commerce.
 - AR advertising could eventually drive revenue but doesn’t yet have meaningful reach and scale.
 - Forthcoming models to watch include Niantic’s Harry Potter AR game and Snapchat’s AR Geofilters.
- Platform choice is important: Align goals with respective scale and strengths of ARCore and ARKit.
 - ARkit has an early advantage in platform reach, but ARCore will achieve greater long-term scale.
 - ARkit has better software and hardware calibration, but ARCore could be more open and flexible.
- Before any of the above, clearly defined ROI goals are a critical first step to AR product strategies.
 - This will inform and dictate all other strategic directions, and make or break AR app outcomes.
 - Doing AR for AR’s sake – or to check an item of a list – will set any AR product up to fail.

Key takeaways are also highlighted throughout the main body of this report.

About ARtillery Intelligence

ARtillery is a publication and intelligence firm that examines augmented reality and virtual reality, collectively known as XR. Through writings, data and multimedia, it provides deep and analytical views into the industry's biggest players and opportunities. It's about insights, not cheerleading.

Run by career analyst and journalist Mike Boland, coverage is grounded in a disciplined and journalistic approach. It also maintains a business angle: Though fun and games permeate VR and AR (especially the former) long-term cultural, technological and financial implications are primary.

Learn more at <https://artillery.co/about>





About Intelligence Briefings

ARtillery Intelligence Briefings are monthly installments of VR/AR data and analysis. They synthesize original and third-party data to reveal opportunities and dynamics of VR and AR sectors. In addition to data, a layer of insights is applied to translate market events and raw figures into prescriptive advice.

More information, past reports and editorial calendar can be seen at:

<https://artillery.co/artillery-intelligence/>

About the Author

Mike Boland was one of Silicon Valley's first tech reporters of the Internet age, as a staff reporter for *Forbes* (print) starting in 2000. He has been an industry analyst covering mobile and social media since 2005, and is now Chief Analyst of *ARtillery Intelligence*, covering emerging tech.

Mike is a frequent speaker at industry conferences such as VRLA, ad:tech and LeadsCon. He has authored in-depth reports and market-sizing forecasts on the changing tech & media landscape. He contributes regularly to highly read online news sources such as *TechCrunch*, *Business Insider* and the *Huffington Post*.

A trusted source for tech journalists, his comments have appeared in A-list publications, including *The New Yorker*, *The Wall Street Journal* and *The New York Times*.

Further background, history and credentials can be found at:

<http://www.mikebo.land/>





Contact

Questions and requests for deeper analysis can be submitted at:

<https://artillry.co/contact/>



Resources

Links to additional information on consumer and mobile AR

Matt Meisnieks (technical AR tactics)

<https://blog.prototypr.io/ar-first-mobile-second-614e85673083>

Augmented World Expo

www.augmentedworldexpo.com

Augmented Reality Dot Org

<http://www.augmentedreality.org/>

AR in Action (ARiA)

<http://arinaction.org/>

The VR/AR Association

<http://www.thevrara.com>



Methodology

This report highlights *ARtillery Intelligence* viewpoints, gathered from its daily in-depth coverage of the XR sector. To support the narrative, data are cited throughout the report. These include *ARtillery Intelligence* original data, as well as that of third parties. Data sources are attributed in each case.

For market sizing and forecasting, *ARtillery Intelligence* follows disciplined best practices, developed and reinforced through its principles' 15 years in research and intelligence in the tech sector. This includes the past two years covering AR & VR as a main focus.

More about ARtillery's market-sizing credentials can be found here:

<https://artillery.co/artillery-intelligence/forecasts/methodology/>

Focal Range

This report's intended focus is business strategies rather than technical ones. Though technical components are referenced throughout the report, it is not meant to be a technical guide. See the above resources for more technical analysis, and contact us above to engage over AR strategies.

Disclosure and Ethics Policy

ARtillery has no financial stake in the companies mentioned in this report, nor was it commissioned to produce it. With respect to market sizing, ARtillery remains independent of players and practitioners in the sectors it covers. It doesn't perform paid services or consulting for such companies, thus mitigating bias — real or perceived — in market sizing and industry revenue projections.

ARtillery's disclosure and ethics policy can be seen in full at:

<https://artillery.co/about/disclosure-and-ethics-policy/>



References

ⁱ See ARtillery Intelligence Briefing, *Enterprise XR: Impacting the Bottom Line*, January 2018 <https://artillery.co/artillery-intelligence/enterprise-xr/>

ⁱⁱ Intel Projections analyzed further at: <https://artillery.co/2018/01/15/data-point-of-the-week-long-run-ar-scale-will-be-in-consumer-markets/>

ⁱⁱⁱ See ARtillery Intelligence Briefing, *ARCore and ARKit: The Acceleration of Mobile AR*, September 2017: <https://artillery.co/2017/10/24/what-will-be-mobile-ars-accelerants-new-report/>

^{iv} Season 3, Episode 9, HBO's *Silicon Valley*: <https://www.hbo.com/silicon-valley/season-03/9-daily-active-users>

^v See ARtillery article, *VR Is a Meal, Not a Snack*: <https://artillery.co/2017/06/02/friday-video-vr-is-a-meal-not-a-snack/>

^{vi} See ARtillery article, *The AR Cloud Explained*: <https://artillery.co/2018/01/26/friday-video-the-ar-cloud-explained/>

^{vii} See ARtillery article, *The AR Cloud Explained*: <https://artillery.co/2018/01/26/friday-video-the-ar-cloud-explained/>