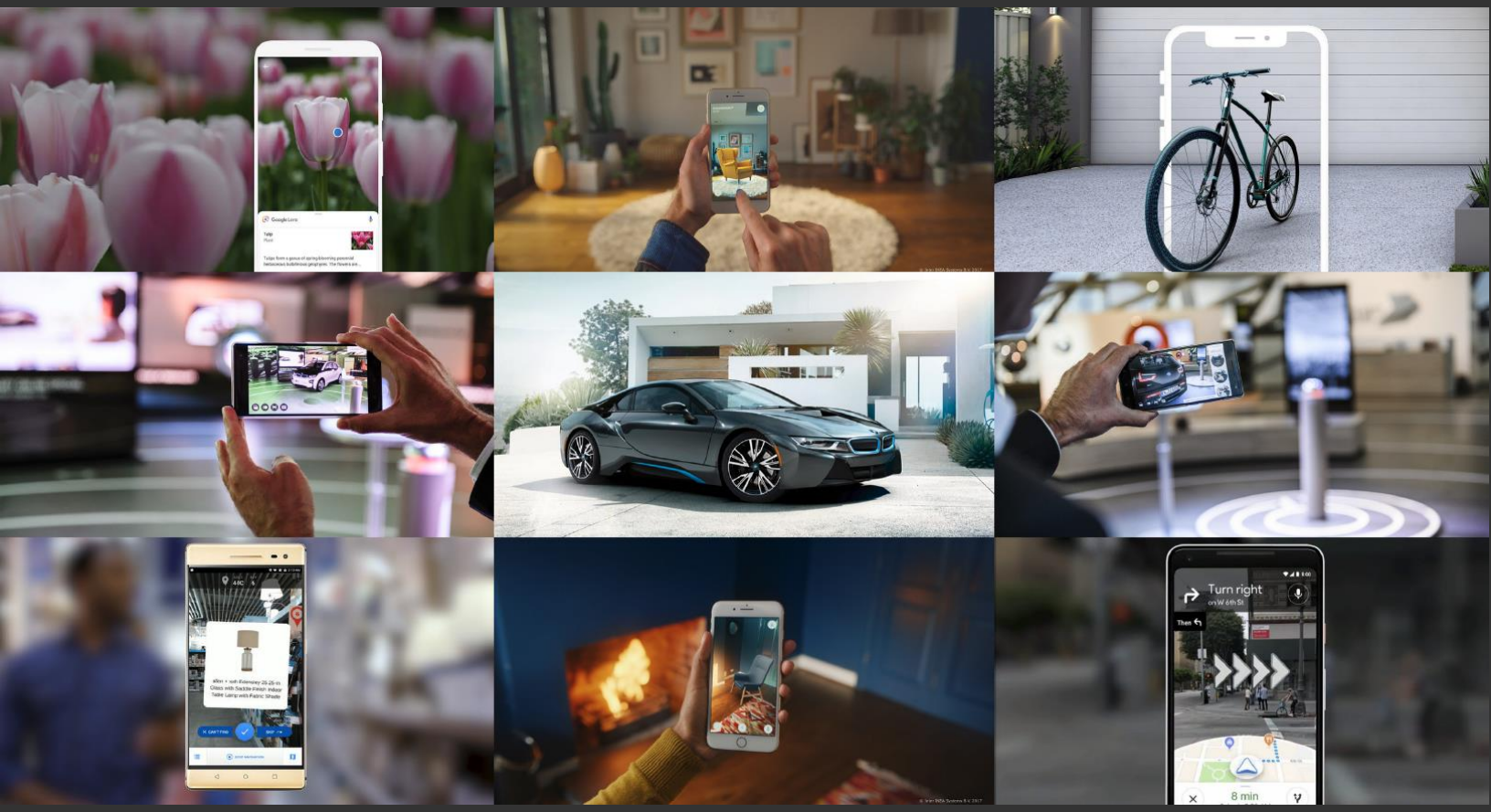
ARtillery Intelligence



ARTILLERY INTELLIGENCE BRIEFING

AR COMMERCE: MONETIZATION COMES INTO VIEW

JANUARY 2019

ARtillery Intelligence

Table of Contents

Executive Summary

There are several forms of monetization that will develop for augmented reality (AR). In past reports, we've examined opportunities for its role in advertising (consumer-facing) and industrial productivity (enterprise-facing). The ROI case continues to strengthen in these and other AR applications.

One particularly promising area of AR will be its role in influencing and fulfilling consumer purchases. Extending from (but different than) AR advertising, AR commerce involves graphical overlays that inform consumers and demonstrate product attributes in physical retail or e-commerce contexts.

For example, AR-pioneering retailers like Walmart let consumers activate product details in store aisles by pointing their smartphones at those items. Employing computer vision and object recognition from product databases, this empowers shoppers and breeds customer loyalty.

Tech giants like Google and Amazon have done similar. By pointing your phone at items in the real world, informational overlays can be triggered to contextualize items. Moreover, transactional calls to action are included to capture consumers' wallets during these high-intent "visual-searches."

This makes AR commerce a key part of the future of these tech giants' user experiences – mapping closely to their core businesses in areas like search and e-commerce. It therefore holds a great deal of priority and investment – both of which will accelerate this sub-sector of AR in the near term.

Beyond visual search (pointing your phone at items to contextualize or buy), AR commerce can work in the reverse manner. In other words, "product visualization" is a key AR commerce modality in which consumers can digitally place 3D product mockups in their surroundings to see how/if they fit.

As you can imagine, this use case maps particularly well to home goods, or large and bulky items that require a more informed purchase in terms of fit and style. For that reason, furniture players like Wayfair and IKEA have invested in such AR features, as have auto manufacturers like BMW.

Add all of these factors together and AR commerce will be one of the most tangible and revenue-generating "flavors" of AR that develop in the near term. ARtillery Intelligence projects that $6.1 billion in annual transaction value (value of goods purchased) will flow through AR interfaces by 2022.

Beyond near-term benefits and monetization, mobile AR commerce developments will also serve a longer-term end: AR glasses. The tactics, business models and consumer acclimation that happen around smartphones will seed next decade's glasses-based AR commerce – the real endgame.

Key Takeaways

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

- AR monetization is taking many forms including advertising, gaming and enterprise productivity.
- The area of AR that's potentially most primed for revenue generation is driving consumer purchases.
  - This includes graphical overlays that inform consumers during their shopping processes.

- ARtillery Intelligence projects $6.1 billion in annual transactions will be influenced by AR interfaces by 2022.

- There are two main ways this is materializing: *visual search* and *AR visualization*.
  - *Visual search*, utilizes the smartphone camera and computer vision to identify and contextualize products.
  - *AR visualization* virtually places product mockups in one's space to better understand them.

- Visual Search a.k.a. "search what you see" will inherit benefits and revenue potential from online search.
  - This includes high-intent queries, done through the millennial-friendly smartphone camera.
  - One third of AR users see it as a valuable shopping utility according to ARtillery Intelligence data.

- Retail visual search will combine the best of e-commerce (digital interaction) and retail (see & feel) shopping.
  - Leaders so far include Walmart and Lowes, which have launched visual search and AR visualization tools.

- Outside of retail contexts, Google will dominate visual search (Google Lens) for general interest queries.
  - Its strengths and positioning are anchored in an existing search index and knowledge graph.
  - Most searches will be general interest, while a smaller share will be monetizable (just like online search).
  - Google is highly motivated to invest in visual search, due to its alignment with the company's core business.
  - Visual search will help achieve "last mile" conversion data – a longtime holy grail for Google.
  - Snapchat is also pushing hard on visual search, in partnership with Amazon (product data).

- Beyond visual search, product visualization is proving to be an opportune area of AR commerce
  - Houzz reports that AR furniture visualization tools have boosted conversions 11x and spend levels 2.7x.
  - BMW reports that 25 percent of its iVizualizer app starts go to an online car configurator.
  - The consumer journey from visualization to purchase makes this a rare "full funnel" medium.
  - Consumers also scored visual search high in ARtillery Intelligence's AR consumer survey.

- Armed with such metrics, many brands have launched AR visualization, especially for large, costly products.
  - Leaders so far include BMW, IKEA, Wayfair and Amazon, the latter being a sleeping giant in AR commerce.

- The biggest missing puzzle pieces in AR visualization include 3D product scans.
  - Product scans – and easy ways to create them – will be a massive business opportunity.
  - Steps made so far include Shopify's integration of the USDZ 3D-imaging file format.

- Success factors in AR commerce will include prioritizing ongoing active utility over novelty.
  - Sustainable AR commerce experiences will be mundane "all-day" use cases like Google Lens.
  - Lowering adoption friction will be a key strategy, including "AR as a feature," versus standalone apps.
  - Brands and retailers that launch AR experiences to "check a box" or appear tech-forward will fail.
  - Native thinking will win, as will native metrics: new analytics will develop for user engagement and ROI.
  - In a transformative period for retail, winners and losers will map to tech adoption, including, but not limited to AR.

Introduction: Augmented Shopping

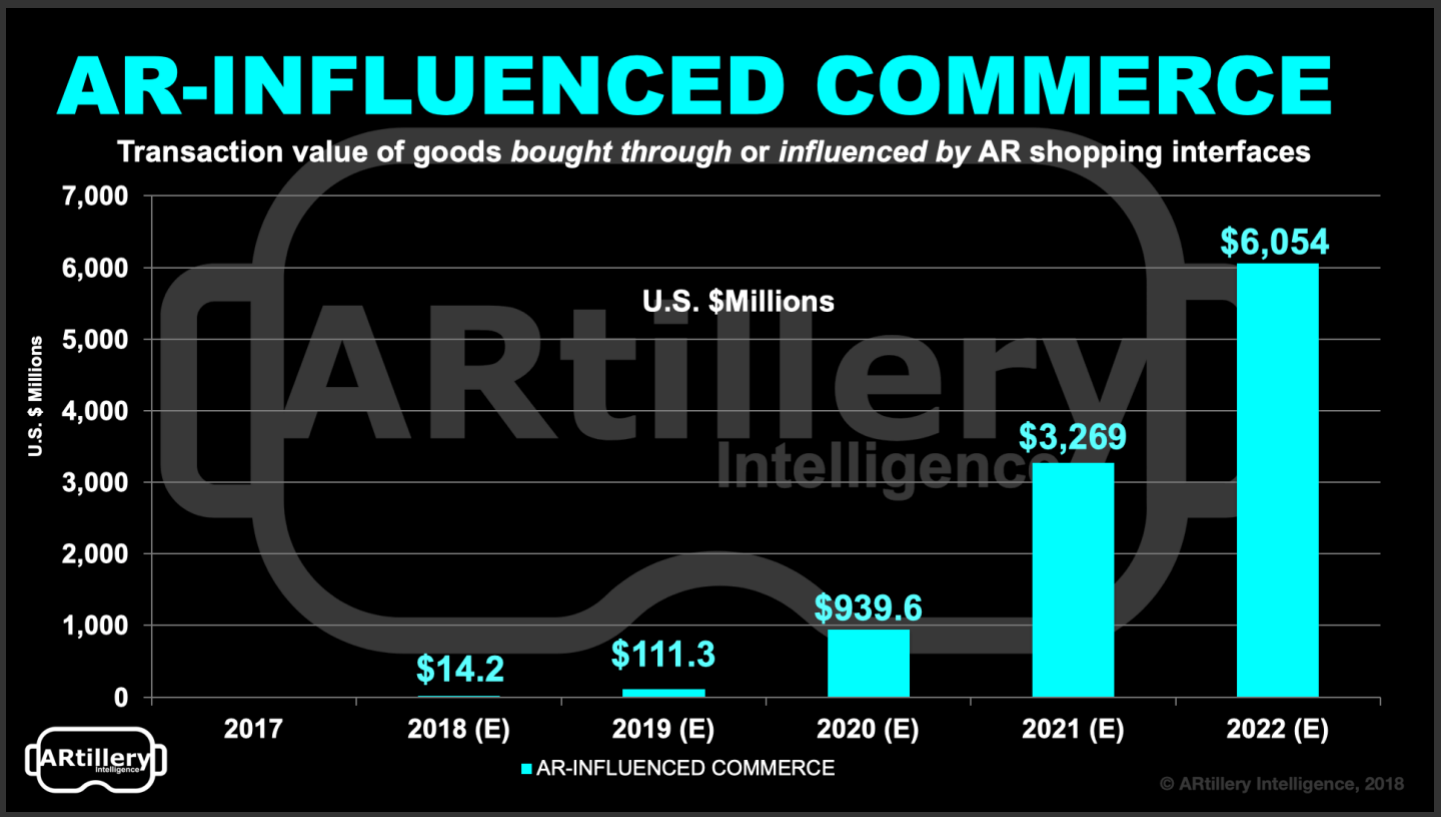
Many questions surround the sometimes-overhyped augmented reality (AR) sector. The biggest is how it will make money. There are several answers to that question including enterprise productivity,[i] AR advertising,[ii] gaming (e.g. in-app purchases)[iii] and others we've examined in past reports.

But the area of AR monetization that's perhaps most logical – and already underway – is commerce. This is the segment of AR in which graphical overlays are presented to inform consumers during their shopping processes. It provides contextual product information to inform and incentivize purchases.

This will represent an increasingly impactful technology for consumer spending. ARtillery Intelligence projects that $6.1 billion in annual transaction value will flow through AR interfaces by 2022. This means AR will be used somewhere in the consumer shopping journey for that volume of transactions.

There are two main ways that this is materializing. The first is *visual search*, in which the smartphone camera (along with computer vision and machine learning) helps identify physical products. The second is *visualization*, in which items are virtually placed in one's space to better understand them.

We'll dive deep on each of these in the coming pages, starting with visual search.



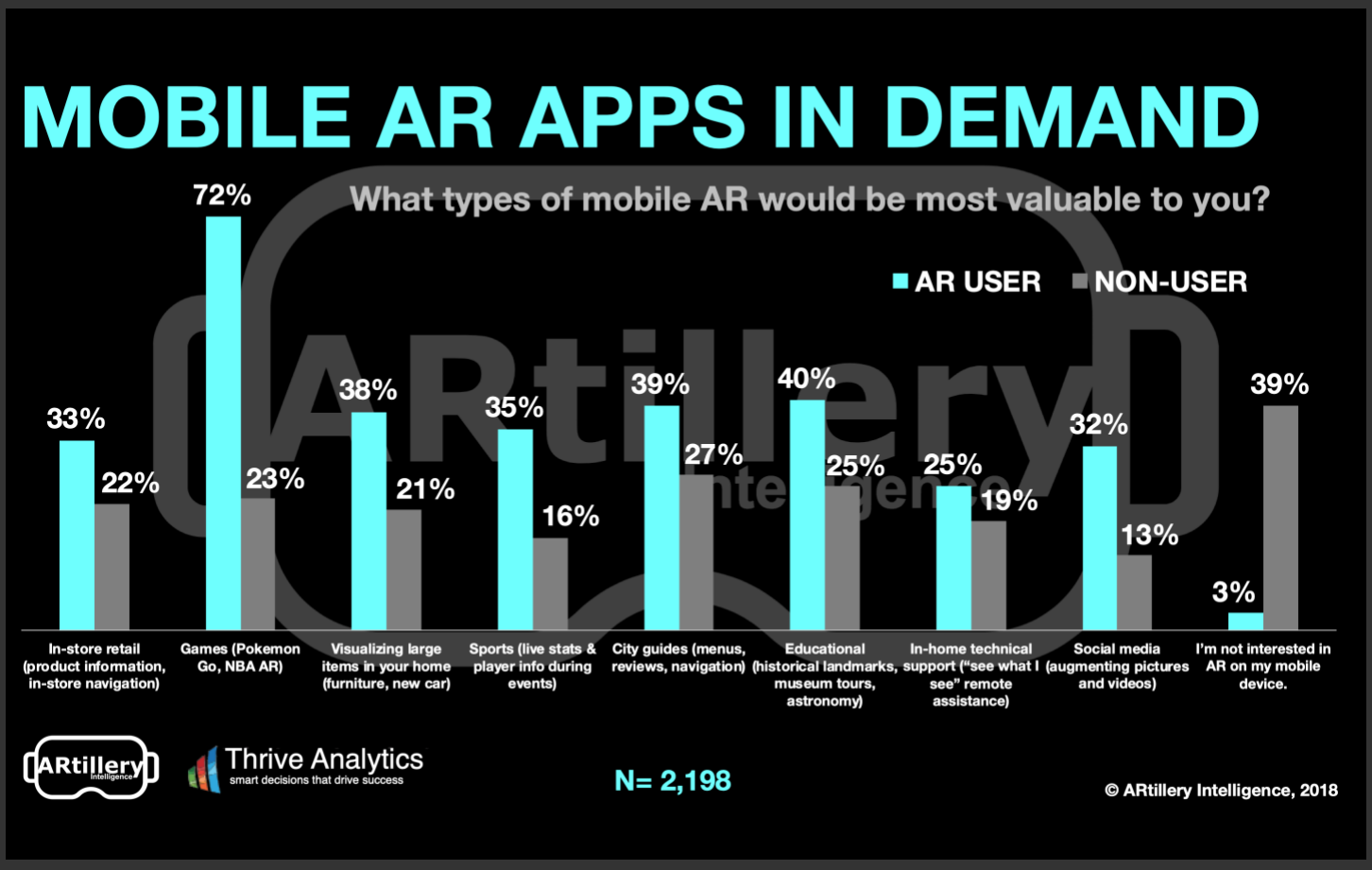
Part I. Using AR to *Search*

Visual search is one way that AR commerce will materialize. Also known as "search what you see," it employs the increasingly powerful smartphone camera (and someday, glasses) to contextualize physical-world items. This includes identifying information and, importantly, transactional functionality.

For example, Google Lens is a product we've examined in past reports[iv] (and deeper below) that lets users point their phones at items to retrieve information, or to buy them. Its use cases and product categories include everything from general interest search (dogs, flowers) to commercial (products).

ARtillery Intelligence's consumer survey data with Thrive Analytics[v] indicates visual search's potential. (see below). One third of AR users see it as a valuable shopping utility. This is mostly in the context of in-store retail engagements, while visual search can also be used in remote e-commerce.

In fact, visual search is subdivided by these two categories – retail and e-commerce. The former happens within store aisles (through a retailer's app) while the latter can happen anywhere (through apps like Google Lens or Amazon's AR View). Retail is where the opportunity is developing first.



Retail AR: Best of Both Worlds

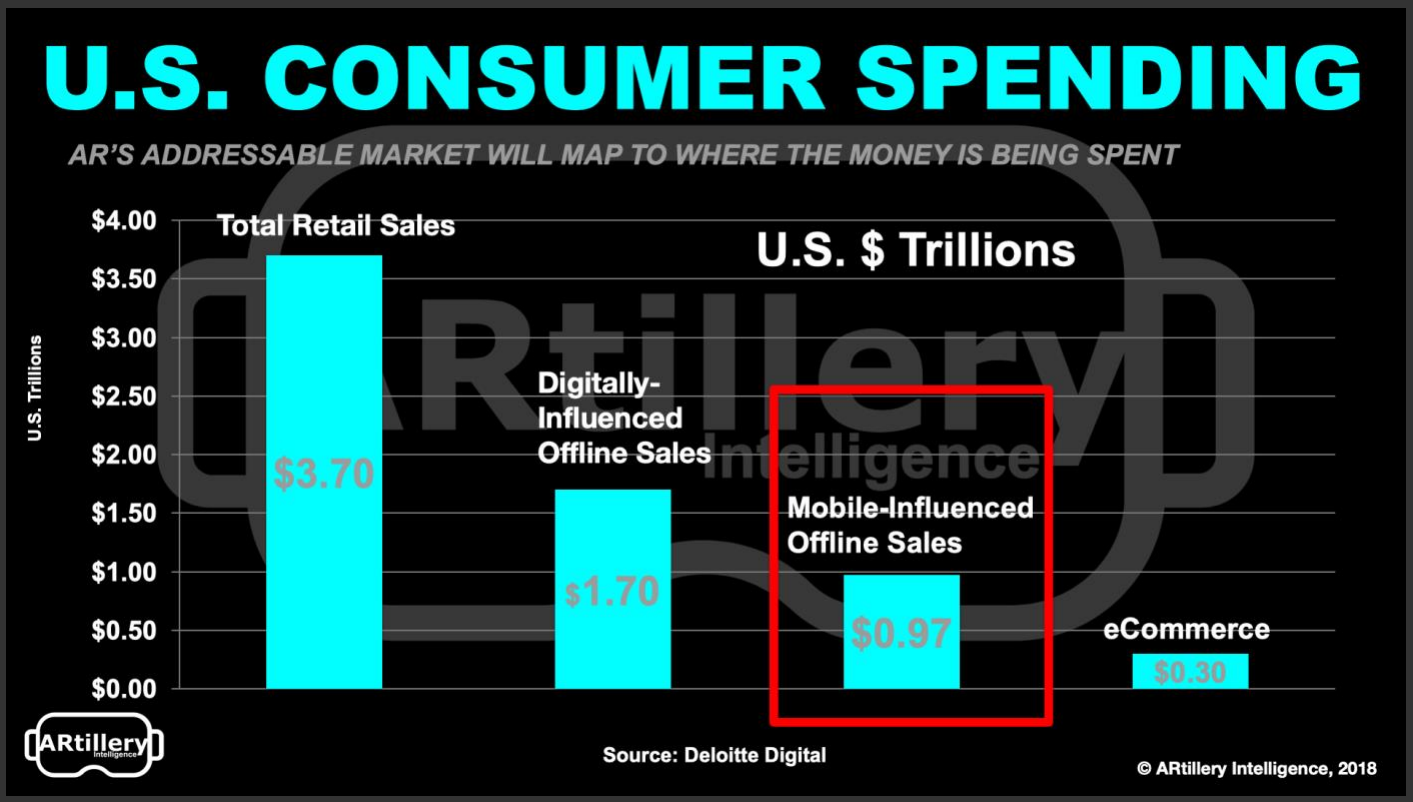
As we've examined in the past, e-commerce represents a small share of retail spending. Of the $3.7 trillion spent in the U.S., about $3.4 trillion is in physical stores. But to be fair, online and mobile media increasingly *drive and influence* that offline spending, to the tune of about $1.7 trillion.

That's where AR and visual search will come in. They're well-suited for qualifying products through informational overlays. Holding up your phone is more intuitive than typing words into Google or Amazon in a store aisle. And camera affinity is strong among buying-empowered millennials.

It's also notable that 71 percent of consumers would shop at a retailer more often if AR were offered, according to a recent survey by Lumus.[vi] 61 percent of respondents also prefer to shop in stores that offer AR. And 40 percent would be willing to pay more for a product if AR were part of the experience.

Stepping back, the best way to think about AR in retail is fusing the best of e-commerce and in-store shopping. The reason the latter dominates, per the above figures, include immediate gratification and the need to see/touch products -- especially big-ticket items like TVs, cars and couches.

But what about the advantages of e-commerce? There's more supply, transparency, cost efficiency, inventory and ability to dynamically search and filter product attributes. Creating the best of both worlds, AR can engender a sort of hybrid UX that brings these digital features to store aisles.



Case Study: Walmart Fuses Clicks and Bricks

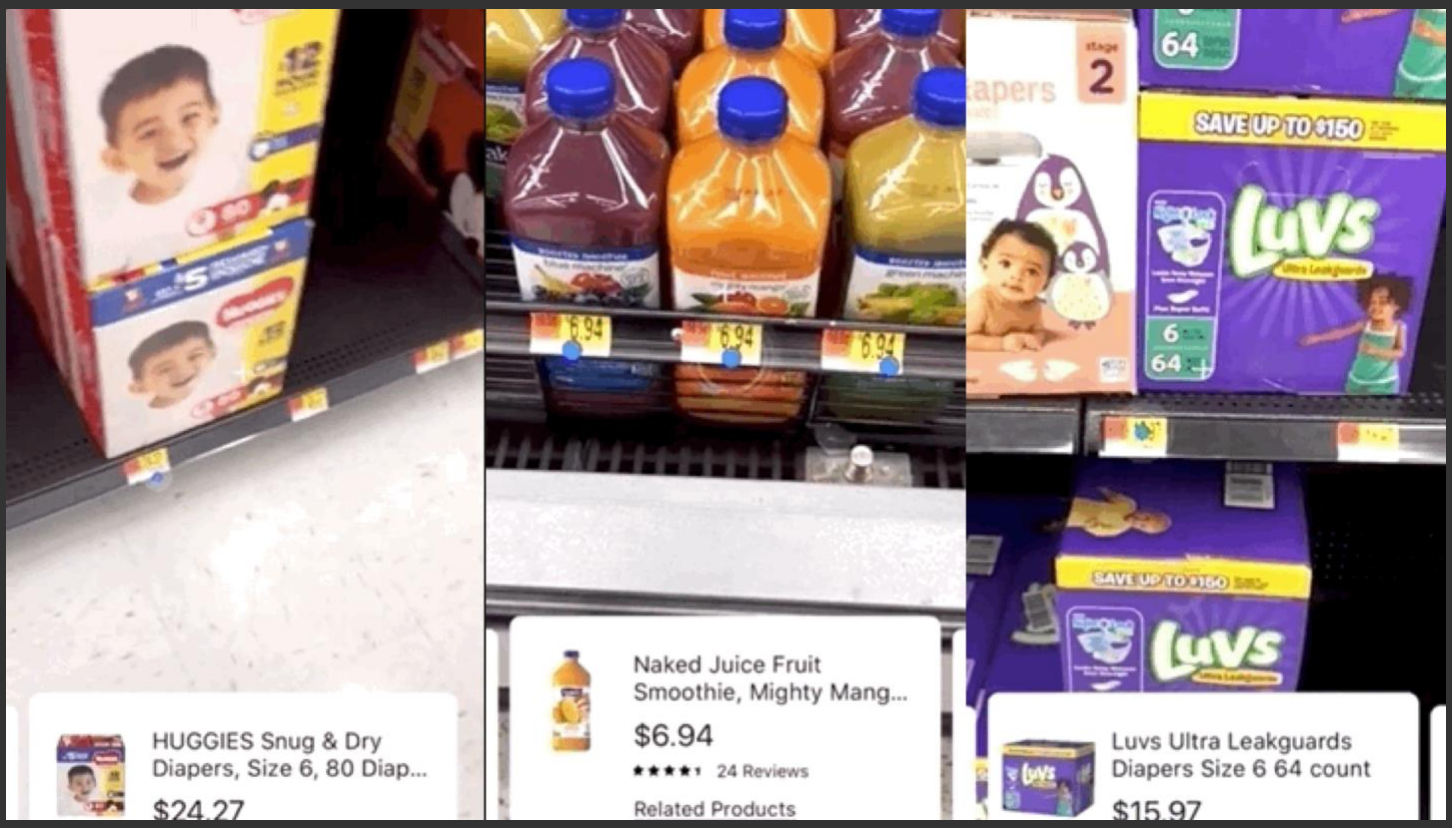
One example is Walmart, which built an AR prototype app to assist in-aisle product engagement. When pointed at a shelf of cosmetic products — a sku-intensive category — it filters attributes like price and color, just like with e-commerce. It then highlights items that match the filter criteria.

“When I say ‘physical to digital’ I mean it literally: smash them together, “said Walmart’s Steven Lewis when demoing the app at the AWE conference in June. “You choose filter criteria and it narrows down and filters out what you don’t want to see. That’s kind of like an e-commerce experience.”

Since Lewis’ AWE comments, Walmart launched *AR Scanner*, an app feature that lets users point their phone at products in store aisles. Closer to the definition of visual search than the above prototype, it dynamically invokes informational overlays such as product details, pricing and reviews.

Beyond the benefits to users — which indirectly drive repeat business and other economics for retailers — there are direct retailer benefits. For example, the AR in-aisle engagement uncovers shopping data that informs everything from inventory management to optimal store layouts.

“There are lots of analytics you can get as a retailer or brand when you actually have someone with a mobile device, or headset in the future, looking at your products,” said Lewis. “Retailers today try to guess your dwell time… there could be a whole lot of [AR] analytics that would be helpful.”



VPS: GPS For Indoors

Similar to Walmart's ambitions to provide an in-store shopping utility, Google is motivated to do something similar. Its visual positioning service (VPS) continues to develop as an in-store shopping utility. Think of it as a combination of Google Maps and Street View, but for indoor locations.

Working with partners such as Lowes, VPS will help shoppers navigate to and obtain information for products. Using point-cloud based 3D mapping data that it works with partners to collect, it forms the foundation for an indoor mapping utility – solving a common pain point in large stores.

"GPS can get you to the door, and then VPS can get you to the exact item that you're looking for," said Google's VR/AR lead Clay Bavor at last year's VPS unveiling at Google I/O. "Imagine in the future your phone could just take you to that exact screwdriver and point it out to you on the shelf."

Here, Google has self-interested reasons for pursuing retail AR. VPS aligns with its core search ad business with "last-mile" attribution data to report ROI to its advertisers. And it knows the best way to do that is to track dollars where they're spent which, again, is predominantly offline in physical stores.

Furthermore, commercial "intent" – a key factor for Google's search performance metrics – is high when you're in a physical store. That, plus VPS' ad-attribution capabilities, makes retail stores a long-coveted "holy grail" for Google. So it will continue to invest heavily to make VPS happen.

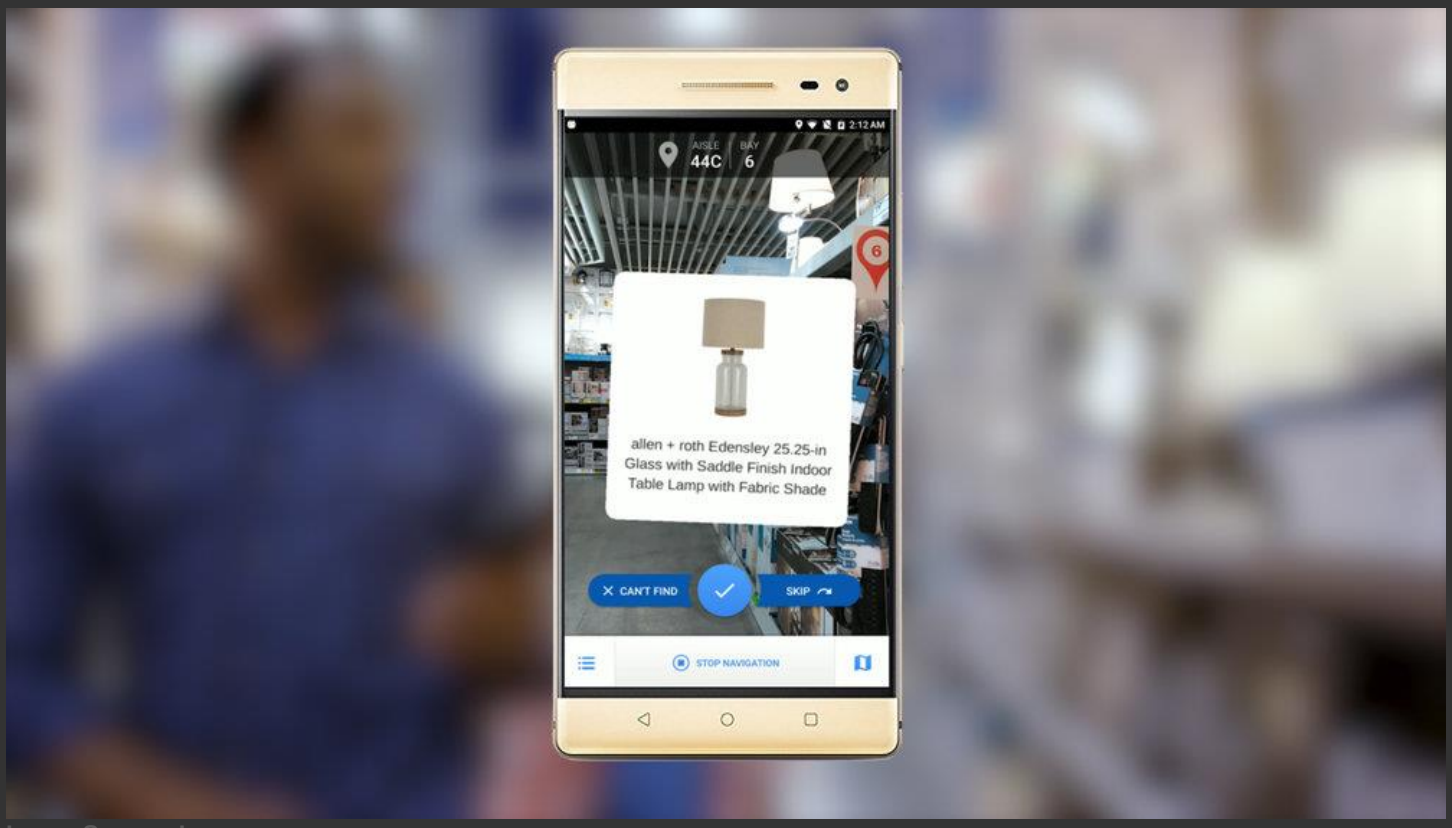


Image Source: Lowes

Google Lens: Organizing the World's Imagery

The term "best of both worlds" was used earlier to reference AR's fusion of online and offline commerce. Here we'll use the term again in reference to Google's efforts. While capturing the retail AR opportunity with VPS, it's also capturing the e-commerce opportunity with Google Lens.

So when you're away from VPS' in-store forte, Lens can perform visual searches on a wider variety of products you may encounter in the physical world. This will include the ability to not only get information on items, but to purchase them through Google Shopping or its search advertisers.

Its use cases will expand over time but currently include general interest (dogs, flowers) and commercial (products) searches. In fact, just like online search, Lens will be a free utility for general interest queries. But the real business case is for the smaller share of commercial-intent searches.

For example, point your phone at a store or restaurant to get business details overlaid graphically. Point your phone at a pair of shoes you see on the street to find out prices, reviews and purchase info. All of these use cases will apply Google's vast image database and knowledge graph.

"So now, when your friend is wearing a cool new pair of sunglasses, or you see some shoes you like in a magazine, you can use Lens to find them online and browse similar styles," said Google's Brian Rakowski at a Google Lens event in October. This style example has "legs" and Google knows it.

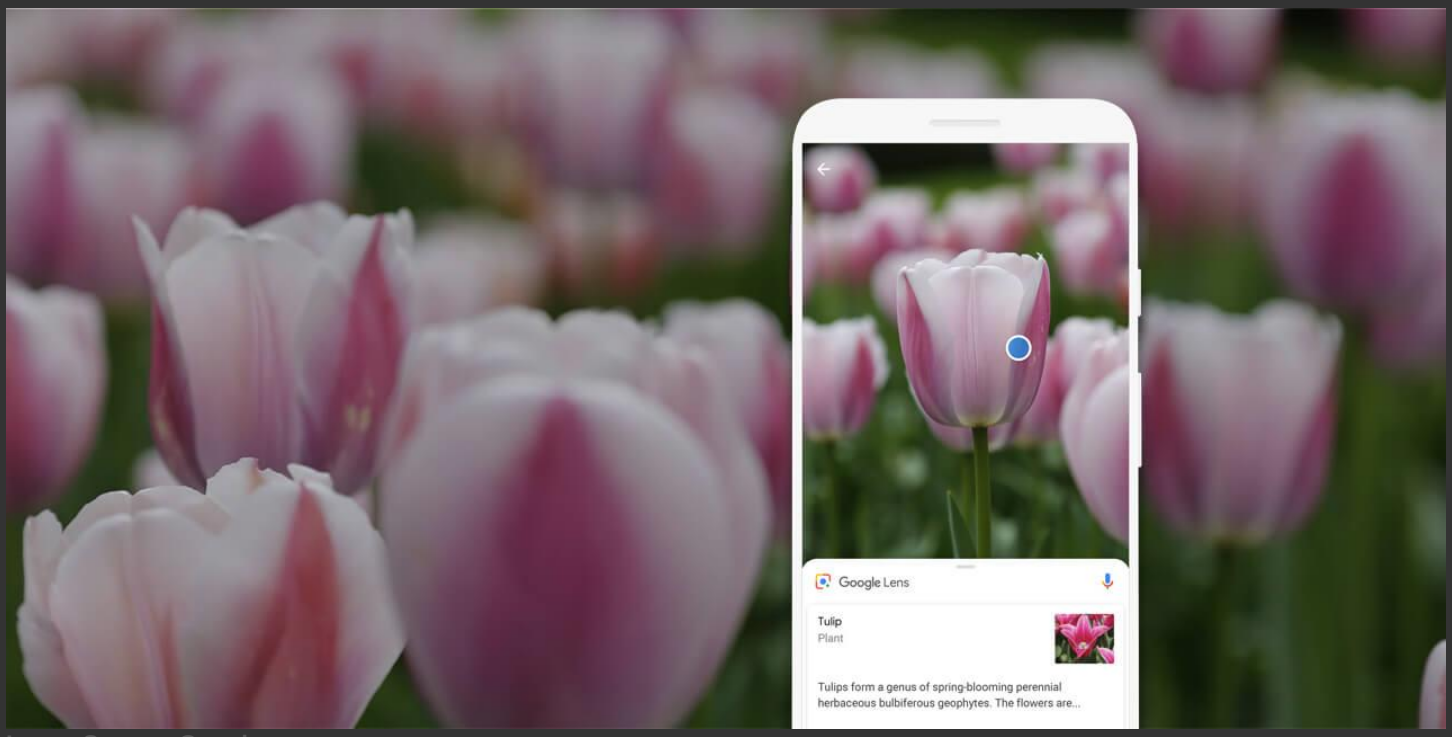


Image Source: Google

Google Lens will also use computer vision and machine learning to ingest and process text. For example, it will scan restaurant menus to search for the ingredients in a dish. It will do the same for street signs and other use cases that develop in logical – and eventually monetizable – ways.

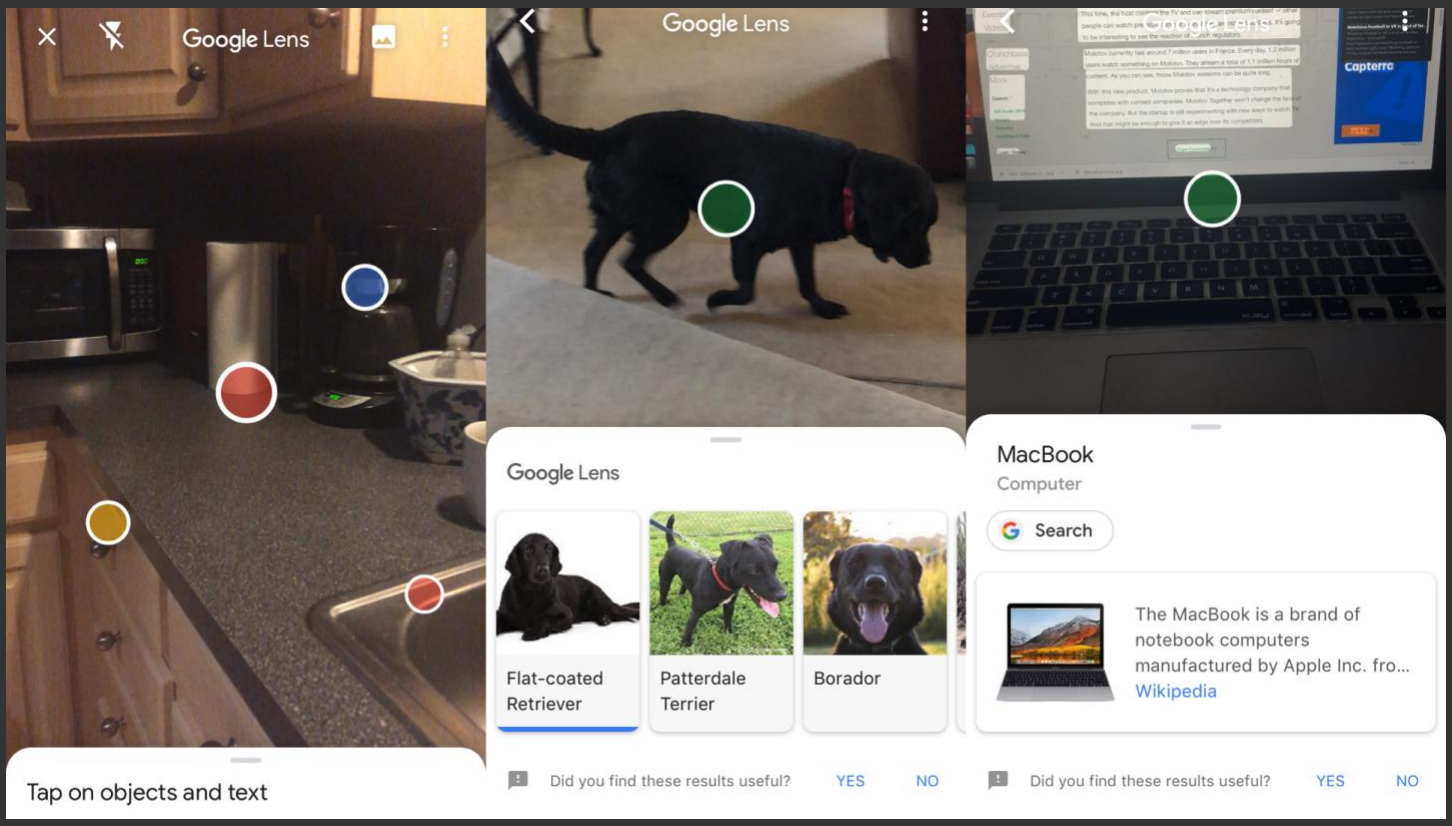
This can be considered an extension to Google's mission statement to "organize the world's information." But instead of a search index and typed queries, visual search utilizes machine learning and computer vision to process visual queries captured (arguably more intuitively) by the camera.

"The camera is not just answering questions, but putting the answers right where the questions are," said Google's Aparna Chennapragada at Google's I/O conference in May.

Case Study: Test Driving Google Lens

As Google Lens and its machine learning brains continue to develop, it's being dispatched to more access points. First available on Pixel 2, then Google Photos on iPhones, it's now on Google's core iOS app. So we decided to test it out on a variety of objects – everything from electronics to dogs.

The first thing that's different about the latest iOS update is that it's activated right in the search box of Google's main search app. Unlike the previous Google Photos integration on iOS (which made users take a picture first), this Lens version lets you just tap on objects in the camera's field of view.



This makes it a lot easier and dynamic, including walking around with the phone and identifying items on the fly. Its machine learning and image recognition go to work fairly quickly, while tapping into Google's vast knowledge graph to identify items as they come into the camera's view.

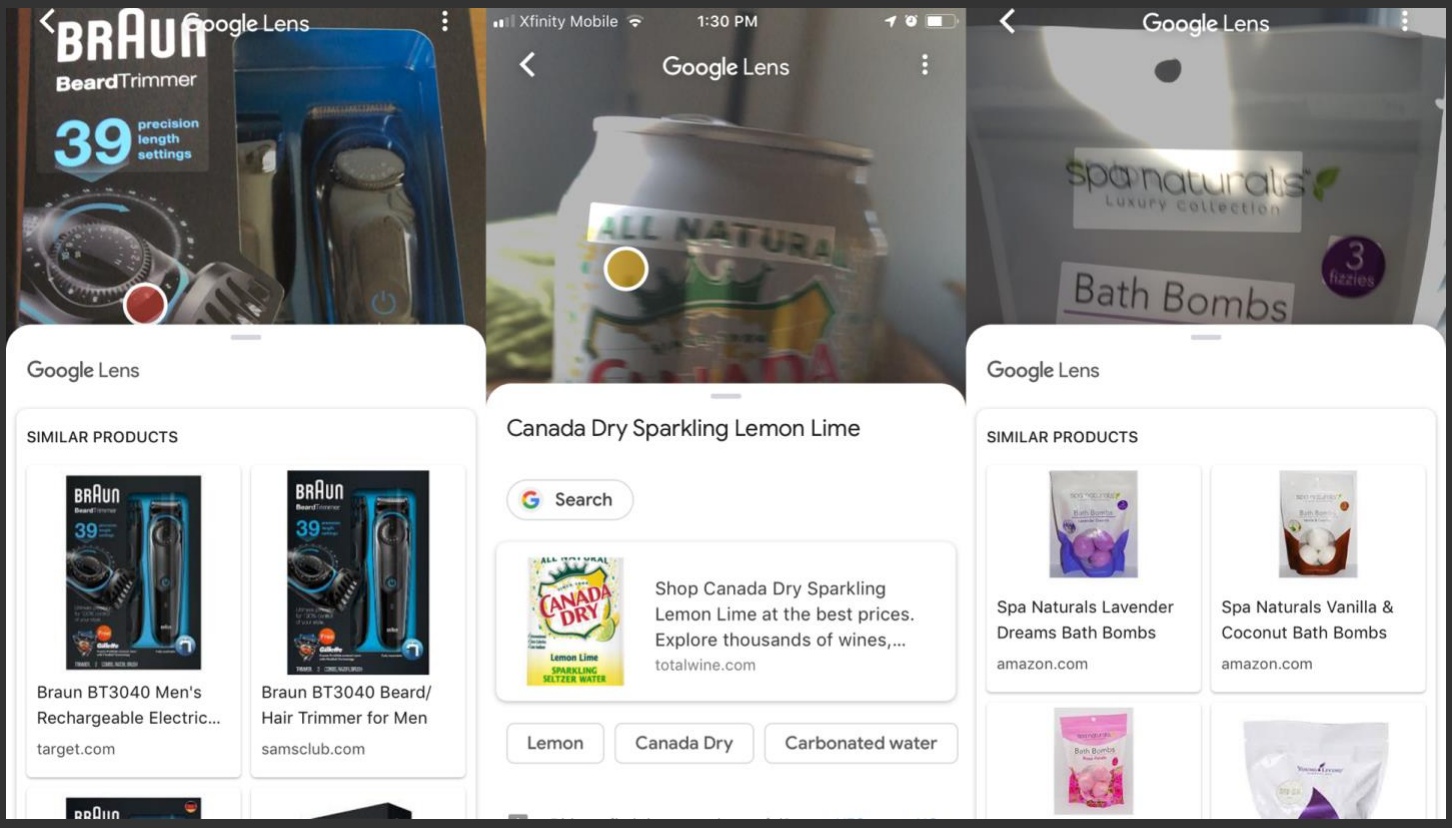
Most of this is hidden until you actively decide what to identify. Object search-prompts take form in Google-colored dots that, when tapped, launch a card from the bottom of the screen. This employs Google's familiar Material Design-oriented cards that are seen in apps like Google Assistant.

We tested Lens on a range of household objects like laptops, packaged goods and dogs, most of which it identified accurately. This range is what will make Google shine in visual search compared with, say, Amazon which will excel in products (explored later), but not general interest searches.

Google is rightly holding users' hands by promoting select categories and use cases, like dogs & flowers (fun) and identifying signage & menu items (useful). Utilizing its vase knowledge graph, these vertical specialties and use cases will develop and condition consumer behavior over time.

For now, we found it works best in "structured" visual queries. This includes packaged goods where it can pick out a logo, as opposed to generic items like a pillow. Products also represent the most reliable images (professionally shot, clean) in the database from which it matches objects.

It's also interesting to note that the Google Lens button sits right next to voice search in the search bar. This is symbolic of their common goal. Like voice, visual search's job is to create more search modalities and user touch points. This equates to more query volume (meaning revenue) for Google.



Google will continue to invest heavily in AR for the above reasons. It's off to a good start with a training-wheels approach to educate users on Lens, and to plant it in easy access points. Bringing it to the main Google iOS app is a big step in that direction. We'll see many more in 2019.

Case Study: Snapchat Joins the Party

Google isn't the only one keen on visual search. Snapchat continues to show lots of interest in the format. This makes sense for several reasons. Snapchat's core millennial demographic is comfortable with the smartphone camera. And Snapchat is motivated to find ways to boost its core ad business.

On the first point about alignment with Snapchat's user base, ViSenze reports that 62 percent of millennials are comfortable with visual search as part of digital shopping experiences.[vii] Not only are millennials (and Gen Z) "XR-native," but they're oriented towards things that are tangible and visual.

"Eighty percent of Millennials won't see a new home unless there's a virtual tour," said Build.com's Dave Nickens at the AWE conference. "It's going from 'tell me' to 'show me.' No one's going to read manuals unless you bring that manual to life. Don't tell me about it… let me experience it."

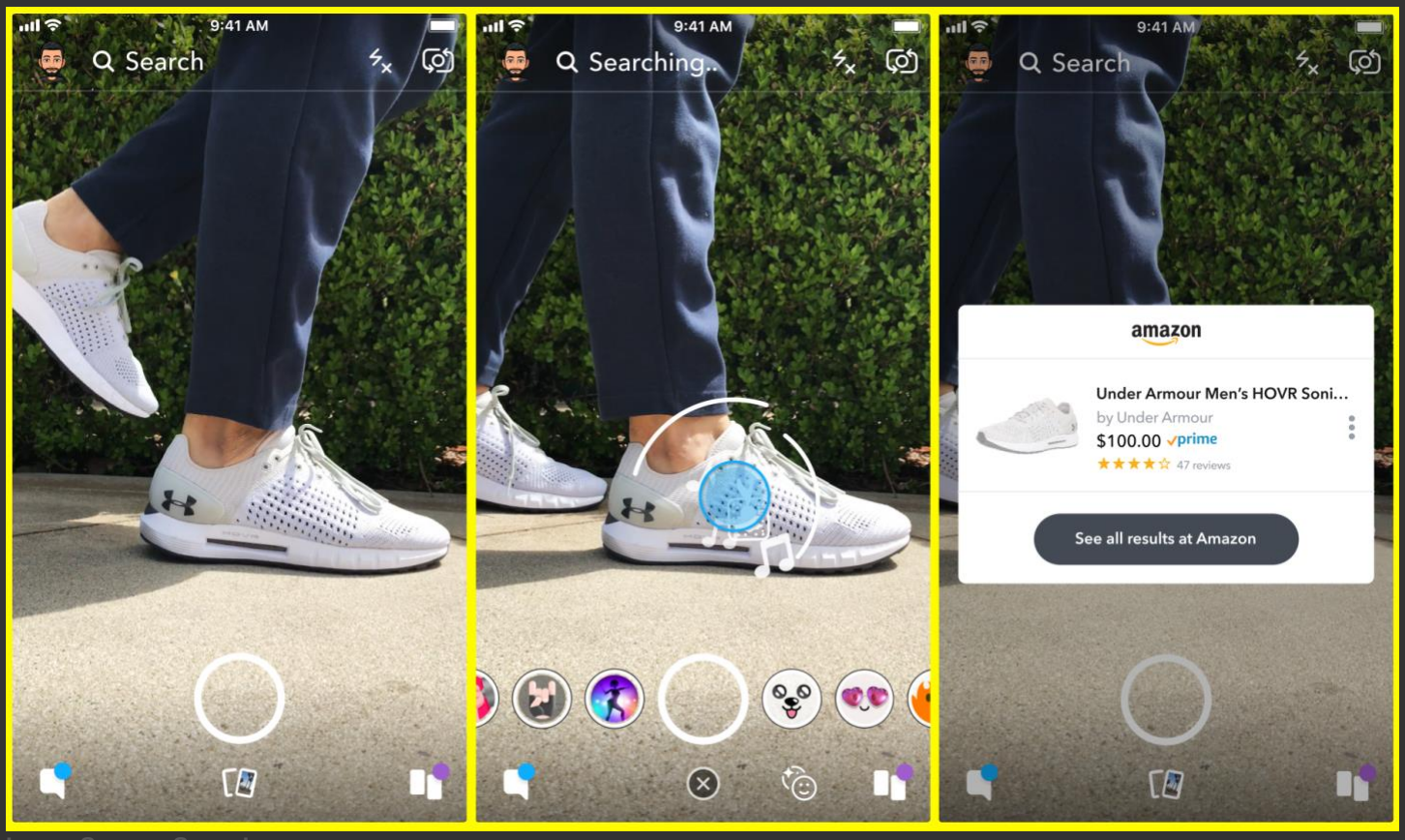


Image Source: Snap, Inc.

So what is Snap doing exactly? Its latest AR feature lets users scan physical items or barcodes with Snapchat's camera. It then overlays a card that shows information about that item or similar ones. That info will include price, reviews and a purchase button, all of which flow from Amazon.

That last part is a key factor, as Snapchat has intelligently partnered for better e-commerce functionality. But beyond just ability to transact, it also taps into Amazon's vast product image database for better object recognition, which means a more functional user experience.

Visual search is a logical extension for Snap. The company is an early AR leader which has conditioned AR behavior with younger users that already have a high affinity for the camera. Fashion is also in its DNA, making the style/product-hunting use case (similar to Google) a natural one.

But more importantly, it's a natural move because of its monetization potential. As referenced above, driving commerce is something Snapchat continues to develop, such as Shoppable AR[viii], and is central to its ability to grow revenue amidst volatile and sometimes-troubled stock performance.

Snap hasn't disclosed if it's getting affiliate revenue from Amazon for purchases it drives. More likely, it's a barter which brings Amazon's integration for a more thorough user experience. It also boosts user engagement and validates an AR commerce model that's core to Snap's long-term vision.

The longer-term play could also be glasses-based. Like Apple[ix], Snapchat is likely seeding that potential end-point by conditioning users in various ways. One of those ways are its Spectacles. Though they aren't AR glasses, they could be acclimating the world to face-worn sensors.

"That's the secret strategy or the Trojan horse: How do you get enough sensors in people's hands at a cheap price or on their face?" Ubiquity 6 CEO Anjney Midha said recently.[x] "That sets them up for very immersive AR experiences or any kind of VR experiences a year or two years from now."

Image Source: Snap, Inc.

Part II. Using AR to *Visualize*

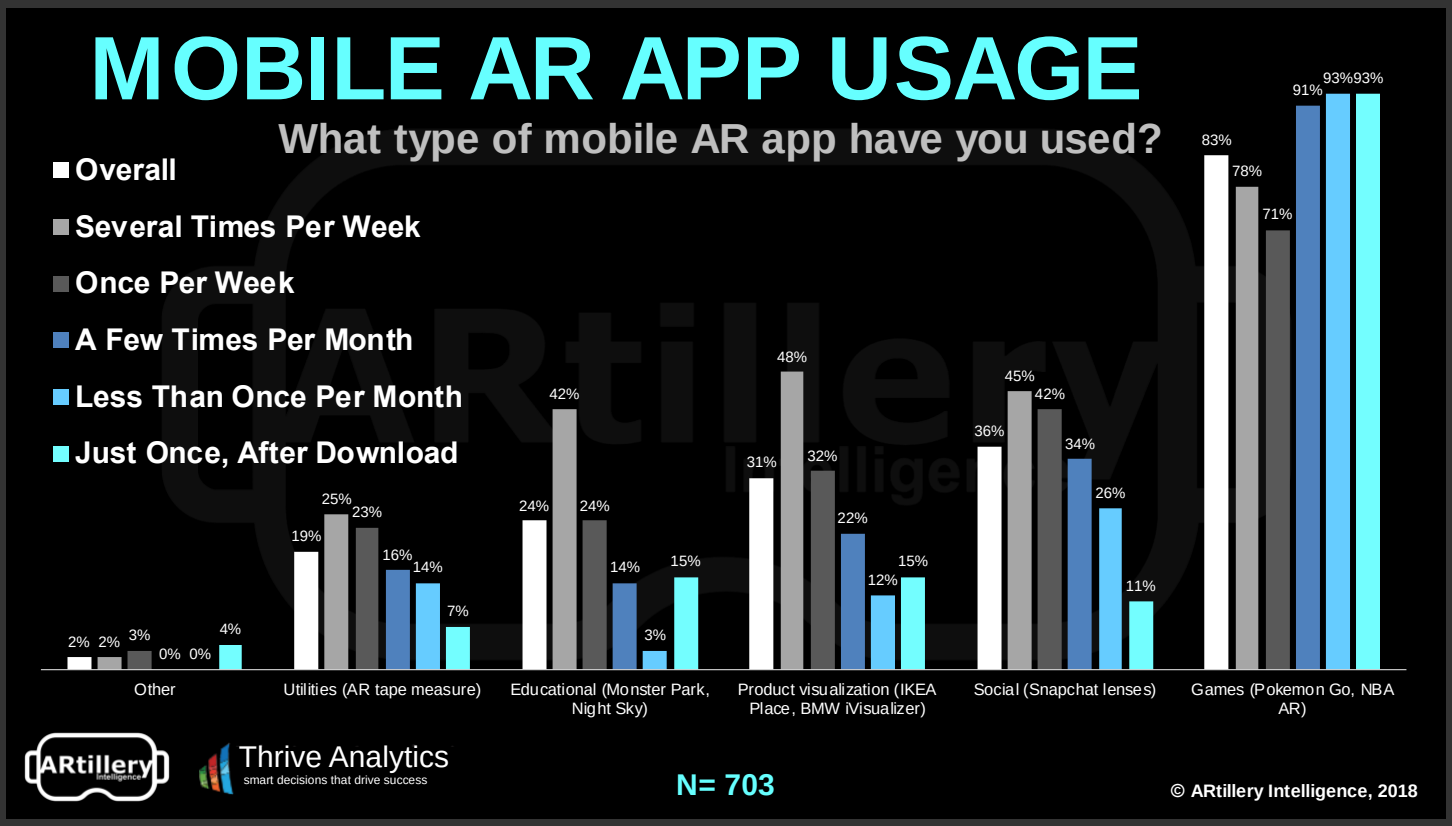
Moving beyond AR's use in visual search, what about its other main modality: product visualization. This is all about using AR as a way to anchor 3D graphics in one's space to simulate the placement of a corresponding product. This is usually done to see if something fits (in size and in style).

Faces & Spaces

There are a few places that AR product visualization is being applied, which indicate the product categories where it's most conducive. The first is on one's face or body. This is usually done through face filters and lenses. It involves activities like trying on cosmetics or fashion items like sunglasses.

This is where AR commerce overlaps with AR advertising. As we've examined,[xi] brands like Michael Kors are buying AR News Feed ads on Facebook that let users virtually try on sunglasses in AR. Where it transitions into commerce is the ability to buy the product seamlessly within the same app.

Similarly, home goods are a leading product category in AR commerce. Due to the size, shipping costs and need to see large items like a couch, AR visualization has solved prevalent pain points. Seeing if a couch fits in your living room before ordering it online can save lots of headaches.

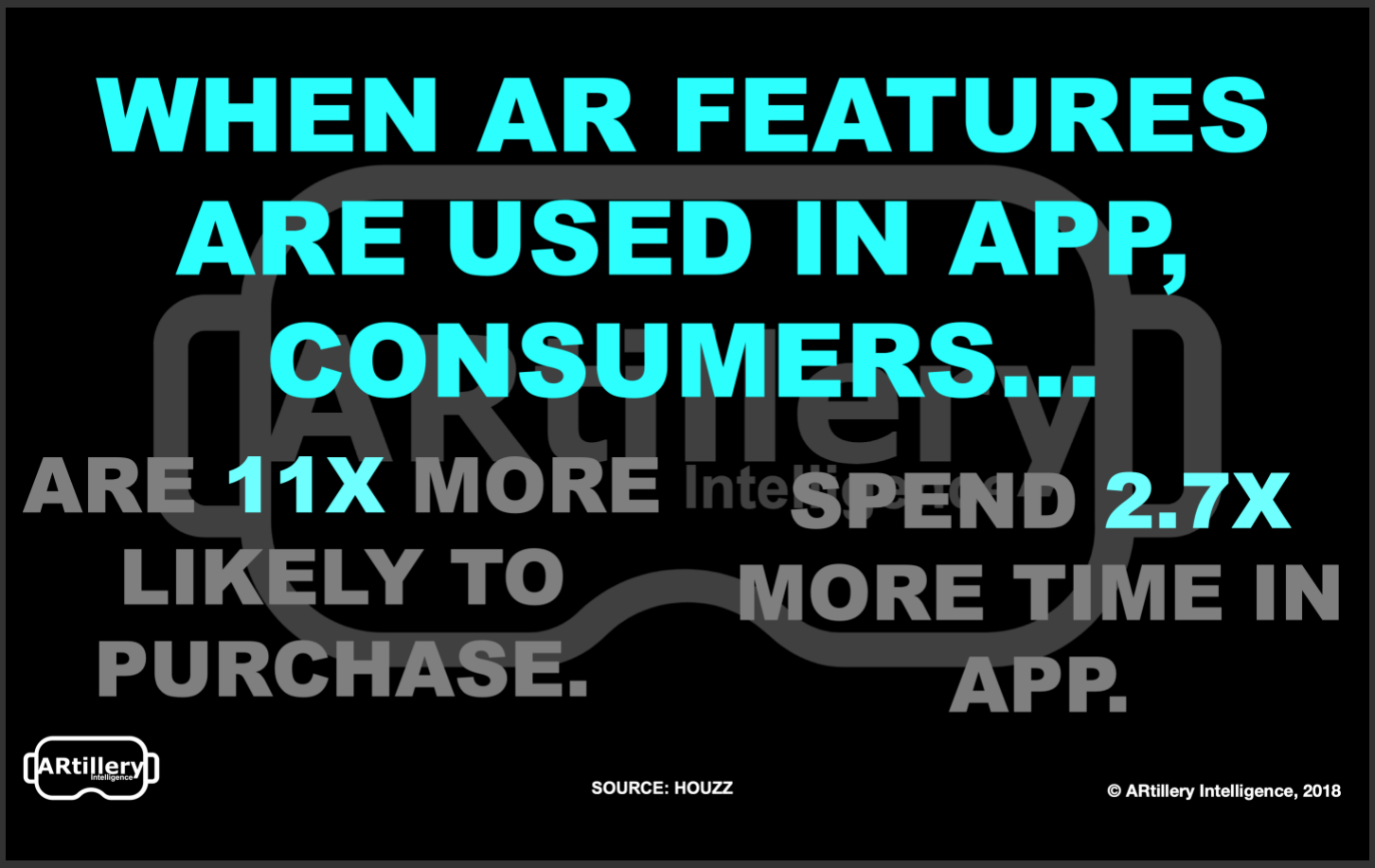


And these theoretical benefits are proving out. In ARtillery Intelligence's AR consumer survey with Thrive Analytics, product visualization had a high share of users among AR app categories that return to use it several times per week. This frequency metric will be a key success factor for AR.

These consumer benefits translate also to online retailer benefits. Amazon sees greater conversions and basket sizes from its popular AR View feature. It also sees fewer product returns, due to more informed buyers. That solves a big pain point for Amazon: costly returns on large items like TVs.

But the most impressive performance indicators so far come from online furniture retailer Houzz. It reports its in-app AR furniture visualization tools have boosted conversions 11x and spend level 2.7x. And this comes from a meaningful sample of a million customer interactions with its AR feature.[xii]

Other ROI proof points can be seen from BMW (cars) and RoOomy (furniture), each of which are detailed in case studies below. The Bottom line: AR visualization can deepen relationships with customers, thereby bringing AR from novelty to actionable and trackable commerce.



Case Study: BMW Moves Cars With AR

Cars hit all the marks for products that are fitting for AR visualization: big and expensive. According to a survey conducted by ZeroLight,[xiii] 82 percent of consumers "totally agree" that they'd like to see, explore and configure their next car using AR. 88.5 percent believe AR will influence their purchases.

The poster child of AR visualization for cars is BMW iVisualizer. Not only does it let you anchor and view a virtual car in your driveway viewed through your smartphone, but it lets you save customizations and research or buy the car locally. This brings it from novelty to attributable value.

"The issue was how do we get millennials, who don't like going to dealerships and dealing with car salesmen, to interact with and configure the car?" Accenture's Rafaella Camera (consultant for iVisualizer) told ARtillery Intelligence recently "That's the type of ROI they're looking for."

This underscores one of AR's benefits which is to span upper funnel (brand engagement, awareness) and lower funnel (purchases) consumer activity. We've examined this full-funnel advantage in light of AR advertising,[xiv] but it equally applies to brand-specific marketing & commerce apps like iVisualizer.

"We have this link to jump from the app to the BMW web configurator," said Accenture Digital's Matteo Alberti on stage at June's AWE conference. "This is very important because it continues the customer journey, and of course you can also search for your nearest dealer."

Image Source: BMW

According to BMW's Stefan Biermann, the strategy is working. Specifically, more than 25 percent of app starts go from AR car visualization to the online configurator. From there they can begin to see prices and local dealer inventory, which BMW calls the "configurator jump."

"In addition to the immersive experience and interaction with our cars, what we achieve is that twenty five percent of all app starts then go one step further in essence in our sales funnel," he said on stage. As they're led through that funnel, they can see actual cars available near them.

That last part is key, as BMW realizes that no one buys a car sight unseen. Though iVisualizer (and AR in general) is proving to be a valuable tool to onboard consumers into product engagement and contextualization, it's not a silver bullet. People still want to see and touch the actual car.

With that local/immediate gratification in mind, BMW designed the app to only visualize models that are available locally. That ensures high-intent users aren't disappointed at the dealership. And it shows that optimized commerce — not AR novelty — is a guiding principle of the app.

"In 38 markets, you see the car that you can actually buy," said Alberti. "This is very important. There is an engine in the app that basically selects and pushes to the customer exactly what you can actually configure and buy in your specific country."

Also important is the data that BMW is able to collect from a large sample that's engaged in a high-touch (literally) AR interaction with the product. Ingesting such data can inform regional sales patterns, supply-chain management, inventory and all kinds of marketing insights.

"Using the analytics, you can get lots of information about what users prefer," said Alberti, echoing the earlier sentiments of Walmart's Lewis. "This really adds to the business case. When you build such applications, basically you can collect lots of feedback in real-time about what consumers want."

Image Source: BMW

Case Study: Selling Furniture… and The Whole House

AR real estate innovator roOomy is built on a lot of the same visualization features explored above, but with a twist. It not only lets you visualize new furniture around the house, but it also wants to sell you the house itself. This bolts AR furniture visualization to a logical context: real estate sales.

The three sides of its business 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 in its full potential," roOomy BD Director Taylor Wilding told ARtillery Intelligence 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 home buyers view dynamically through its AR app. This natural habitat for furniture boosts conversions.

"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."

Image Source: roOomy

Lastly, real estate agents themselves pay roOomy on a per-listing basis. And they tend to be early adopters, given a hunger for tools that can give them an edge in closing big deals. There's also cost savings in virtual staging, and further incentive through a cut of furniture sales.

Of course, viewing a new home through the small window of your smartphone still needs time to marinate as a consumer activity. But the Amazons and BMWs of the world could accelerate that learning curve, not to mention the muscle behind Apple (ARkit) and Google (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."

Image Source: roOomy

Case Study: Amazon Enters

AR has clear implications for supporting e-commerce and boosting Amazon's ability to sell things and improve margins — core organizational priorities. This could play out in a few ways, mostly orbiting online shopping, increasing the probability of purchases and decreasing the probability of returns.

Like many of the above examples, Amazon's app houses an AR feature that lets you place virtual products around your house. Known as AR View, it visualizes stylistic and practical factors like if the TV will fit on the wall. Amazon also likes it because it reduces margin-depleting TV returns.

"For big-ticket purchases, historically you would try to visualize what it would look like in your home," said Lenovo's Carter Agar who worked with Amazon on an early AR integration on Lenovo phones. "Amazon thinks a lot of that can be simplified through allowing consumers to visualize that product."

In fairness, Amazon isn't the only company taking this image-based approach. Wayfair and IKEA have launched AR features that let shoppers visualize furniture placement. And Pinterest lets users take pictures of products to search for similar items. But Amazon's scale may give it a natural lead.

Furthermore, Amazon's work in machine learning and AI for voice (Alexa) positions it well against competitors. Those parallel efforts with voice indicate Amazon's interest in using alternate forms of search to increase the levels of interaction — and ultimately order volume — from online buyers.

Another big differentiator for Amazon's AR visualization is that it doesn't require a standalone app. Given that Amazon's flagship mobile app is highly used, the company decided to include AR features with several launch points in the shopping flow, including the home screen and product pages.

This exemplifies a strategy we call "AR as a feature." The idea is that AR's early days compel "training wheels" for potential AR users. And one way to train them is to ease them into the experience by meeting them half way. That means delivering AR within the apps they already use.

Lastly, visualization only represents one dimension of Amazon's AR ambitions. It will also likely launch more visual search functionality, similar to Google Lens, explored earlier. This builds from its decade-old FLOW app that let users buy any book by taking a picture of its cover.

But with advancements in computer vision and object recognition, the proposition is now to search for a broader range of products, as Amazon's catalog has likewise broadened. The idea is to find matches for products or complementary products – a longstanding tradition on Amazon.

Based on AR's current surge, and Amazon's proven interest, ARtillery Intelligence believes the company will re-activate the path it once initiated with FLOW. Evidence can already be seen in its visual search partnership with Snapchat (profiled earlier), in which it's testing the current waters.

Image Source: Amazon

AR Building Blocks: 3D Scanning

One key piece of the puzzle for all of the above AR visualization technologies is the actual 3D assets that correspond to real products. This is an important and challenging component, especially for retailers like Amazon that have such vast product libraries, or even furniture-only players like IKEA.

And if it's a challenge for them, it's definitely a challenge for the long tail of mid-market and small business retailers. For this reason, we believe a key business opportunity over the next five years will be technologies that democratize and streamline 3D digital asset creation for physical goods retailers.

"Whenever anyone asks what they need to do to get ready for the future, I say make digital twins of everything in your inventory," Unity's Timoni West told ARtillery Intelligence. "A lot of companies don't have that right now or they have CAD files for 3D printing that are too big and won't work for mobile."

Beyond tools for 3D digital asset creation, the next step in the value chain will be indexing and distribution. Think of it like Getty Images for AR components. We've seen some movement in this direction such as Sketchfab and Google Poly, though the latter is mostly artistic content.

In the near term, IKEA, Wayfair and others offering AR visualization apps rely on individual solutions to scan products. But the real opportunity is for specialized and standardized methods that can help them scale up 3D image libraries, and bring it within reach of smaller down-market players.

"Larger players like Wayfair and IKEA have their own means and methods they've created in-house, because there's nothing out there that's scalable, affordable and easy," said Super Ventures Partner Tom Emrich at a recent event. "These are startup opportunities that, as an investor, I'm looking at."

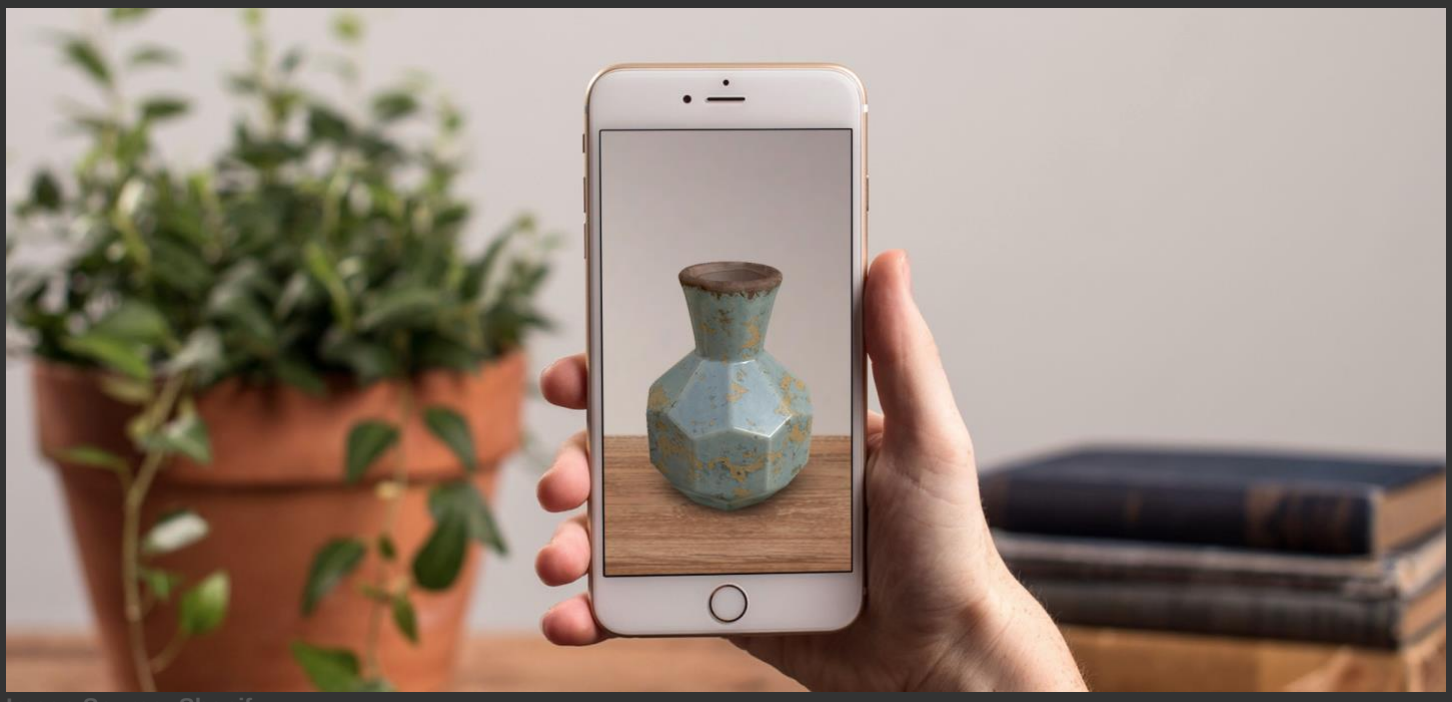


Image Source: Shopify

Case Study: Shopify Brings AR to 600K Stores

During Apple's WWDC, the company announced AR Quick Look. This builds on one of AR's most promising and monetizable use cases — product visualization — by making it more accessible to users in mobile browsers. And it's accessible to developers using the new USDZ file format.

One area where Quick Look will shine is product visualization. And the latest company to adopt it is Shopify. The company announced that it will integrate Quick Look into its pervasive e-commerce suite, thus bringing it to 600,000 businesses and effectively lowering AR adoption barriers.

This will have a democratization effect, per the previous section. There are minor drawbacks, such as the fact that Quick Look only works on the Safari mobile browser, which limits its reach. Bike shop PureCycles reports that 50 to 60 percent its site visitors are mobile, and 70 percent use Safari.

And though USDZ has a democratizing effect on 3D asset creation, it's still a proprietary file format which will have some compatibility hurdles in early days. On the bright side, USDZ integrates directly with Adobe Creative Suite which is a big boost, given its ubiquitous design tools like Photoshop.

Overall, Shopify's move is a step forward for AR commerce. This will continue to be a slow process of consumer and retailer acclimation. It's a classic chicken and egg dilemma — retailers aren't motivated to invest in AR when consumers aren't yet clamoring for it… and vice versa.

But if there's anything that will jumpstart that chicken & egg dilemma, it's businesses taking the lead on adopting tools like Quick Look. They'll need a business case to do so. Fortunately, we're already seeing just that, with companies like Houzz (cited earlier) reporting clear lifts in conversion rates.

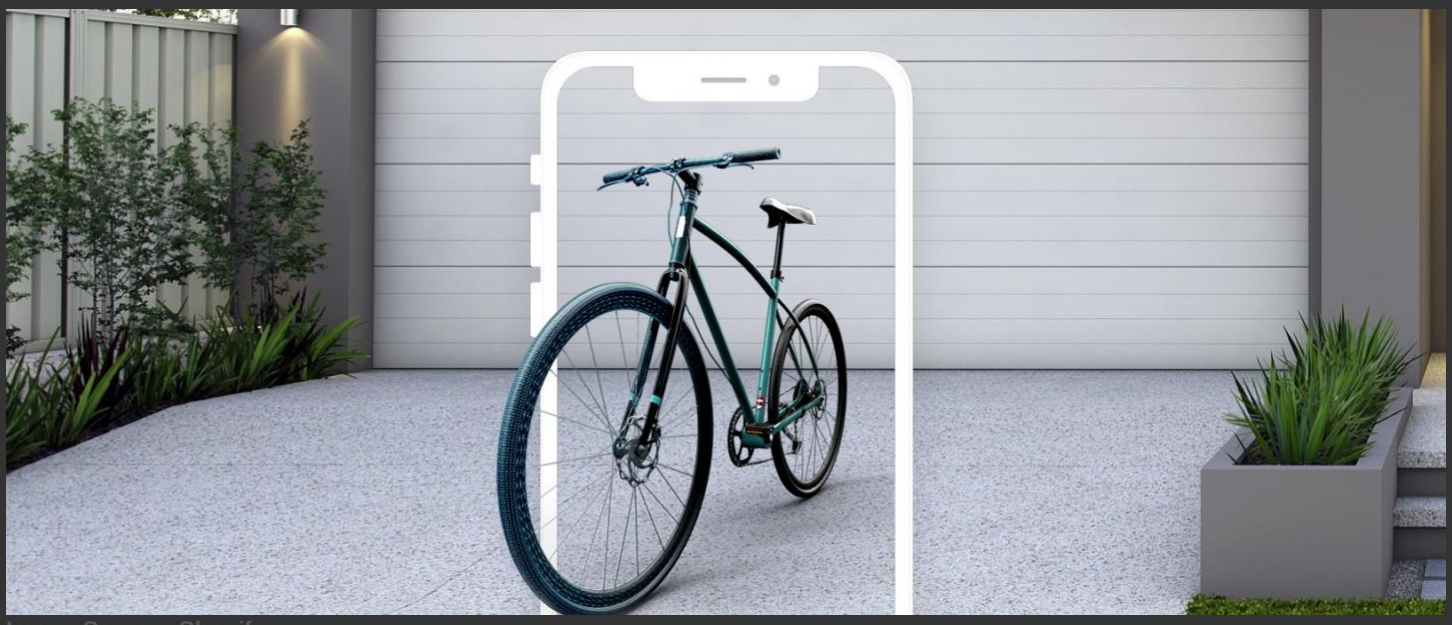


Image Source: Shopify

Part III. Success Factors

One of the benefits of the evolving AR modalities covered in this report is that they have the potential to be true consumer utilities. Though gaming and social will be key AR use cases, we believe that some of the more mundane or utilitarian apps – like Google Lens – will scale as "all-day" use cases.

But though they're broadly applicable, visual search and AR visualization aren't silver bullets. For example, the latter is useful with large items (furniture) or sku-intensive categories (cosmetics). It also shines where there's lots of variability and product attributes such as size, color, texture, etc..

"It's objects that have some kind of texture or size that [users] want to measure… and that could be on their body," said Transformation Group's Irena Cronin at AWE "This is a way of adding more info. Not only that, but to go through with the purchase right after [makes it] extremely good for utility."

But in addition to utility, it should maintain some novelty or sex appeal said Media Monks' Kelly Kandle during the same AWE panel. The primary goal is utility, but there's also an entertainment or brand marketing angle — showing again that AR can span the consumer purchase funnel.

"There's kind of that x-factor of bringing in brand ethos and style," she said. "Lacoste has a great AR app which is trying on shoes, but surrounding that is the whole experience of different graphics which is aligned with their style guide. So I think it's kind of in those two buckets."

Image Source: BMW

But the guiding principle is AR experiences that drive recurring engagement instead of novelty-driven one-time use. And that's all about designing for everyday people. This invokes a fundamental success factor in AR and technology in general: solve human problems, not engineering ones.

"You don't want to build something and spend millions of dollars and it's a one-time experience," said Walmart's Lewis "That one-time experience may be amazing… but we try to make sure that we build it so it works for everyone — not just the one-time use but for continuous use."

The Don'ts

Beyond where AR works in retail and brand marketing, what about where it doesn't work? Kandle warns against half-hearted, under-budgeted AR activations; or those that are done just for the sake of doing *something* in AR. This ends up being ineffective at best and damaging at worst.

"For me, as I work with brands and agencies, the projects that don't work well is when there's not a real reason for it," she said. "Or there's not a budget and you're just doing it for the sake of checking that box that 'we did an AR project.' I think those are the ones that kind of fall flat."

Another mistake that will be prevalent in AR commerce (and AR advertising) is ill-fitting performance metrics. As is always the case with emerging forms of media, the metrics of legacy formats – with which everyone is comfortable – get shoehorned in. AR will need native metrics to succeed.

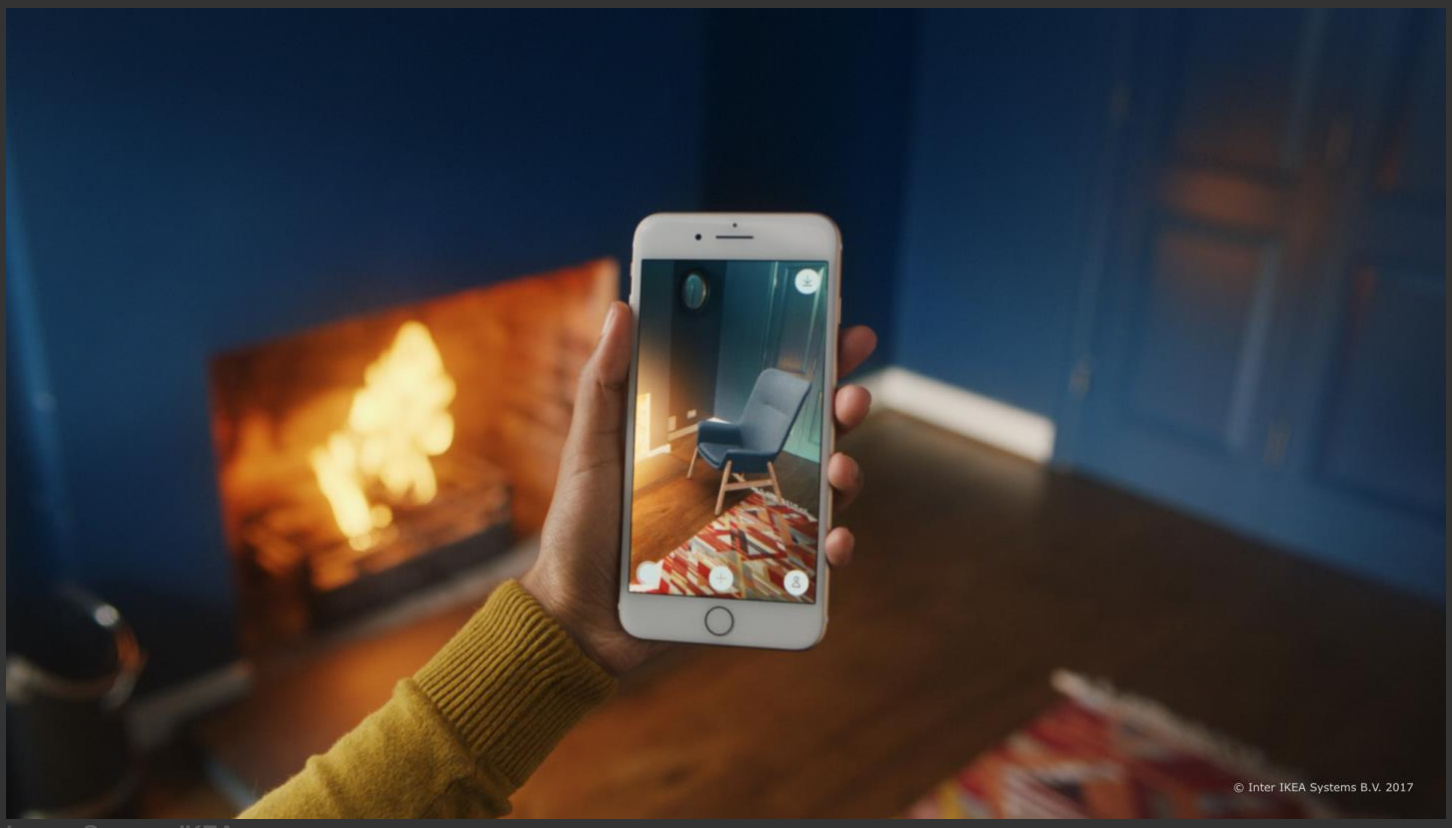


Image Source: IKEA

Here again, there is a historical lesson: Just like early days of smartphones when legacy metrics were slapped onto mobile apps, we'll see lengthly learning curves for AR commerce players to not only design experiences natively but *measure* them natively. Otherwise AR's efficacy will be misjudged.

For example, we'll likely see AR user engagement measured with things like click through rates. The eventual metrics will have to better capture things like buyer intent or transactions. Given AR's use in retail and last-mile engagement, it should measure activities that happen closer to the transaction.

And because of the use of the front facing camera for things like lenses, computer vision could enter the picture to determine quantitiative signals of brand affinity and engagement through biometric measurements. Like Walmart's Lewis stated earlier, things like retail dwell time can be tracked.

"With immersive technology, everyone's going to ask for the ROI," said You Are Here Labs' futurist and XR marketing guru, Kathy Hackl at AWE. "Do we need new metrics… something like return on engagement or whatever that would translate to? There's definitely going to be new metrics."

Final Thoughts: Techno-Darwinism

AR in retail will be the latest version of "showrooming" — the smartphone-era trend of using the mobile device's connectivity and portability to inform in-store purchases (or order online). And just like with showrooming, the losers in the next era of AR commerce will be those that try to fight it.

We're currently seeing lots of examples of this "adapt or die" principle with retailers embracing digital disruption. There's a growing divergence in the retail sector where digital converts are thriving and exceeding quarterly revenue targets, while non-adaptive companies are dying a la "retailpocalypse."

The former include companies like Target and Walmart that are innovating with in-store digital shopping tools, mobile payments and order/pick-up features. The latter include companies like Toys 'R Us and Sears that failed to embrace mobile technology and millennial proclivities.

The next step won't just be AR but complimentary forms of in-store digitization like cashier-less stores, and other innovations being pushed by Amazon. Retailers will have to look beyond next quarter to bring tech to their aisles, and control their own destinies. If not, someone else will.

Bottom line: Amazon is bringing the advantages of in-store shopping to e-commerce through AR product visualization. Retailers can likewise use AR and visual search to bring the advantages of e-commerce to their aisles. Those that do will be primed (excuse the pun) for the next era of commerce.

Key Takeaways (redux)

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

- AR monetization is taking many forms including advertising, gaming and enterprise productivity.
- The area of AR that's potentially most primed for revenue generation is driving consumer purchases.
  - This includes graphical overlays that inform consumers during their shopping processes.

- ARtillery Intelligence projects $6.1 billion in annual transactions will be influenced by AR interfaces by 2022.

- There are two main ways this is materializing: *visual search* and *AR visualization*.
  - *Visual search*, utilizes the smartphone camera and computer vision to identify and contextualize products.
  - *AR visualization* virtually places product mockups in one's space to better understand them.

- Visual Search a.k.a. "search what you see" will inherit benefits and revenue potential from online search.
  - This includes high-intent queries, done through the millennial-friendly smartphone camera.
  - One third of AR users see it as a valuable shopping utility according to ARtillery Intelligence data.

- Retail visual search will combine the best of e-commerce (digital interaction) and retail (see & feel) shopping.
  - Leaders so far include Walmart and Lowes, which have launched visual search and AR visualization tools.

- Outside of retail contexts, Google will dominate visual search (Google Lens) for general interest queries.
  - Its strengths and positioning are anchored in an existing search index and knowledge graph.
  - Most searches will be general interest, while a smaller share will be monetizable (just like online search).
  - Google is highly motivated to invest in visual search, due to its alignment with the company's core business.
  - Visual search will help achieve "last mile" conversion data – a longtime holy grail for Google.
  - Snapchat is also pushing hard on visual search, in partnership with Amazon (product data).

- Beyond visual search, product visualization is proving to be an opportune area of AR commerce
  - Houzz reports that AR furniture visualization tools have boosted conversions 11x and spend levels 2.7x.
  - BMW reports that 25 percent of its iVizualizer app starts go to an online car configurator.
  - The consumer journey from visualization to purchase makes this a rare "full funnel" medium.
  - Consumers also scored visual search high in ARtillery Intelligence's AR consumer survey.

- Armed with such metrics, many brands have launched AR visualization, especially for large, costly products.
  - Leaders so far include BMW, IKEA, Wayfair and Amazon, the latter being a sleeping giant in AR commerce.

- The biggest missing puzzle pieces in AR visualization include 3D product scans.
  - Product scans – and easy ways to create them – will be a massive business opportunity.
  - Steps made so far include Shopify's integration of the USDZ 3D-imaging file format.

- Success factors in AR commerce will include prioritizing ongoing active utility over novelty.
  - Sustainable AR commerce experiences will be mundane "all-day" use cases like Google Lens.
  - Lowering adoption friction will be a key strategy, including "AR as a feature," versus standalone apps.
  - Brands and retailers that launch AR experiences to "check a box" or appear tech-forward will fail.
  - Native thinking will win, as will native metrics: new analytics will develop for user engagement and ROI.
  - In a transformative period for retail, winners and losers will map to tech adoption, including, but not limited to AR.

About ARtillery Intelligence

ARtillery Intelligence chronicles the evolution of augmented reality (AR) and virtual reality (VR). Through writings and multimedia, it provides deep and analytical views into the industry's biggest players, opportunities and strategies. It's about insights, not cheerleading.

Run by analysts and former journalists, coverage is grounded in a disciplined and journalistic approach. It also maintains a business angle: Though there are lots of fun and games in AR & VR, long-term cultural, technological and financial implications are primary.

Products include the *AR Insider* publication and the *ARtillery PRO* research subscription, which together engender a circular flow of knowledge. Research includes monthly Intelligence Briefings, market-sizing forecasts and consumer survey data, all housed in a robust intelligence vault.

Learn more at **https://artillry.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://artillry.co/about/

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* and Editor-in-Chief of *AR Insider.*

Mike is a frequent speaker at industry conferences such as AWE, VRLA and LeadsCon. He has authored in-depth reports and market-sizing forecasts on the changing tech & media landscape. He contributes regularly to 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/

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 tech sector research and intelligence. This includes the past 3 years covering AR & VR exclusively, as seen in research reports and daily reporting.

Furthermore, devising these figures involves the "bottom-up" market-sizing methodology, which involves granular ad revenue dynamics such as campaign pricing and spending. For more on *ARtillery Intelligence's* market-sizing methodology, see the explanations at the following link.

https://artillry.co/artillry-intelligence/forecasts/methodology/

Disclosure and Ethics Policy

ARtillery Intelligence has no financial stake in the companies mentioned in this report, nor was it commissioned to produce it. With respect to market sizing, *ARtillery Intelligence* remains independent of players and practitioners in the sectors it covers, thus mitigating bias in industry revenue calculations and projections.

ARtillery Intelligence's disclosure and ethics policy can be seen in full at:
https://artillry.co/about/disclosure-and-ethics-policy/

Contact

Questions and requests for deeper analysis can be submitted at:
https://artillry.co/contact/

References

[i] See ARtillery Intelligence Briefing, *Enterprise AR: Impacting the Bottom Line:* **https://artillry.co/artillry-intelligence/enterprise-xr/**
[ii] See ARtillery Intelligence Briefing, *The Camera is the New Search Box: Ads in AR:* **https://artillry.co/artillry-intelligence/the-camera-is-the-new-search-box-ads-in-ar/**
[iii] See ARtillery Intelligence Briefing, *AR Usage & Consumer Attitudes:* ***https://artillry.co/artillry-intelligence/mobile-ar-usage-and-consumer-attitudes/***
[iv] See ARtillery Intelligence Briefing, *AR Business Models: The Top of the Food Chain*: **https://artillry.co/artillry-intelligence/ar-business-models-the-top-of-the-food-chain-part-i/**
[v] See ARtillery Intelligence Briefing, *AR Usage & Consumer Attitudes:* ***https://artillry.co/artillry-intelligence/mobile-ar-usage-and-consumer-attitudes/***
[vi] **https://arinsider.co/2018/04/30/data-point-of-the-week-retail-xr-will-reach-1-6b-in-2025/**
[vii] **https://arinsider.co/2018/10/29/data-point-of-the-week-millennials-comfortable-with-visual-search/**
[viii] See ARtillery Intelligence Briefing, *The Camera is the New Search Box: Ads in AR:* **https://artillry.co/artillry-intelligence/the-camera-is-the-new-search-box-ads-in-ar/**
[ix] See ARtillery Intelligence Briefing, *AR Business Models: The Top of the Food Chain*: **https://artillry.co/artillry-intelligence/ar-business-models-the-top-of-the-food-chain-part-i/**
[x] **https://artillry.co/2018/09/21/xr-talks-building-an-mmo-for-the-real-world-part-1/**
[xi] See ARtillery Intelligence Briefing, *The Camera is the New Search Box: Ads in AR:* **https://artillry.co/artillry-intelligence/the-camera-is-the-new-search-box-ads-in-ar/**
[xii] **https://arinsider.co/2018/02/26/data-point-of-the-week-ar-boosts-purchase-intent-and-time-in-app/**
[xiii] **https://arinsider.co/2018/10/01/data-point-of-the-week-car-shoppers-hungry-for-xr/**
[xiv] See ARtillery Intelligence Briefing, *The Camera is the New Search Box: Ads in AR:* **https://artillry.co/artillry-intelligence/the-camera-is-the-new-search-box-ads-in-ar/**