VISUAL SEARCH

THE TECHNOLOGY & THE MARKET
WHO USES IT, HOW & WHY?
SUMMARY

Large internet providers like Google have been interested in visual search for more than ten years. Already entrenched in large security-focused applications, technological limitations prevented the widespread commercialization of visual search technology at the consumer level—until recently, via mobile app deployment.

Analysts predict that the time is right for a global implementation of visual search technology. Today, the widespread penetration of mobile culture makes consumers receptive to image-based shopping.

Retail visual search technology gives retailers the edge needed to stay competitive today by enhancing customer experience and engagement as well as facilitating impulse purchases. Many top retailers have deployed visual search technology in their customer mobile/web apps in the last 18 months, either to their complete catalogs or for specific product lines.

Currently, visual search is implemented in numerous retail sectors—apparel and accessories, home improvement and decor, electronics and toys, as well as fast-moving goods like groceries. Visual search has great potential in the world’s developing countries, since these regions are very mobile-friendly.

The data emerging from recent deployments of visual search indicate that visual search has significant positive impact on sales. In addition to customer mobile apps, technology providers are exploring other innovative ways to implement visual search broadly.

A global leader in retail visual search technology, Slyce technology powers the apps of several of North America’s largest retailers. Slyce is a trusted, one-stop technology partner for retailers of all sizes.
# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>1</td>
</tr>
<tr>
<td>Contents</td>
<td>2</td>
</tr>
<tr>
<td>The genesis of visual search</td>
<td>3</td>
</tr>
<tr>
<td>The commercial application of visual search</td>
<td>4</td>
</tr>
<tr>
<td>Retailers are ready for visual search</td>
<td>6</td>
</tr>
<tr>
<td>Visual search’s impact on commerce</td>
<td>8</td>
</tr>
<tr>
<td>What are shoppers using visual search to find?</td>
<td>9</td>
</tr>
<tr>
<td>From where do visual searchers come?</td>
<td>10</td>
</tr>
<tr>
<td>Visual search &amp; apparel/accessories – a natural fit</td>
<td>11</td>
</tr>
<tr>
<td>Visual search in developing markets</td>
<td>12</td>
</tr>
<tr>
<td>Visual search and the world’s top retailers</td>
<td>13</td>
</tr>
<tr>
<td>How other large retailers embrace visual search</td>
<td>16</td>
</tr>
<tr>
<td>Conclusion</td>
<td>19</td>
</tr>
<tr>
<td>Notes</td>
<td>20</td>
</tr>
</tbody>
</table>
THE GENESIS OF VISUAL SEARCH

According to Google’s Executive Chairman, Eric Schmidt, visual search began for the internet titan with the green chiffon dress that Jennifer Lopez wore to the 2001 Grammy Awards\(^1\). So many people searched online for pictures of the star in the breezy, revealing gown—held together only by a strategically placed broach under her navel and tape—that it became the most popular search query ever to date.

A light went on in the minds of Google developers: here was a query only answered accurately with an image. Thus, in 2001, Google Image Search was born. It is a text-based image retrieval system that uses an image’s filename, the link text in its web page as well as any text near the image as keywords.

At 1 billion hits per day even as far back as 2010, Google Image Search still remains the most popular way to find images on the internet.

Medical and security applications of visual search

Visual search has a more dignified genesis in medical applications, where it has been used for 15+ years to sift through and interpret the large volume of patient data that exists in image format—X-rays, MRIs, ultrasounds, and so on. This natural union between technology and image-based patient data has been mainly text-based, like Google Image Search. That’s because the technology was not yet available to process the actual content of images.

Advocates cite the importance of true content-based image recognition for reducing diagnosis time and improving diagnosis accuracy at a global level. Large health care organizations in the USA are listening loud and clear as administrators hunt for ways to reduce the cost of providing care, while simultaneously improving patient outcomes.

Security applications of visual search, such as facial recognition or fingerprint matching, are well-developed and widely implemented by government for investigation and surveillance. For example, visual search technology is used in some airports to monitor how individuals change their appearance; frequent changes will trigger a security alert. Use in this sector continues to expand rapidly.

Privacy concerns waning in favor of consumer convenience

The general public is more accepting when their pictures are used to catch bad guys. Privacy advocates worldwide balked at the first mainstream use of facial recognition by private companies like Facebook and Google (the latter on its Google Plus social network). In 2011 users were "creeped out" when Facebook unveiled new opt-out facial recognition technology to tag images\(^2\).

In 2012, the US Federal Trade Commission recommended that private companies inform consumers when they use facial recognition technology, and give them the choice to opt out\(^3\). However, these are recommendations only, not rules. Companies are under no obligation to report these activities to consumers.

Consumer privacy concerns are diminishing in favor of a more pervasive use of location and recognition technology when there is a personal benefit to consumers. An International Data Corporation report on privacy challenges, published in May 2014, showed that, from its 2013 survey data, already 47% of American consumers preferred receiving relevant offers and were not as concerned about privacy as getting a timely good deal.\(^4\)
Similarly, users hardly peeped in March 2014 when Facebook researchers published a paper about DeepFace, its new artificial intelligence system that interprets photos nearly as well as humans. (Facebook has no obligation to share its deployment plans with the public, either.)

The UK supermarket giant, Tesco, adopted a facial detection technology at cash registers in 2013 that identifies consumers’ gender and age and then tailors advertisements accordingly. The plan met with some resistance by British privacy campaigners, but not enough to delay or modify deployment.

According to Simon Sugar, CEO of Amscreen, the tech company that developed the OptimEyes application installed in 509 UK Tesco gas stations, "this could change the face of British retail and our plans are to expand the screens into as many supermarkets as possible."

Today Amscreen facial detection technology is used widely in the UK, with its “digital signage media advertising” on 2,650 Forecourts parking lots/garages’ smart screens (reaching 30 million people weekly), 131 screens with W.H. Smith (reaching 1 million per week in airports, train stations and other transportation hubs), and 615 screens reaching 1.3 million people per week in UK health care centres and hospitals.

**THE COMMERCIAL APPLICATION OF VISUAL SEARCH**

A market not dominated by internet giants

Despite Google’s long-standing interest in visual search, the internet giant on its own hasn’t succeeded in securing a universal foothold and transforming search into true content–based image recognition. Google Shopper, an app with 10 million+ downloads, incorporated limited visual search technology to help consumers find products. It was retired in 2013, and its functionality has yet to be completely replaced. The Goggles app introduced by Google in 2011 was able to identify many logos and landmarks, but back then Google admitted the app wasn’t good at picking out cars, furniture, and clothes in photos.

**Reverse image-search** was easier to implement widely. This technology identifies all instances of a specific source image. Pioneers like TinEye, for example, offered copyright holders a way to track down the use of their images anywhere on the web. Google liked TinEye’s idea and launched its own similar reverse image tool in 2011, called Google Search By Image (located at images.google.com). The sheer size of Google’s database ensured that it outperformed TinEye. The Google Search By Image algorithms create a mathematical model based on shapes, lines, proportions, colors and other elements. They then match the model against images already in Google’s index. Google engines perform a page analysis to make a text–based guess of what the image is, as part of the process of identifying the image and returning similar results. The Search by Image tool worked well for popular content, but was not reliable in finding similar results for unique images.

Google is not the only large company whose interest in dominating the image recognition market has faced technology or market–driven detours. Back in 2012, Toshiba began promoting its prototype Object Recognition Scanner, which it touted as a revolutionary product intended to replace barcode scanning in grocery stores and other retail outlets. The scanner could read items via color and pattern and without the use of barcodes, even telling the difference between two types of apples.
However, consumers spoke differently. Instead of doing away with barcodes, it’s now routine for grocery chains to offer barcode scanning via their mobile apps. At Canada’s Metro Grocer, barcode scanning was in fact implemented at the request of users in 2013. Products can be quickly added to a shopper’s grocery list for future reference both in-store and online. The app also uses emojis to mark a product’s nutritional value, based on the evaluation of in-house nutritionists. In the weeks following its launch, the My Metro mobile app was the most downloaded app in the food and beverage category in Apple Canada’s app store. According to Gino Plevano, Metro’s Senior Director, Digital Strategy & Platforms, the app has "greatly outperformed expectations." 12

Instead of a new piece of store-dependent hardware, consumers value what’s easier at the spur of the moment for them, not for retailers. Slyce engineered a visual search solution to address this need. The app Slyce developed for the brands of the large Purchase Decision Network (PDN) in 2015 allows for hardware-free mobile product scanning (Purina, Nestle, CoverGirl, and Tide, just to name a few of the brands). With their smartphones, shoppers can scan a barcode or take a picture of any grocery or household item, even unpackaged, to add it to their shopping lists.

Innovation driven by independent technology providers

Only in the last three years has the technology for interpreting the very content of an image become sophisticated and reliable enough to be deployed flexibly and widely to both retailers and consumers. Like Slyce’s app for the PDN shows, it is small tech providers who are responsible for the innovation in current image recognition algorithms, rather than the market titans. Today, delivery of visual search is via numerous tailored solutions, such as customizable white-label solutions for businesses that integrate seamlessly with websites and product catalogs, and, of course, user-friendly, free mobile apps. Slyce maintains its position as the world leader in retail visual search technology by offering clients a choice of the modules they need (whether scanning of coupons, print ads, real-world items and images) and the delivery means— an API (application programming interface), SDK (a software development kit for iPhone or Android), an APK (an android application package), or standalone DCA (a direct-to-consumer application).

Mobile app delivery of visual search is the preferred medium for customers. Superfish had previously partnered with Lenovo to deliver their software pre-installed on laptops, but has also recently transitioned to mobile apps.13

Amazon’s Firefly: paving the way for big retailers

The first big company to launch visual search was a retailer, rather than an internet technology giant. Consumer hopes were stacked on Amazon’s Firefly app, released in June 2014 on Amazon’s proprietary hardware, the Firephone. Firefly is able to recognize more than 100 million products. About 30 million of these are TV shows, songs and movies and the other 70 million are household items and apparel/accessories.

This made several of Amazon’s brick and mortar competitors do a double take. With good reason: as of July 24, 2015, and thanks to a large second-quarter profit, Amazon is now valued higher than Walmart, the world’s largest retailer. "Amazon is firing on all cylinders," analysts said.14 (And in June 2015, Facebook managed to outsize Walmart’s total value, knocking the retail colossus out of the top 10 list of the highest-valued companies on the Standard & Poor's 500 index!)15
Per Deloitte’s annual list of top 250 retailers, “Amazon continues to disrupt” any market category it enters.16 As the 15th largest retailer in the world and the largest “e-tailer”, as well as one of the 50 fastest growing companies in the world, when Amazon introduces new technology, everyone is watching.

The fact that Firefly was tied to the Amazon hardware and the AT&T Network alienated Amazon users, who, accustomed to the flexibility and value of the Amazon platform, balked at the $700 price tag for a device that didn’t offer many other useful new features.17 The fallout led Amazon to make the Firefly app available for iOS and Android within a couple weeks of its initial release.18 Amazon set an important precedent by offering the software development kit so third parties could build custom apps based on Firefly. Niche adaptations followed. MyFitnessPal is a point-and-shoot nutrition diary whereby users snap a picture of their dinner to research its nutrition and caloric content. Vivinois is an app that enables users to photograph a wine label and research its vintage. Kurzweil is a prominent developer of literacy technology for people with learning disabilities or visual impairment; they based their popular learning app on Firefly.

Firefly didn’t convince searchers to drop text-based search. In fact, Firefly exposed the true consumer need and habit: users blend both image-based and text-based search to get the results they want faster. Amazon users found Firefly reliable when the image by which they searched was actually in the Amazon catalog. Without easily identifiable markers and high-contrast borders between product and background, objects were hard to identify. App reviewers noted that Firefly couldn’t find similar results for a unique image.19 Mike Torres, an Amazon executive working on the Firefly software near the time of its release stated that “it works really well when we can match an image to the product catalog. Where things are rounded or don’t have (visual markers) to latch on to, like a black shoe, it’s a little harder to do image recognition.”20 Slyce technology provides improved algorithms and accuracy. Slyce client Neiman Marcus claimed that the Slyce Snap.Find.Shop app, which shows users exact and similar results based on mobile photos of print ads or real-world images, is 95% accurate.

RETAILERS ARE READY FOR VISUAL SEARCH

Rapid innovation & deployment under way
Visual search technology is gaining major ground with retailers. In addition to the proliferation of third party apps based on its Firefly technology, Amazon’s adoption of visual search technology lit a fire under its competitors. These are traditional brick and mortar stores or department stores selling household items and apparel/accessories, who hadn’t yet made a major move into visual search. Currently visual search is undergoing rapid deployment at the brand level.

Wearable smart devices like the AppleWatch and Google Glasses have also spurred innovation by app developers and retailers alike in voice-activated mobile apps. Canada’s avant-garde Metro Grocer has already rolled out a shopping list app for the AppleWatch based on visual search.
Five years ago, analysts thought mobile shopping would eclipse both desktop and in-store shopping. Instead, consumers have once again surprised analysts by continuing to shop from all these platforms simultaneously. Partnered with this development is the unspoken consumer expectation that the transition between retailer marketplaces be completely seamless—same products, same prices, same features, same options, and so on. Erasing the borders between the physical and digital storefronts has prompted retailers to embrace a variety of augmented reality technologies in unison across these numerous platforms, offering what’s known as an omni-channel delivery.

Visual search is one critical component of an omni-channel shopping experience. For example, Slyce now partners with OfferPop and Signal360 to fuse visual search technology with social media shopping, location beaconing and other consumer-behavior based technologies. With Slyce algorithms, images posted to social media can be branded and shopped instantly. Consumers can snap a photo of a real-world product, and receive notification of where it is in-store as well as coupons and instant 1-Tap-Checkout.

Retail success requires increased consumer engagement
Analyses of recent shopping trends point to one major conclusion about current shopper habits: consumers value unique, brand-defining experiences that enhance their opportunities for self-expression. No matter the purchase channel—be it in-store, via mobile or via desktop, consumers reward retailers with their loyalty based on how companies foster this concierge culture. The selling environment grows increasingly complex for retailers, who are on the hook to offer better means of interacting, connecting, and communicating with their customers to secure repeat business. Consumers expect to start their shopping journey on one channel and then return later and continue seamlessly in other channels.

Digital tactics to promote impulse buying are of tantamount importance to retailers. While reluctant to implement new technology for its sake alone, retailers are hungry for technology that can increase impulse buys. This is one way to make up for the drop in brick and mortar impulse sales that occurred after the popularization of online shopping (with its anti-impulse consumer behaviors of showroombuying, webrooming and spearfishing).

Visual communications are entrenched in today’s consumer culture
The fact that visual communication is linked to impulse purchasing is a very exciting prospect for retailers. A recent review of new augmented reality technologies by Stylus.com states that “visual searches trade on context and emotion, and are an important mechanism to persuade potential consumers to make the leap from inspiration to gratification that much faster.”

Indeed, visual communication is the preferred medium of mobile users, who now comprise a greater number of searchers and shoppers than ever. Image-based sites like Instagram have more daily mobile users than a text-based platform like Twitter. Sharing user-generated product images is now entrenched in consumer behavior.

These consumer preferences expose the emotional component of visual communication that extends beyond the hardware limitations of a small screen and touch-based keyboard. Visual communication is more expressive and immediate than text description. In the ever-changing dance between buyer and seller, emotion matters. Simon Liss, managing partner of UK retail advertising & technology implementing firm Omni-Fi, states that “emotion is the prime driver. Search is not rational....[E]specially when users don’t have a specific destination in mind—and interestingly runs against the usual consensus that product search and discovery is a very rational process.”
From our own extensive research into consumer behaviour and visual search algorithms, we learned that:

- **74% of consumers** say that traditional text-based keyword searches are inefficient in helping them find the right product online.

- **90% of information** transmitted to the brain is visual, and this information is processed 60,000 times faster than text.

- **67% of consumers** say that the quality of product images is very important in selecting and purchasing a product.25

**Future of visual search: “more a question of when, not if”**

Prominent analytical firms predict the time is right for the retail commercialization of visual search. According to eMarketer.com, the “future of visual search is more a question of when, not if.” In late 2014, eMarketer.com predicted visual search to become a mainstream tool for retailers within one or two years.26 Andrew Ng, Head of Baidu Research, has stated that “in five years, we think 50 percent of queries will be on speech or images.” 27

Markets and Markets, a global market research and consulting firm based in the USA and providing intelligence services to several Fortune 500 companies, estimates that the image recognition market will grow from $9.65 billion in 2014 to $25.65 billion by 2019, at a whopping compound annual growth rate of 21.6%.28 (They also predict that North America will remain the biggest market for image recognition solutions.)

**No more waiting for universal deployment**

Retailers get it. Rather than waiting for the big fish to roll out a universal tool for image search on which they can piggyback, more and more retailers and brands have released mobile apps in the last year that support image recognition for their product lines. Instinctively, retailers know they need it now, and that it’s going to work.

**VISUAL SEARCH’S IMPACT ON COMMERCE**

So far, the data is impressive...

Since visual search is currently implemented via specific retailers and brands and even then deployed sometimes only to specific product lines, there is not a broad data sample. Regardless, the data that has been published, and our data thus far, shows most impressive results. With the September 2015 release of Slyce Insights, a propriety analytics platform used by retailers who implement Slyce visual search technology, metrics of visual searchers will be that much clearer and easier to leverage strategically.

BloomReach is a tech firm that develops custom relevancy engines for several large retailers including Staples, Shop.ca, Neiman Marcus, Williams Sonoma, Fossil, Guess, Shutterfly, Tilly’s, Drugstore.com and more. Some of these companies, such as Neiman Marcus and Tilly’s, are using Slyce visual search technology. In October 2014, BloomReach released some data based on the performance of those retailers on its platform that have implemented visual search technology.

**From the three-month period dating July 2014 through September 2014 for American retailers, BloomReach found that visual search resulted in more product views and return visits, a longer site visit, and a greater average spend, as reported by eMarketer.com:**29
Of 30.3 million visits to department store sites, visitors who used visual search viewed 48% more products, initiated 75% more return visits, spent 51% more time on the website, and had an average order value of 9% greater than those visitors who did not use visual search.

Of 4.4 million visits to casual apparel sites, visitors who used visual search viewed 37% more products, initiated 68% more return visits, spent 36% more time on the website, and had an average order value of 11% greater than those visitors who did not use visual search.

Of 3.9 million visits to teen apparel sites, visitors who used visual search viewed 31% more products, initiated 42% more return visits, spent 28% more time on the website, and had an average order value of 2% greater than those visitors who did not use visual search.

Percentage Increase in Customer Engagement Due to Visual Search- US Retail Sites Sept 2014

Even just a few months’ data show notable improvements to not just one, but several key metrics, when companies implement visual search technology.

WHAT ARE CONSUMERS USING VISUAL SEARCH TO FIND?

Slyce visual search technology services many large retailers such as Toys R Us, Neiman Marcus, J.C. Penney, Tilly’s and Urban Outfitters. Slyce technology can be applied in modules to a segment of each retailer’s product line, or the entire product database; our clients choose which services they need and where to implement them. We customize our delivery to the exact needs of our clients.

While many of our relationships require strict confidence, the data available for publication to date shows that the adoption of visual search by users is exponential. During the first 7 months of operation, we recorded 1 million photo searches, which jumped to 3 million after the first year of operation by April 2015. We have captured a profile of how market segments are engaged in visual searches by the 12million+ users of our technology:
39% of searches were for apparel—clothing, shoes, bags, and other accessories.

31% of searches were for home décor items such as kitchenware, small appliances, furniture, and wall, bathroom and lighting treatments.

24% of searches were for personal and home electronic devices such as play stations, MacBooks and PCs, and mobile devices.

4% of searches were for grocery products like chips, soda, muffins, vitamins, and so on. The remaining 2% of searches comprised beauty items such as makeup, kids’ products (toys, sports) and automotive products and tools.

What are consumers using visual search to find?

**APPAREL 39%**
- Clothing
- Shoes
- Accessories

**ELECTRONICS 24%**
- Mobile
- Desktop
- Gaming

**HOME DECOR 31%**
- Kitchenware
- Appliances
- Treatments

**GROCERY & MISC 6%**
- Food
- Beauty
- Auto, toys, etc

Slyce’s available data to date shows that when visual search is deployed to a product line, it is embraced quickly by consumers across market segments.

FROM WHERE DO VISUAL SEARCHERS COME?

Slyce’ available geolocation data for our clients shows that visual search can attract new consumers from around the world, but its primary return on investment is in driving up sales from local customers via enhanced engagement. For example, Tilly’s, a surf and skate clothing, shoes and accessories retailer, is based in Southern California and has 211 stores in 33 US states. From all of Tilly’s visual searches from the period November 2014 through May 2015, 77% originated in the USA, with 49% of all searches coming solely from California, the nexus of surf and skate.

Our data also shows that shoppers around the world do embrace visual search. Of the retailers who use Slyce technology, 50.4% of their searches originated in North America, with 28.4% of searches originating in Asia and 21.2% in Europe. The numbers for Europe and Asia can be expected to rise accordingly as more retailers in these regions embrace Slyce visual search technologies.
What are consumers using visual search to find?

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**NORTH AMERICA**

50.4%

**EUROPE**

21.2%

**ASIA**

28.4%

Excerpted from Slyce’s June 2015 infographic, “Top Mobile Searches.”

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**VISUAL SEARCH & APPAREL/ACCESSORIES – A NATURAL FIT**

Craves is a stand-alone visual search shopping app developed by Slyce and released in July 2015. It empowers shoppers to find exact and similar items to what they photograph either from print ads or in the real world, and then buy them with one tap.

Scott Cormier, Craves’ co-founder, revealed recently to the Calgary Herald that his wife’s online clothing shopping habits inspired him to develop the app. "She had an album of these photos and screenshots of things she loved so she could try to track down similar items whenever she had some free time. More often than not, she’d be unsuccessful and frustrated.” He reports that finding similar outfits was time consuming or too difficult. Results would turn up unfamiliar retailers she didn’t trust, with onerous shipping costs.

Craves addresses these problems by incorporating Slyce’s proprietary advanced visual search algorithms, Slyce’s 1-Tap-Buy interface, and Slyce’s trusted brand relationships. The result is a stand-alone visual search app that anticipates and responds to consumer needs.

As the example of Craves shows, the apparel and accessories market is a natural, inspiring partner for consumer visual search. No longer dependent on in-store mannequins to motivate our fashion choices, we can snap a picture of anyone wearing something we like, find it, and buy it on the spot.

The net profit margin, retail revenue growth and return on assets of the Apparel/Accessories sector sits several points above the other sectors such as Fast-Moving Consumer Goods (e.g., groceries, household cleaning products) and Hardlines and Leisure Goods (e.g., home improvement supplies, home decor, and personal electronics). Hardlines & Leisure Goods places second in terms of sales growth and profitability.
Sales growth and profitability by product sector \( ^1 \) [%]

Excerpted from Deloitte’s *Global Powers of Retailing 2015: Embracing Innovation*, 25

**VISUAL SEARCH IN DEVELOPING MARKETS**

Despite still accounting for the largest share of top retailers and revenue, European and North American retailers posted the lowest growth rates\(^5\) whereas retailers in Africa and the Middle East posted the highest growth in retail revenue and profit margins of all the top 250.\(^6\) The reason for this growth is the rapid expansion of middle class in Africa, Asia and the Middle East. Per reputed consulting firm PWC, “as GDP growth continues to be robust in these regions...millions more consumers will join the middle class every year.”\(^7\)

Notably, unlike North American and European consumers who browse and shop online from both mobile and desktop, most shoppers in the developing world don’t have personal computers and only use mobile technology for their digital searching and shopping. China has surpassed the USA for the number of adults who own a cell phone, at nearly 100%\(^8\). Consumers in the developing world have embraced leading edge mobile technology, such as mobile wallets, much faster than consumers in the developed world. Social media is pivotal to shopping culture, whereas in the developed world, social media is more for communicating than buying. Close to 95% of Chinese surveyed by PwC use social media, and this heavily networked model is also found in other large developing nations, such as India, Brazil and Turkey.\(^9\)

The opportunity for mobile commerce in these markets is very promising. For example, Blippar is a UK-based augmented-reality mobile app developer that employs image recognition technology in their suite. They have found good opportunities for expanding in India, thanks to the widespread penetration of smartphones (these have driven up consumer engagement significantly). Per Blippar India’s Regional Director Arnav Ghosh, the company hopes to expand from 30 to 100 clients this year alone.\(^0\) India’s large online marketplace and umbrella e-Tailer, Flipkart, has launched image search on its mobile app to help shoppers find products similar in style, color, and pattern. This virtual shop assistant technology also originates in Asia; Singapore-based ViSenze provided the visual algorithms for the Flipkart app.\(^1\)
Slyce is currently the world’s leading provider of visual search technology, offering numerous top retailers custom-tailored visual search functionality in their mobile apps and websites. We are also actively pursuing numerous exciting opportunities in the Asian, African and Middle Eastern markets as we continue our global expansion.

VISUAL SEARCH AND THE WORLD’S TOP RETAILERS

Of the top ten global retailers identified by Deloitte, several have implemented some form of image recognition technology to improve customer experience and enhance engagement. A first step for all these retailers was to implement 1D (one-dimensional) scanning, or coupon scanning of QR codes and barcodes, which is a service Slyce offers as well. Now these retailers have taken visual search to the next level, and in this section we summarize how:

Walmart (USA)

With 4,000 stores in America alone, and 140 million Americans comprising its weekly foot traffic, Walmart has occupied the number one position on Deloitte’s annual retail list of top 250 retailers for years. In late 2012, Walmart tested an upgrade to its mobile app called Scan and Go. It allowed in-store shoppers to scan barcodes of products in their physical shopping carts in order to speed up self-checkout. Soon after, Walmart moved instead to a visual search function that better leveraged its enormous walk-through traffic by mobile-enabling its barcoded products with price and review information. Walmart implemented this technology to offer enhanced customer service and engagement to the majority of its customers. Wendy Bergh, Wal-Mart’s Vice President of Mobile and Digital, stated during her CNET interview at San Francisco’s 2014 AppsWorld that "we need to make sure we’re not just going after the shiny object." Walmart’s interest in app functionality that improves customer experience—rather than technology for its sake alone—is indicative of giant retailer sentiment generally. Bergh states this eloquently and clearly: "We need to make sure we are addressing the friction point, or making it easier for the customer, if we can actually make a meaningful impact to their experience. It's not something we're going to do just to do it."

The care that large retailers take in deploying visual search technology that leverages current strengths to maximize customer engagement is typical of its application in the marketplace as a whole. With Slyce, retailers choose which technology modules they need and the best way to implement them (ranging from an application programming interface that integrates with existing infrastructure to a stand-alone app).
Costco (USA)
Costco is the biggest warehouse club chain in the USA, and the second largest retailer in the world. It incorporated visual search technology into its mobile app back in April 2013 (despite its AVP of Publishing, David Fuller, stating that “Costco likes to move cautiously as new technologies emerge.”) 45

Costco chose to mobile-enable several dozen images from its monthly paper magazine, *The Costco Connection*. This magazine happens to have the largest print circulation (8 million) of any monthly magazine in the USA. Readers scan an enabled–image and are taken to related helpful content at the Costco website, or to Costco’s e–commerce store for quick checkout. For example, a home décor photo shoot in the magazine can be scanned to view detailed product information for each item featured in the image, as well as buy them directly online.

Scanning print advertisements is called 2D (two-dimensional) scanning. This is one of the many visual search services offered by Slyce.

Carrefour (France)
The French hypermarket chain Carrefour is the third largest retailer in the world and a technology pioneer, piloting Bluetooth Low Energy (BLE) beacons back in 2013 to track a shopper’s journey around the store, with location data tied to individual customers.46

The enormous success of its BLE implementation, with its 400% increase in mobile engagement47, led the French giant back to the forefront of innovation. In March 2015 Carrefour rolled out its Connected Kitchen concept, intended to streamline its customers’ process of replenishing groceries. Rather than being a smartphone–delivered app, Connected Kitchen is a fridge–magnet dongle–scanner that allows customers to scan, photograph or speak their needed items. Real–world products photographed are automatically loaded into customers’ online shopping baskets.

The Carrefour dongle incorporates 3D, or three-dimensional, scanning, whereby users photograph real-world items to digitally enable them. This is also a service offered by Slyce.

Schwarz Gruppe (Germany)
Schwarz, the world’s fourth-largest retailer, is a family–owned German company which owns the discount grocery chain Lidl and the hypermarket Kaufland. With more than 10,000 locations in Europe and the UK, they’ve succeeded in profiting from the European crisis as middle–class consumers continue to tighten their belts by shopping at discount chains.48

The Lidl mobile app offers 1D and 2D scanning; shoppers photograph single product images as well as product photo shoots from the Lidl newspaper brochures and leaflets to reveal additional information and then add those items to an online shopping basket.
Tesco (UK)

The UK grocery chain Tesco is the world’s fifth-largest retailer, and it has embraced visual recognition technology with both arms. Way back in 2009, Tesco introduced a wine app for iPhone. Users photographed a wine bottle label; if it was one of the vintages carried by Tesco Wine, tasting notes and pricing information would be provided to the user.

In 2013, Tesco rolled out OptimEyes facial detection technology in 450 gas stations, embedded in a smart screen near the cash register where customers wait to pay. Whereas facial recognition implies that images of customers’ faces are recorded and stored in a database for future reference, facial detection only detects a customer’s age and gender and delivers tailored advertisements (these are based on other factors as well, such as time and date.) These smart screens detect and advertise to 3 million+ adults each week. Additionally, while the cameras don’t record customer faces, they do keep track of customer purchases as well as the time and date, providing Tesco with significant customer intelligence.

Tesco incorporates visual search with other customer-behaviour retail technologies. Slyce also integrates visual search with, for example, geo-targeting technology.

Tesco also adopted image-recognition technology to streamline the efficiency of its internal operations. Tesco and IBM have collaborated for the last 2 years on a visual app to optimize product shelving. According to Head of Tesco Labs, Angela Maurer, bad product layouts contribute to a poor customer experience. Significant research time is invested in figuring out which products sell better where. Currently, employees rely on instructional documents for direction on how to properly restock shelves. Tesco’s new image recognition technology for shelving lets employees photograph a shelving unit. The app analyzes the image and returns feedback on the products displayed, providing guidance for improvement. This is yet another example of how visual search technology can be applied to improve customer experience while in–store.

Kroger (USA)

With 2300 stores, Kroger is America’s largest grocery store chain (owning, for example, Ralphs and Food 4 Less), and is the 6th largest retailer in the world. There are more than 1.5 million downloads of its mobile app, which was just enhanced on June 30, 2015 with 3D scanning image recognition technology.

Now customers can use their smartphone cameras to add products to their grocery shopping lists. Customers snap pictures of items in their own homes or elsewhere, from magazines or from inside their own refrigerators. The app recognizes the item and in one step conveniently adds it to the shopper’s grocery list. Why the upgrade? According to Jackie Siekmann, Media and Government Relations Manager for Kroger’s Columbus-area stores, “Shoppers who engage digitally with us are much more loyal shoppers.”

Slyce’s Snap2Add mobile app function lets 2 million+ grocery shoppers photograph even unpacketged fruits & vegetables to add them to their shopping lists.
Home Depot (USA)
America's Home Depot, the ninth largest retailer in the world, is known for its enormous stores. Each contains about 35,000 products, and there are more than 1 million products available online.

Shoppers can take a picture of a tool or product they need, and the app will show a list of exact or similar products that are available and where they are located.

Home Depot has launched a visual search tool from Slyce that helps customers locate items in-store more quickly. Home Depot is the largest non-apparel or grocery retailer to implement visual search technology. Its adoption of visual search is a hallmark for the technology across industries.

While many of the largest retailers have adopted some visual search functionalities to enhance and increase customer engagement out-of-store, Home Depot is the one of the first to deploy the technology to move items off store shelves faster while customers are in-store. However, once again, the retailer is not adopting the technology for its sake alone: Home Depot identified the difficulty customers have in locating one of its many (often small) products in their warehouse-style stores as a friction point to be addressed.

Target (USA)
American discount department store Target is the tenth largest retailer in the world. Target introduced a 2D scanning app in July 2014 that lets shoppers buy products after scanning magazine ads with their iPhones. "In a Snap" recognizes images for Target’s Room Essentials products in ten prominent home décor magazines, such as Architecture and Real Simple. By scanning the picture, customers are able to load it into their online shopping carts and check out in a few clicks.

HOW OTHER LARGE RETAILERS EMBRACE VISUAL SEARCH
The companies described above are just those in Deloitte's top ten retailers that have adopted visual search. Several other large retailers have also implemented visual search to improve their customers' experience. Most are American companies, marketing to American audiences, using Slyce technology.

J.C. Penney (USA)
In April 2015 the apparel and accessories retailer contracted with Slyce to deploy image recognition technology. J.C. Penney ranks #82 on Deloitte's Top 250 and is the world's 11th largest retailer of apparel and accessories.

What's unique about the J.C. Penney mobile app is that the technology is deployed to the company's entire product catalog; shoppers can match any uploaded image, from real life, from a magazine, or social media, and find exact or similar products in the J.C. Penney product lines. The visual searches automatically tag and share found products in look-books across all of JC Penny's media channels.
## Top 10 Retailers - Summary of Visual Search Strategies

<table>
<thead>
<tr>
<th>RETAILER</th>
<th>VISUAL SEARCH FEATURE</th>
<th>PRIMARY DRIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walmart</td>
<td>In-store digitally-enabled barcode scanning retrieves product information (2D scan)</td>
<td>Enhance in-store experience of existing foot traffic</td>
</tr>
<tr>
<td>Costco</td>
<td>Digitally-enabled print magazine (2D scan)</td>
<td>Enhance and increase consumer engagement out-of-store</td>
</tr>
<tr>
<td>Carrefour</td>
<td>“The Connected Kitchen” dongle (3D scan)</td>
<td>Enhance and increase consumer engagement out-of-store</td>
</tr>
<tr>
<td>Schwarz</td>
<td>Mobile-enabled print flyers to find product information and shop online (2D scan)</td>
<td>Enhance and increase consumer engagement out-of-store</td>
</tr>
<tr>
<td>Tesco</td>
<td>Facial detection technology Employee product shelving app</td>
<td>Increase reach of product ads Increase staff efficiency and effectiveness</td>
</tr>
<tr>
<td>Kroger</td>
<td>3D scan (real world images) to grocery list</td>
<td>Enhance and increase consumer engagement out-of-store</td>
</tr>
<tr>
<td>Home Depot</td>
<td>3D scan in-store – item locator</td>
<td>Move products off shelves more quickly in-store</td>
</tr>
<tr>
<td>Target</td>
<td>2D scan – digitally enabled print-ads</td>
<td>Enhance and increase consumer engagement out-of-store</td>
</tr>
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</table>

**Toys R Us (USA)**

In May 2015, the toy company, who ranks #77 on Deloitte's Top 250, contracted with Slyce to deploy visual search across its extensive product catalog. Shoppers can snap a photo from real life and find exact or similar items. According to company leaders, the impetus behind the adoption of visual search is to streamline and improve the shopping experience for younger, tech-savvy customers.
Tilly’s (USA)
The US surf and skate apparel and accessories retailer operates 211 stores in 33 American states. In November 2014, it launched a stand-alone app using Slyce technology called SnapShop. Shoppers use the mobile app to take a picture of a page in Tilly’s catalog and then discover additional product information online and purchase those products directly from their phones.

Urban Outfitters (USA)
The American fashion and speciality lifestyle retailer operates 230 stores in the United States, Canada, and Europe, encompassing several brands, including Anthropologie, Bhldn, Free People and Terrain. In October 2015, it announced a new partnership with Slyce to implement visual search for mobile commerce.

Neiman Marcus
The American luxury department store also sits on Deloitte’s Top 250 list at #193 and ranks #35 of all global apparel and accessories companies. It deployed visual search technology in October 2014 with the Slyce white-label standalone app called “Snap. Find. Shop.” to its footwear and accessories lines. In August 2015 Neiman Marcus decided to deploy the app to its entire catalog.

The company claims 95% accuracy for visual searches, matching any uploaded image from real life, magazines or social media to exact or similar Neiman Marcus products. Wanda Gierhart, Neiman Marcus CMO, stated that “from the moment of your inspiration of seeing something that you like on someone walking down the street with a great bag, or in a magazine, or wherever, you can take a picture of it in our app and [get] immediate gratification.”
CONCLUSION

Most of the world’s large retailers have incorporated visual search technology to improve in–store customer experience and enhance customer engagement out of store. Several of these companies employ various modules of Slyce technology for coupon, barcode, print ad or 3D real–world image recognition, making Slyce a leader in retail visual search technology. Visual search finds a natural partnership with the accessories and apparel sector worldwide, but businesses in other sectors and around the world are expected to embrace the technology quickly to better market to their local customers. ToysRUs and Home Depot are two such Slyce customers who have incorporated 3D visual search to drive in–store sales. Innovation by developers and retailers is broadening implementation of visual search technology. The use data for visual search is impressive and readily makes its business case. Retailers are eager to adopt technology that is proven to increase customer engagement, loyalty and impulse buying in the mobile age.
NOTES


15. Ibid.
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22. Ibid.

23. Ibid.

24. Ibid


31. Ibid.


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44. *Ibid*.


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