THE ‘BIG 5’ PATENTS REPORT

Patent activity and trends across Amazon, Apple, Facebook, Google, and Microsoft.
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“Think of the fundamental value chain of venture capital ... If we play the clock forward, the finding and assessing of investments will be almost entirely done by technology, not human beings. And the company that is today positioned to be the market leader in that evolution is CB Insights.”

Pat Grady
Sequoia Capital, Partner
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EXECUTIVE SUMMARY

OVERALL PATENT ACTIVITY FROM BIG 5 COHORT ON THE RISE

Applications trend upwards: Collectively, these IP powerhouses have applied for more than 52,000 patents since 2009. Total applications have steadily risen as each company diversifies its research activities, with annual combined applications nearing 10,000 in 2013.

Microsoft leads, Facebook lags: Microsoft has filed for the most patents, applying for over 16,800 since 2009, with second-place Google applying for more than 14,500. Apple was in 3rd and Amazon 4th, with Facebook lagging significantly behind.

Grants also rising: Although somewhat dependent on the USPTO approval process, annual grant publications for this cohort have also consistently grown. Google is now surpassing Microsoft for the top spot here in part thanks to the reversal of its anti-patent stance early in the decade.

INDIVIDUAL PATENTS REVEAL BROAD INTERESTS IN AI, AR/VR, AND VEHICLES

AI activity skyrockets: 2014 applications with AI-related keywords have already set an annual record, with more applications likely to be published. Microsoft leads with Google quickly rising in second, while Apple lags all of its peers thus far.

Facebook picking up: Although behind the other four in overall filings, its activity is on the rise and recently published applications reveal its efforts to automate the removal of objectionable content using machine learning.

Apple targets vehicles, wearables: Apple came in second behind Google in our keyword analysis of vehicle-related tech. Individual filings point to research in autonomous vehicles and AR/VR.

Amazon broadens activities: The e-commerce company has moved from consumer devices like e-book readers and tablets to drones, cybersecurity, and potentially tech to support its Go stores.
Overall Trends

PATENT APPLICATIONS & GRANTS
Amazon, Apple, Facebook, Google, and Microsoft have applied for over 52,000+ PATENTS since 2009
Collective patent applications from these technology giants has consistently risen on an annual basis, as each company broadens the scope of its research activities.

Combined applications neared 10,000 in 2013; more recent years may exceed that threshold as more patents are published.
Microsoft began the decade with the most patent applications by a wide margin, but patent applications from Google and Apple have skyrocketed since.

Google’s activity dramatically increased from 2011-2013 as the company reversed its early anti-patent bias.
CUMULATIVE APPLICATIONS BY COMPANY

By date of application, 2009 – 2016 YTD (12/12/16)

16,840
14,596
13,420
5,186
2,508

Microsoft
Google
Apple
Amazon
Facebook
GRANT COUNT RISE REFLECTS APPLICATION UPTICK

The growing number of patents applications from this cohort is beginning to surface in publication of granted patents figures as well.

Total grants published for the group has topped 10,000 for the first time in 2016 to date.
Google’s flurry of early-to mid-decade application activity has led it to top Microsoft in grants published from 2015 on.

With the exception of Microsoft, patent publications are trending upward across our big 5 cohort.
Aggregate themes

EXPLORING TRENDING TECH AREAS
MICROSOFT, GOOGLE DOMINATE AI PATENTS

Activity has sharply increased in the key battleground of AI and machine learning technologies.

Microsoft leads the pack with over 200 related patent applications since 2009, while Google comes in second with over 150. Apple, criticized for being slow to the draw in this field, comes in last.
GOOGLE APPLYING FOR HUNDREDS OF VEHICLE PATENTS

With the Google Self-Driving Car Project (recently launched as Waymo) long in gestation, it’s not surprising that Google holds the crown.

Apple comes in second, while Amazon has also applied for a handful of patents related to automated delivery drones and warehouse vehicles.
Thus far, patent submission activity for AR/VR and related tech peaked in 2012.

Microsoft again leads the way, driven by the development of the mixed reality HoloLens. Microsoft also has number of patents related to its Kinect motion sensing and gaming devices, which HoloLens traces its lineage to.
Individual company analysis

AREAS OF INTEREST & PATENTS OF NOTE
Amazon
AMAZON PATENT APPLICATION ACTIVITY
By date of application, 2009 - 2016 YTD (12/12/16)

AMAZON RISING CONSISTENTLY FROM 2009 ON
The Seattle giant’s patent activity has rocketed as it pushes beyond core e-commerce into cloud services, hardware, B&M retail, and so on.

Amazon’s annual patent applications more than quadrupled from 2009 to 2013.
Amazon’s top keywords represent a shift in focus from core e-commerce competencies like product recommendation to developing its Kindle line and other consumer devices (red) as well as delivery drones (orange).

As AWS has risen in prominence, the frequency of cybersecurity keywords has also spiked (light blue).
ISOLATING SPECIFIC USERS

This filing relates to the identification of a specific user in a crowd by comparing a physiological condition across individuals (e.g., heart rate).

This patent describes a device use case, but similar technology could hypothetically be employed to track shoppers in Amazon’s recently-announced, highly automated Go stores.
Regarding Amazon Go, the company also applied for a patent describing the identification and tracking of user-picked items from a “materials handling facility.”

Interpreted in the context of Amazon Go, this research could be used to track each shopper’s shopping cart in an automated store.
AMAZON PATENTS OF INTEREST

Example 3: “Generating robotic grasping instructions for inventory items”

Application date: 12/16/2014
Publication date: 6/16/2016

WAREHOUSING AUTOMATION ALSO A FOCUS

Amazon is known for its drive to maximize efficiency in its warehouses and fulfillment centers, often leveraging automation (e.g. with its acquisition of Kiva Systems).

The company has applied for a number of robotic packaging and inventory management systems.
Apple
APPLE'S APPLICATIONS RISING AFTER DIP IN 2013

Cupertino’s annual application count fell in 2013 but seems poised to resume an upward trend as the company continues pushing into new fields such as wearables and vehicles.
Many of Apple’s top phrases reflect its core device and hardware businesses.

However, more recent years reveal Apple’s emphasis on wearable development (orange), especially as the Apple Watch has come to market.
Though Apple has lagged somewhat in overall AI research, recent reports have detailed the expansion of its machine learning efforts.

Apple’s long-rumored automotive project has said to have shifted focus from developing an actual vehicle to developing a self-driving system instead.
Another recently published Apple patent involves precisely mapping and navigation indoor environments.

As the patent’s description notes, such capabilities would be useful not just for smartphones, but also "smart glasses and other devices."
FACEBOOK PATENT ACTIVITY BEGINNING TO PICK UP

Of this cohort, Facebook is notably less active from an intellectual property standpoint.

However, it has recently begun to submit more applications, with its 2014 applications already marking an annual record, even with more patents (likely) awaiting publication.
Since the 2016 US presidential election, Facebook has faced increasing criticism for “fake news” on its platform. Recently published patents reveal efforts to leverage machine learning to automate the flagging and removal of objectionable content dating back to 2015.

Example 1: “Systems and methods to identify objectionable content”

Application date: 6/1/2015
Publication date: 12/1/2016
FACEBOOK PATENTS OF INTEREST
Example 2: “Hand-held controllers for virtual reality system”

Application date: 6/3/2015
Publication date: 12/8/2016

OCCULUS FORGING AHEAD

Oculus’ VR patents are still filed under the Facebook subsidiary itself rather than the corporate parent.

A number of recently published documents reveal work in hand-held VR controllers, likely for the development of Oculus’ just-launched Touch controllers.
Google
Google executives (up to Larry Page and Sergey Brin) were once infamous for opposing excessive patenting as a threat to innovation.

However, as the threat of smartphone litigation intensified in the early 2010s, Google began applying for patents at a blistering pace.
### Google Top Phrases by Significance

*By date of application, 2009 - 2016 YTD (12/12/16)*

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### X Projects

Advertising (light blue) has fallen off the top keyword list as Mountain View seeks to diversify.

Highly visible are keywords related to X “moonshot” projects, including self-driving cars (red), Google Glass and wearables (orange), and Project Loon’s internet delivery balloons (blue).
Google’s Self-Driving Car Project has “graduated” from beta and become the new full-fledged Alphabet company Waymo.

This just-published application describes the mechanisms to both initiate a ride and trigger an emergency stop, either through input buttons in an autonomous car or other devices.
Despite the failure of Google Glass to generate significant traction, the company’s patent outputs reflect the various augmented and virtual reality projects that it is still pushing forward.
Microsoft
Out of this tech cohort, Microsoft’s patent application totals have been the least volatile.

Despite a corporate restructuring in 2013 and an executive transition in 2014, the company’s overall research activity has remained strong.
Microsoft’s patent keywords provide an early glimpse into the development of the Surface tablet lines (orange).

The “headset” and “visor” patents (light blue) highlight the ramp-up of Microsoft’s efforts in the AR/VR space seen earlier, specifically its HoloLens headset.
MICROSOFT CONTINUES NATURAL LANGUAGE WORK

One new patent application details Redmond’s efforts to facilitate natural language conversations by personalizing virtual assistant responses.

This would bolster Microsoft’s Cortana assistant and potentially chatbots for its productivity software.
MICROSOFT PATENTS OF INTEREST
Example 2: “Wearable personal information system”

Application date: 7/11/2016
Publication date: 11/3/2016

FIG. 3

WEARABLES STILL ON THE RADAR

Microsoft may still be interested in wearables and smartwatches despite the discontinuation of its Band fitness wearable, as the company recently filed a patent detailing a new wearable device and corresponding dock.
A word on the nature of patents analysis

The patent filing and grant process involves several key dates with significant time lags in between (see the graphic to the right).

After an application is submitted, there is a delay before it is published. This lag is typically 12-18 months but can range from several months to over two years.

The delay before the publication of granted (approved) patents is even more variable; occasionally decades can pass before grants are published.

Applications and grants cannot be captured for analysis until they are published, so these time lags are important to keep in mind.

Note: Our analysis focuses on patents filed or granted directly under each company’s name, although this may still include a small number of patents from acquired companies attributed to their parent.