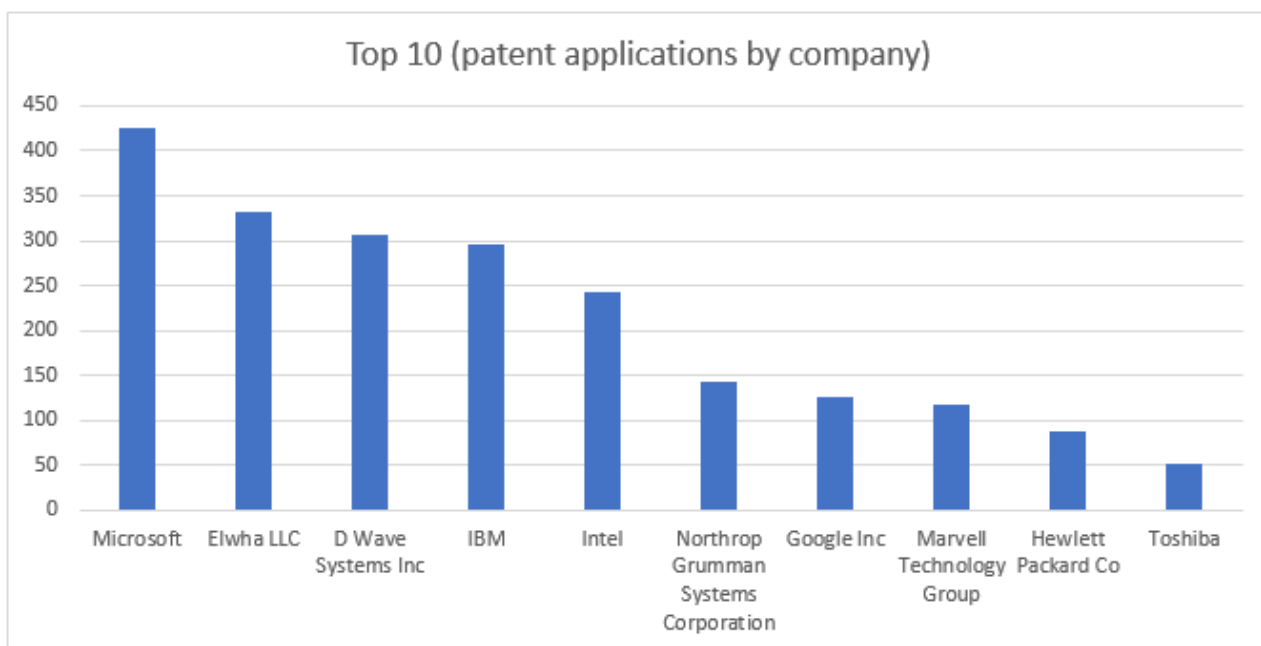


31 Jan
2020

It's a tight race for quantum patent supremacy

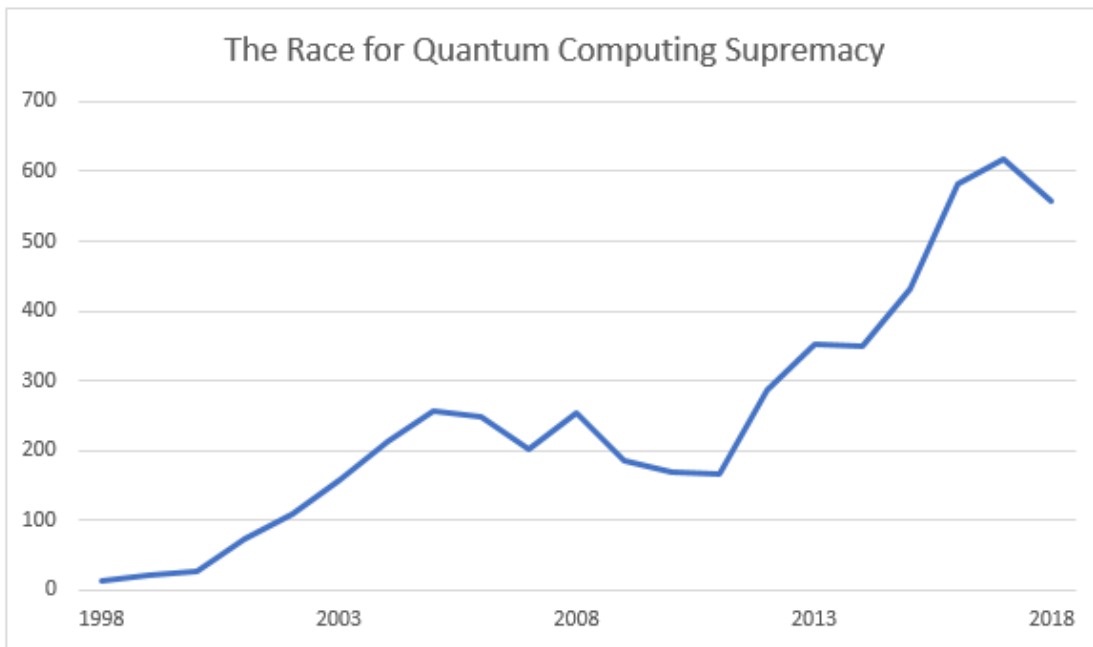
Quantum computing has hit a stage of rapid development, with [Intel predicting](#) that after 2025 systems for commercial use will begin to appear. The integration of ultra-powerful computers has many [potential benefits](#), ranging from improving cyber security to formulating new drugs. All of which means plenty of opportunities for licensing further down the line for those who own the right IP. The biggest players are now racing to develop the most powerful quantum computing technologies. And when it comes to patents, data analysis shows it is still anyone's game.

[RS Components](#) recently [conducted a search](#) using [Patentscope and found](#) that, when it comes to PCT applications filed through WIPO, Microsoft is leading the pack with 245 patent applications relating to quantum computing over the past two decades (see graph below).



Source: *RS Components*

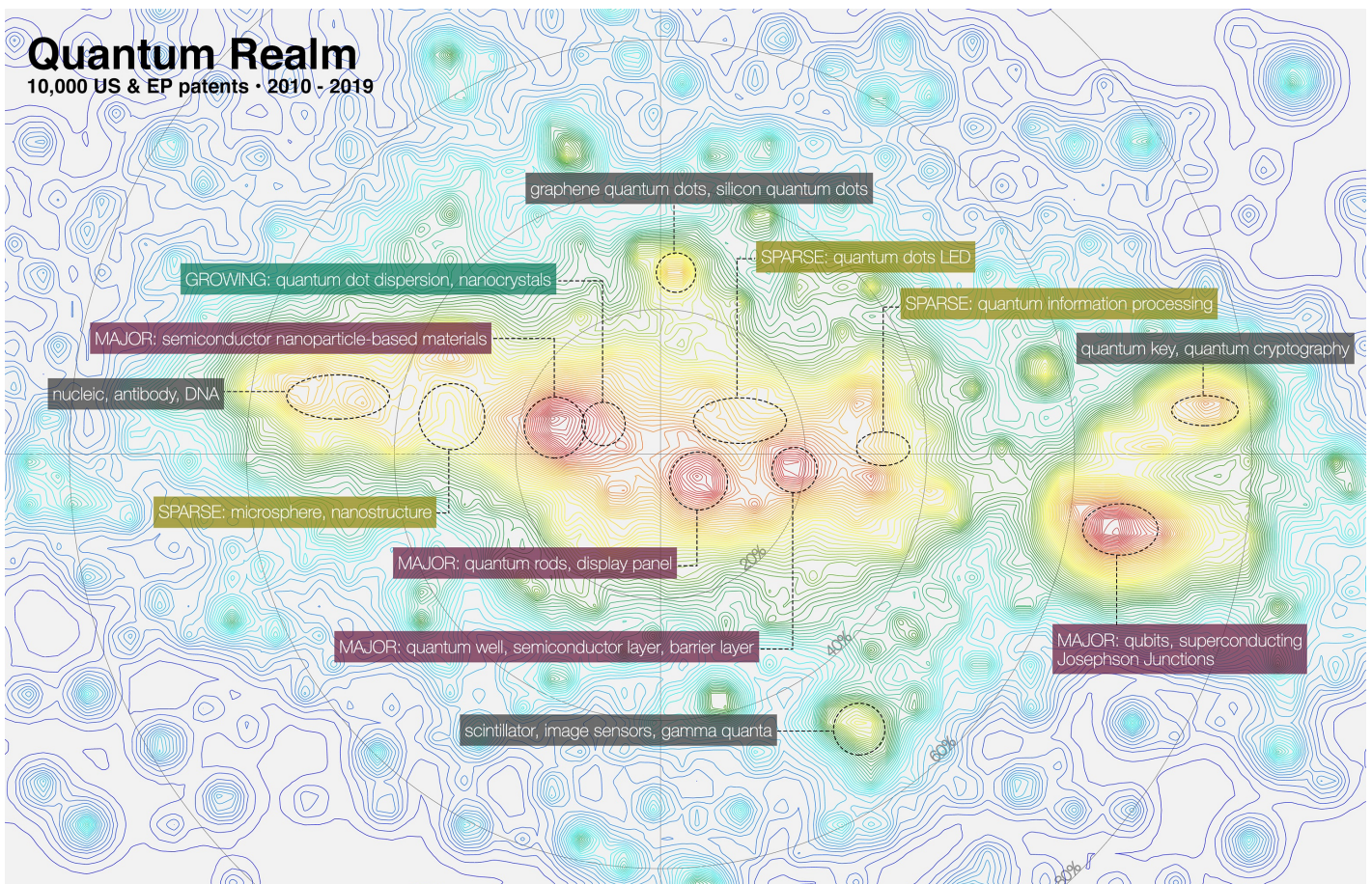
The research further emphasises that the field is becoming more important, as the number of patent applications has steadily climbed over the past decade (see graph below).



Source: RS Components

Valuenex carried out its own analysis, isolating for 2010-2019 USPTO and EPO patents containing 'quantum computing' in the title. This pulled 435 results and the company text-mined these patents to get a data set of rights containing similar content (limiting this to 10,000 patents).

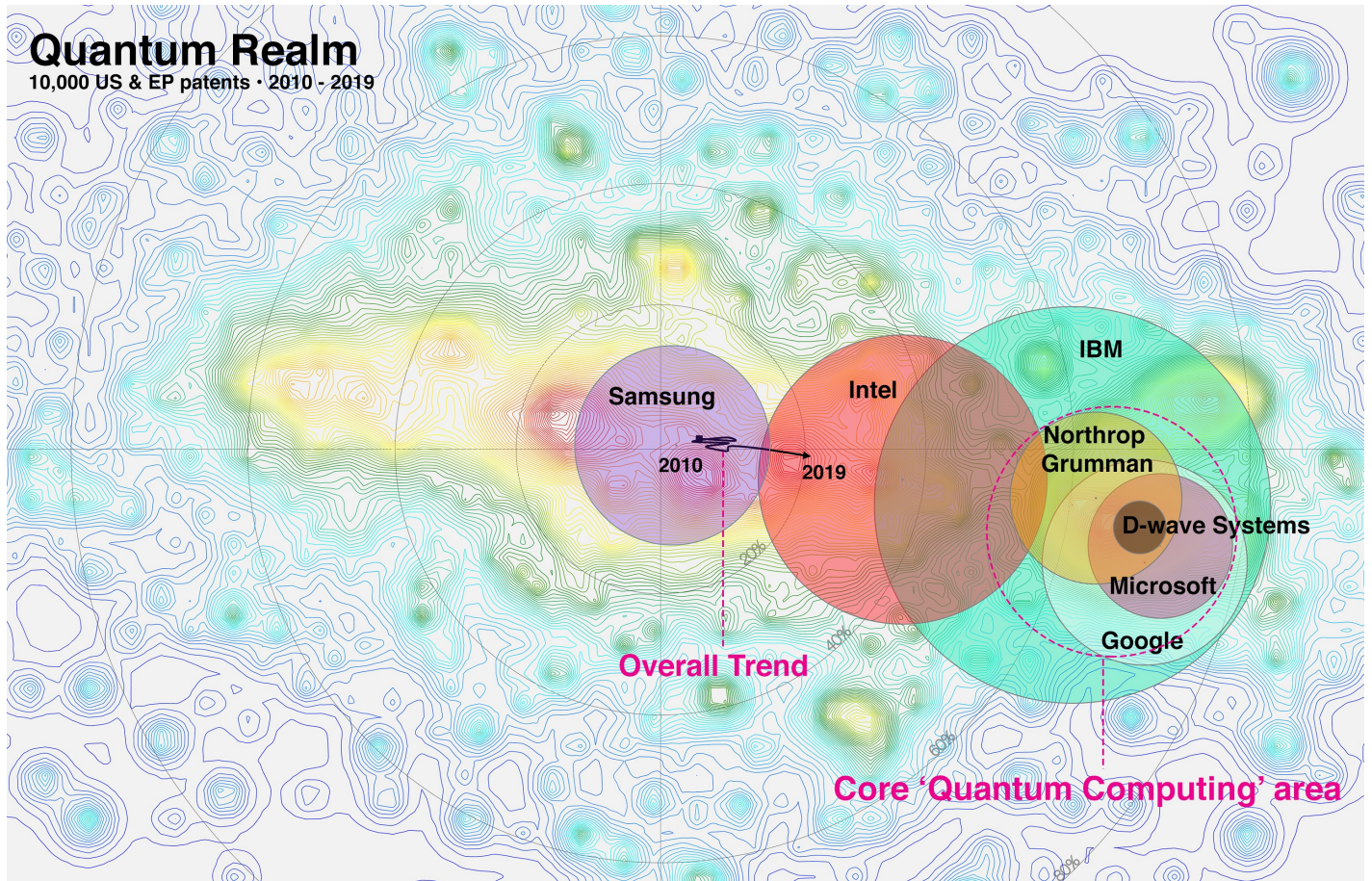
The first graphic depicts the major and growing areas within the entire quantum realm. Not surprisingly, qubits and superconducting Josephson Junctions crop up as a major feature. Worth noting is that there are few patent applications covering quantum information processing.



Source: VALUENEX; see full size image [here](#)

The image below shows the top filers, as well as Google (who ranked about 40th in terms of volume) and their centres of gravity. Important to note is the filing behaviours of the major players, which are focused almost exclusively around the specific quantum computing area.

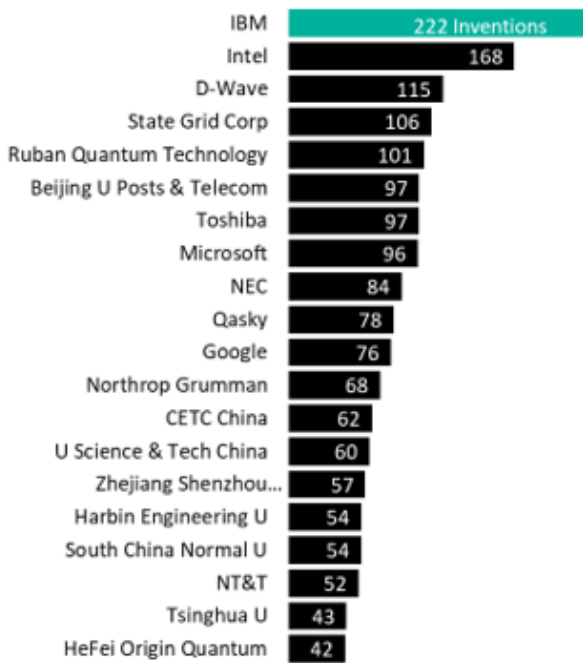
The expectation might be that companies will seek broader coverage within the realm, especially because these businesses have such large portfolios and strong R&D investments, but this is not the case. It is clear from the trend line that research is moving more specifically into 'quantum computing' and away from broader quantum technologies.



Source: VALUENEX; Note: Centre of gravity does not necessarily represent portfolio size, rather it shows the core coverage of the company. For example, D-Wave has a smaller centre of gravity compared to Microsoft but has more filings in the dataset. See full size image [here](#)

From a global perspective, IBM is the top applicant for quantum computing patents with 222 patent families applied for worldwide since 2007, according to analysis conducted by [Derwent, a Clarivate Analytics business](#) (see graph below).

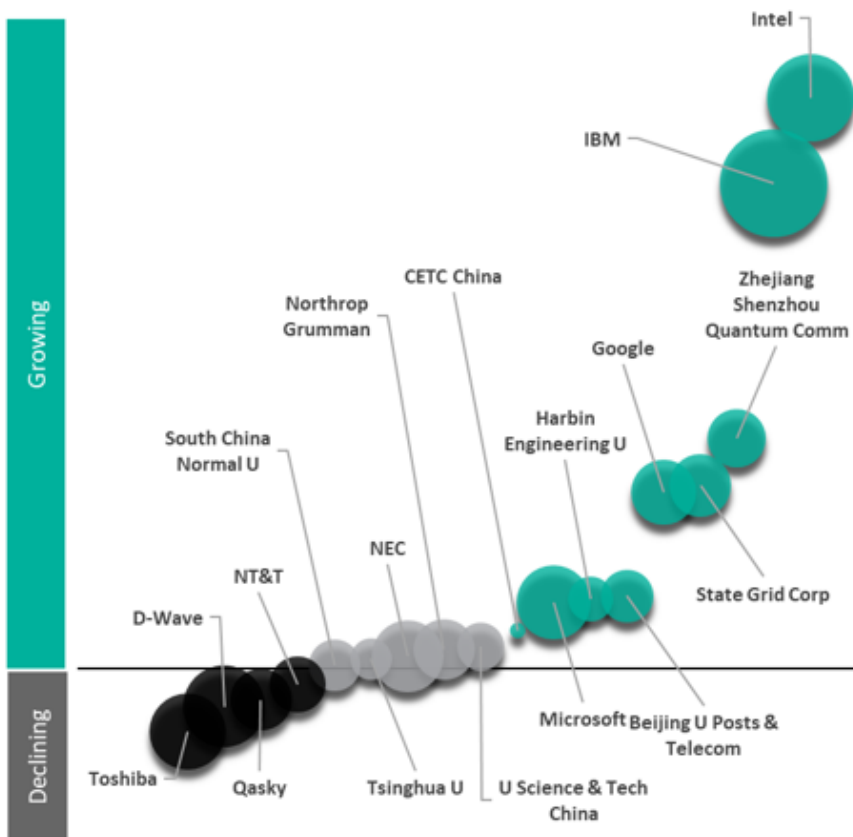
Top 20 Patent Assignees



Source: Derwent, a Clarivate Analytics company; Top 20 patent applicants within the data collection; the bar represents the number of inventions included in the study for each entity.

Aside from being the top player by volume, IBM is in possession of one of the fastest growing portfolios of the top 20 (see graph below).

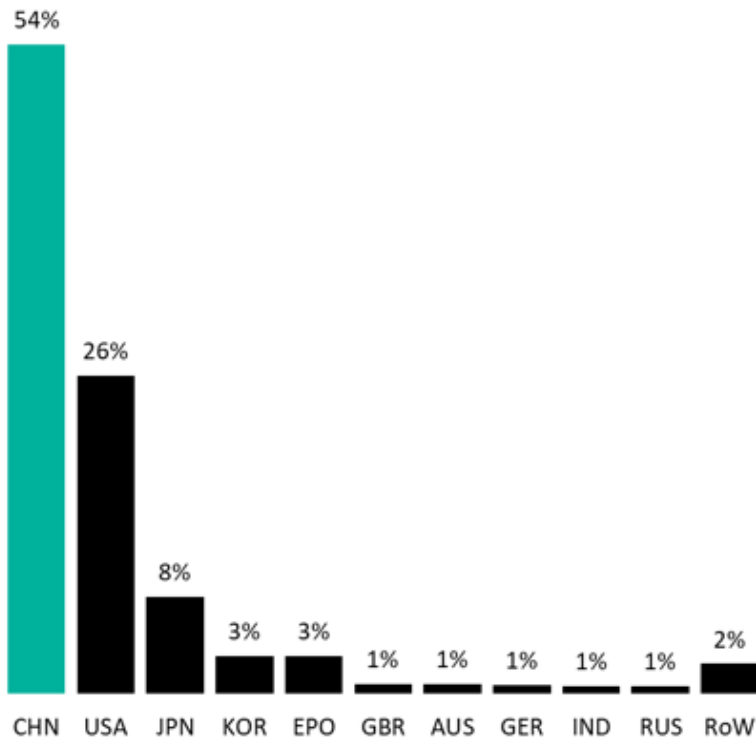
Top 20 portfolio trends



Source: Derwent, a Clarivate Analytics company; Note: This is a trend direction visualisation for the top 20 largest portfolios, as measured by the activity change over the last four years of complete data for each entity group, using a least squares/line of best fit function to calculate trajectory/inclination. The data is sorted left to right from highest decline to highest growth. Bubble size represents the number of inventions per entity.

China is home to the most innovators, according to Derwent's analysis (see graph below).

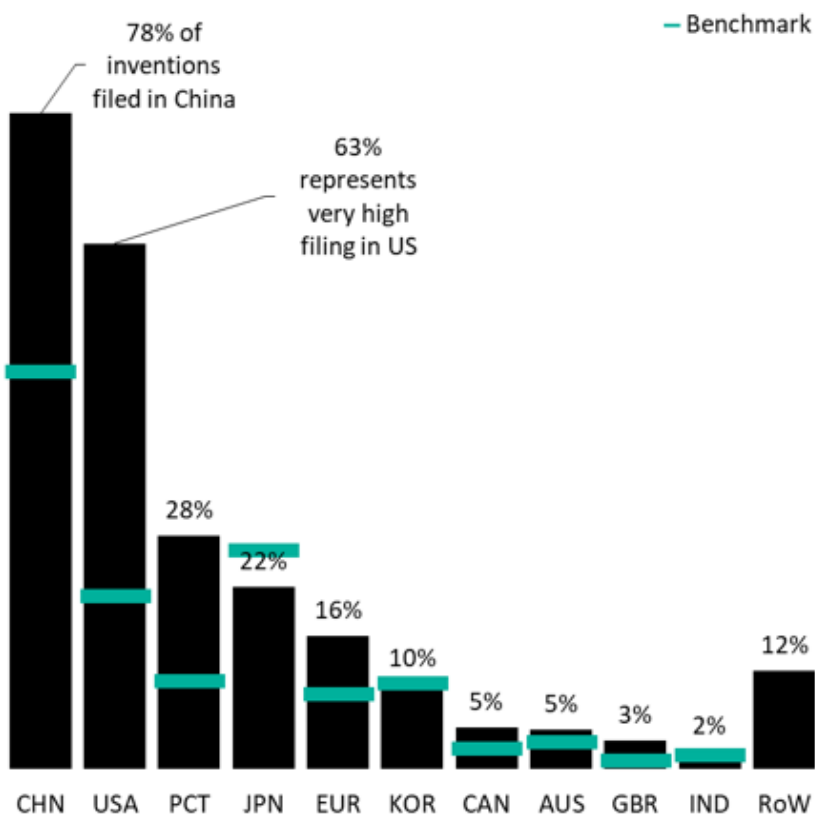
Top innovation sources based on inventor country



Source: Derwent, a Clarivate Analytics company; A review of the geographical sources of innovation within the data collection, based on the priority listed within the patent records.

Although there is significant output from Chinese entities, it is notable that applicants are seeking coverage in the US, as well as utilising the PCT route. The graph below is a review of the jurisdictions in which patents from the dataset have been protected, alongside the same distribution across all global patents within the Derwent World Patents Index.

Top protection countries (family member publications)



Source: Derwent, a Clarivate Analytics company; Note: Some variation may be due to limitations in the geographic coverage of the data collection, where this occurs it is noted in the visual. Inventions filed in "EUR" represents filings via the European Patent Convention, a treaty organisation that provides single examination and grant procedures for the (predominantly) European countries that are treaty signatories. This means that this single filing may ultimately represent significant European patent protection at a later date. PCT represents a single application filed at one of the international receiving offices (of which the USPTO is one) that grants the applicant the right to file future national patent applications in any of the contracting states.

The graph below compares the Derwent Strength Index scores with the average years remaining on a portfolio. Patent owners which appear on the right-hand side of the x-axis have younger holdings.

The top left quadrant shows the main current commercial entities in the space, as they have the stronger, older portfolios. Here we can see D-Wave, Toshiba, Microsoft and Northrop Grumman. The teal series are "emerging entities", described as such because of their higher levels of Derwent Strength and more recent activity. Google, IBM, HeFei Origin Quantum, State Grid Corp and Ruben Quantum Technology fall under this category. These players further appear in the top right quadrant, which is where those possessing strong, newer portfolios exist. They tend to be entities heavily investing in the space and which are likely to be working towards commercialisation in the near future.

The bottom left and right quadrants often display local/regional players as well as academic entities. The latter area is also the entry location for new speculative innovators who are not yet investing heavily in IP protection.

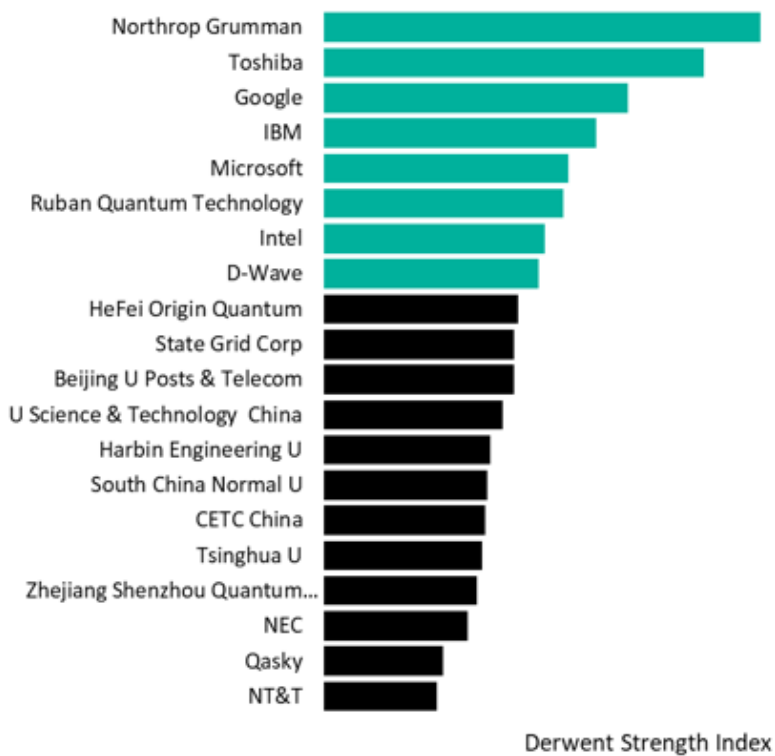
Market Model: Matrix of Derwent Strength Index (y-axis) versus average years remaining (x-axis)



Source: Derwent, a Clarivate Analytics company; Note: This scatter plot contains all large portfolios. Bubble size represents number of inventions.

Northrop Grumman comes out on top when focusing on the Derwent Strength Index of the top portfolios (see graph below). It is followed by Toshiba and Google.

Strength analysis of the top 20 patent assignees



Source: Derwent, a Clarivate Analytics company; Note: This graph represents to average Derwent Strength Index of the top 20 portfolios in the data collection, as measured by volume of inventions

IAM says:

Quantum computing has the potential to disrupt a number of industries and high-tech companies are not the only ones preparing for its advent. Just last week JP Morgan [hired a](#) long-time IBM researcher known as a “master inventor” for regularly producing valuable patents. Marco Pistoia, who focused on quantum computing algorithms, is now heading up a group at the bank dedicated to emerging technologies such as these.

The vast range of practical uses for quantum computing is part of the reason why so many companies are innovating in this field. The data does not give a clear answer as to who is leading the pack, with a different player pulling ahead of the others depending on the analysis. However, it seems that businesses like Microsoft, IBM, Intel and Northrop Grumman are highly invested in the space, while R&D initiatives are narrowly focused on technologies specific to quantum computing, rather than the wider quantum realm.

Note: RS Components pulled the data on 17/10/2019, analysing a total of 5,512 patent applications which were analysed when inputting DE:(“Quantum computing”).

Note: Derwent’s search was based on keywords on areas of quantum computing. Patent families with an earliest priority year of 2007 were included, and the final dataset contained 46k patent families.