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Who is leading 5G development?

A transparent assessment of 5G patent leadership

Many sources have reported on which companies are leading 5G development in recent months, often concluding that Huawei (or China generally) is in the lead. But such studies paint an incomplete picture, as they are often over-simplistic or flawed. For example, they count patent declarations made to standards bodies when measuring each company's share of the 5G "essential patents", even though not all declared patents are essential. **When using a broader range of metrics, we show that European, South Korean, Chinese, and US companies can all take the top spots.**

This infographic is based on a report published by Bird & Bird's patent intelligence consultancy, Pattern, which first appeared in IAM Issue 96, published by Globe Business Media Group.
See https://bit.ly/2ot3y3l

What is 5G?

Fifth generation (5G) cellular technology is heralded as a game-changer. With vastly improved speed, responsiveness, reliability and flexibility, it has the potential to disrupt or kick-start many industries – from automotive to medical to IoT – and to usher in an explosive "fourth industrial revolution".

Who is leading 5G development?

The question of who is leading the development of 5G is of immense interest to businesses and to politicians. Many recent articles have argued that Chinese companies, such as Huawei, have a huge lead over established players such as Nokia, Ericsson and Qualcomm; and over companies from South Korea, such as Samsung and LG Electronics.

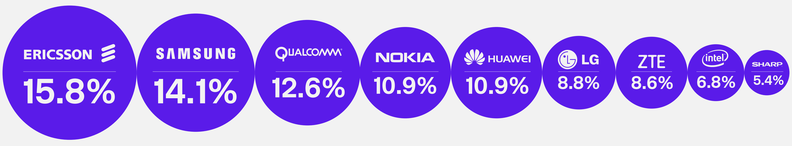
We conclude that many published studies are over-simplistic and unreliable. These studies restrict themselves to a narrow set of assumptions, even though company rankings are highly sensitive to: the assumptions; the analysis date; and the metrics used.

When running the analysis with a broader range of assumptions and metrics, we find that there is no consensus that China is in the lead. Depending on the precise inputs, European, South Korean, Chinese, and US companies can all take the top spot(s).

Essentiality audits are necessary to estimate 5G leadership

When counting standard essential 5G patents (i.e. "SEPs"), many studies rely on publicly-available declarations to standards bodies. However, declarations are not independently assessed, and some degree of over-declaration is inevitable.

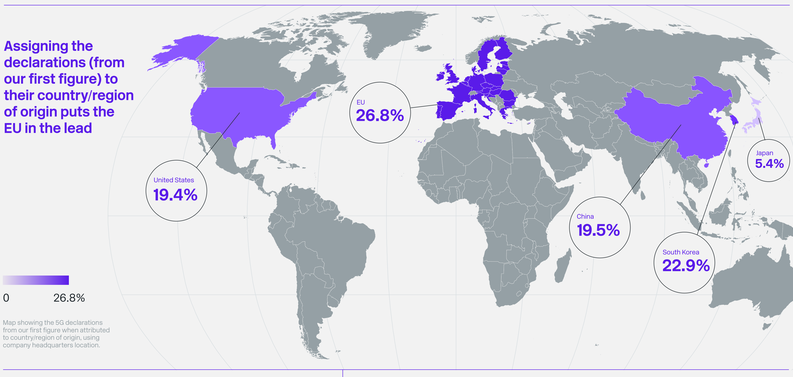
When counting declarations, simply applying the essentiality filter used in the seminal *Unwired Planet v Huawei* case in the English High Court reverses the view that Chinese companies are leading the 5G patent race.



This figure shows Ericsson, Samsung and Qualcomm taking the top spots when an essentiality filter is applied

Count of raw disclosures to 5G-only technical specifications or projects by company group, filtered to 1 October 2018 by declaration date, using a European Telecommunications Standards Institute (ETSI) download from April 2019. Essentiality scores from *Unwired Planet* have been applied.

Assigning the declarations (from our first figure) to their country/region of origin puts the EU in the lead



Map showing the 5G declarations from our first figure when attributed to country/region of origin, using company headquarters location.

Additional factors need to be considered

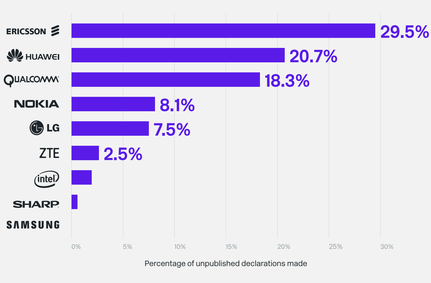
ETSI is the main standards body which maintains a database of 5G declarations. ETSI's database always appears up-to-date, as it includes declarations made right up to the download date. However, there's a hidden bias: while some companies' declarations appear quickly, other companies' declarations take many months to appear. As the bias is random, we can only control for this bias by filtering out the problematic months.

There are other hurdles to be overcome when charting 5G leadership.

1. Company rankings are highly sensitive to the analysis date, as the number of declared 5G patents is still rapidly growing.

2. When measuring patent leadership, it's typical to count patent families (i.e. a group of patents, usually filed in different countries, representing a single invention), meaning that the youngest patents get ignored. This is because they have not yet been published and so it's impossible to know if they represent new families or previously-declared families. This unfairly disadvantages companies who own more young patents.

This graph shows each company's share of young (i.e. unpublished) patent applications, indicating which companies are most disadvantaged when using (published) patent families as a metric



Count of declarations (made to 5G-only technical specifications or projects) in ETSI's database which cannot be matched to bibliographic patent data of published patent applications. Declarations are filtered to 1 October 2018 by declaration date, using an ETSI download from April 2019, matched to EPO patent data (PatStat Autumn 2018). Essentiality scores from *Unwired Planet* have been applied.

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