Patent **Quality and Value** Rankings

Ranking Systems Based on the Process of Self-Evolution

InQuartik

2021 Version

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Introduction:

Breaking the "All Patents Are Created Equal" Myth and Removing the Subjective Guesswork From Patent Evaluation

The "Quantity First" Myth Is Coming To an End

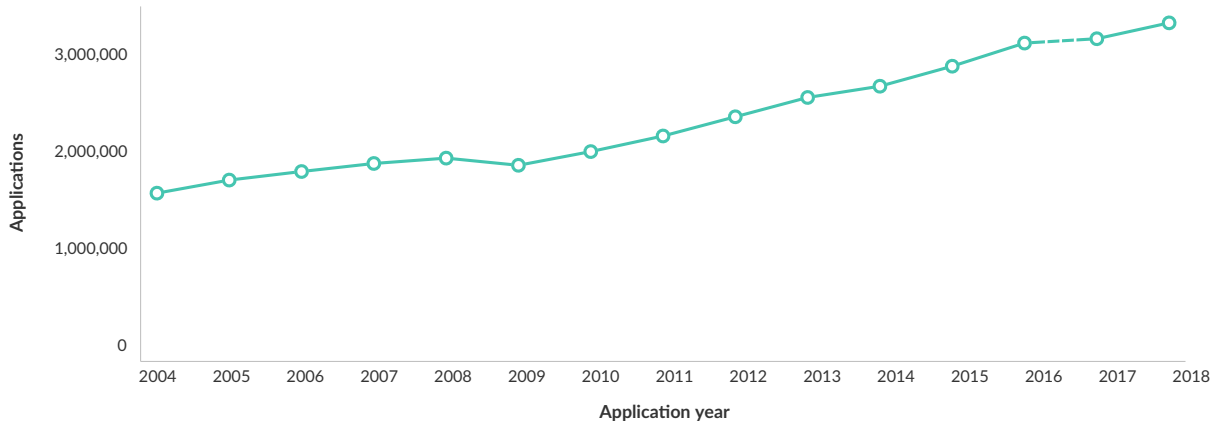
The debate over quality vs. quantity has been around for as long as patents themselves. Though it's becoming more apparent that quality is a relatively more dependable metric than merely relying on quantity, most patent professionals, however, fall into the infinite loop of evaluating the patent's strength by quantity instead of quality. To get to the bottom of this myth, we may need to reconsider the traditional idea of patent evaluation entirely. Before finding out, let's take a look at the current approach and the story behind it.

Patent systems were established with the ultimate goal of fostering economic growth and technological developments by rewarding those individuals — the inventors — willing to share their wisdom with society.

Just as technology and global economies have boomed over the decades, so has the resulting number of patent filings. A look at the statistics (Figure 1) from the *World Intellectual Property Organization* offers us a glimpse into this trend.

There is certainly no doubt that such a rich disclosure of knowledge brought a significant number of benefits to our day-to-day lives. The rapid pace at which the phenomenon occurred, however, introduced several downsides.

Figure 1: Worldwide patent applications reached 3.3 million



Source: WIPO

A greater number of patent filings may not necessarily result in more innovations successfully making it through the patent office's scrutiny for novelty and non-obviousness (see Figure 2).

When comparing the number of patents granted to the number of patents filed, there is a considerable gap where a significant number of patent applications cannot be granted due to patentability issues — thus giving us a strong indication that filing more patents does not necessarily equal having higher technical capabilities. Therefore, a mere belief in quantity-based evaluation cannot give us in-depth insights into a patent's quality.

Let us now take a look at one of the greatest global trending topics of recent times: 5G. This cutting-edge telecommunication standard will change the world entirely — from personal mobile to mega factories at scale. Who is leading the 5G race has been a long-standing dispute for almost half a decade. If we evaluate the leading position by counting the standard-essential patents (SEPs) declared to the ETSI (*European Telecommunications Standards Institute*) database, we can see the following rankings in Figure 3.

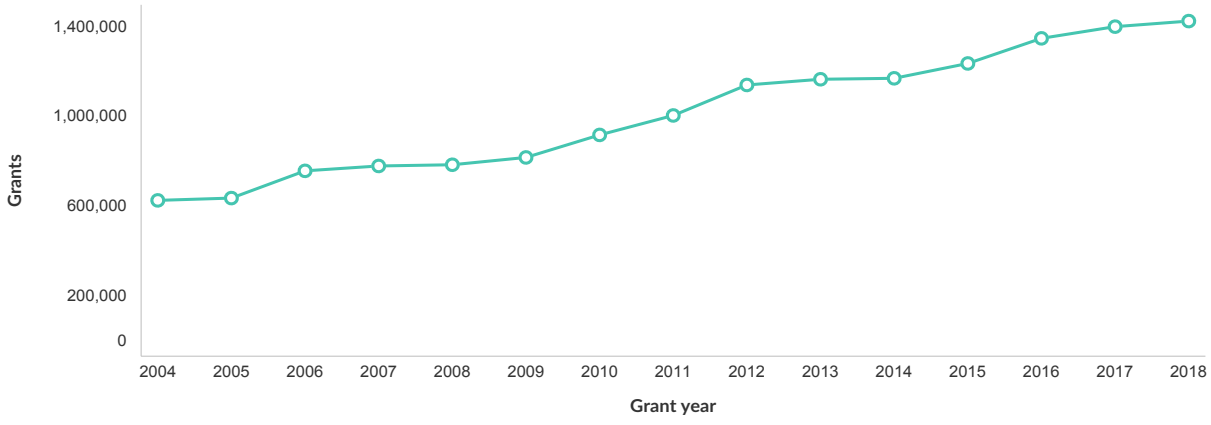
Many — such as the media, who do not possess enough knowledge of tech entities — tend to report or evaluate a company's position in the 5G race based on the quantity of its declared SEPs. Still, we need to ask, what is the potential risk of evaluating a patent portfolio by only considering quantity?

Back to the literal meaning of standard-essential patents. A standard-essential patent means that it must consist of both a "standard" and "essentiality" for it to be recognized as a SEP. However, the current declaration ETSI process is more than excessive, causing the "over-declaration" phenomenon that induced multiple problems in patent licensing negotiations.

Possible reasons for over-declaration:

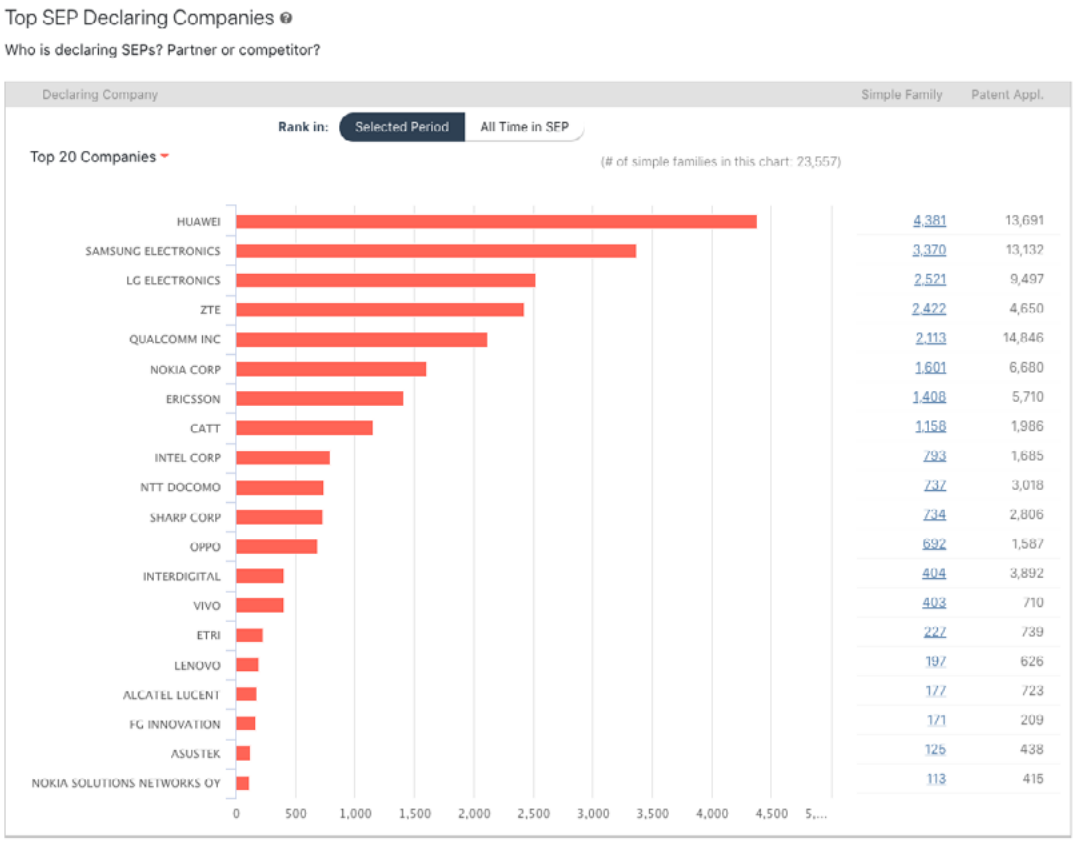
- ETSI requires that any patent applicants with patents that might be essential should submit them to ETSI.
- As technology evolves, some patents might lose their essentiality.
- Patent claims are narrowed down or even rejected during prosecution; the essentiality may be reduced or diminished in the meantime.
- Some patent applicants tend to overclaim as many as SEPs to gain a competitive edge on future negotiations.

Figure 2: Patents granted worldwide reached 1.42 million in 2018



Source: WIPO

Figure 3: The top ETSI SEP declaring companies



Source: Patentcloud's *SEP*, updated on September 7th, 2020

Merely depending on the quantity-based assumption to evaluate the strength of the patent portfolio seems unreliable. Large portfolios may not directly result in a higher value for the patent holder, in fact; most patents create no value at all and remain dormant until they are either abandoned, lapsed, or they simply expire.

However, this approach has its grounds on the wrong assumption that all patents are created equal, making it a less "intelligent" form of evaluation.

As an attempt to fix this stagnant situation, the first online patent databases appeared in the 90s: even though they provided accessible and consolidated patent data to everyone for the first time, the overall data quality was poor and lacking in depth.

Therefore, the issue of data utilization was there to stay, and without comprehensive data to rely on, patent intelligence remained focused on quantity-based evaluations.

> As practitioners in the patent field are already well aware, the mere quantity of patents in a portfolio is an extremely weak indicator of its actual strength.

To sum up, the quantity-based patent analytics that relies on the "all patents are created equal" myth and uses underutilized patent data, has resulted in the assumption of "quantity equals value," leading practitioners away from facts and valuable insights.

However, there are several barriers to shifting people from a quantitative approach to a qualitative approach for patent evaluation.

Traditional Patent Evaluation Methods and the Challenges Faced

The financial valuation process

The concept of patent price and the corresponding valuation models were first developed for accounting and financial reporting purposes.

These valuation models — which were initially developed to meet the *Generally Accepted Accounting Principles* (GAAP) and the *International Financial Reporting Standards* (IFRS) — were later leveraged in decision-making and the practice of patent asset management and transactions.

Traditional evaluation methods used for asset management and transactions typically relied on the judgments of the stakeholders (i.e., inventors, applicants, agents, and examiners), based on their knowledge, experience, and the particular case they were facing.

Later on, different aspects of the market, technology, and patent practices started to be considered. However, due to the insurmountable costs associated with the time needed to perform such an evaluation, this traditional method could only really be used on a case-by-case basis and performed for specific patents on specific decision points.

Computer algorithms

To increase the speed and efficiency of patent evaluations, computer algorithms were developed to emulate the patent practitioners' evaluation methods, such as the work by CHI Research in the 90s.

Many patent data and analytics service providers also created evaluation indicators based on their own understanding of patent quality, value, and price.

Utilizing assumptions, foundations, and key parameters formulated as secret "recipes," these early approaches and indicators often had difficulty overcoming several significant challenges.

> Their main pain point is that they often aggregate multiple distinct elements into a single indicator, making such an indicator vague and unclear.

Whether such an indicator reflects the true patent value or not, it often provides no reason why the patent is of any value. To establish it, each distinct element or “recipe” used by patent practitioners to evaluate patents must be transparent. However, unsurprisingly, most practitioners are unwilling to divulge the secrets of their trade.

> Even if the “recipes” are published, proving the relevance of this aggregation of multiple considerations remains problematic, simply because there is no single meaning for the indicator.

This lack of consistency in interpretation has caused controversy among patent professionals of different backgrounds and experience levels, ultimately leading clients astray.

In contrast to the aggregated indicator approach, some vendors or researchers set up simple parameters, such as the number of forward citations or the number of family members for evaluation.

However, these simple parameter approaches have forced users to return to their offline assessments by aggregating up the parameters by themselves, since it is even harder to tell the relevance and weight of the contribution of each parameter.

As a result, returning to a case-by-case evaluation happened as a matter of course.

A More Meaningful and Useful Method for Patent Evaluation

Before introducing a better way to value patent assets, we should take a moment to discuss the three concepts that patent practitioners have introduced over the years in an attempt to deal with the myth mentioned above. The concepts are depicted in Figure 4.

Quality

The notion of quality is tied up with the patentability requirements stated in Title 35 of the *United States Code*, particularly in Section 101 (utility and eligibility), Section 102 (novelty), Section 103 (non-obviousness), and Section 112 (adequately described):

> If a claimed invention is eligible, novel, non-obvious, and described with clarity, it is deemed to have at least a baseline (or minimum) quality.

Quality patents must feature a claim language that is carefully crafted to ensure accuracy and logic, as this will broaden their scope and consequently slim down the chances of competitors performing a design-around.

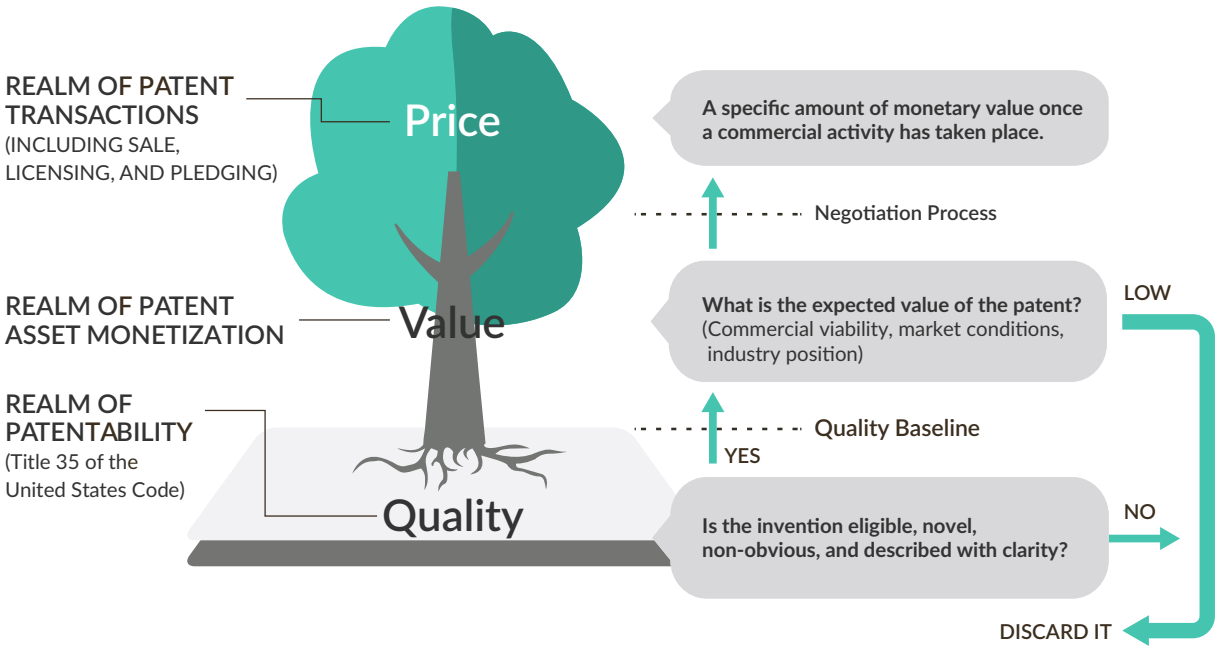
Despite the slightly different definitions, the concept of patent quality is widely accepted as the foundation of value and price.

Value

Should a patent be practiced without authorization, its owner may decide to enforce it before a court. This confidence in patent enforcement provides the foundation for patent transactions, such as selling, licensing, and pledging.

The expected value earned from these transactions is widely agreed upon as being the commercial or monetary value of the patent as an asset.

Figure 4: The relationship between patent quality, value, and price



We should point out that a heavily researched and well-written patent may meet all the patentability requirements but have very little value. The covered invention, for example, might be outdated or related to an obscure technology that only the inventor is interested in developing.

> Patent value — either realized from enforcement, transaction, or other commercial practices — goes well beyond the four corners of a patent by considering commercial viability, market conditions, and industry position.

For patent holders who are managing patent assets, the patent value does not necessarily need to be a specific monetary figure: at this stage, it is far more important for them to understand the potential monetary return of the patent, especially when deciding whether to maintain, activate, or discard it.

Price

Once a commercial activity occurs, both parties need to determine a specific amount for the monetary value — this is when they resort to patent price.

The concept of patent quality determines whether a patent can be deemed an asset or not according to its validity and enforceability.

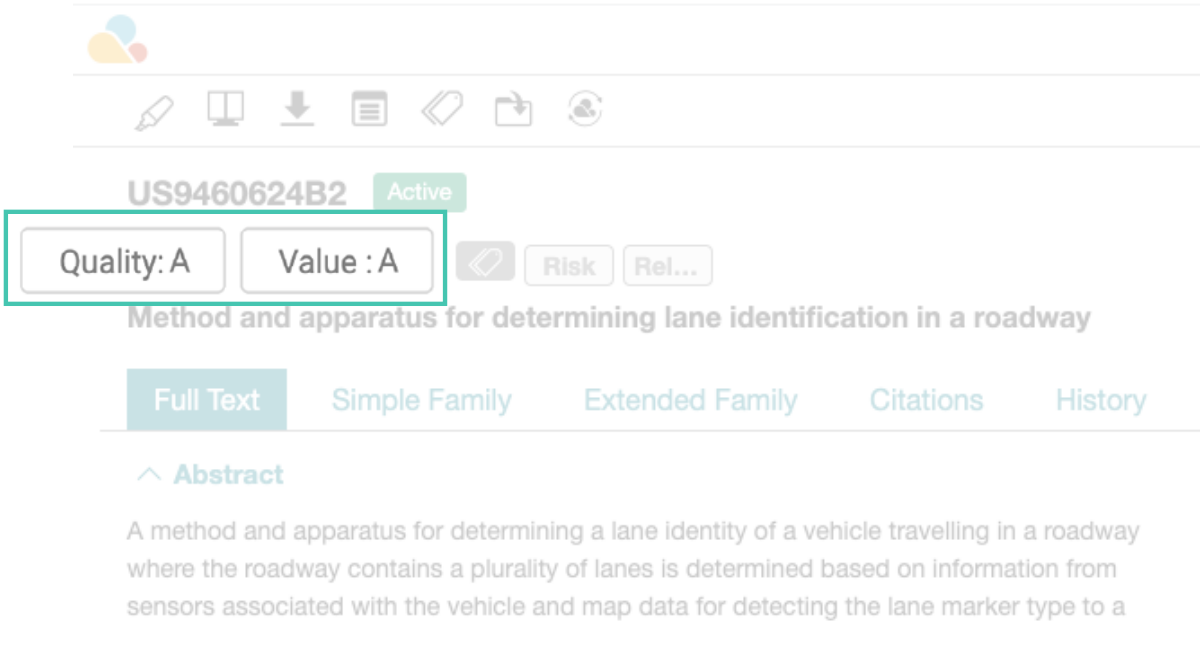
> The price of a patent is generally formulated through negotiation or litigation based on the cognition that each party has about the value of the patent at issue.

It should be clear by now that, although practitioners may advocate different approaches, it is widely agreed that **patent quality, value, and price are separate — yet highly dependent on one another — factors.**

Patentcloud's Quality and Value Rankings

With the emergence of big data and machine learning technology, data modeling for predicting

Figure 5: The Quality and Value Rankings in Patentcloud's *Patent Search*



the tendency of a specific event involving patents has now become possible. As long as the big data provides sufficient information for machine learning to extract useful patent data, this technology may provide an analysis that resembles patent value.

InQuartik has a team of researchers and data scientists who leverage machine learning technology to uncover the strength, or other indexes, of patent data. Consequently, we have a more meaningful and useful method for evaluating patents via InQuartik's Patentcloud platform, including the exclusive and proprietary Quality and Value Rankings.

> The Patent Quality Ranking focuses on indicating the relative eventuality of prior art references being found for a patent, which can threaten its validity.

> The Patent Value Ranking focuses on reflecting the relative tendency of a patent to be practiced or monetized after its issuance.

By separating these two indicators, users can leverage the Patent Value Ranking and the Patent Quality Ranking independently for different decision points in the patent life cycle, and even obtain patent intelligence for insights, such as patent clearance, patent portfolio, patent landscape, and patent due diligence for M&A and investment purposes.

These rankings are not meant to replace a case-by-case evaluation of a specific patent; they are intended to serve as an effective filter or additional dimension when dealing with patent data and provide actionable intelligence.

The Principles Behind:

How Machine Learning Gave Us a Better Approach To Patent Evaluation

After discussing the traditional way to evaluate patents and its major shortcomings, let us dig deeper into the matter by analyzing in detail the machine learning technology that enabled InQuartik's engineers to introduce a more reliable approach.

Acquisition and Data Cleansing

As illustrated in Figure 6 below, the machine learning process behind Patentcloud's Quality and Value Rankings begins with acquiring patent data from multiple sources such as bibliography, specification, and prosecution history.

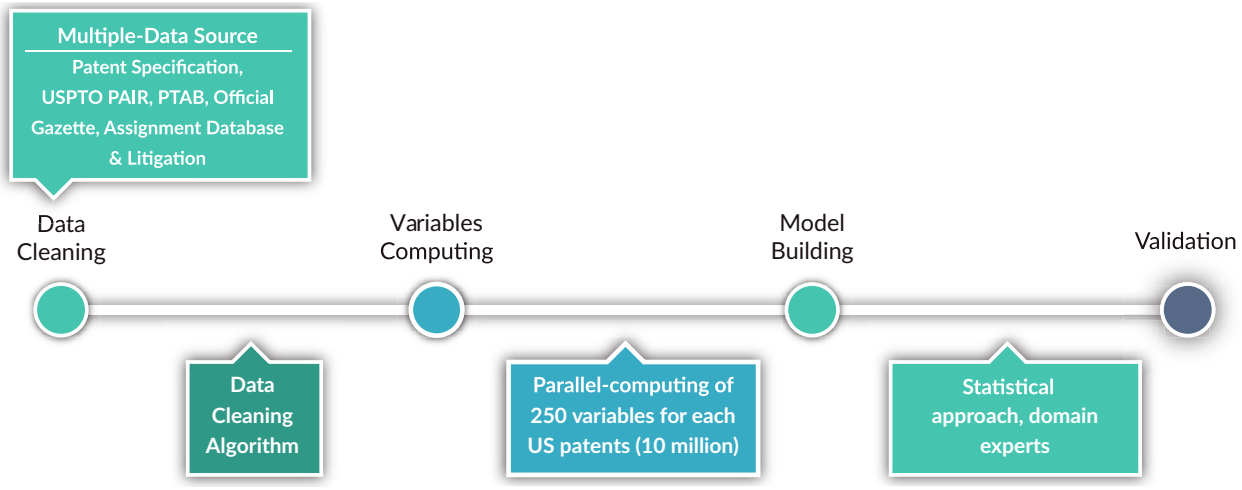
After rigorous data cleansing and feature engineering, InQuartik's data scientists worked with patent professionals to identify a set of 250 defining features.

These features mainly relate to the experience of the stakeholders (i.e., inventors, applicants, agents, and examiners), backward and forward citations, claim structure, assignment records (transaction, licensing, pledging), and the prosecution history (i.e., rejections, amendments, change of attorneys) of patents.

Variables Computing and Model Building

Building a machine learning model requires hundreds of data variables. As InQuartik's data scientists have identified a set of 250 features,

Figure 6: The machine learning process behind Patentcloud's Quality and Value Rankings



this data is classed as having two different purposes, as shown in Figure 7 below:

1. Data training: We use data to train the model so that the AI can learn how to predict a patent's quality and value; such data includes:
    - The profile of the inventor, applicant, agent, and examiner
    - Claim structures
    - Forward and backward citations
    - Assignment records
    - Prosecution history

Why did we select this data to train the model? Since we think these are important factors of a patent's quality and value, we believe that the ranking can bring out the best predictability by incorporating these factors into the training model.

2. Validating data: We use data to validate the predictability of the model so that it gives us some clues for modifying the model and enhancing the predictability; such data includes:
    - Litigation records
    - IPR and other reexamination records
    - The FDA's *Orange Book*

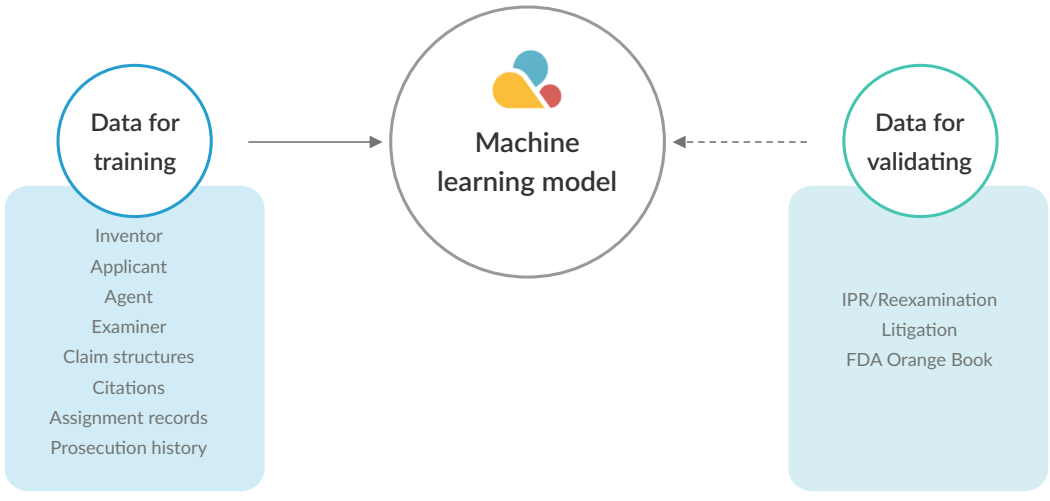
Why did we select this data to validate the model? IPRs, Reexaminations, and litigations are the most common forms of practicing a patent. Therefore, they are good indicators for validating the model's predictability since it is easy to map the predictability to these real events.

The FDA's *Orange Book* records approved medicines and their patent information. Those patents registered in the *Orange Book* are deemed to have high value.

The Self-Evolving Model

The statistical approach is then involved in training the model through the parallel computing of the variables. These variables range across all stages of a patent's lifecycle — from application to post-grant activities. This approach, in reality, is quite important for all kinds of patent analysis and decision-making. Since some data from post-grant events (such as assignments) will be evaluated, the ranking of a patent's value may be changed dynamically according to the transacted event that occurred. With more and more monetization activities, the Value Ranking of that patent will increase.

Figure 7: The data training and validation process of Patentcloud's machine learning model



The new Patent Value Ranking is a system that evolves inherently and dynamically and is determined based on all of the data available both at the time of publication (or issuance) of the patent as well as post-publication (or post-issuance) events.

For instance, if a patent is filed with an IPR petition or used in a patent infringement litigation, its value score will increase and may lead to a higher value ranking. If a patent is registered in the newly issued *Orange Book*, its value ranking could increase.

Though currently, the Patent Quality Ranking is determined by the data available at the time of publication or issuance, it is anticipated that there will be a new Quality Ranking that will also consider the data available after publication or issuance within the next year.

If a patent is filed with an IPR petition, the model will adjust its quality score according to the petition's final judgment. Whether the patent is accepted, partially accepted, or rejected, it will lead to some changes in the quality ranking. After repetitive training with the model, it will eventually be capable of predicting a patent's quality and value by giving a score to each patent. Nevertheless, the absolute scores would be too challenging to interpret. The next step is to assess the similarity of each patent with the high-quality or high-value models identified above and provide the resulting relative rankings as Figure 9 indicates.

Figure 8: The data scope considered for the Patent Quality Ranking and Patent Value Ranking respectively

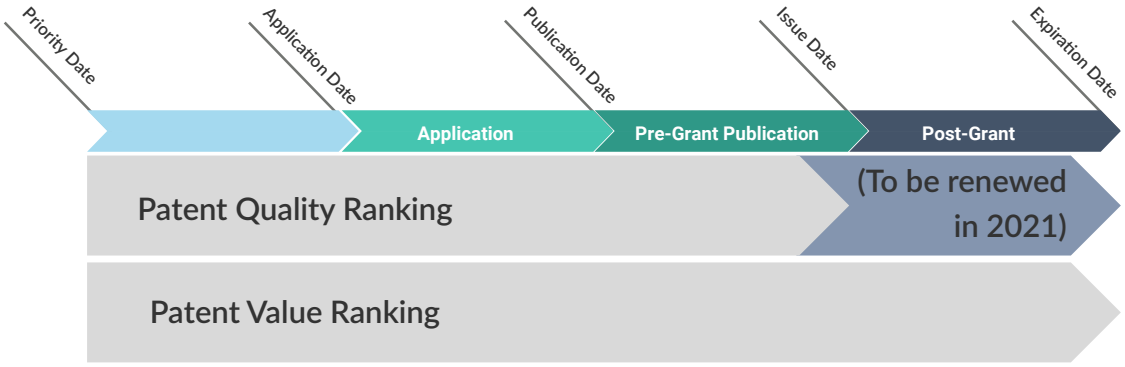
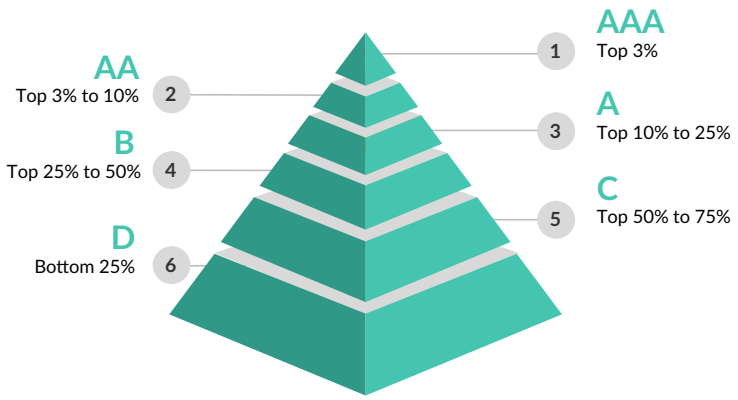


Figure 9: The relative ranking structure of Patentcloud's Patent Quality and Value Rankings



Validation

Following the initial model building phase, InQuartik's data scientists continued their collaboration with patent professionals to validate the results and optimize the models.

In particular, to continuously track the significance of the correlation between the models and the events they are trying to predict, the team built two monitoring systems — one for patent IPR cases and infringement cases to validate value, the other for USPTO PTAB cases to validate quality.

As shown in Table 1 below, among the 11,808 litigated patents considered, the new model of the Patent Value Rankings reveals more than 78% of patents with a score of higher than A, which shows an improvement on the previous version (60%).

Similarly, reexamination and IPR cases were tracked to verify the reliability of the Patent Quality Ranking. The results are comparable to the previous ones — among the 3,626 patents involved in IPR or reexamination cases considered, nearly 60% scored lower than C (see Table 2).

Table 1: Examining the value model using U.S. patents involved in infringement cases

Model	Number of Patents	A+%	AAA%	AA%	A%	B%	C%	D%	P-Value
New Value Model	11,808	78.76%	29.64%	24.59%	24.53%	14.86%	4.95%	1.42%	<.001
Old Value Model	11,808	60.10%	15.62%	18.95%	25.53%	20.65%	12.01%	7.23%	<.001

Note: the infringement case data was collected from RPX between 2017/7/11 and 2019/09/24 (inclusive)
Source: InQuartik

Table 2: Examining the quality model using U.S. patents involved in PTAB cases

Model	Number of Patents	AAA%	AA%	A%	B%	C%	D%	C-%	P-Value
Current Quality Model	3,626	4.14%	6.98%	12.36%	18.37%	19.50%	38.67%	58.17%	<.001

Note: the PTAB case data was collected from RPX between 2017/7/11 and 2019/09/24 (inclusive)
Source: InQuartik

The Patent Value Ranking also validates against data related to patent commercialization, such as patent linkage data (FDA *Orange Book*), standard-essential patent (SEP) declarations (ETSI database), and patent virtual marking data collected from several S&P 500 companies.

To further validate the new Value Ranking model, we brought in the patent data listed in the FDA *Orange Book* to examine the value distribution of the list. If a patent related to an approved medicine is listed in the *Orange Book*, it will have a higher value ranking on average. By importing the patent list into Patentcloud's *Due Diligence*, we can view the Figure 10 below from the Quality and Value Dashboard.

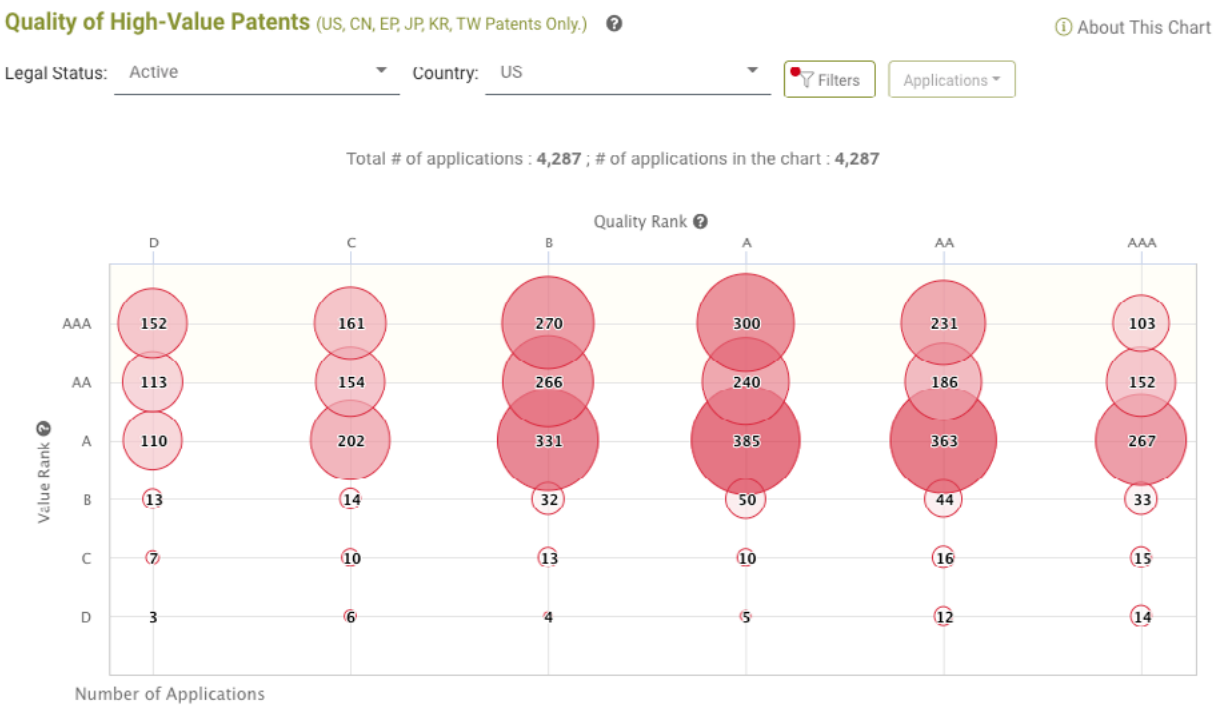
Patentcloud's *Due Diligence* can timely process up to 50,000 patent numbers and get results in seconds. From the Quality of High-Value Patents dashboard, we can see that most of the patents in the FDA *Orange Book* — 92.9% to be precise — are ranked above grade A. This validation further verifies the applicability of Patentcloud's new Value Rankings.

Large M&A deals — such as the Nortel deals — are also selected as validation data. All the validations are performed on a portfolio (landscape) or entity basis.

The results conservatively reflect that:

> For a patent portfolio or the patents of an entity, the percentage of rankings above A and the percentage of rankings below C is significantly relevant to the monetization, commercialization, and invalidation events that the rankings are trying to predict.

Figure 10: The value ranks of the U.S. patents listed in the FDA *Orange Book*



Source: InQuartik

Limitations

Patentcloud's Quality and Value Rankings are an attempt at predicting the likelihood of future events involving patents. The rankings have both strengths and limitations.

Firstly, they should be leveraged exclusively within the correct context as their definitions may not always align with the various "literal meanings" of the terms "Patent Quality" and "Patent Value" in different scenarios.

For example, even though the Patent Value Ranking relates to the likelihood of patents being practiced or transacted, it does not consider the market size of the products practicing a patent or the cost-effective enhancement of the products practicing a patent.

Additionally, a higher Patent Value Ranking does not necessarily mean that a specific patent will be litigated or transacted — patents are rarely litigated or transacted at all.

However, the rankings provide greater confidence when identifying patents that have been subject to litigation or transaction within large portfolios.

As shown in Figure 11 below, over 30% of the AA/AAA-ranked patents have been transacted after their issuance. The details are found in Table 3 below.

Figure 11: Patent value model validation using U.S. transaction patent data

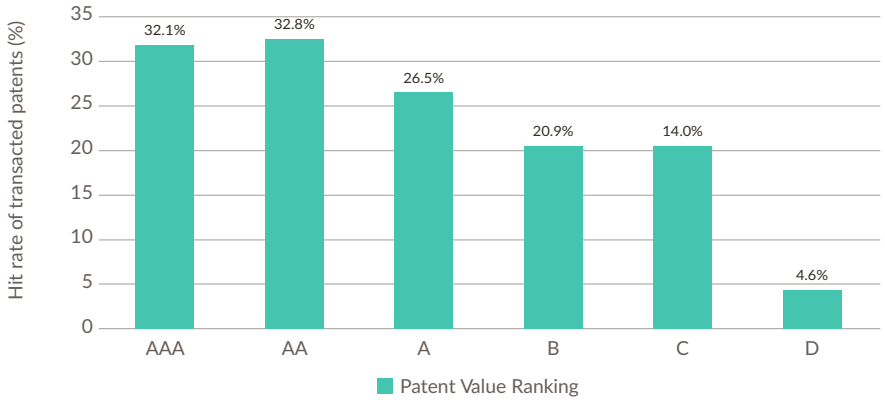


Table 3: Patent value model validation using U.S. transaction patent data (in detail)

Active U.S. patents from Jan. 2020 to Aug. 2018	AAA-ranked	AA-ranked	A-ranked	B-ranked	C-ranked	D-ranked
All active patents (#)	161,754	246,753	490,878	788,597	793.143	1,051,719
Transacted patents	51,964	80,984	129,996	165,132	111,281	48,060
Hit rate (%) of transacted patents	32.1%	32.8%	26.5%	20.9%	14.0%	4.6%

Note: To filter out inter-affiliate company transaction data, only patents transacted more than twice have been included in the data set.

However, even though there is a significant difference (about six times) between the best and the worst quality patents, around 2/3 of the AA/AAA-ranked patents may never be involved in transaction or litigation.

> It is clear that the higher the relevance between the definition of the rankings and the scenarios in which they are applied, the higher their effectiveness.

For contexts requiring different assumptions of "Patent Quality" and "Patent Value," the rankings may still be applicable, but other relevant indicators should be considered and combined for better results.

Best Practices:

Using Patent Quality and Value Rankings for Analysis

Actionable analytics must clearly answer the questions that decision-makers have in mind — what they need is objective information rather than vague assumptions. However, as we saw above, some of the indicators traditionally used are a mere aggregation of data relating to the inventor's expertise and the patent's novelty, breadth of rights, and other criteria. They cannot be regarded as valuable insights since they do not provide any information about why the patent is graded as high-value.

Example 1: Wearable Medical Devices — An Overview of Patent Landscaping

Patent landscapes are used in competitive benchmarking to identify the major applicants or patent owners in a given technology field.

A conventional listing may include "poor value" patents, many of which may have never been practiced or may have even been abandoned. The more patents of this kind that an applicant or patent owner has, the higher the possibility of overestimating their technological strength.

Apart from these false-positive issues, there could also be false-negative issues, wherein the major high-value patent applicants or patent owners end up being overlooked simply because they have been buried in the overwhelmingly large number of patents.

Using the Patent Quality and Value Rankings to analyze patent landscape charts can help in this scenario. Filtering out above A-ranked patents from the original landscape is a way to address the false-negative issues and let the analyst focus on the portfolio.

Let us dive deeper by looking at an excellent patent landscaping analysis, "Wearable Medical Devices in Monitoring Bio Data," conducted by our enterprise partners — Wispro Technology Consulting Co. — to try to sort out the patents worth analyzing in the wearable medical devices patent field.

In this report, Wispro's experts collected patents from 40 major companies who produce wearable medical devices and 95 devices submitted to the USFDA for approval. The report ultimately collected 514 patent applications.

Figure 12 — created with data collected by Patentcloud —provides an overview of the 495 patent applications.

From the chart, we can see that around 22% of the patents are both high-quality and high-value. While maintaining the simplicity of quantity-based patent intelligence, Patentcloud's Patent Quality and Value Rankings can function as an effective filter to sort the signal from the noise, especially when considering the overwhelming number of patent applications filed each year.

Example 2: The Race for Advanced Chip Manufacturing — Competitive Intelligence Analysis

The Patent Quality and Value Rankings can also be used to conduct competitive intelligence analysis. For in-house patent portfolio managers, it is a great way to realize the strengths and the weaknesses of their patent portfolio, giving them enough insights to improve their patent portfolios; for investors, it easily depicts the competitive landscape and the position of each company, enabling them to make well-informed decisions.

By reviewing the report "Competitive Intelligence Analysis of IC Foundries" conducted by Wispro, we can assess the patent portfolios of major global IC foundries from the perspective of patent quality and value.

In this report, Wispro's experts collected patents with the following criteria:

- Jurisdictions: US & CN
- Legal status: published or granted
- Assignee: TSMC, Intel, Samsung Semiconductor, and GlobalFoundries

Let us try to identify the major technologies in the chip manufacturing patent field first. After the data collection, the experts further categorized the patents with different metrics. In this case, nearly 20,000 patents were categorized by technology structure and patent office; by utilizing the two-level, pivot table-like PatentMatrix Dashboard, we can form a patent

Figure 12: Identifying the high-quality and high-value patents in wearable medical devices

Source: Wispro

landscape by examining the patent quality and the patent value at the same time with the above two metrics (see Figure 13).

Assessing the quality and value of patent portfolios brings several benefits. It allows decision-makers to identify low performing patents — in other words, low-quality and low-value patents (below C-ranked) — they can then consider divesting in order to reduce maintenance fees.

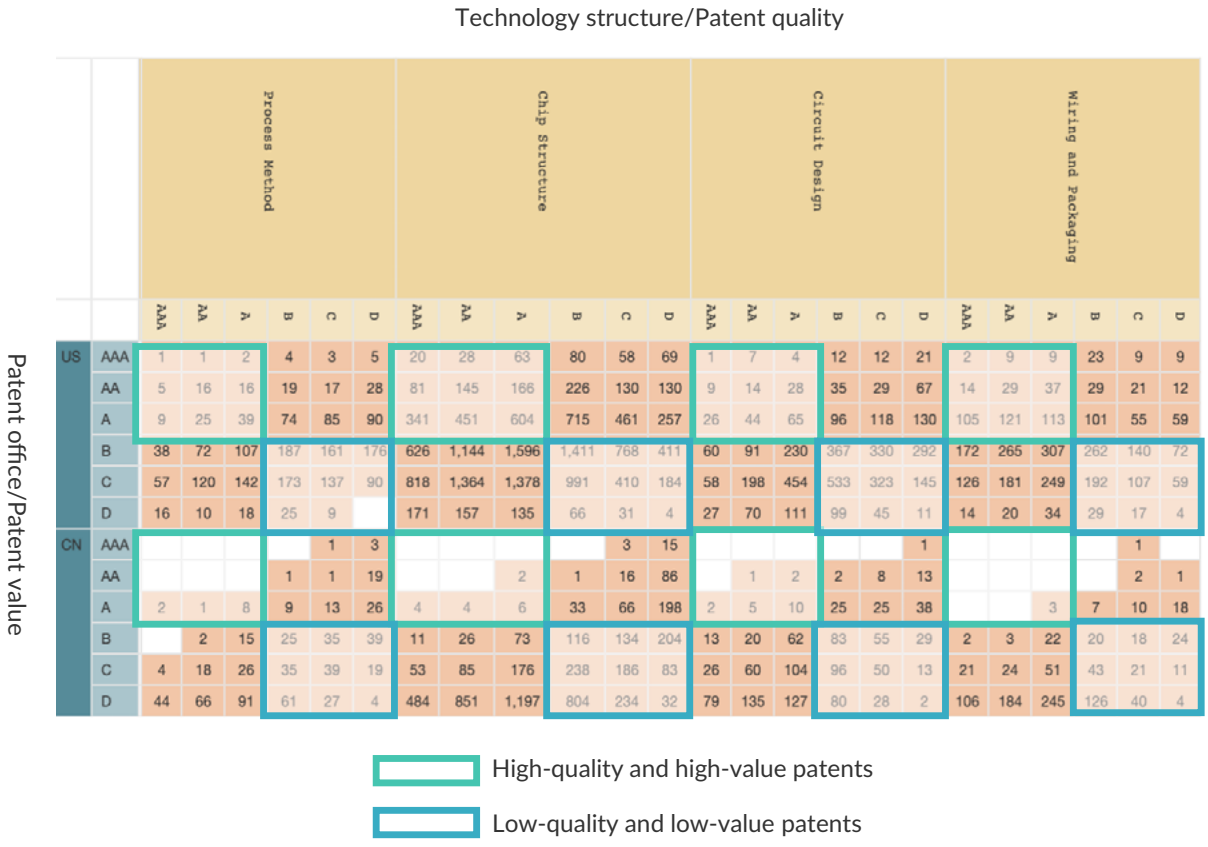
On the flip side, high performing patents — patents with higher quality and value rankings (above A-ranked) — deserve to be monetized more often than the other patents.

Let us dive deeper by examining the patent portfolio of each IC manufacturer. Candidates such as TSMC, Intel, Samsung Semiconductor, and GlobalFoundries step into the game since they are the most well-known and possess the highest market ratio.

Focusing on these top applicants could complement the previous approaches: setting the filters to show patents ranked above A will result in a list of applicants with more valuable patents in terms of practicing and monetizing potential. Based on the classification of technology structure and identification of high-quality and high-value patents above, Wispro's experts depicted Chart 4.

The "Emerging Technology" shown here is an alternative way of categorizing the patents according to the technology structure categorization above. From the chart, we can see

Figure 13: The patent landscape of patent portfolios from major IC foundries



Source: Wispro

Chart 4: A competitive analysis of world major IC manufacturers

Emerging Technology	Company	tsmc		intel		SAMSUNG		GLOBAL FOUNDRIES	
	office	US	CN	US	CN	US	CN	US	CN
Non-planar Transistor	Application count	3,714	896	1,415	356	2,159	362	4,446	274
	High Quality &Value ratio	17.0%	0.6%	14.7%	0.0%	1.1%	0.0%	7.7%	0.4%
EUV Technique	Application count	453	81	249	19	574	42	350	19
	High Quality &Value ratio	9.0%	1.3%	0.8%	0.0%	0.2%	0.0%	3.7%	0.0%
System in Package (SiP)	Application count	3,461	474	1,259	180	4,303	261	985	47
	High Quality &Value ratio	16.6%	0.2%	6.6%	0.0%	0.4%	0.0%	4.8%	2.1%

Source: Wispro

that TSMC does not always have the most patent applications among all the technologies in every patent office, but it has the highest overall high-quality and high-value patent ratio compared to its competitors.

For example, GlobalFoundries has the most U.S. patents in **non-planar transistors**, and Samsung has the most U.S. patents in **EUV technique** and **system in package**. However, neither of these two companies possesses more qualitative and valuable patents than TSMC — it is no wonder that TSMC continues to lead in advanced chip manufacturing technologies.

By leveraging the Patent Quality and Value Rankings, we can successfully identify the key players in the IC manufacturing technology field and narrow down the pool of patents for a preliminary review.

Example 3: ETSI SEP Evaluation — Gain the Upper Hand in the 5G Era

It is crucial for companies investing in new technical fields related to 5G to understand the ETSI SEP declaration activities in a timely manner. How do the declaration activities affect the daily operation of a business? How do different stakeholders in the 5G race — such as product developers, licensees, and investors — know the competitiveness and the trustworthiness of the counterpart? From the perspective of patent quality and value, it enables the stakeholders to make better decisions.

1. Product developers: Setting up an FTO search scope

Patent infringement risk is one of the defining elements of commercial success; an FTO search is the standard process for identifying and controlling these risks.

As the 5G industry moves towards maturity, the technologies involved in a product or a Technical Specification (TS) often become more sophisticated, making it harder to determine the

relevance of a specific patent to a product or a TS.

As a result, the scope of a patent clearance search can become vague, and some companies — especially in Asia — may even give up on controlling patent risk and simply allocate a budget for taking licenses.

With Patentcloud's *SEP*, it is clear to see the SEP declaration status by each 3GPP Technical Specification in Figure 14.

The Patent Quality and Value Rankings can help set the scope of an FTO search when the 5G technology becomes more complicated, and the number of related patents continues to increase.

Take TS 38 331 for example, by importing the declared SEP into *Patent Vault*; we can instantly utilize the PatentMatrix Dashboard to take a glimpse into the patent quality and value distribution, along with the patent office (only the IP5 are displayed) and legal status (only active statuses are displayed) information (see Chart 5): while there would still be thousands of relevant

Figure 14: Top SEP declaring specifications in ETSI's database

SEP Declarations by 3GPP Specifications

Which technical specifications are the most popular?

3GPP Spec

All Spec Selected

(# of simple families in this chart: 24,324)

	3GPP Spec	Spec Title	Simple Family
1.	TS 38 331	NR; Radio Resource Control (RRC); Protocol specification	10,973
2.	TS 38 213	NR; Physical layer procedures for control	10,667
3.	TS 38 211	NR; Physical channels and modulation	9,202
4.	TS 38 214	NR; Physical layer procedures for data	8,376
5.	TS 38 212	NR; Multiplexing and channel coding	8,118
6.	TS 38 300	NR; Overall description; Stage-2	5,665
7.	TS 38 321	NR; Medium Access Control (MAC) protocol specification	5,436

Source: Patentcloud's *SEP*, updated on September 7th, 2020

Chart 5: The patent office/patent quality and legal status/patent value distribution of TS 38 331

Patent office/Patent quality

Legal status/Patent value		US						EP						CN						JP						KR						TW					
		AAA	AA	A	B	C	D	AAA	AA	A	B	C	D	AAA	AA	A	B	C	D	AAA	AA	A	B	C	D	AAA	AA	A	B	C	D	AAA	AA	A	B	C	D
Active	AAA	3	3	1	2	3	7					1		1	3	4	4	1	1	1	2	6	7	4			1	10	7		1	2	2	2	1	1	
	AA	2	5	8	9	12	23		1	7	12	5		2	4	10	7	7	4			8	10	9			2	11	10	3	1	1			3		
	A	9	23	41	50	31	16	1	4	8	27	7	2	1	9	21	34	17	5	1	2	15	33	12			5	6	11	5	2		1	1	1	1	1
	B	20	43	63	65	30	13		5	25	40	16	1	4	2	13	14	12	4	2	9	22	27	6		2	6	20	7	9	2						
	C	17	36	35	35	18	10			18	23	12	2	3	10	10	10	11	1	1	6	31	12	3		2	5	4	5	4	7		1				
	D	8	26	30	28	10	4		2	12	53	39	6	5	17	34	35	23	17	5	36	34	2				2	1	3	7	1						
PGPub - Granted	AAA				11	4	4				1			4	5	4	2	1			3	5	8	5	1		3	9	5	3			2	3	1	2	
	AA	1	3	10	19	16	12		1	12	13	1		11	5	5	7	5	6			9	14	8	1		3	18	9	3	1		2	1	1		
	A	1	16	45	63	39	16		2	19	23	8	4	11	7	5	15	24	30	1	2	11	43	20	1	1	8	10	10	8	1				1	2	1
	B	8	23	61	69	53	20		2	33	39	14	2	17	2	4	4	7	20	1	2	25	38	10	1		6	21	11	6	3			1			
	C	8	17	41	38	30	15		3	19	25	18	8	10	3	7	12	7	11	2	5	29	23	3	4	2	2	5	10	5	8			4			
	D	2	3	20	31	36	18	1	4	29	48	21	4	9	9	19	24	23	51	1	20	45	20	2			3	4	5	2	1		1		1		

Source: InQuartik

patents, the Patent Quality and Value Rankings could be useful when limiting the search scope, so that the preliminary review could start with the patents that have relatively higher quality and value.

On the other hand, by identifying the patents with Patent Quality and Value Rankings lower than D (the bottom 25%), practitioners could somewhat narrow down the scope. If a patent holder takes the D-ranked patents against the product, it should be possible to settle the risk by invalidating them.

2. Licensees: Reach a fair trade

Many companies find themselves unprepared when licensors knock on their doors to ask for royalties — they simply do not have a way of knowing if the royalties asked for are fair or not. This phenomenon is amazingly common in the SEP-related products. The licensors tend to overclaim their patent portfolio and make a bundle deal — a licensing program that blends with only a limited amount of quality and valuable patents — which makes it harder for licensees to identify the diamonds in the rough.

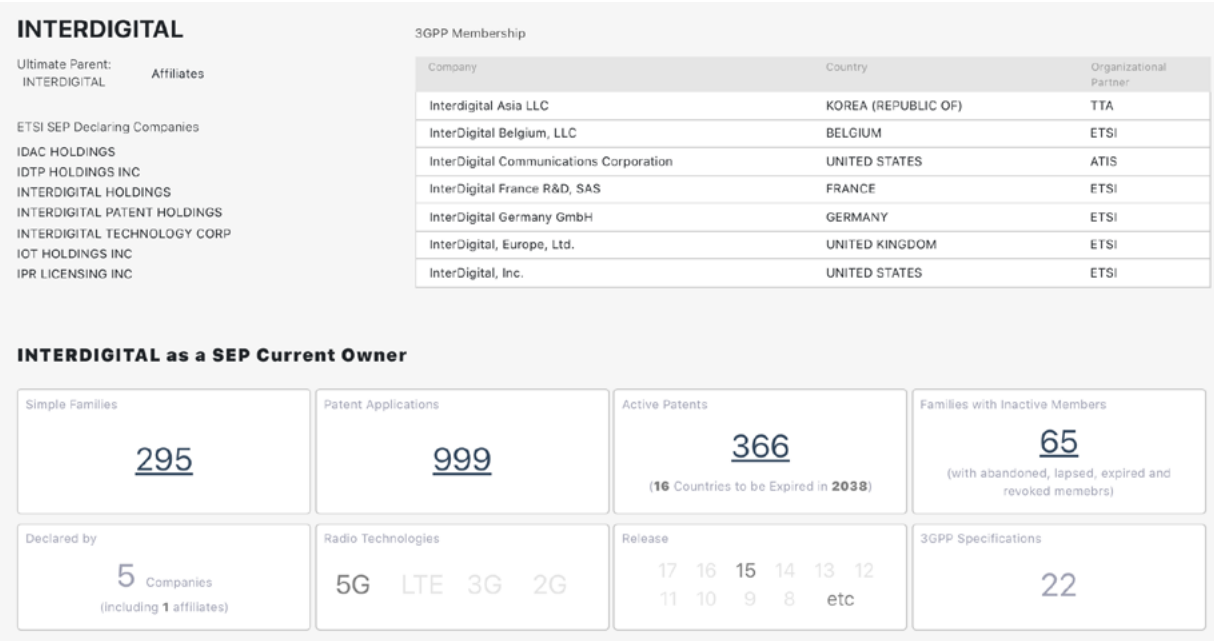
However, with the help of Patentcloud's *SEP* and the Patent Quality and Value Rankings, one can assess the true quality, value, and the declaration status of the licensor's declared patent portfolio, immediately consolidating the negotiation strategies against the licensing program.

By viewing the company profile in Patentcloud's *SEP*, one can immediately acquire a preliminary overview of the company's declaring status. Let us get into **INTERDIGITAL**'s profile shown in Figure 15 and take a look at its declaring status: we can save all of the SEPs into a *Patent Vault* folder and obtain an analysis chart on the patent quality and the patent value via the PatentMatrix Dashboard (Figure 16).

With this kind of analysis chart, licensees can utilize the following information:

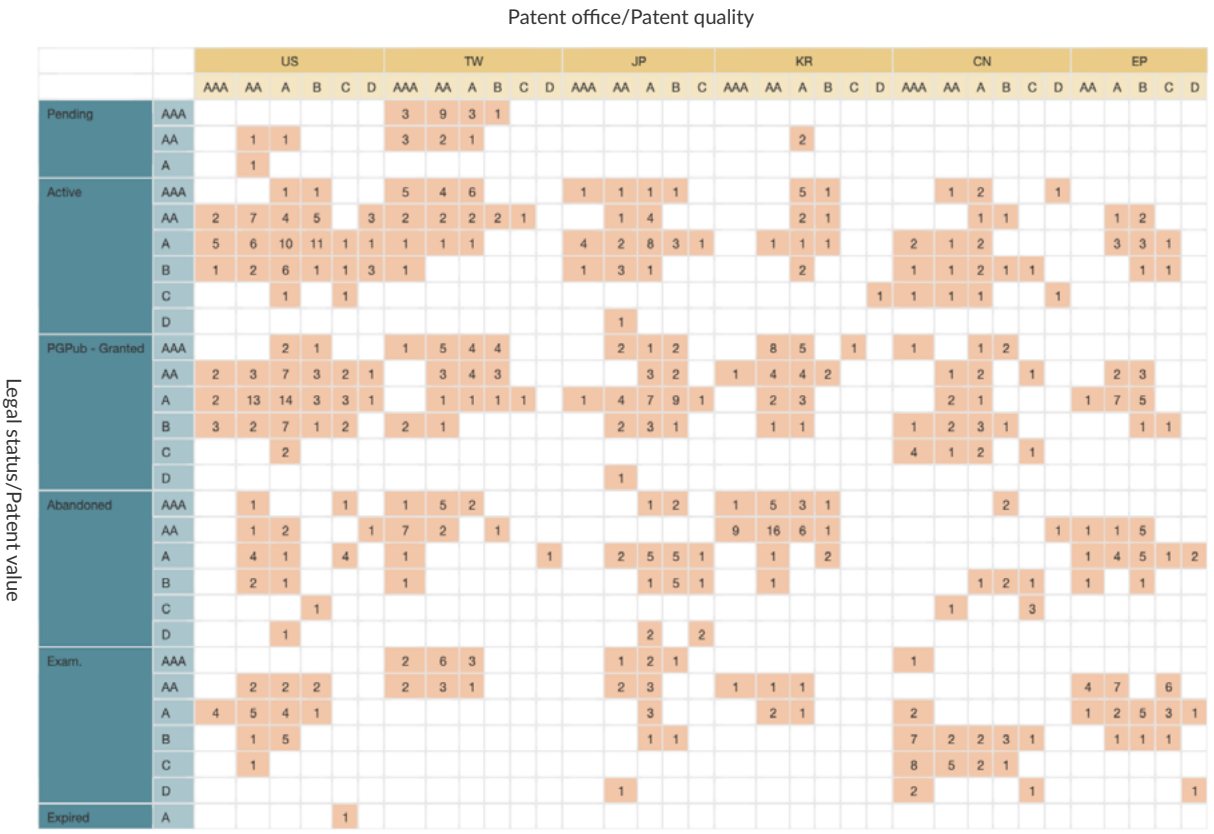
- The patent office coverage — The SEP

Figure 15: Top SEP declaring specifications in ETSI's database



Source: Patentcloud's *SEP*, updated on September 7th, 2020

Figure 16: The patent office/patent quality and legal status/patent value distribution of INTERDIGITAL



Source: InQuartik

portfolio contains applications in multiple patent offices. Try to find the applications outside your product's selling markets and exclude them from the licensing program.

- The legal status — Some of the SEPs do not have an active status. If the SEPs are abandoned, expired, or still under years of examination, they should not be used for claiming royalties.
- The quality and value of patents — Watch out for the quality and value of the SEPs with the help of the Patent Quality and Value Rankings — to find out more about how many SEPs are worth it and how many are not.

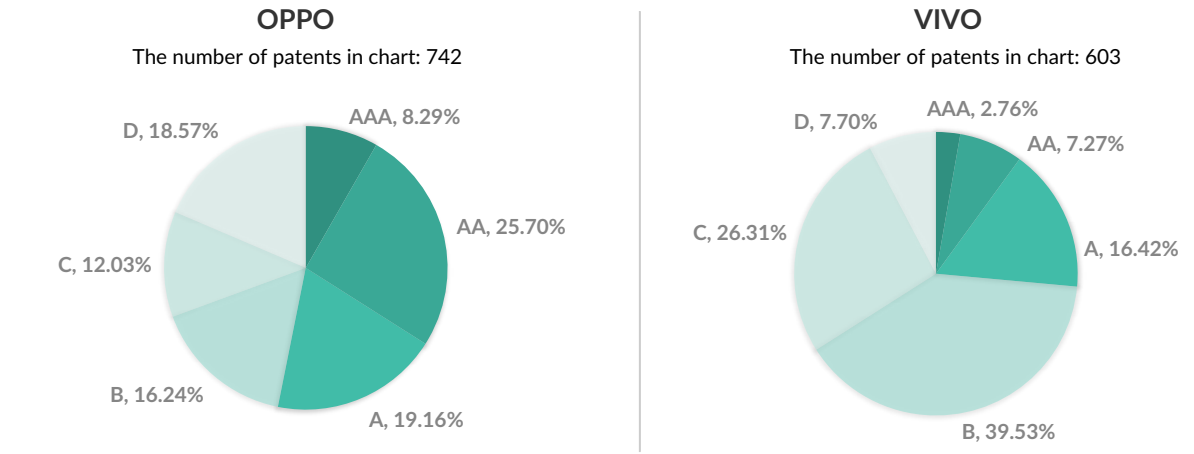
3. Investors: Find valuable investment targets

The Patent Quality and Value Rankings can also be beneficial to patent portfolio assessment, especially in the case of patent transactions or M&A.

Except for subject-matter expert reviews concerning the current or future adoption in the industry, the Patent Quality and Value Rankings can provide an instant overview of the portfolio and offer a quick comparison to other portfolios (competitive benchmarking) or even the whole technical field (for analyzing the positioning of the portfolio itself).

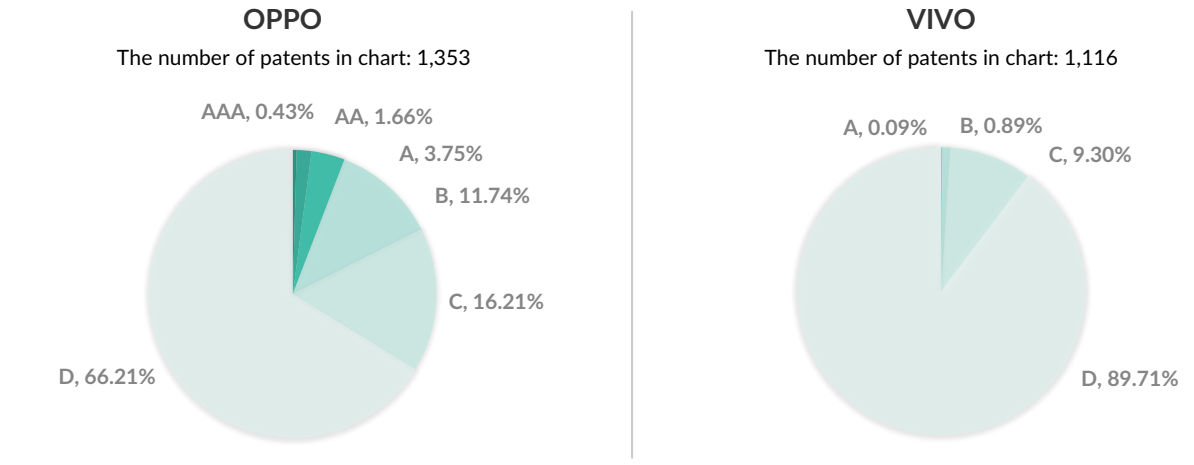
Let us look at the SEP portfolio of two Chinese mobile phone brands — OPPO and VIVO — and their respective subsidiaries. A pie chart displaying the proportions of the Patent Quality

Figure 17: The patent quality proportion of OPPO and VIVO



Source: InQuartik

Figure 18: The patent value proportion of OPPO and VIVO



Source: InQuartik

and Value Rankings (Figure 17 and 18) may offer a glimpse into the desirability of the portfolio. It appears that OPPO's declared SEPs have higher patent quality and value proportion. Consequently, OPPO may be a better investment target in 5G SEPs.

Conclusion

Along with the rapid growth of patent data, patent evaluation has become a very significant issue.

To propose an effective solution to this problem, we first introduced a framework of patent quality, value, and price to describe the different aspects of a patent.

Starting from these theoretical assumptions, we have tried to overcome the challenges commonly found in the traditional approaches and deliver a meaningful and useful method for evaluating patent quality and value.

The result — supported by machine learning technologies, the comprehensive patent data in Patentcloud, and continuous validation — is Patentcloud's exclusive and industry-leading Patent Quality and Value Rankings.

This white paper has presented the origin and the validation of the Patent Quality and Value Rankings. Perhaps most importantly, it has revealed how they can help by complementing quantity-based intelligence, separating the signal from the noise, and gaining actionable insights in several stages of Patent Lifecycle Management (PLCM).

We sincerely hope that every patent professional can benefit from our Patent Quality and Value Rankings — to deliver more accurate insights and make well-informed decisions.

About InQuartik

InQuartik is an IP intelligence company dedicated to converting patent data into actionable insights and delivering AI-driven solutions. From first-tier companies and law firms to SMEs, InQuartik supports IP professionals throughout the entire patent lifecycle so that they can work smarter, live better, and gain more success.