Beyond portfolio optimisation: understanding the connection between patent cost and value

Only 19% of IP owners believe that their portfolio is the right size. With growing pressure on budgets, strategic patent intelligence models are increasingly being used to communicate value

By Nigel Swycher, Steve Harris and Niall McMahon

In March 2020 the Cipher Report on Portfolio Optimisation was published based on a global survey of patent owners that was conducted in collaboration with *IAM* between October and December 2019. One of the key findings of the report was that over $40 billion is spent on patents each year, yet fewer than 20% of patent owners report that their portfolio is the right size. While companies claim to spend on average 9% of their patent budgets on strategic patent intelligence, many organisations report that the biggest impediment to high-quality analysis is accessibility to the right data, at the right cost.

These findings are a call to action. With so much time and money invested in the development of patent portfolios, it is essential to understand why the majority of patent owners report that they have both too many and too few patents in different areas, and what is being done to improve this position.

This article begins by reviewing the key findings of the Cipher Report. Taken together, there is a broadly consistent narrative: most operating companies with large patent portfolios have defensive strategies; they strategically use their portfolios to reduce patent risk from other owners of relevant patents. What is more, respondents agree that not every patent has the same value, and an increasing number have implemented sophisticated models to keep their position under regular review.

In an earlier article ("How many patents are enough?", *IAM* issue 97), we presented a strategic patent intelligence (SPI) model to help identify areas of under and overstocking at companies where the strategic objective is to neutralise threats. The Cipher Report provided an opportunity to explore further how patent owners are implementing this model and better understand the benefits derived from it.

The second section of this article explains the SPI model by reference to a hypothetical company with a range of product lines and competitors whose patents pose differing levels of threats. This illustrates how the model identifies areas of imbalance relative to the levels of threat posed by various companies.

The final section of this article goes beyond the challenge of optimisation to other situations in which the SPI model supports strategic patenting decisions. These include quantification of mitigated patent risk, budget management, cross-licensing, patent acquisition and pruning. In all of these cases, connecting patent, revenue and cost data provides a greater level of actionable intelligence. This is partly attributable to the use of AI and machine learning to improve the accuracy and reduce the cost of accessing the strategic patent intelligence required to build robust and repeatable models.

Key findings from Cipher Report

The key findings from the Cipher Report on Portfolio Optimisation are as follows:

Fewer than 20% of companies report that their portfolio is the right size

Portfolio optimisation is a challenge faced by all organisations that choose to protect their investment in technologies through patents. This is true irrespective of sector, geography or portfolio size.

Patents are a primary way for companies to protect their investment in technology. The challenge is to both optimise patent protection for the technologies delivering the most value and protect the organisation from competitive threats. What is valuable and who is a competitor change constantly. It is hard for the teams tasked with policing a company's intangible assets, specifically intellectual property, to keep up with the drivers of corporate strategies. The result is typically overstocking of patents in some areas and understocking in others. This imbalance means that the patent portfolio fails to deliver full value for the corresponding financial investment.

Figure 2 provides an analysis of survey responses grouped by size, industry and geography. The findings vary in each area:

- Size – almost half of companies with fewer than 100 patents believe that their patent portfolio is too small. At the other end of the spectrum, no companies with more than 10,000 patents regard their portfolio to be too big. The more nuanced answer is that owners of large portfolios often consider their portfolio to be both too small and too big in different areas.
- Sector – the industrials sector scores the lowest for perceived portfolio perfection (8%), with nearly one-half of software companies saying that their portfolios are too small (46%). One-third of companies in the technology sector report being both too small and too big (33%).
- Geography – there are also geographical distinctions. Over half of US companies think that their portfolios are both too small and too big, compared to only 25% of companies in the rest of the world category (defined as outside Europe and the United States).

As Jared Engstrom, head of patent development at Red Hat, notes: "Portfolios are often too big and too small in different technology areas and your patent strategy needs to account for this reality."

A well-balanced portfolio reduces the threat of patent litigation

Over 75% of patent owners agree that a well-balanced patent portfolio reduces the risk of patent litigation. For the majority of companies, a defensive position is the most important strategic objective.

While the survey identified a range of strategic benefits served by a patent portfolio, 62% of respondents report that their main objectives are either defensive – namely, to neutralise threats posed by other patent owners – or to act as a deterrent. Figure 3 presents an analysis of these primary strategic objectives.

There are also differences in responses across categories of respondents (see Table 1). In the healthcare sector (which includes pharmaceuticals, biotechnology and medical devices), monetisation is the primary objective, while in the automotive sector, half of respondents flagged reputation as the top-ranking strategic objective.

The significance of the majority view that patent strategy is designed around the neutralisation of threats invites further study. Patents have long been regarded as a so-called 'negative asset', conferring the right to exclude others from using the invention protected by the patent. It is now common in many sectors for companies with large portfolios to look for the freedom to trade without third-party interference (often referred to as 'freedom of action').

In these circumstances, the function of a portfolio is to create a force field around the company, such that all potential intruders are deterred by the risk of counter-assertion – that is to say, the potential impact of the company retaliating with claims against the aggressor that exceed the potential claim. "The goal is to avoid litigation so having a decent-sized portfolio provides the perfect protection for our products," notes Daniel Hernandez, IP manager at Stryker.

This is critical, as the optimisation model discussed below was originally designed for companies that have this strategic objective. Companies with other objectives may take a different approach to optimisation (many of these are discussed in *IAM* issue 97).

Patent strategy is scrutinised by chief technology officers, chief financial officers or the board in most organisations

Companies across all sectors, including industrials, automotive, technology and healthcare, are being disrupted by new technologies, and increasing attention is being given to both the strategic benefits and the cost of building large patent portfolios, with around 70% of organisations reporting scrutiny from the chief technology officer (CTO), chief financial officer (CFO) or board.

Patents have long been regarded as a cost – irrespective of whether such costs are allocated to business units or borne centrally by the legal or IP functions. The survey asked who is scrutinising patent strategy and cost, and the responses are represented in Figure 4.

For Gareth Jones, vice president – intellectual property at BenevolentAI, taking into account a company's broader context is crucial in strategic thinking and portfolio development. "To be effective in patent strategy and portfolio optimisation we need to have the best understanding of the external market, the technology landscape and competitive threat," he says.

In over 60% of companies the CFOs or CTOs are focusing on both patent strategy and cost. Meanwhile,

FIGURE 1. Portfolio optimisation

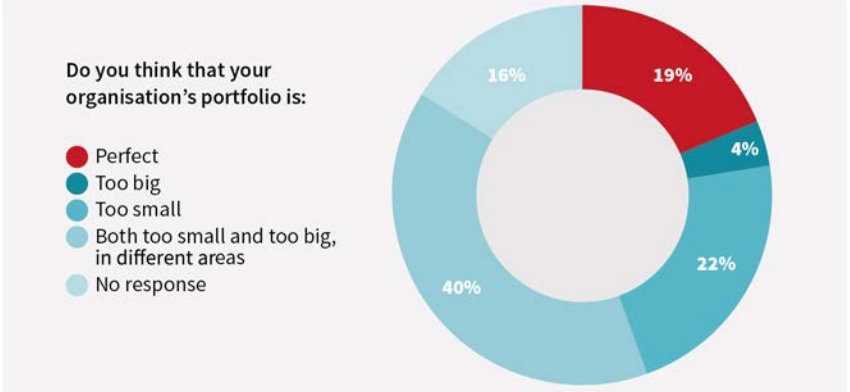
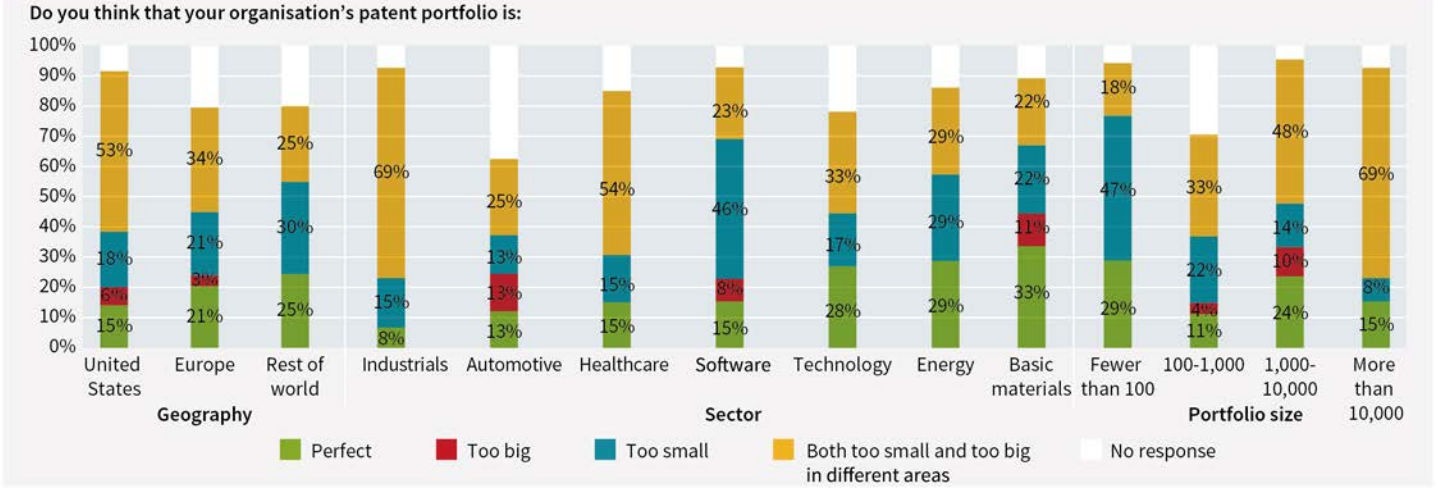


FIGURE 2. Too small, too big or perfect?



results show that boards of directors are requesting more information about patent strategy than cost. This inevitably drives the need for more objective evidence.

According to Andreas Iwerbäck, director of group technology and IP intelligence at Husqvarna Group, it can take "something bad to happen for management to realise the importance of intellectual property". But by then: "it's usually too late and costs are even higher. In my opinion, patenting should not be seen solely as a cost, but more as an investment."

Over 80% of companies claim to review their portfolio at least once a year. There is also evidence to suggest that companies that assess the size and shape of their portfolio more frequently are more likely to believe that their portfolio is not optimised. Conversely, in organisations where it is more difficult to obtain the data needed or the engagement required, the fallback position seems to be to assume that the portfolio is perfect.

Organisations spend on average 9% of their patent budgets on strategic patent intelligence

While more than 70% of patent budgets continue to be spent on new patents and the maintenance of existing portfolios, on average 9% is being invested on analysis and modelling to communicate the strategic benefit of the patent portfolio (see Figure 5). This investment contributes to the implementation of more strategic, objective and repeatable methodologies to optimise the size of the portfolio – and is entirely justifiable in an environment where, on average, 4.5% of revenues can be exposed to third-party patent claims.

"If you're spending several million dollars a year on patent filings and you are filing several hundred new patent applications every year, then it seems like a clearly beneficial trade-off to spend a small portion of those expenses specifically on insights to drive better strategic decisions," explains Engstrom.

This level of investment in strategic patent intelligence is broadly consistent across both sector and geography. However, automotive respondents invest only 3% of their budget on this capability. This merits further investigation in the context of the disruption caused by autonomy and electrification in the sector, as well as the number of extremely large portfolios owned by both manufacturers and suppliers.

For over 80% of companies strategic patent intelligence includes routinely tagging their own patents to the company's products and technologies, but fewer than half tag their patents to those of their competitors (see Figure 6). Further investigation reveals that the impediments to sophisticated threat analysis include accessibility, time and cost involved in the manual processes that have historically been required.

SPI models – a hypothetical example

The Cipher Report supports the use of a model that combines patent data with revenue data for both businesses and those companies that are perceived to be a threat from a patent perspective. To illustrate how models are deployed in practice, consider a hypothetical company.

Foo Corp has three product lines: light detection and ranging (LiDAR), stereo cameras and ultrasound sensors (see Table 2). LiDAR is its biggest earner; it has a leadership position in cameras; and it is pulling out of ultrasound. In each area it competes with two or three other companies, which could be the source of a patent assertion (the so-called 'threat list'): Bar Systems, Baz Technologies and Qux Solutions (although Qux does not sell products in the camera area). In addition, Foo has obtained patent licences in relation to LiDAR and cameras from third parties.

Table 2 provides the patent and revenue data to calculate whether Foo is exposed to patent risk from Bar, Baz and Qux. Columns A to F describe the known data about each sector, while G and H are calculated later in this article.

FIGURE 3. Strategic objectives of patents

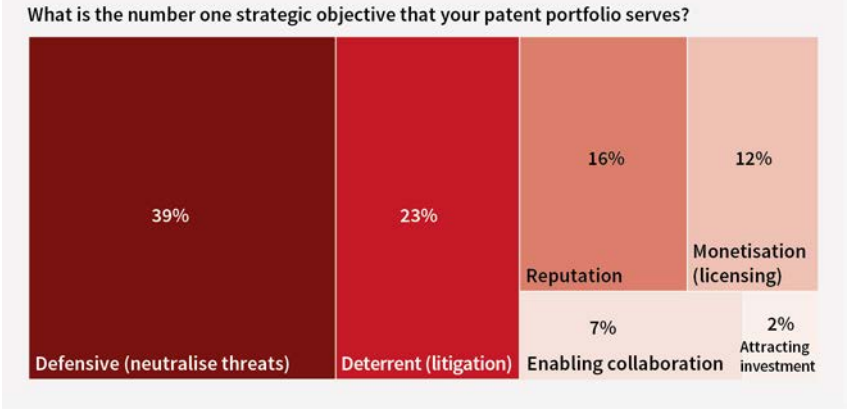


FIGURE 4. Scrutiny of patent strategy and cost

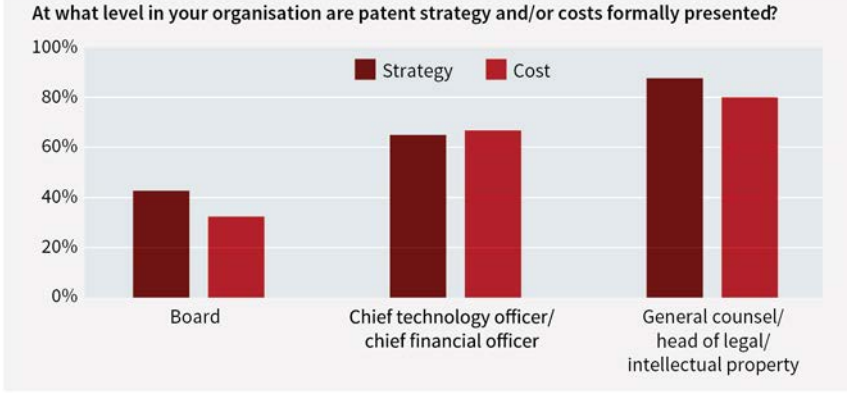


FIGURE 5. Patent budget allocation

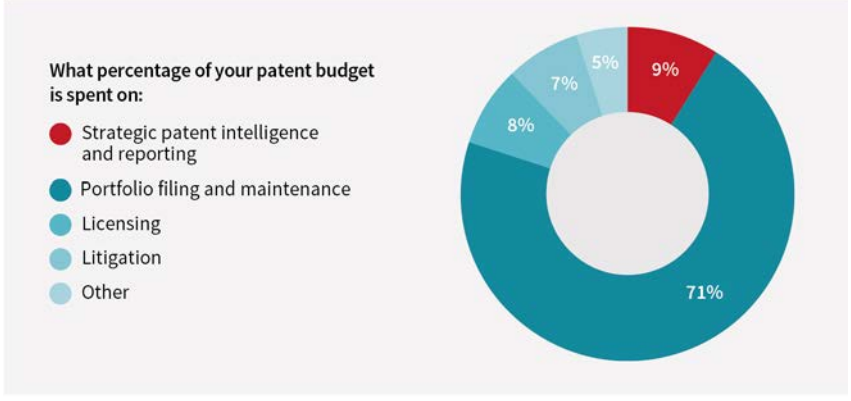
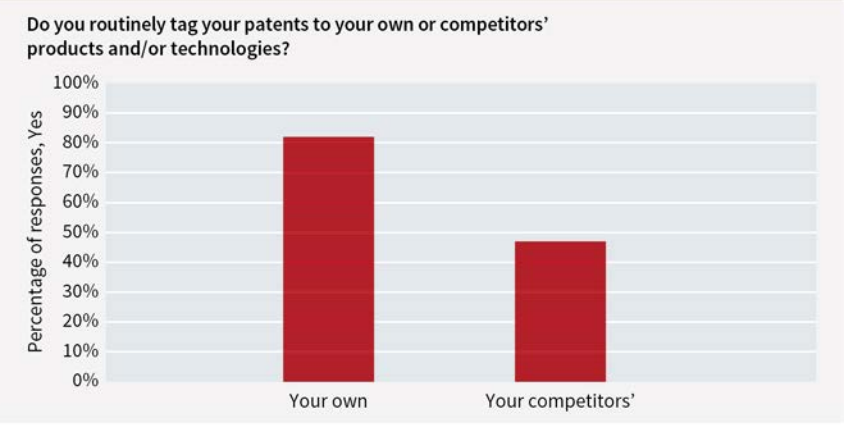


FIGURE 6. Tagging patents to products and technologies



This is a simplified example of the kind of data that is normally used for this type of modelling, as it ignores the relative strength of the various portfolios, the importance of different patented technologies to the end products and the significance of geographies. However, it gives enough information to illustrate the approach.

Using this data and the model from "How many patents are enough?", we can predict the ideal portfolio size to neutralise the various threats in the sector.

For the portfolio to be in balance with respect to a single competitor, for each product line, the number of tagged patents versus the revenue line must be the same. We can then calculate the optimum portfolio size for each product line against each competitor. For example, in the LiDAR product line, the formula for determining the optimum balancing of Foo against Bar is:

$$\frac{\$1{,}357 \text{ million} \times 163}{\$949 \text{ million}} = 233 \text{ patent families}$$

Similarly, the optimum size of the LiDAR portfolio to neutralise the threat from Baz would be 226, and from Qux would be 168. Assuming that the financial data is available, the same can be done for the industry as a whole. In the case of LiDAR, the optimum size of the Foo portfolio is 190 patent families versus the global total.

These differences exist because although Foo's portfolio is reasonably well balanced in the industry as a whole (8.7% share of patents against 9% share of the market), its two key competitors are overstocked compared to the industry average. This means that in both cases, Foo is exposed to royalties in the event that either of these companies were to assert their portfolios. In contrast, in ultrasound technology, Foo is significantly overstocked, with a portfolio of 139 families, where even the most pessimistic position would suggest that 74 is sufficient.

Making the connection between the company's portfolio and mitigated patent risk

The same model naturally lends itself to calculating and communicating the degree of patent risk mitigated by a company's own portfolio. Referring back to "How Many Patents are Enough?", if Foo owned all the LiDAR patents in the world, it would face no patent risk in this area; similarly, if it owned no patents, its liability would be the market royalty against all of its LiDAR revenue. Hence in Column H of Table 2 its portfolio neutralises 8.7% of the risk. Column H also includes the calculated risk mitigated by Foo's portfolio against its competitors and from its in-licensing activities.

In order to determine the total risk mitigated, the contribution from Foo's own portfolio, defence against specific threats and the impact of its in-licences must be considered separately.

The total exposure (assuming that Foo has no patents or licences) would be the company's revenue, multiplied by the royalty rate (eg, for LiDAR, \$1,357 million×4.3%=\$58.4 million). From this, the protection afforded by the company's portfolio can be calculated by multiplying by the patent share (\$58.4 million× 8.7%=\$5.1 million) and likewise for the licensed-in portfolio (\$58.4 million × 10.7%=\$6.3 million).

The royalty rates are hypothetical, but in practice can be ascertained from one of a variety of sources. The Cipher Report includes data from an Analysis Group study, but there are many providers of market royalty rates, which can typically be supplemented from the company's own licensing experiences.

The calculation of the specific threats in the hypothetical case (ie, Bar, Baz and Qux) is a little more complex. The residual risk from an assertion involving that company will be the lesser of:

- the threat company's patent share; and
- the company's patent share, multiplied by the threat company's revenue share, divided by the company's revenue share.

For example, in the case of Bar's LiDAR portfolio, the formula would be:

$$min\left(7.7\%, \frac{8.7\% \times 6.3\%}{9\%}\right) = 6.1\%$$

TABLE 1. Strategic objectives of patents (by sector)
What is the number one strategic objective that your patent portfolio serves?

	Industry						
	Technology	Software	Automotive	Basic materials	Healthcare	Industrials	Energy
Defensive (neutralise threats)	39%	46%	38%	44%	23%	38%	57%
Deterrent (litigation)	22%	31%	13%	33%	23%	23%	14%
Reputation	11%	15%	50%	0%	8%	15%	0%
Monetisation	17%	0%	0%	22%	31%	0%	14%
Enabling collaboration	11%	0%	0%	0%	8%	15%	14%
Attracting investment	0%	8%	0%	0%	0%	8%	0%

The rationale for this is that the benefit of a defensive position against a third party can never exceed its patent share, and the residual risk is whatever portion of the company's revenue would be exposed in a cross-licence.

Aggregating the total of the mitigated specific threats percentages and multiplying by the total risk gives the risk mitigation contribution from that part of the company's portfolio (ie, $58.4 millon × (6.1%+6.8%+2.4%)=$8.9 million). Adding all the contributions gives the total protection from third-party risk (ie, $5.1 million+$8.9 million+ $6.3 million=$20.3 million).

In addition, the protection offered by each family can be estimated by simply dividing by the portfolio size. This per-family contribution can be used to assess the value of adding patent assets in each technology area or, similarly, to assess whether the cost benefit of pruning in a specific area is outweighed by the risk consequences – a topic discussed in more detail later.

Plugging data into the model in the real world

There are two primary data sets required for the model: patent data and revenue data. Mapping and tagging patents to technologies or product lines used to be a slow and manual task, which itself acted as a deterrent. Cipher and other automated approaches to mapping have greatly increased the accessibility of this data and have reduced both the time and costs involved.

"With improvements in AI technology and other analytics platforms like Cipher, today we are able to understand the numbers of patents that are relevant to certain technology areas at a push of a button," notes Facebook head of patents Jeremiah Chan. "This insight can help you determine whether you need more or less patents in a particular area and start to set parameters around the investment required to put the company in good standing relative to its business objectives."

The importance of advances in data science is a recurrent theme for those using sophisticated models to help optimise and organise their portfolios. "Data science and machine learning helps us better manage and shape our portfolio," Google head of patents, Mike Lee explains. "The machine learning tools and models we've built have enabled us to operate more efficiently and at scale so that we can execute on our patent strategy."

Collecting the revenue data includes numbers relating to both an organisation's activity and that of its competitors (or other companies on the threat list). This information is accessible to Cipher and other consultancies that provide similar services to patent owners. It is the type of information that many companies routinely track and can be easily combined with other publicly available sources (eg, Securities and Exchange Commission filings and industry reports).

Strategic patent intelligence for strategic decisions

With the building blocks in place, there are a range of situations in which the SPI model is actionable.

Portfolio optimisation

This was the starting point. For those organisations that believe that their portfolio is too big, too small or both, the model presents a way of identifying areas that merit closer attention. Importantly, the model is repeatable, as the assessments should be regularly updated.

Risk mitigation

One of the primary roles of the board of directors is to manage corporate risk. Quantifying the value of the patent portfolio by reference to risk mitigation is well received by this audience.

TABLE 2. Modelling a hypothetical sector

A	B	C	D	E	F	G	H
Product	Company	Issued families	Patent share	Revenue	Revenue share	Optimum portfolio	Risk removed
LiDAR	Foo Corp	184	8.7%	$1,357 million	9%		8.7%
	Bar Systems	163	7.7%	$949 million	6.3%	233	6.1%
	Baz Technologies	175	8.3%	$1,051 million	7%	226	6.8%
	Qux Solutions	50	2.4%	$405 million	2.7%	168	2.4%
	Licensed	226	10.7%	-	-		10.7%
	Global total	**2,105**	**100%**	**$15,052 million**	**100%**	**190**	
Stereo cameras	Foo Corp	121	10.2%	$511 million	13.8%		10.2%
	Bar Systems	46	3.9%	$148 million	4%	159	3%
	Baz Technologies	114	9.7%	$432 million	11.7%	135	8.7%
	Qux Solutions	0	0.0%	$0	0%	N/A	0%
	Licensed	28	2.4%	-	-		2.4%
	Global total	**1,181**	**100%**	**$3,700 million**	**100%**	**163**	
Ultrasound	Foo Corp	139	14.4%	$139 million	7.4%		14.4%
	Bar Systems	15	1.6%	$123 million	6.6%	17	1.6%
	Baz Technologies	90	9.3%	$403 million	21.5%	31	9.3%
	Qux Solutions	321	33.3%	$601 million	32%	74	33.3%
	Licensed	0	0%	-	-		0%
	Global total	**964**	**100%**	**$1,877 million**	**100%**	**71**	

TABLE 3. Aggregate and per-family mitigated risk

		Risk mitigated per year					
Product	Royalty rate	Total risk	Own portfolio	Specific threats	Licences	Total	Per family
LiDAR	4.3%	$58.4 million	$5.1 million	$8.9 million	$6.3 million	$20.3 million	$110,156
Stereo cameras	5.3%	$27.1 million	$2.8 million	$3.1 million	$0.6 million	$6.6 million	$54,268
Ultrasound	4.7%	$6.5 million	$0.9 million	$2.9 million	$0	$3.8 million	$27,547
Total		**$92 million**	**$8.8 million**	**$14.9 million**	**$6.9 million**	**$30.7 million**	

Action plan

The strategic decisions around patenting strategy are becoming increasingly evidence-based. This means building models that can be understood by both patent teams and the wider business.

For the majority of companies whose primary objectives are defensive, the SPI model delivers an accepted industry view of how a portfolio can be optimised to neutralise identified patent threats and additional risk posed by patent owners more generally.

Models of this sort also:

- communicate the value of the patent portfolio by reference to third-party patent risk;
- link the patenting budget and costs to the impact on risk mitigation;
- understand the cost/benefit of existing and potential cross-licensing deals;
- evaluate the benefit of patent acquisition; and
- direct and support pruning strategies.

These developments in best practice are a vast improvement in an area that, to this point, has been largely managed by experience and gut instinct. As evidence-based approaches become more widely adopted, it will be interesting to monitor whether more companies gain confidence that their portfolios are the right size.

Budget management

Because exposure to risk is quantifiable, it can easily be compared to the cost of filing and maintaining the portfolio. Strategic patent intelligence platforms such as Cipher include estimated cost data on both a historic and forward-looking basis. This enables a direct connection to be drawn between budget changes (both upward and downward) and the impact on risk exposure.

Cross-licensing

As has been explored previously (see "The role of AI in evidence-based strategic IP decisions", *IAM* issue 92), companies can use the SPI model to determine rational outcomes in proposed cross-licensing arrangements. While this will not eliminate the need for identification of key assets to support a given negotiating position, it will bolster the ability to war game potential outcomes of portfolio licensing prior to engagement.

Patent acquisition

Valuing individual patents is hard. There is more agreement about royalty rates attributable to a patented technology. Where patents are being acquired, the model will evidence the impact of the acquisition, not only in terms of the seller, but also in the context of other threats and the market more generally.

Portfolio pruning

Linking the per-family contribution to risk mitigation (see Table 3) highlights the impact of overstocking. In the hypothetical example, because Foo is grossly overstocked in ultrasound patents, the per-patent contribution is $27,547 (compared to $110,156 per patent in LiDAR). Similarly, the SPI model illustrates the negative consequences of cutting in areas of understocking. In practice, pruning is more nuanced and considers patent families at a country level. What might be overstocking in Germany could well be understocking against specific threat companies in the United States. It is also common to factor in age profiles, not least because patents are typically more expensive in later years.

The inherent limitation of models

Models are used in all walks of life, from economics and politics to pandemics. It is okay for models not to be perfect. "All models are wrong, and some are useful. Portfolio balancing using a model provides a methodology that is transparent and capable of scrutiny," reflects Erik Oliver, chief operating officer of Richardson Oliver Insights. "This doesn't mean that you can't model for subjective elements such as the size of the threat or the quality of the patents, it simply forces you to articulate your assumptions and enables exploration of their impact."

What models provide is the confidence to communicate and find a rational basis for a strategy at any given time. They also have the benefit of being adaptable over time – a vast improvement over instinct and gut feeling.

The increasing use of models to drive strategic decisions in patent-owning organisations shines a light on the fundamental question of how best to establish whether a portfolio is delivering against patent strategy and aligned to the wider business strategy. The reality is that although fewer than 20% of companies consider their portfolio to be optimised, many more companies are actively taking steps to improve their position.

In a climate where economic growth depends on technology and the IP rights that protect this investment, it is entirely appropriate that senior corporate executives are paying closer attention to the strategic rationale underpinning patents, in addition to the blunt measure of cost.

Teams with strategic responsibility for patents that are able to optimise the size and shape of their patent portfolios are typically those that build trust and respect within their organisation and report that they find it easier to secure the budget they need to build valuable patent portfolios. Those that are unable to explain the value of patents may struggle for recognition – and understandably so. iam

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This article includes data and analysis first published by IAM *in the Cipher Report on Portfolio Optimisation. The full report is available for download or on request to the authors.*