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## Executive Summary

The modern economy is increasingly driven by intangible assets, such as intellectual property, brands, and networks. However, common measures of value have failed to adapt to this transformation. The path forward involves both accounting reform and improved methods to directly value intangible assets. Investing in intangible-rich companies can be profitable as they are often misvalued by traditional metrics.

## The Asset-Light Economy

### The Greatest Trade Ever

“The four largest companies today by market value do not need any net tangible assets. They are not like AT&T, GM, or Exxon Mobil, requiring lots of capital to produce earnings. We have become an asset-light economy.”

- Warren Buffett (2018)

In [Value Investing Is Short Tech Disruption](#), we told the story of how Warren Buffett transcended the teachings of his mentor, Ben Graham. Graham established the principles of value investing in an era of railroads and steel mills. However, Buffett recognized that he had to evolve Graham's strategy for the information age. Over the years, he infused his investing style with an appreciation for intangible assets such as consumer brands, quality management, industry leadership, and network effects.

This culminated in the greatest trade of all time. From 2016 to 2018, Buffett invested \$35 billion in Apple. Since then, Apple's stock has tripled, earning him a **\$65 billion** profit. This dwarfs both George Soros' mere \$1 billion payday from breaking the Bank of England and John Paulson's paltry \$15 billion subprime windfall.

However, looking at Apple's balance sheet in 2016, it is a bit puzzling that the legendary value investor would have made this investment. In 2016, Apple had a market cap of \$500 billion compared to shareholders' equity of only \$119 billion. Apple was trading at over four times its replacement cost, at least as defined by book value!

### Exhibit 1

#### How Do You Like Them 🍏 ?



Source: S&P, Sparkline (as of 10/14/2020)

But Buffett understood that intrinsic value consists not only of tangible assets but also intangible assets. While missing from its balance sheet, Apple's intangible assets (e.g., intellectual property, brand, network effects) are at least an order of magnitude more important than its tangible book value.

### The Rise of the Intangible Economy

Intangible assets are not just useful for Apple, but are the defining feature of the modern economy. In a bygone era, we used physical capital to produce things. However, value today is driven by information, ideas, and relationships.

The economists [Corrado, Hulten and Sichel \(2005\)](#) were among the first to recognize that our national accounting framework (e.g., GDP) was omitting the increasingly critical value of intangible assets. They led an effort to incorporate more intangibles into the national accounts.

They created the taxonomy below. Thanks to their work, about half of intangible investment is now included in the US national accounts. The variation in assumed capitalization and depreciation rates reflects the unique nature of each type of intangible investment. For example, advertising has a shorter life than software.

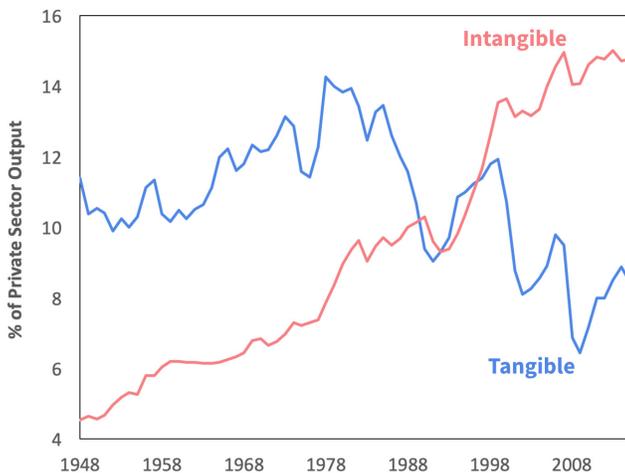
**Exhibit 2**  
**Intangible Investment Taxonomy**

	Included in National Accounts	Capitalization Factor	Depreciation Rate
<b>Computerized Information</b>			
Purchased Software	Yes	1.0	0.315
Internal Software	Yes	1.0	0.315
Databases	Yes	1.0	0.315
<b>Innovative Property</b>			
R&D	Yes	1.0	0.15
Mineral Exploration	Yes	1.0	0.075
Artistic Originals	Yes	Varies	Varies
Financial Innovation	No	1.0	0.2
Design	No	0.5	0.2
<b>Economic Competencies</b>			
Advertising	No	0.6	0.55
Marketing Research	No	0.6	0.55
Training	No	1.0	0.4
Purchased Organizational Capital	No	0.8	0.4
Internal Organizational Capital	No	1.0	0.4

Source: [Corrado et al \(2016\)](#), Sparkline

Using this framework, they showed that private sector intangible investment has grown relentlessly over the past 70 years. Intangible investment supplanted tangible investment around 2000. Since then, the gap has been continually widening.

**Exhibit 3**  
**The Rise of the Intangible Economy**



Source: [Corrado and Hulten \(2010\)](#), [Lev \(2018\)](#), Sparkline (as of 2015)

**Intangible Accounting**

Corrado, Hulten, and Sichel didn't stop at the national accounts. They proposed a similar methodology to estimate intangible capital from corporate financial statements, which was later refined by several other researchers.

Baruch Lev, an accounting professor, has carried forth this crusade in his boldly titled book, "The End of Accounting."

"The increasing dominance of intangibles among corporate assets is widely recognized with its consequences having become known as the 'knowledge economy,' except, that is, by accountants, who strangely persist in ignoring the intangibles insurgence."

- [Lev and Gu \(2016\)](#)

Corrado, Lev, and others are critical of the inconsistent capitalization rules used in accounting. Capitalization is the accounting practice of recording a cost as an asset on the balance sheet and allowing its recognition over its useful life. Currently, investment in tangible assets (e.g., factories) and intangible assets acquired via M&A (e.g., goodwill) are capitalized. However, internally-generated intangibles are not capitalized.

**Exhibit 4**  
**Inconsistent caPitalizatiOn**

Capitalized?	Tangible	Intangible
<b>Purchased</b>	✓	✓
<b>Internally-Generated</b>	✓	✗

Source: Sparkline

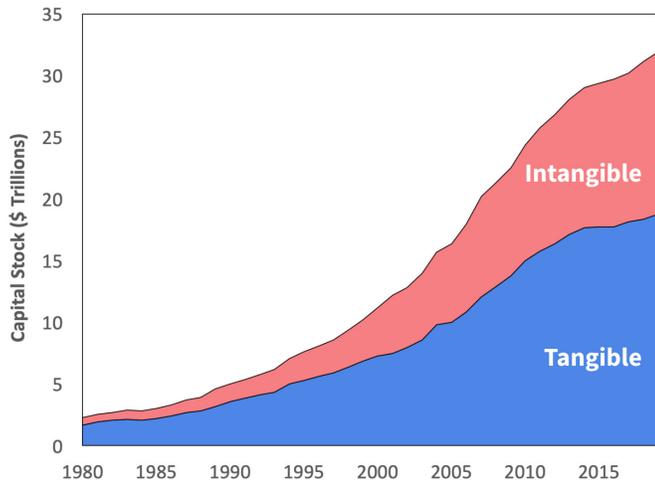
The upshot is that firms that invest heavily in intangible assets such as intellectual property, employee training, or marketing have less accounting capital. As we saw, the omission of intangibles from Apple's balance sheet explains why it trades at such a huge premium to replacement value.

A second distortion is that serial acquirers have stronger balance sheets than firms relying on homegrown investment. For example, the more acquisitive Microsoft has \$43 billion of intangible-related assets on its balance sheet, while Apple has essentially zero.

As with the national accounts, capitalizing intangibles requires estimating depreciation and capitalization rates for each type of intangible investment. One unique challenge is that while most firms itemize R&D, they lump brand- and culture-building expenses in the catch-all line item of “selling, general and administrative expenses” (SG&A). Many researchers have sought to estimate these parameters ([one](#), [two](#), [three](#), [four](#), [five](#), [six](#), [seven](#)). For lack of any strong prior, we use the assumptions from [Peters and Taylor \(2017\)](#).

The exhibit below shows the resulting capital stock of US public companies. As with the national account data, the rise of the intangible economy is striking. Intangible capital was a mere rounding error in the 1980s but has grown at a faster rate than tangible capital. We estimate that intangible capital comprises 42% of the capital stock today and will overtake tangible capital within the next several years.

**Exhibit 5**  
**Can't Touch This** 🛠️



Source: Sparkline, S&P

## The Dark Matter of Finance

Dark matter constitutes 85% of the universe. While it cannot be directly observed, physicists infer its existence from astronomical observations. Without dark matter, physical laws imply the galaxies would fly apart. Since the universe has not exploded, we know that dark matter must exist.

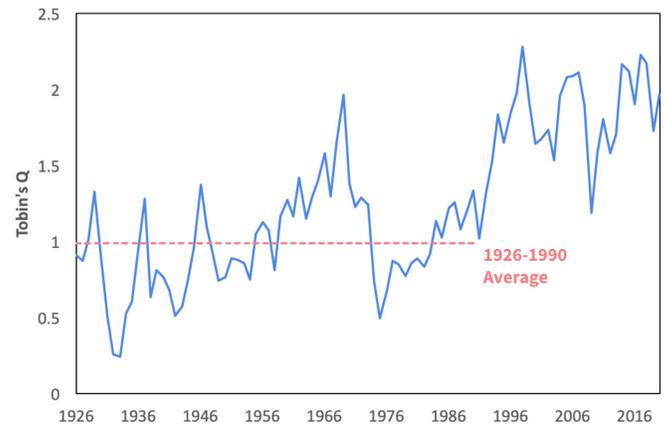
Intangible assets are the dark matter of finance. They are challenging if not impossible to precisely measure. But they comprise a significant portion of financial matter and are essential for explaining the modern economy.

## Financial Gravity

One of the central principles of asset pricing is the law of arbitrage. If a company is trading below its replacement value, it can be broken up and sold for parts at a profit. If it is trading above its replacement value, entrepreneurs can recreate the company and drive profits down. Companies themselves engage in this arbitrage via share issuance and buybacks. Capital should enter and exit companies, industries and even the market as a whole in order to keep expected returns at a fair level.

Tobin's Q is the ratio between market value and replacement value. While there are irrational investors and limits to arbitrage, Tobin's Q should generally gravitate toward a value of one. At the stock market level, this was true for many decades. From 1926 to 1990, the average value was exactly one! However, since then, Tobin's Q has been on a merciless upward trajectory.

**Exhibit 6**  
**To Infinity and Beyond?**



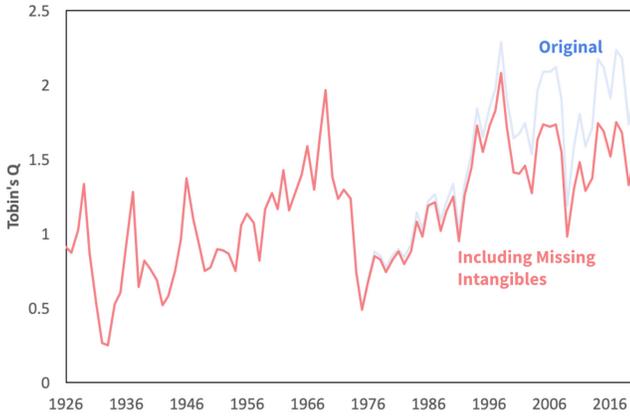
Source: Fama-French, S&P, Sparkline

It would seem that mean reversion has broken down and valuations are spiraling upward to infinity! One explanation is that markets are overvalued due to irrational exuberance, low interest rates, monopolies, and other factors. However, this is unlikely to be the full explanation as even in the depths of the Global Financial Crisis the capital stock was still 20% overvalued on Tobin's Q.

An alternate explanation is that Tobin's Q only appears high because it omits the rising importance of intangible assets (at least those not captured by goodwill). If we include intangible capital in our measure of replacement value, the

stock market still appears overvalued, but much less so. Furthermore, Tobin's Q seems a lot more mean reverting.

**Exhibit 7**  
**Restoring Gravity**



Source: Fama-French, S&P, Sparkline

Without the gravitational force of dark matter, the galaxies would fly apart. Without intangible assets, valuations would spiral off in a similar manner. As with physics, a sane world requires accounting for all matter, even the invisible.

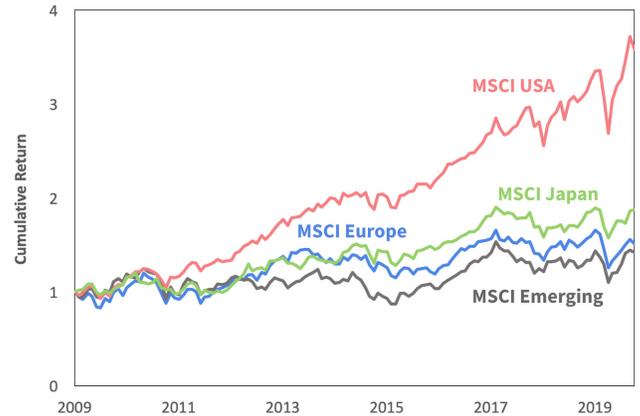
**American Exceptionalism**

Another hotly contested debate in asset allocation is over the rising gap between US and international stock markets. US stocks have massively outperformed their international peers over the past decade and now seem much more expensive on a relative basis.

The price to book for the US is 3.6, compared to 1.6 for Europe, 1.3 for Japan and 1.8 for Emerging. Of course, there are many reasons for this divergence. In this globalized world, companies compete in a winner-take-all fashion. Persistently higher profit margins for US companies suggest they are winning the game.

However, investors should also consider that US companies have a higher proportion of intangible assets. This results from the US economy's tilt toward more intangible-intensive technology and service industries. The exceptional US stock market returns over the past decade have largely been fueled by the rise of the big tech platforms, of which only China has been able to create homegrown equivalents.

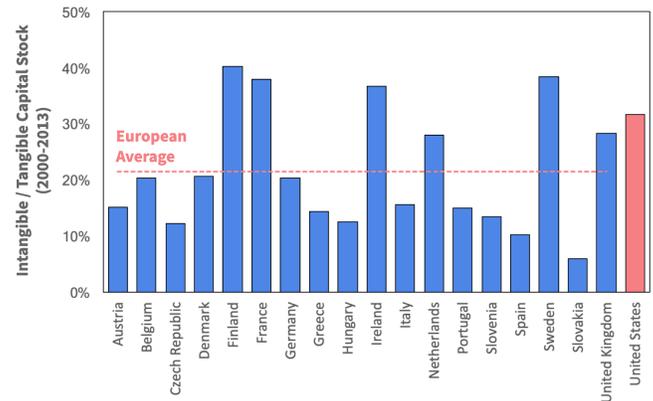
**Exhibit 8**  
**American Exceptionalism**



Source: MSCI, Sparkline (as of 9/30/2020)

[Corrado, et al \(2016\)](#) applied their national accounting framework to Europe. They found that the ratio of intangible to tangible capital was between 50 to 100% higher in the US than Europe. Exhibit 9 shows how the more conservative 50% gap emerges from a diverse set of European countries. This data is a bit outdated and anecdotally it appears the gap has only widened.

**Exhibit 9**  
**Europe vs. US Intangible Capital**



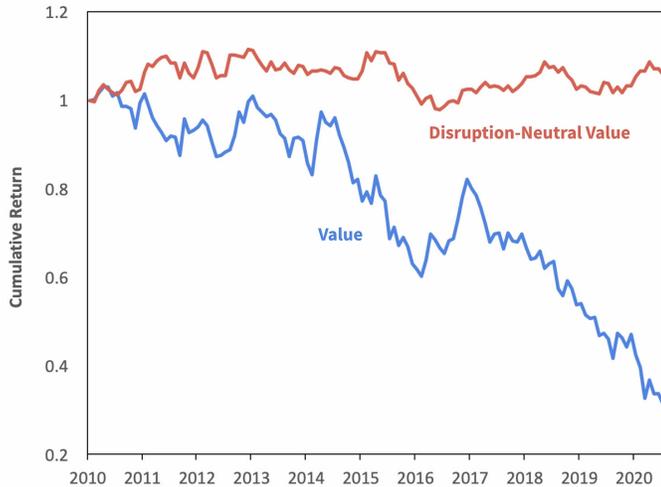
Source: [Corrado, et al \(2016\)](#)

As with the market in general, intangibles do not fully explain the divergent valuations of US and international stock markets. However, they do at least help make the world seem a bit less crazy!

## Value Investing

In [Value Investing Is Short Tech Disruption](#), we discussed the long suffering of value investors. We argued that value's thirteen-year drawdown is being driven by an implicit bet against disruptive technology companies.

**Exhibit 10**  
**Value Investing Is Being Disrupted**



Source: Sparkline, MSCI, S&P (as of 7/31/2020)

We urged value investors to follow Buffett's lead and adapt their metrics for the new intangible economy.

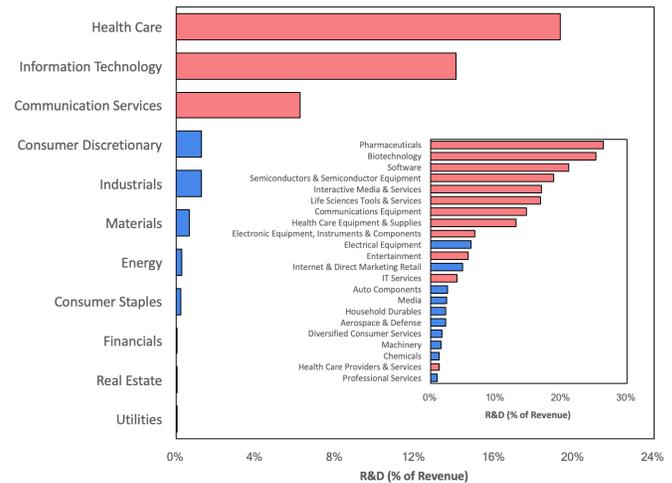
“Value investors would benefit from following the Oracle’s lead. They should discard any blind prejudice they have against companies simply because they are in the tech sector. Technology is, for better or for worse, a fundamental part of our lives. They should also adjust their measures of intrinsic value to reflect the reality of today’s ‘asset-light’ economy. They should develop ways to assess the considerable value of the tech ecosystems. If the 89-year-old Buffett can continue to evolve, so can we all.”

Valuing intangible assets is more challenging than physical assets, which is why accountants, a conservative bunch, have largely avoided dealing with them. However, while imperfect, the capitalization of intangibles provides at least a starting point in our attempt to capture a fuller picture of corporate balance sheets.

## The Old and New Economies

The role of intangible assets varies extremely widely by industry. Biotech companies invest 27% of their revenue in R&D. On the other hand, 62% of industries invest less than 1% of their revenue in R&D. At the sector level, we can broadly classify health care, tech and communications as “new economy” (red) and the other eight sectors as “old economy” (blue).

**Exhibit 11**  
**A Tale of Two Economies**



Source: SEC, S&P, Sparkline (equal-weighted averages)

Given that the new economy relies much more heavily on intangible assets, the exclusion of intangibles distorts comparisons between new- and old-economy companies. Price-to-book ratios (P/B) and return on equity (ROE) are systematically higher for technology companies. Something would have to be broken in capitalism for an entire sector of the economy to have consistently higher profits. Fortunately, this is largely an illusion due to the artificially smaller denominator in these ratios.

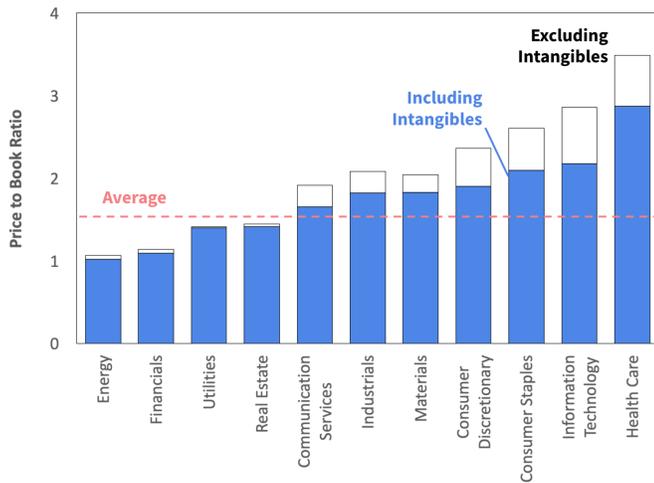
Price to earnings (P/E) measures are similarly distorted, as they penalize new-economy firms for R&D expenses that are deducted from their bottom line. However, this effect is smaller, as intangible investment is partially offset by depreciation in the intangible capital stock.

The upshot is that value investors using traditional metrics are betting against the intangible economy. It is important to note that this does not necessarily show up at the less-granular sector level (e.g., tech, financials, health care). For example, the health care sector includes both high-tech

pharma and less R&D-intensive health care providers & services.

Accounting for intangibles helps reduce value's bias against the asset-light economy. This adjustment makes tech and health care companies both less expensive and profitable, bringing them more in line with other industries. Again, keep in mind that this chart obscures the considerable variation across the sub-industry components of each sector.

**Exhibit 12**  
**Intangible Adjustment**



Source: SEC, S&P, Sparkline (2010-2020 average)

## Disruption and Intangibles

In [Value Investing Is Short Tech Disruption](#), we used natural language processing (NLP) to classify companies as disruptive or non-disruptive. Using NLP transcends the limitations of industry classifications. We found that value investors are implicitly short disruptive companies and that this bet fully explains their drawdown.

We are curious about the overlap between our disruption and intangible capital metrics. Exhibit 13 shows the percentage of companies that fall into each bucket with some examples (for illustrative purposes only). It turns out there is a positive but weak relationship (26% correlation) between the variables.

**Exhibit 13**  
**Disruption vs. Intangible Investment**

		Intangible-Intensive	
		Yes	No
Disruptive	Yes	 32%	 19%
	No	 18%	 31%

Source: Sparkline

This low overlap highlights the distinction between these two concepts. Our intangible capital proxy is derived from historical outlays on R&D and SG&A. However, R&D doesn't necessarily lead to disruptive innovation. For example, R&D can be used to incrementally improve existing products in legacy domains. Furthermore, while investing in branding and organizational competencies via SG&A is important, it is not disruptive.

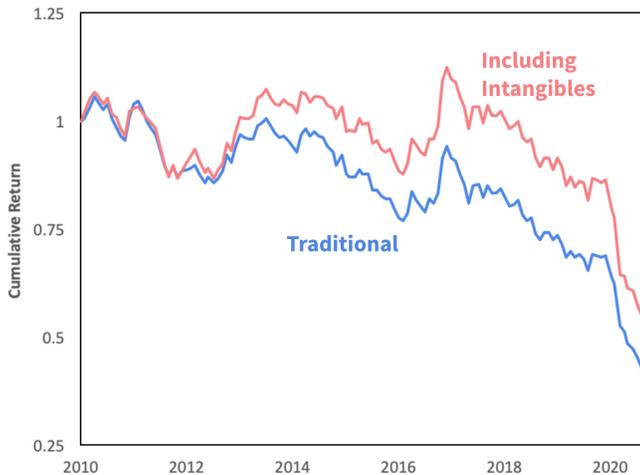
The main effect of capitalizing intangibles is to reduce value's bias against research-intensive business models. This does also somewhat reduce value's short disruption bias but only to a limited degree.

## Value with Intangibles

Capitalizing intangibles reduces the systemic bias of standard value metrics against companies that invest heavily in intangible assets (R&D and SG&A). Given the success of the intangible economy, we would expect this adjustment to improve our value strategy.

Exhibit 14 shows the performance of the value factor both with and without capitalized intangibles over the past decade. In line with [Lev and Srivastava \(2019\)](#), [Park \(2019\)](#), and [Arnott et al \(2020\)](#), we find that capitalizing intangibles provides a long-term improvement to standard price to book of around 1% per year. However, as with these authors, we also find that it does not prevent the sharp drawdown of the most recent few years.

**Exhibit 14**  
**Value Investing with R&D and SG&A**



Source: SEC, S&P, Sparkline

Ultimately, we conclude that including accounting proxies for intangible capital is helpful but not fully satisfying. While it improves the long-term return, it does not resolve the drawdown that has occurred since 2016. And even with this adjustment, we would still be on the wrong side of Buffett’s Apple trade. But don’t worry, we aren’t done yet!

## The Hard Thing About Soft Things

The previous approach makes the fundamental assumption that intangible assets should be treated like tangible assets. While this is better than pretending intangible assets don’t exist, it disregards the properties that make them so special.

[Haskel and Westlake \(2017\)](#) argue that intangibles are unique on the four dimensions of sunkness, spillovers, scalability, and synergies. For simplicity, we collapse this framework into two dimensions.

**Uncertainty:** Investment in intangible assets produces much more variable outcomes than that in tangible assets. A \$10 million research project could turn out to be worth \$1 billion or \$0. In other words, a failed research project is often a **sunk cost**. Some accountants even value R&D using a “real option” approach that attempts to capture the optionality embedded in intangible investment.

Greater uncertainty in outcomes is exacerbated by the **spillovers** inherent in intangible assets. For example, when Apple invented the iPhone, its sleek design was immediately imitated by a host of rivals. This makes it hard to know whether a successful R&D project will be successfully monetized by its inventor.

Capitalizing intangibles simply books them at historical cost. This may be reasonable at the economy level, as one can average across thousands of research projects. However, for any individual company, historical cost may be a nearly worthless indicator of ex-post value.

**Scalability:** Intangible assets are much more **scalable** than tangible assets. They tend to have high upfront fixed costs and zero marginal costs. Once the source code is written, producing additional units of software costs nothing. The tendency for intangibles to have network effects further amplifies these economies of scale (discussed later).

The greater **synergies** inherent in intangibles also fuels the winner-take-all dynamic. Inventions are often more valuable when combined with other inventions. For example, many of the innovations used for the iPod were instrumental for the invention of the iPhone.

This creates further challenges for historic cost-based valuations, which implicitly assume a linear input-output relation. Investing twice as much in R&D yields twice as much output. However, the dynamics of intangibles are anything but linear.

Due to the unique attributes of intangible assets, accounting reform alone is insufficient to fully adapt value investing to the asset-light economy. We need to move beyond what financial statements can tell us. We need more direct ways to quantify the value of companies’ intangible assets.

## Brands

### The Pepsi Paradox

In 2019, Coca-Cola spent \$4.25 billion on advertising. Over the past 25 years, it has invested a cumulative \$67 billion in building its brand. This massive investment has built its key competitive asset.

The value of the Coke brand is illustrated by the famous Pepsi Challenge marketing campaign. Pepsi showed that in a

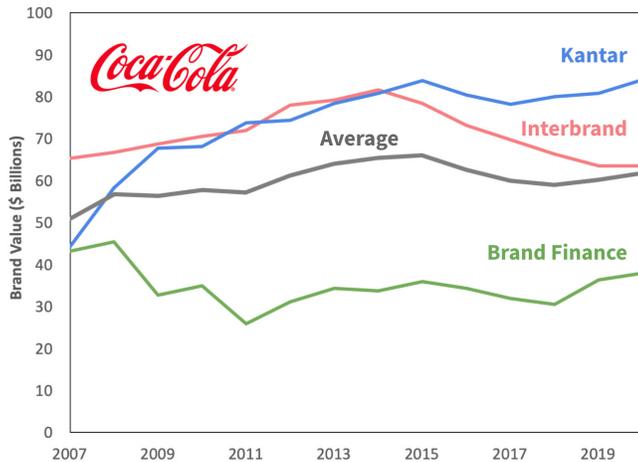
blind taste test subjects preferred Pepsi over Coke. However, subsequent studies found that, when the bottles were labeled, subjects preferred Coke. This was termed the “Pepsi Paradox.” Future studies conducted in labs even linked Coke’s positive brand associations to specific [brain activity](#).

Coca-Cola owes its market-leading position not to the technical superiority of its “secret formula” but to its dominant brand. If a competitor wanted to buy the Coke brand, it would certainly have to pay billions of dollars. However, arriving at a precise valuation is tricky.

Several marketing firms attempt to quantify this so-called “brand equity” using various proprietary approaches. These methodologies generally combine a measure of brand strength derived from market research with segment-level financials. For instance, a firm might survey consumers about their preferences for various cola brands to arrive at a brand strength score. This would then be used to attribute a share of the value of Coca-Cola’s sales of Coke to its brand value (as opposed to a generic version of the product).

Below is the valuation of the Coca-Cola brand (the company, not the soda) from three leading brand valuation firms.

**Exhibit 15**  
**How Much For a Coke?**

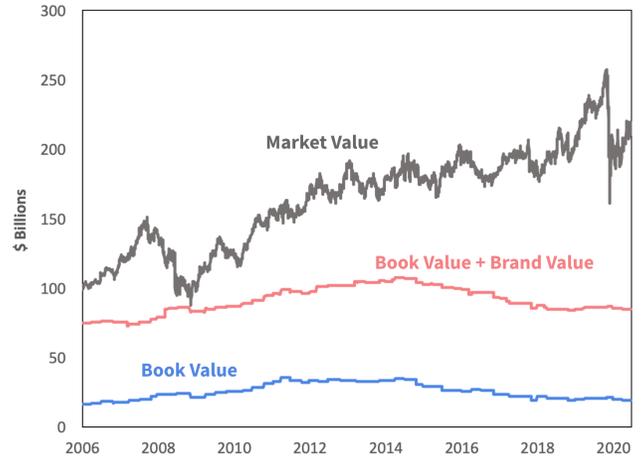


Source: Kantar, Interbrand, Brand Finance

The wide dispersion in these estimates underscores the inherent subjectivity of brand valuation. If we take the average, we find that around \$61 billion of Coca-Cola’s value can be attributed to its brand.

Coke has a market cap of \$215 billion but only \$19 billion in book value. Thus, it trades at a ridiculous 11x premium to replacement cost. We know this is wrong - if it only cost \$19 billion to recreate Coca-Cola, everyone would be doing it! While it does not fully explain this valuation gap, putting this \$61 billion of brand value back onto Coca-Cola’s balance sheet goes a long way in plugging this hole.

**Exhibit 16**  
**Coca-Cola Brand Equity**

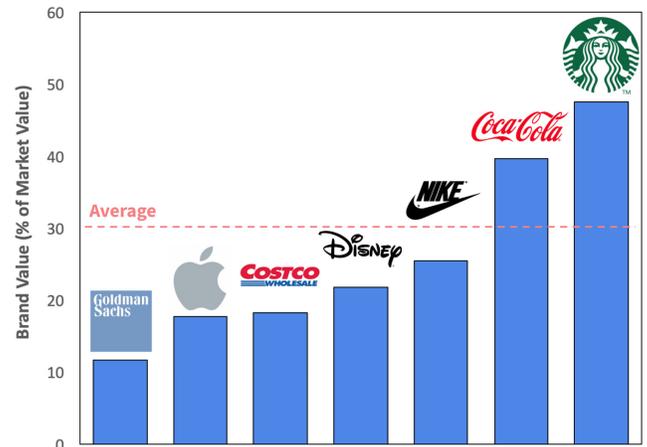


Source: Kantar, Interbrand, Brand Finance, S&P, Sparkline

**Beyond Coke**

How does Coca-Cola, one of the world’s most iconic brands, compare to other notable brands? For consistency, we’ll focus on the valuations from a single brand consultancy, Kantar.

**Exhibit 17**  
**How Brands Stack Up**

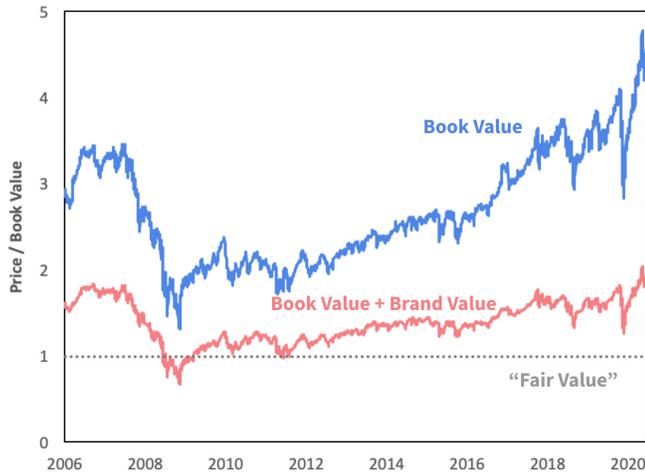


Source: Kantar, S&P, Sparkline

The average company for which we have data derives 30% of its value from its brand. Coca-Cola is a bit more dependent on its brand, while Apple relies more heavily on other intangibles besides brand.

We can aggregate this data into an index and examine the overall price to book ratio through time.

**Exhibit 18**  
**Tobin's Q and Brand**



Source: Kantar, S&P, Sparkline

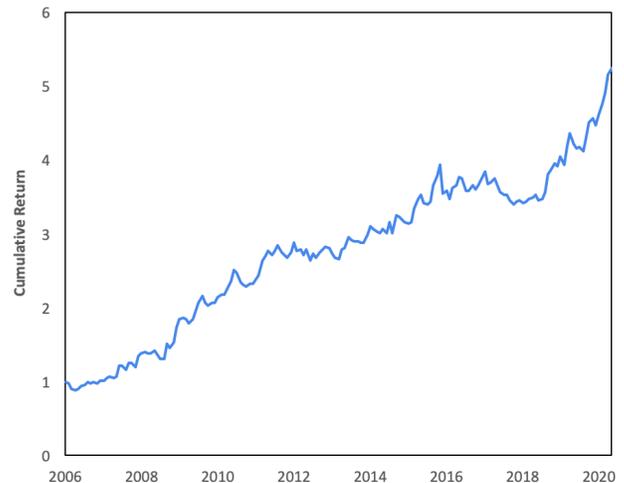
On standard book value, valuations appear to be consistently elevated and, more importantly, seem to be spiraling upward away from fair value. Accounting for brand value helps anchor price toward replacement value, preventing runaway valuations.

We caveat readers that the results above have sample selection bias. Kantar only produces valuations for the top brands. This creates a bias toward larger and more brand-intensive companies. Thus, we view the 30% brand contribution as a ceiling. But it does give us one more observation to triangulate the presence of dark matter.

### Brand Unawareness

As investors, our goal is to look for value that is underappreciated by the market. Most value investors focus on quantitative metrics such as tangible book value. Therefore, we would expect a subjective, squishy metric such as brand equity will tend to be overlooked. We built a strategy to exploit this. While this is a backtest, the results suggest that investors should pay more attention to brands.

**Exhibit 19**  
**Sparkline Brand Backtest**



Source: Sparkline

## Intellectual Property

Investing in R&D is necessary to have a shot at creating valuable intellectual property. However, effort alone doesn't guarantee a successful ex-post outcome. Innovation is extremely unpredictable.

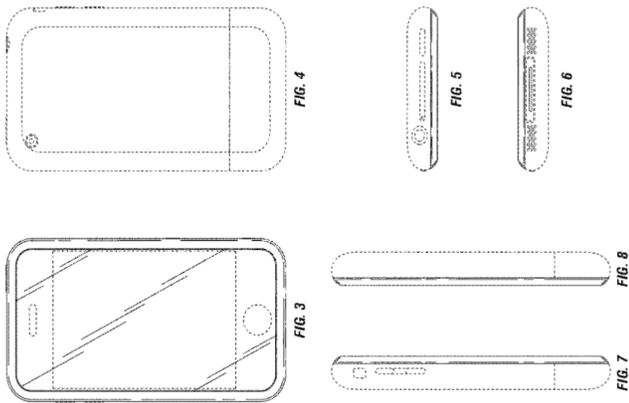
For this reason, we would prefer to measure the value of IP directly, rather than the cost of producing it. While there is no perfect metric, patents provide a useful way to analyze the value of companies' inventions.

### Patents

Patents grant their owners a legal monopoly on the use of a new invention for a defined period of time in exchange for public disclosure. Patents are granted for inventions that meet certain standards of novelty, usefulness and non-obviousness. Each country has its own patent office, although efforts are being made to harmonize the process.

Below is an exhibit from the original iPhone design patent.

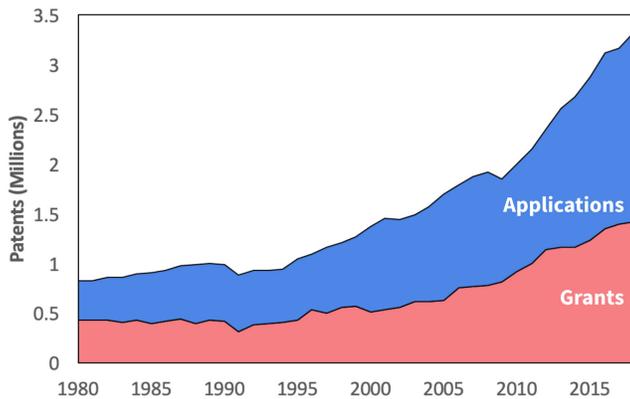
**Exhibit 20**  
**The Original iPhone**



Source: [USPTO](#), Apple

In line with the growth of the intangible economy, patent activity has surged over the past few decades.

**Exhibit 21**  
**Worldwide Annual Patent Activity**

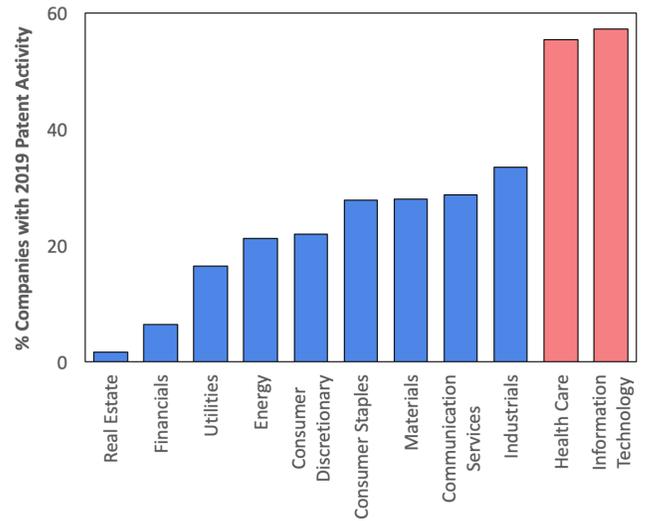


Source: [WIPO](#), Sparkline

**The Patent Power Rankings**

The importance of patents varies widely by industry. In the US, patents are most prevalent in the health care and technology industries. Over half of these companies have been granted at least one patent in the past year. We saw earlier that these are also the most R&D-intensive industries. However, patents are at least somewhat relevant for all sectors except for financials and real estate.

**Exhibit 22**  
**Patent Usage by Industry**



Source: USPTO, S&P, Sparkline

A less democratic picture emerges if we examine the total number of patents. Last year, 50% of all patents were granted to technology companies, compared to only 12% for the next highest sector (communication services) and 6% for health care. It turns out there are a handful of mega-cap tech companies running the patent game. This is the superstar effect in action! Below are the top US companies ranked by lifetime number of patent grants.

**Exhibit 23**  
**The Patent Power Rankings**

Rank	Company	Sector	Lifetime Patents (1000s)
1	IBM	Technology	140
2	General Electric	Industrials	52
3	Microsoft	Technology	44
4	Intel	Technology	42
5	Hewlett Packard	Technology	36
6	Exxon Mobil	Energy	28
7	Micron Technology	Technology	28
8	General Motors	Discretionary	26
9	Apple	Technology	26
10	Qualcomm	Technology	26
11	AT&T	Communication	25
12	Texas Instruments	Technology	24
13	Ford Motor	Discretionary	24
14	Motorola	Technology	24
15	Xerox	Technology	23

Source: USPTO, Sparkline

## Patents and Value Investing

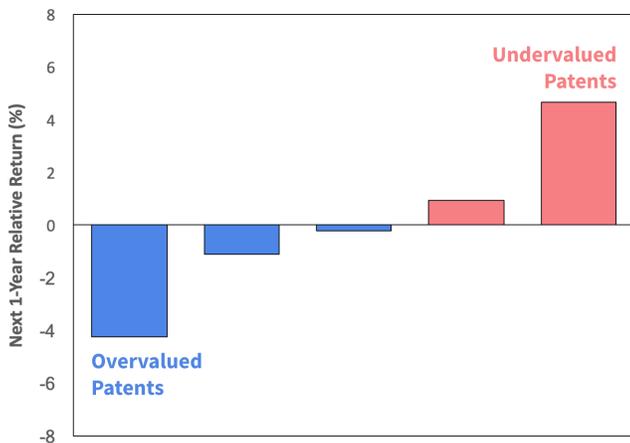
Patents are a form of intellectual property, but they are not the only form. Companies often do not bother to patent their inventions. This could be due to a desire for secrecy, a low perceived probability of enforcement, or other strategic reasons. Furthermore, the value of any individual patent is difficult to measure and varies considerably.

Despite these limitations, patents are valuable. Firms would not spend the estimated \$30,000+ to obtain a patent unless they expected to garner at least some economic value. While the market for patents is thin, the occasional transaction helps illustrate their potentially large value. In 2011, Nortel Networks famously sold its patent portfolio for \$4.5 billion.

[Kogan et al \(2012\)](#) provides more systematic evidence for the value of patents, showing that successful patent grants tend to be associated with higher stock prices. Moreover, this abnormal return is greater for more heavily cited patents (a proxy for scientific significance). Thus, the number of patents provides a reasonable proxy for the value of a company’s intellectual property portfolio.

In the last section, we argued that brand value is a “missing intangible”. We showed that this leads investors using quantitative valuation metrics to systematically undervalue these firms. The same principle applies to companies with strong patent portfolios. Exhibit 24 shows that stocks that are cheap compared to the estimated value of their intellectual property tend to subsequently outperform.

**Exhibit 24**  
**Finding Undervalued Patents**



Source: USPTO, S&P, Sparkline

Obviously, not all IP is equally valuable. In the next section, we show how investors can categorize inventions to identify companies innovating in important fields.

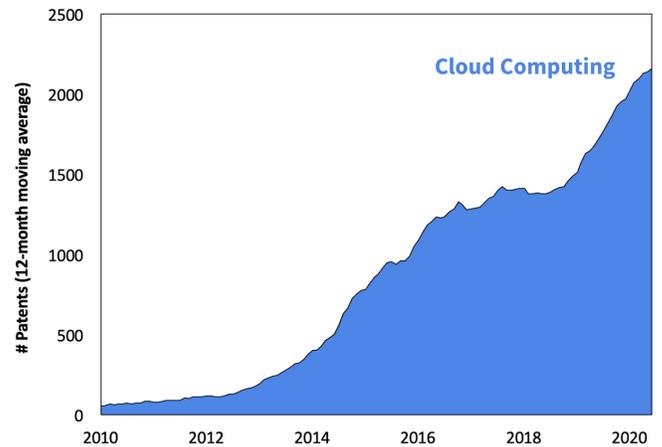
## Patents Thickets

In [Value Investing Is Short Tech Disruption](#), we discussed the disruptive nature of certain technologies. We used natural language processing (NLP) to classify companies based on the use of disruptive language in company documents. We use a similar approach to classify patents.

The advantage of using patents rather than company filings and earnings calls is that it is more difficult for companies to spin the narrative. It’s easy for a CEO to talk about how they are “leveraging blockchain to facilitate the transition to a cloud-based, digital ecosystem.” It’s much less likely they will actually invest the considerable resources required to file and successfully obtain patents in this field.

We can use cloud computing as a case study. Below are the number of annual patent grants related to the cloud.

**Exhibit 25**  
**To the Cloud!**



Source: USPTO, Sparkline

The field is relatively new and the patent approval process takes a long time, so we don’t see the rise of the cloud until 2010. But since then, patent activity has exploded!

Exhibit 26 shows the top ten US companies based on the number of cloud-related patents. This list makes sense.

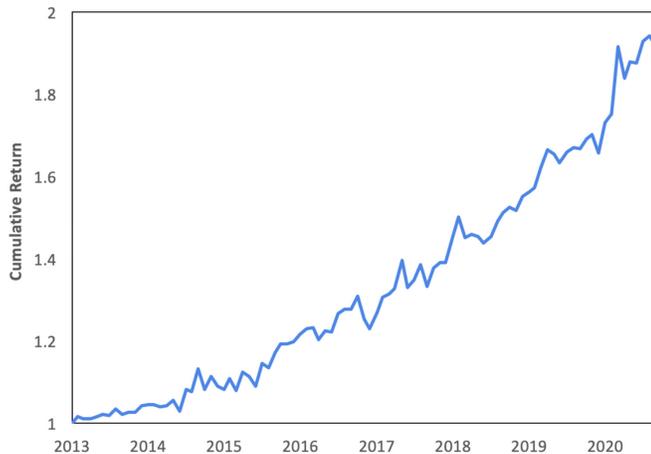
**Exhibit 26**  
**Cloud Top Ten**



Source: USPTO, Sparkline

Given the growth of the cloud, companies that own patents in the field have outperformed. The next exhibit shows the return of a rotating portfolio of companies with cloud computing patent activity. We equal weight so that smaller companies can have a meaningful role in the portfolio.

**Exhibit 27**  
**To the Cloud!!!**



Source: USPTO, S&P, Sparkline

The historical (backtest) performance is extremely good. Furthermore, these companies are very well positioned to profit from the future growth of the cloud. They possess legal monopolies (patents) around critical intellectual property. These so-called [patent thickets](#) make it harder for competitors to infringe on their domains.

## Scale Effects

### Scale as an Asset

We begin our discussion of scalability with a long but worthwhile passage from W. Brian Arthur, who pioneered the ideas of complexity theory and increasing returns.

“Western economies have undergone a transformation from bulk-material manufacturing to design and use of technology—from processing of resources to processing of information, from application of raw energy to application of ideas. As this shift has occurred, the underlying mechanisms that determine economic behavior have shifted from ones of diminishing to ones of *increasing* returns.

Increasing returns are the tendency for that which is ahead to get further ahead, for that which loses advantage to lose further advantage. They are mechanisms of positive feedback that operate—within markets, businesses, and industries—to reinforce that which gains success or aggravate that which suffers loss. Increasing returns generate not equilibrium but instability: If a product or a company or a technology—one of many competing in a market—gets ahead by chance or clever strategy, increasing returns can magnify this advantage, and the product or company or technology can go on to lock in the market.”

- [W. Brian Arthur \(1996\)](#)

Arthur argues that the intangible economy is qualitatively different from the industrial economy due to “increasing returns to scale”. This is a supercharged version of the more familiar notion of economies of scale.

In practice, increasing returns to scale are most commonly associated with network effects. Network effects are a phenomenon whereby additional users enhance the value of a product to its existing users. This creates a positive feedback loop. Once a network has a critical mass of users, it becomes extremely challenging for competitors, even those with technical and brand superiority, to lure users away. Thus, a mature network is itself an asset.

To bring us full circle, we’ll return to Warren Buffett’s Apple investment. He explained this investment at his 2018

shareholder meeting, saying: “I didn't go into Apple because it was a tech stock... [but] because of the value of their ecosystem and how permanent that ecosystem could be.” Buffett gets network effects.

## Valuing Networks

While placing a valuation on a company’s network can be challenging, it cannot be avoided. Network value can be quite considerable, especially for the so-called “platform companies.”

For example, Uber does not own a fleet of vehicles or taxi medallions. Its technology, brand, and customer data are valuable but do not justify its \$60 billion market cap. Instead, Uber’s main asset is its driver and rider network. This doesn’t show up on its balance sheet, but it is the key asset enabling Uber to generate its billions in revenue.

Investors in Uber should carefully monitor the growth and stability of its driver and rider networks. Just as we collected data on brand equity and patent activity, we can measure the size and strength of companies’ networks. This can often be done in real time in our digital age. However, a thorough discussion is beyond the scope of this article.

## Value Is Short Monopolies

In [Monopolies are Distorting the Stock Market](#), we discussed how technology and network effects produce natural monopolies. We showed how monopoly power can in turn lead to pricing power and excess stock returns.

We also suggested that value investors are implicitly short monopolies. Monopolies trade at higher multiples, as the market recognizes their higher profits and monopoly power. However, as monopoly power does not appear on the balance sheet, monopolies systematically appear expensive on standard valuation metrics. We hypothesized that this in part explains why returns have been so poor.

We were able to test this hypothesis. First, we separated the universe of US stocks into high- and low- concentration industries, measured by the [Herfindahl-Hirschman Index](#). Next, we calculated the returns to a value strategy run in each of these two universes.

## Exhibit 28 Impenetrable Moats



Source: USPTO, Sparkline

We found that value performed better in less concentrated industries, validating our theory. The rise of monopolies has not been friendly to value investors.

## Conclusion

The rise of the intangible economy has changed the rules of investing. Intangible assets comprise almost half of the capital stock and their importance grows steadily each year. Their omission from financial statements distorts our perception of value at the levels of market, country, industry and company.

However, intangible assets are uniquely uncertain and scalable. Thus, even accounting reform is unlikely to lead to a clear picture of the intangible economy. We need to go beyond accounting data to more directly measure intangibles, such as brand equity, patents, and network effects. This is a worthwhile endeavor, as these intangible assets are often misvalued.

Baruch Lev and Feng Gu, in “The End of Accounting,” tell a similar story of the decaying usefulness of accounting measures in the era of intangibles. They propose companies supplement their financials with reporting on key “strategic resources,” which are intangible assets such as patents, strategic alliances, and organizational capital.

## Exhibit 29 The Strategic Resources & Consequences Report

DEVELOPING RESOURCES	RESOURCE STOCKS	RESOURCE PRESERVATION	RESOURCE DEPLOYMENT	VALUE CREATED
<b>R&amp;D (\$)</b> Internal • Research • Development Acquired technology	<b>Patents &amp; Trademarks</b> Quantity • Applied • Approved • Stock Patent attributes (quality)	Infringement Detection programs  Disruption Mitigation programs	<b>Patents</b> • Developed • Sold/licensed • Donated • Expired	<b>Value Created in Period (\$)</b> Cash flows from operation Plus: • Expensed investments Minus: • Capital expenditure Minus: • Cost of equity capital
<b>Customer Acquisition Costs (\$)</b>	<b>Customers</b> • Additions • Terminations • Total • Churn	<b>Resources</b> Decay prevention	<b>Oil &amp; Gas Rights</b> • % explored • % producing • % abandoned	Plus: • Expensed investments Minus: • Capital expenditure Minus: • Cost of equity capital
<b>Oil &amp; Gas Exploration (\$)</b> Exploration • Successful • Unsuccessful Rights acquisition	<b>Proven Oil &amp; Gas Reserves (\$)</b> • Exploration rights • No. of rigs	<b>Knowledge Management</b> • No. of employees participating	<b>Alliances &amp; Joint Ventures</b> • Investment in alliances (\$) • No. of alliances – R&D – Manufacturing	Plus: • Expensed investments Minus: • Capital expenditure Minus: • Cost of equity capital
<b>TV &amp; Movie Content (\$)</b> • New • Sequels	<b>Brands</b> • Number • Market share • Brand value (\$)	<b>Maintaining Workforce Quality</b> • In-house and external training (\$) • Employee turnover	<b>Movie/TV Content</b> • No. streams to customers • Serialization • International	<b>Resources Value Changes (\$)</b> • Lifetime value of customers • Value of oil & gas reserves • Brands value
<b>Spectrum</b> • Acquisition (\$) • Broadband				

Note: The information in squares is quantitative (\$ denotes monetary values), and in circles is qualitative (narrative).

Source: [Lev and Gu \(2016\)](#)

We have provided case studies showing how to use “alternative data” to gather intelligence on strategic resources on our own. However, we also stand as advocates of Lev and Gu’s framework. Presenting this information in a more accessible structured format would go a long way in helping investors make sense of an increasingly intangible world.

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Kai Wu is the founder and Chief Investment Officer of Sparkline Capital, an investment management firm applying state-of-the-art machine learning and computing to uncover alpha in large, unstructured data sets.

Prior to Sparkline, Kai co-founded and co-managed Kaleidoscope Capital, a quantitative hedge fund in Boston. With one other partner, he grew Kaleidoscope to \$350 million in assets from institutional investors. Kai jointly managed all aspects of the company, including technology, investments, operations, trading, investor relations, and recruiting.

Previously, Kai worked at GMO, where he was a member of Jeremy Grantham’s \$40 billion asset allocation team. He also worked closely with the firm’s equity and macro investment teams in Boston, San Francisco, London, and Sydney.

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