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Market-Derived Patent Data: What Data is Important and How Does It Impact Value?

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About Mike Pellegrino

- President of Pellegrino & Associates
  - 16 year old consulting firm, >400 projects, ~300 clients
  - Frequent speaker/author around world on valuation topics
- Provide strategic IP consulting, valuation, and damages analysis to companies large and small around world
  - Intel, IBM, State Farm, Yum! Brands, Uber, Ericsson, Office Depot, ZTE, GE, Avaya, Lockheed Martin, Biomet, ABB, Ingersoll-Rand, Elanco, Bissell, Rolls-Royce, Sony, Con-Ed, TeleTech, AM General, Celanese, etc.
- Recovering professional software developer
  - Developed massive research data sets for patent analytics
  - ~10-year record in patent analytics analysis and publishing

Some Major Headlines

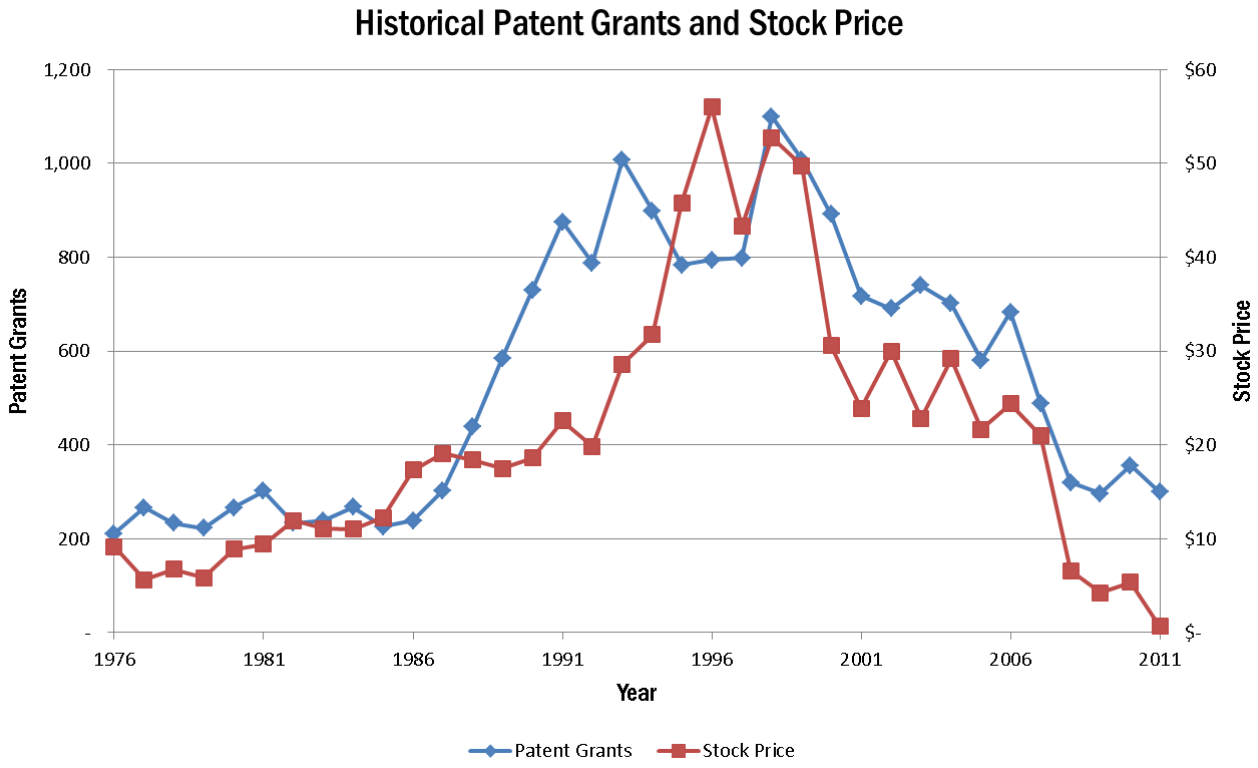
- "Google Buys 1,023 IBM Patents to Bolster Defense of Android"
- "Facebook Is Said to Buy 750 IBM Patents to Boost Defense"
- "Facebook Buys AOL Patents From Microsoft for $550 Million"
- "AOL Announces Close of $1.056 Billion Patent Transaction with Microsoft"
- "Intel to buy InterDigital patents for $375 million"
- "Acacia Subsidiary Acquires Patents Related to Cellular HSPA and LTE Technology from a Major Corporation"
- Why is all of this occurring?

Why?

- Economic justification
  - Authorized right to exclude others
  - Economic construct enables abnormal profits via price skimming
  - Right patent is worth more than most companies!
- Democratizing economic instrument
  - Larry Page is long way from modest Michigan upbringing
  - Started on the back of a patent from 1997
- Defensive posturing drives significant recent patent activity
  - Microsoft received 86 patent grants in 2000
  - Now within the top 10 recipients in any given week for new U.S. patent grants

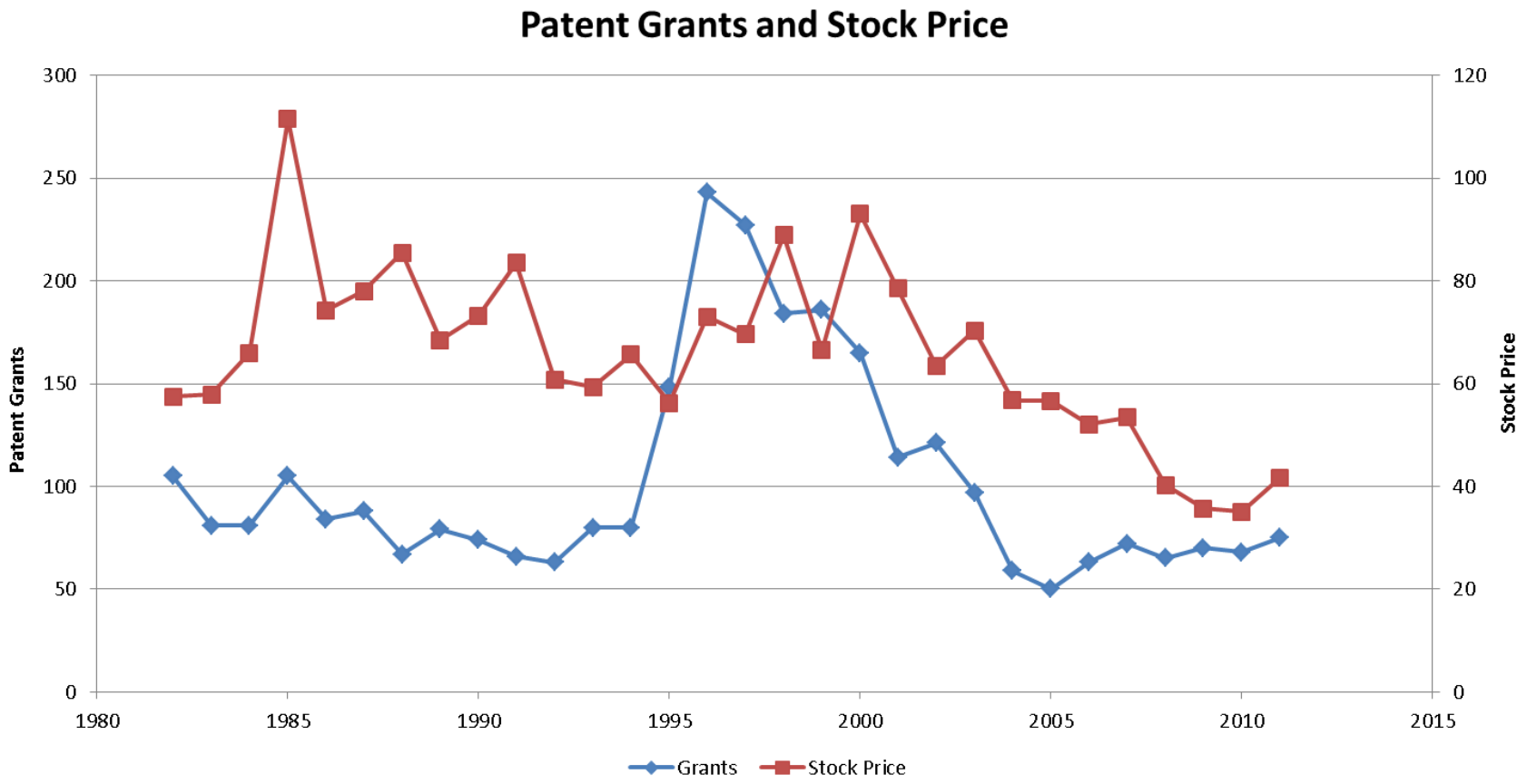
Ignorance is NOT Bliss

- What happens when a patent-centric consumer-based business stops investing in IP:



Ignorance is NOT Bliss

- This happens in pharmaceuticals too:



This is Big Business

- >94% of all patents assigned at time of award to companies
  - Top 300 patent holders own >half of the issued patents
- Lots of money at stake
  - At $10,000 per patent, prosecution fees top $4 billion per year
  - Does not include internal staff time (e.g., patent review committees), consultants, etc.
- >2,500 patent lawsuits enter court system each year
  - >$7.5 billion dedicated to patent litigation, damages, productivity losses, etc.
- This spend is a relative pittance compared to the economic value creation attributable to patents
  - The same holds true for patent lawsuits

Generalized Hot Development Areas

Main U.S. Patent Class	Patent Count	Gov't Funded	Abandonment Rate
438 - Semiconductor Device Manufacturing: Process	65,983	598	11.02%
257 - Active Solid-State Devices	60,801	665	8.97%
370 - Multiplex Communications	54,525	303	6.75%
514 - Drug, Bio-Affecting And Body Treating Compositions	50,056	2,780	27.25%
455 – Telecommunications	43,444	115	7.87%
435 - Chemistry: Molecular Biology And Microbiology	41,890	4,424	22.54%
345 - Computer Graphics Processing And Selective Visual Display Systems	35,871	116	10.56%
709 - Electrical Computers And Digital Processing Systems: Multicomputer Data Transferring	34,399	155	6.46%
424 - Drug, Bio-Affecting And Body Treating Compositions	32,943	1,914	19.90%
428 - Stock Material Or Miscellaneous Articles	32,546	467	20.48%

The Problem

- **Pain:** Comps do not work well with patents
  - Not selling commodities
  - Difficult to identify prospects
  - Difficult to gauge a good deal
  - Remarkable amount of information asymmetry in IP by design
- **Pain:** Individual patent analysis is impractical
  - Expensive
  - Takes time
  - Does not scale well
  - Dependent on analyst quality
- **Need:** Must derive credible answers on large portfolios
  - Oftentimes in hours

The Problem

- **Facts:** There are millions patents in force
  - About 6,500 new patents issue each week, ~340K per year
  - About 7,500 applications publish each week, ~380K per year
  - >20,000 assignments publish each week, ~1M per year
  - Transactions, withdrawals, abandonments and expirations change daily picture
- **Problem:** The dataset is huge
  - USPTO dataset is ~100TB
  - USPTO publishes >130GB of compressed data each week
  - Data spread among various different, discrete data sources
  - Compounds with international data sources
- **Pain:** Smart people make suboptimal IP decisions constantly
  - How does one reasonably consider all of this information?

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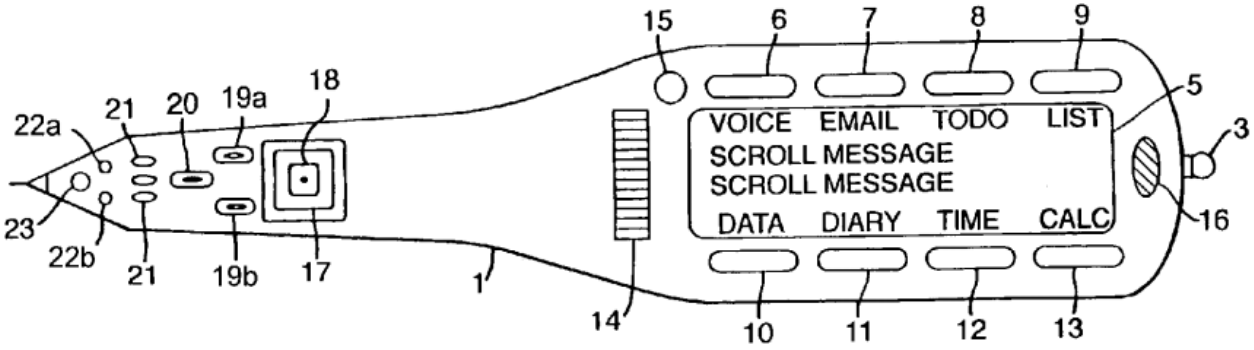
Data-Derived Patent Metrics

Main Thesis

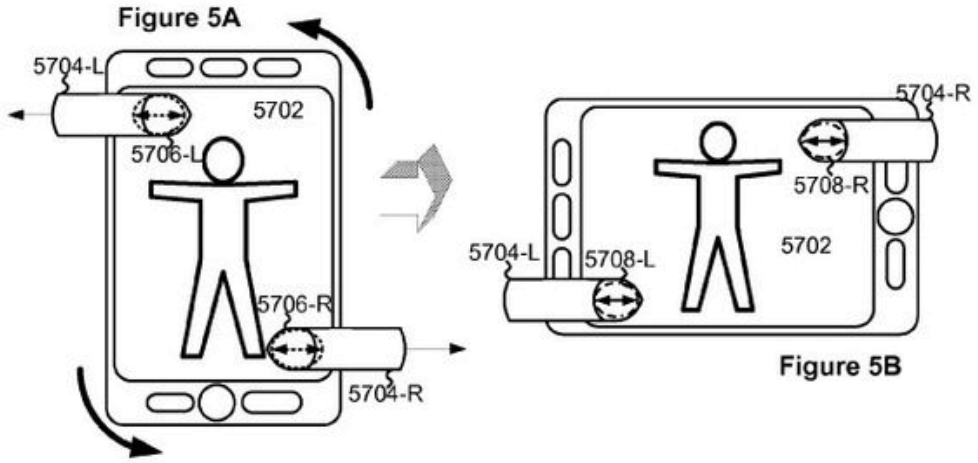
- **Thesis:** Underlying behavior has an economic basis, driving business decisions
  - **Result:** People's behavior informs on patent strategy
    - Whether they want it to or not
  - **Impact:** Narrows the focus of where to expend scarce resources
    - Increases operating margin of consulting practices
- **Example:** Apple filed several reissues on patent #6,956,564
  - Concept originated in 1998 in England
  - Apple bought patent from British Telecom in 2007
  - Underlying technology was defining feature of original iPhone
  - Describes device that changes display view tied to accelerometer

Apple Example

- Original 1998 British Telecom preferred embodiment



- How Apple applied the patent in 2007



Behavioral Analysis Advantages

- Patent data is not normally distributed
  - Depends heavily on tail analysis in many forms
- Behavior embedded in the public information
  - Just need to know where to look (e.g., the tails)
  - Sophisticated strategists cannot hide behavior
  - Especially in specific technology areas of interest
- Behavior informs on many different levels
  - Patent relevance
  - Mortality analysis
  - Market inspiration
  - Prosecution strategy
  - Operational efficiency
  - Technology importance

Why Consider Macro Patent Data?

- Key innovations typically rely on patents
- Such data is publicly available
- Patent data is authoritative
  - Easy to use in court
  - Published by U.S. government
  - Generally federated by college-educated workforce
- Statistical analysis of trends in data informs market on variety of levels
- **Impact:** Insights open doors to new influencers on patent value (both positive and negative)

Analysis Data Sources

- Today's discussion focuses on variety of USPTO data sources
  - Patent grants – 6.9 million
  - Patent applications – 5.6 million
  - Assignments – 10 million
  - Maintenance fee events – 16.4 million
  - PAIR dockets – 9.3 million (5.6 million with full image file wrappers)
  - PRPS dockets – ~93,300
  - PTAB E2E dockets – ~11,300
  - Ex parte reexaminations – > 8,700
  - Inter partes reexaminations – >1,700

About This Data

- Data sources have limitations
  - Errors in data that the USPTO receives
  - Some errors are trivial (i.e., misspelled name)
  - Some errors are more serious (wrong dates on patents)
    - Much of the data is impossible to change
    - Patents are legal documents and require costly legal documents to make edits or corrections
- Each data source tracks data differently
  - Mapping must occur, which is a noisy process
- Such noise does not alter any conclusions materially

Metrics of Interest

- Hundreds of tracking signals
  - Way too many to discuss today
- Several major ones
  - Grant activity
  - Application activity
  - Application/grant (A/G) ratio
  - Patent priority
  - Portfolio composition
  - Provisional strategy
  - Prosecution progeny
  - Prosecution difficulty
  - Transaction activity
  - Maintenance activity

Grant Activity

- Rate of change in grants indicates current/historic market significance
- For example:
  - Few patents in button making
  - Many patents in multiplex communications
  - Grant activity has increased over time
- **Conclusion:**
  - Patents for multiplex communications are of greater interest to the market than they are for button making
  - Button making patents are likely worth less and/or there is no buyer

Grant Activity

- Location of art indicates market significance
  - Perform search for “diabetes”
  - Most patents are in chemical compound and biotech art classes
  - Little possible relevance if end device is a diagnostic for measuring glucose levels
  - In such a situation, most diabetes patents bring little relevance to analysis
  - Data informs us that market is more interested in treating disease via drugs versus devices
- **Impact:** Lack of data can be helpful in opining on patent value

Application Activity

- Patent applications are leading indicator to patent grants
- Rate of change in application indicates current/future market significance
  - For example:
    - Many new patents in soft tissue repair for spinal discs
  - Conclusion:
    - Possible growth market for an orthopedic company
- Like patent grant activity, location of art indicates market significance

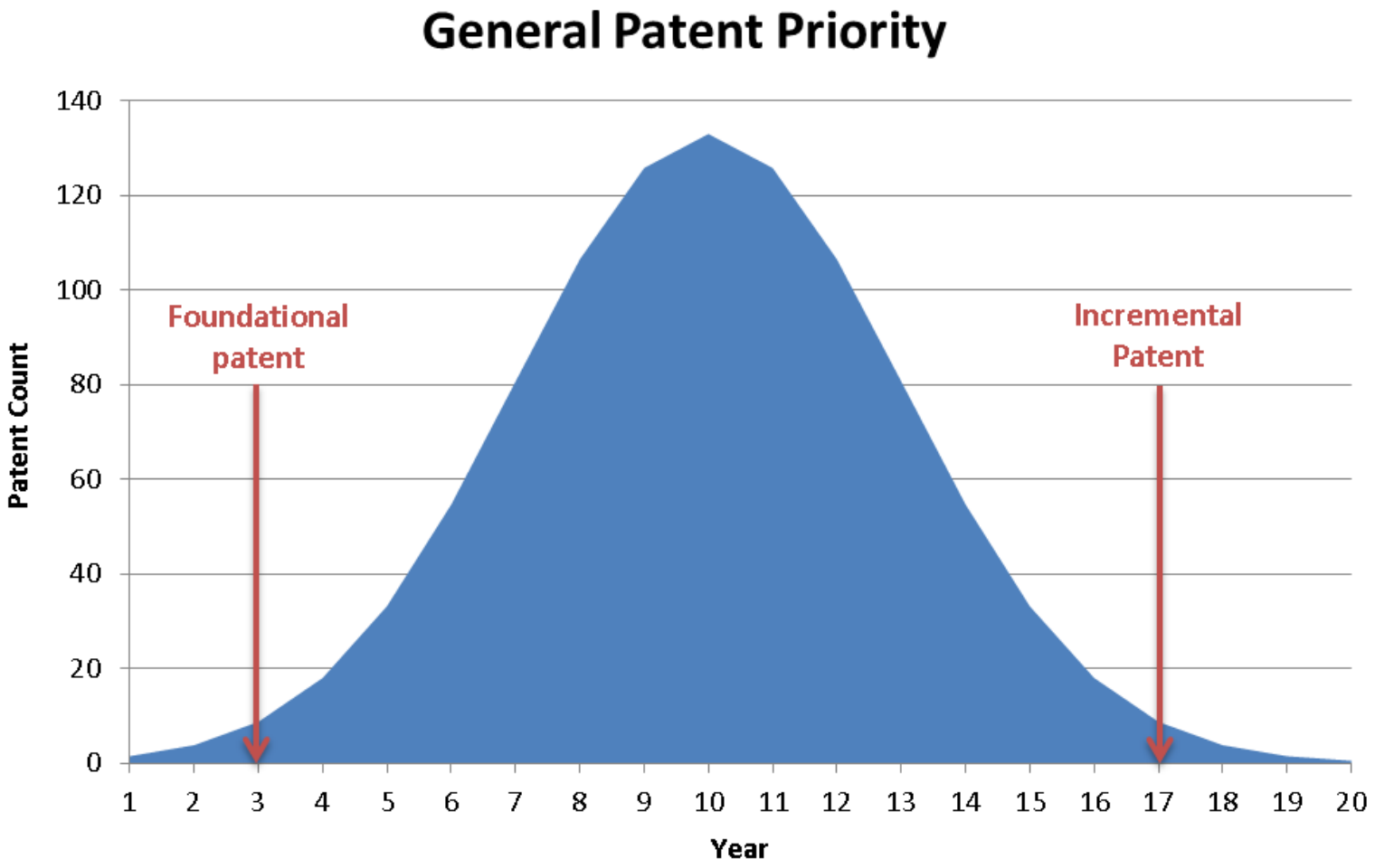
Application/Grant Ratio

- A/G ratio provides evidence of market significance over time
  - Total patent applications / total patent grants
- Interpretation
  - <1 : Market interest is waning as new filings lag grants
  - =1 : Market's interest is stable and maintained as new filings keep up with patent grants
  - >1 : Market interest is growing as new filings exceed grants
- **Impact:** A company's A/G ratio can tell you whether their pace of innovation is slowing or not.
  - Same holds true for broader market

Patent Priority

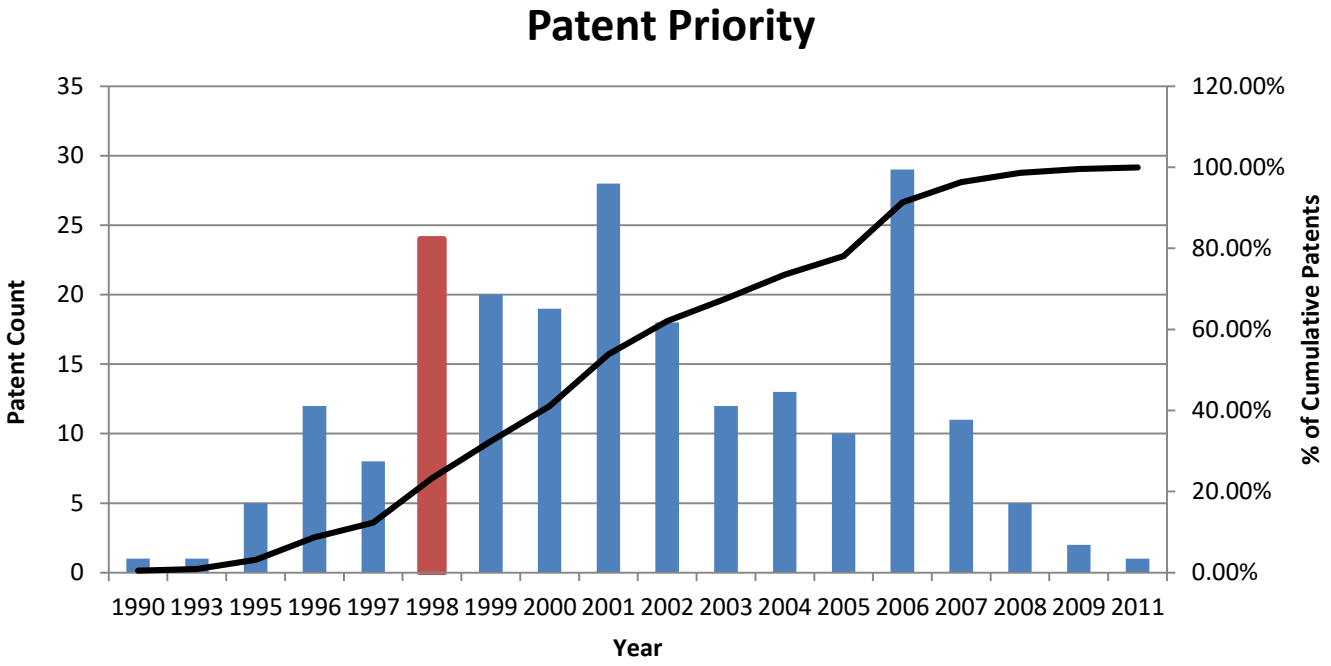
- Patents have an associated priority
  - Think of patent priority like a place in line
  - Patent priority is based on a date
    - That date is the point where invention novelty evaluation begins
  - Patents with earlier priority dates are closer to line front
  - Patents with earlier priority dates might exhibit a greater degree of novelty and be more foundational in nature
  - Patents with later priority dates might exhibit a lesser degree of novelty and be more incremental in nature
- **Impact:** Foundational patents generally worth more

Patent Priority Profile



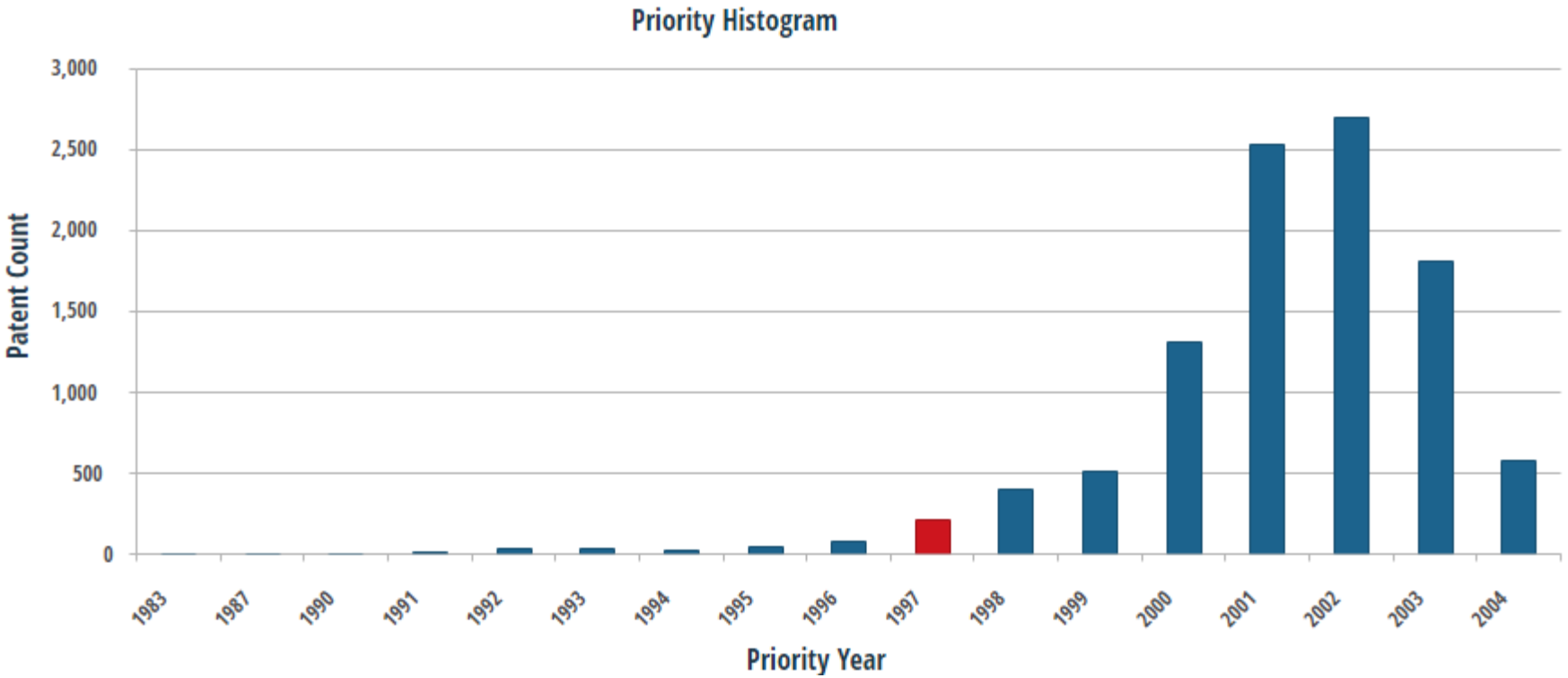
Patent Priority

- Patents with earlier priority dates may be more valuable
- **Impact:** Less impeaching art = less invalidity risk



Patent Priority

- Priority date of patent Apple bought from British Telecom
  - Apple sued HTC in 2011 with this patent



Portfolio Composition

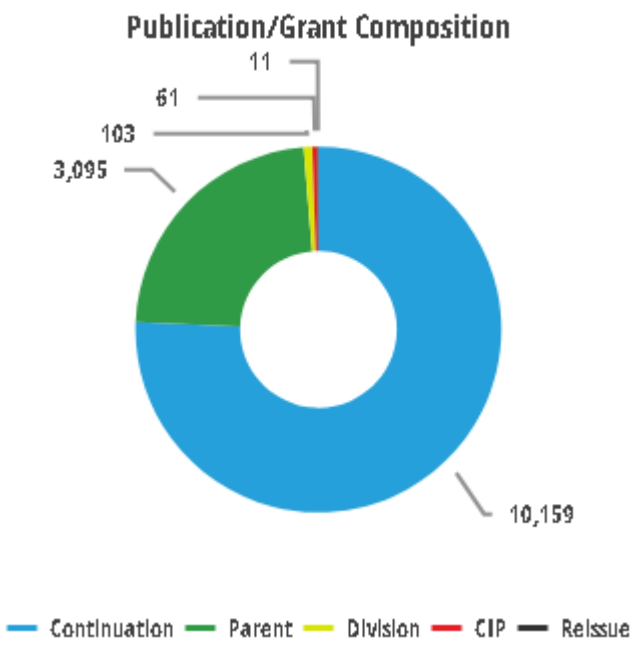
- **Thesis:** Patent types matter
  - Parent, continuations, divisionals, CIPs, etc.
  - Companies play games with patent types
- Heavy focus on continuations
  - Relatively inexpensive bulking up strategy
  - Makes portfolio look large
    - Reality is narrow scope
    - Oftentimes waste of money

Portfolio Composition

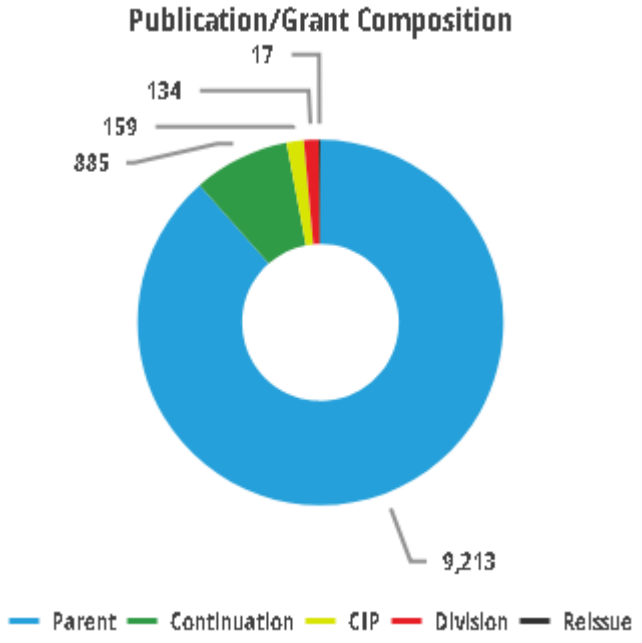
- **Example:**
  - Only 18% of Huawei's portfolio are parent assets
  - Most are continuations
  - Deep coverage in narrow footprint
  - Less valuable than Qualcomm, Ericsson Nokia, etc.
    - Public record regarding royalty payments confirms

Portfolio Composition

Huawei



Nokia



Integration Ratio

- Metric highlights breadth of portfolio
  - Ratio of parent assets to total portfolio size
  - Quickly highlights which companies are bulking portfolios
  - Range: 0 < Integration Ratio < 1
  - Ratios closer to 1 are horizontally aligned
    - Longer economic lives
    - Generally broader in scope
    - Generally more valuable all else the same
  - Ratios closer to 0 are vertically aligned
    - Shorter economic lives
    - Deeper, but narrower scope
    - Generally less valuable all else the same

Integration Ratio

Assignee	Grants	Terminal disclaimer	Horizontal integration ratio	Parent patents
International Business Machines Corporation	8,861	37%	56%	4,992
Samsung Electronics Co, Ltd	6,840	11%	82%	5,585
Canon Kabushiki Kaisha	3,331	4%	84%	2,809
LG Electronics Inc	3,086	20%	73%	2,265
Intel Corporation	3,063	17%	71%	2,171
Google, LLC	2,838	23%	61%	1,725
QUALCOMM Incorporated	2,646	9%	84%	2,219
Apple Inc	2,593	15%	58%	1,517
Microsoft Technology Licensing, LLC	2,409	22%	69%	1,663
Samsung Display Co, Ltd	2,306	5%	88%	2,036
Toyota Jidosha Kabushiki Kaisha	2,120	2%	96%	2,037
Amazon Technologies, Inc	1,985	15%	76%	1,508
Ford Global Technologies, LLC	1,949	5%	86%	1,678
Sony Corporation	1,803	20%	58%	1,054
General Electric Company	1,605	6%	86%	1,383
Taiwan Semiconductor Manufacturing Company, Ltd	1,558	11%	50%	777

Provisional Strategy

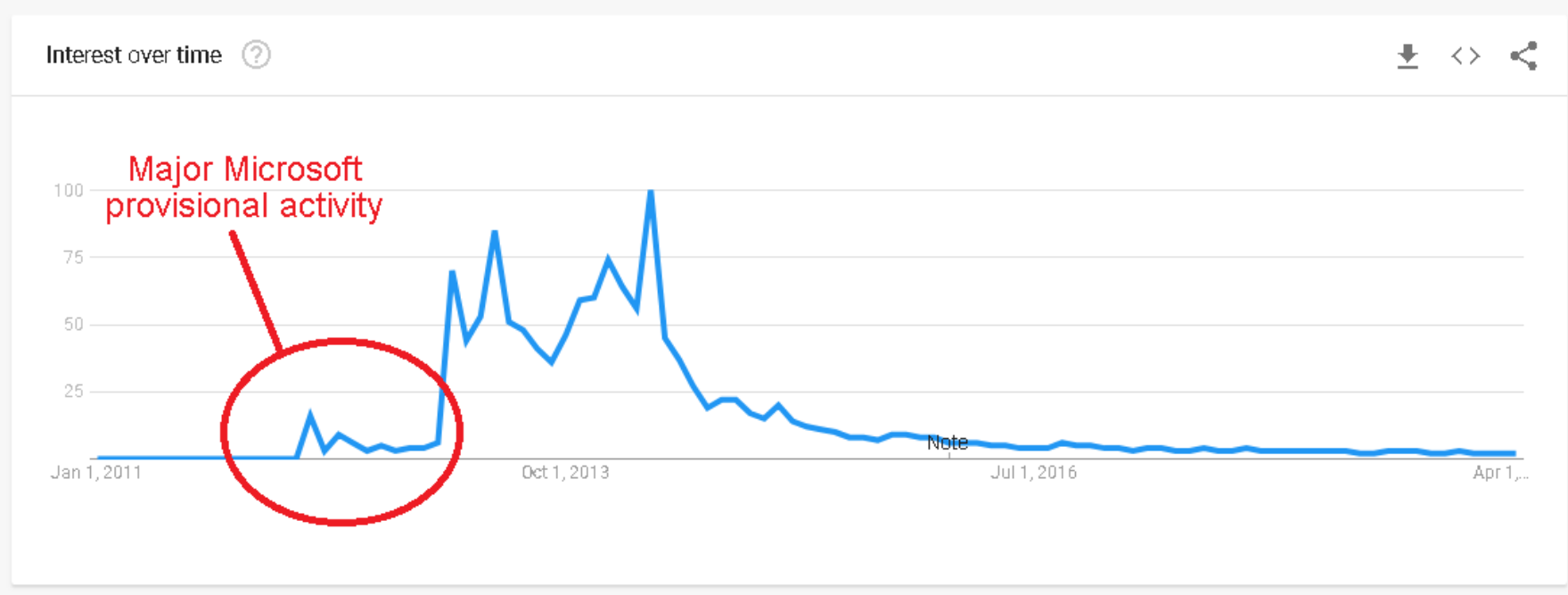
- **Thesis:** Provisional applications are leading innovation indicator
  - Many grants have multiple associated provisional applications
  - The volume and frequency of provisional applications highlight key focus areas
  - Large patent families tend to have many associated provisional applications
  - Provisional application change rates important indicator to future portfolio growth

Provisional Strategy

- **Example #1:**
  - Google acquires patent portfolio from Exbiblio B.V. in 2011
  - Addresses text capture from rendered documents
    - Important capability for search engines
  - Parent patent #7,707,039
    - Priority dates back to 2004
    - > 100 provisional applications
    - > 80 progeny today
  - Google still prosecuting patents under this estate in 2019
    - Most recent published application filed September 17, 2018

Provisional Strategy

- **Example #2:**
  - Microsoft files large number of provisional applications in 2011-2012
  - Address augmented reality inventions
  - Coincident to Google activities based on "Google Glass" search trends
    - Microsoft appears to be following Google in this area



Prosecution Progeny

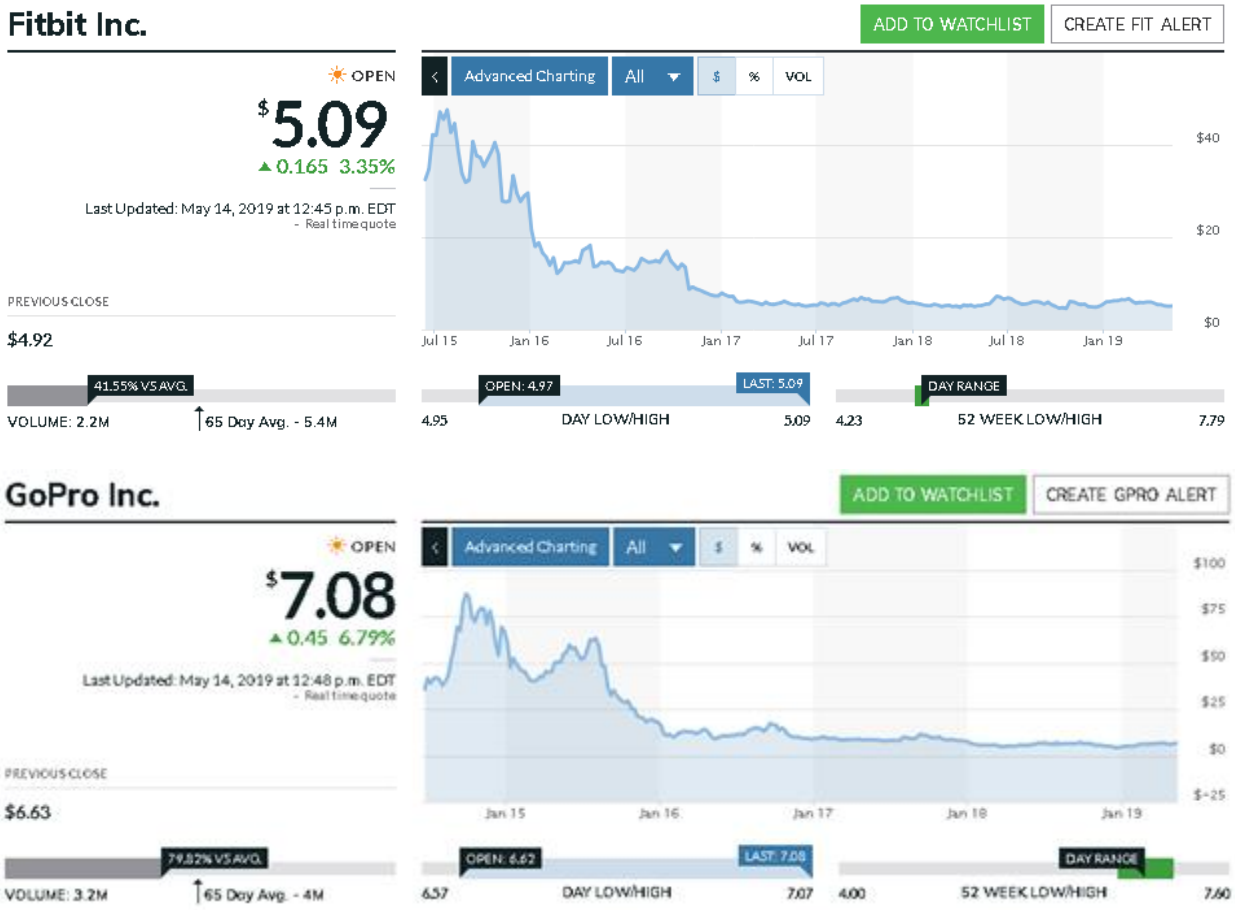
- **Thesis:** Many progeny = significant patent estate
  - There is business reason for depth of filings
  - Seeking coverage of many variations of inventions
  - Can highlight remarkable value risk in the portfolio

Prosecution Progeny

- **Example :**
  - FitBit has about 340 granted patents
  - Owns U.S. patent #9,167,991
    - Addresses portable devices that monitor caloric burn
    - Parent asset has 108 progeny
    - Among deepest progeny trees in entire USPTO data set
    - 32% of FitBit portfolio emerges from ' 991 original specification
  - FitBit has remarkably narrow coverage in only one inventive area
    - Risky proposition for a consumer electronics company
- This issue is not unique among companies
  - E.g., Huawei, Dolby, Digimarc, etc.

Prosecution Progeny

- Stock market finally caught up with FitBit's inventive reality
  - Same story at GoPro, though not as extreme



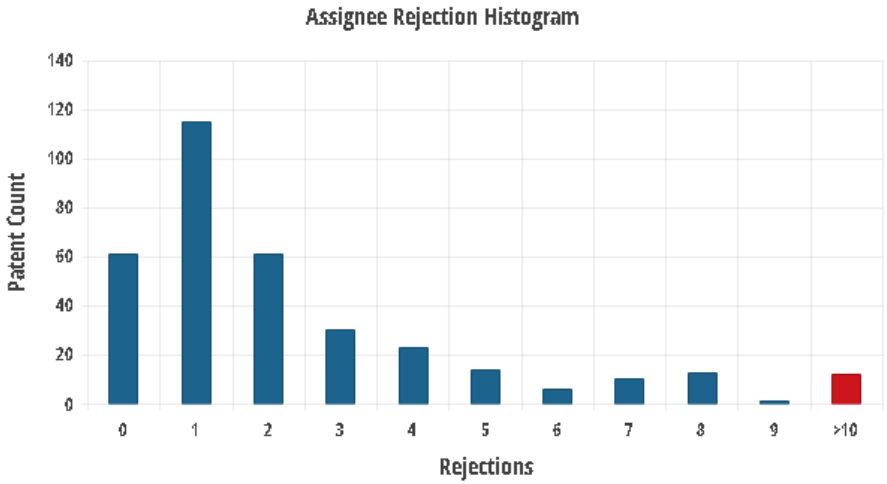
Prosecution Difficulty

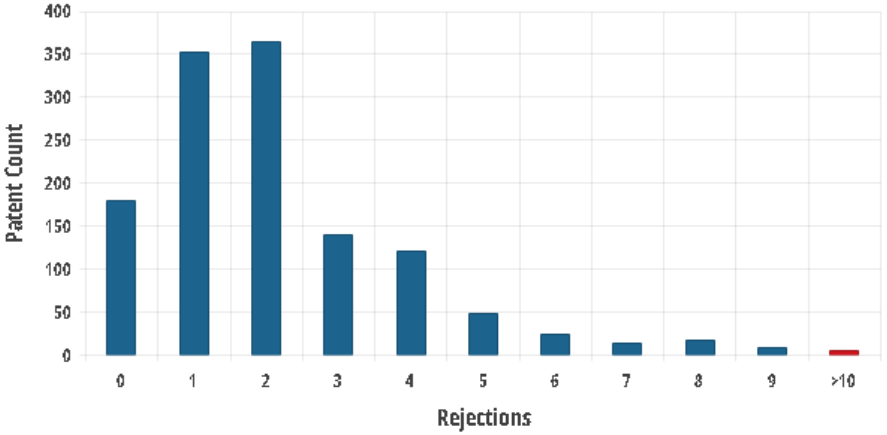
- **Thesis:** Companies invest significant sums to acquire patents important to them
  - ~66% of patents sail through USPTO
    - Zero or one rejection
  - Rejections are expensive to address
    - Generally $1,500-$2,500 each
    - Not including requests for continued examination (RCEs) or appeals

Prosecution Difficulty

- **Example:**
  - Procter & Gamble U.S. patent #9,585,827
    - Addresses dental erosion (i.e., tooth decay) using sodium hexametaphosphate
    - Earliest effective filing date: January 21, 2000
    - 11 non-final rejections, 12 final rejections, 9 RCEs, 6,255 days pendency (17 years!)
    - Patent issues March 7, 2017, four years before it expires
  - There is a business reason that explains this behavior
  - Essential ingredient in Crest Pro-Health toothpaste
    - Sodium hexametaphosphate helps fight stains and tartar buildup

Prosecution Difficulty





Patent Citations

- Patent citations are references to other granted patents or published patent applications
  - Similar to references in academic publications
  - Have relevance to the patent of interest
- Much interest exists in using citations to indicate patent quality value
  - Some academic research indicates that companies that have high degrees of citation to their patents have greater market values

Patent Citations

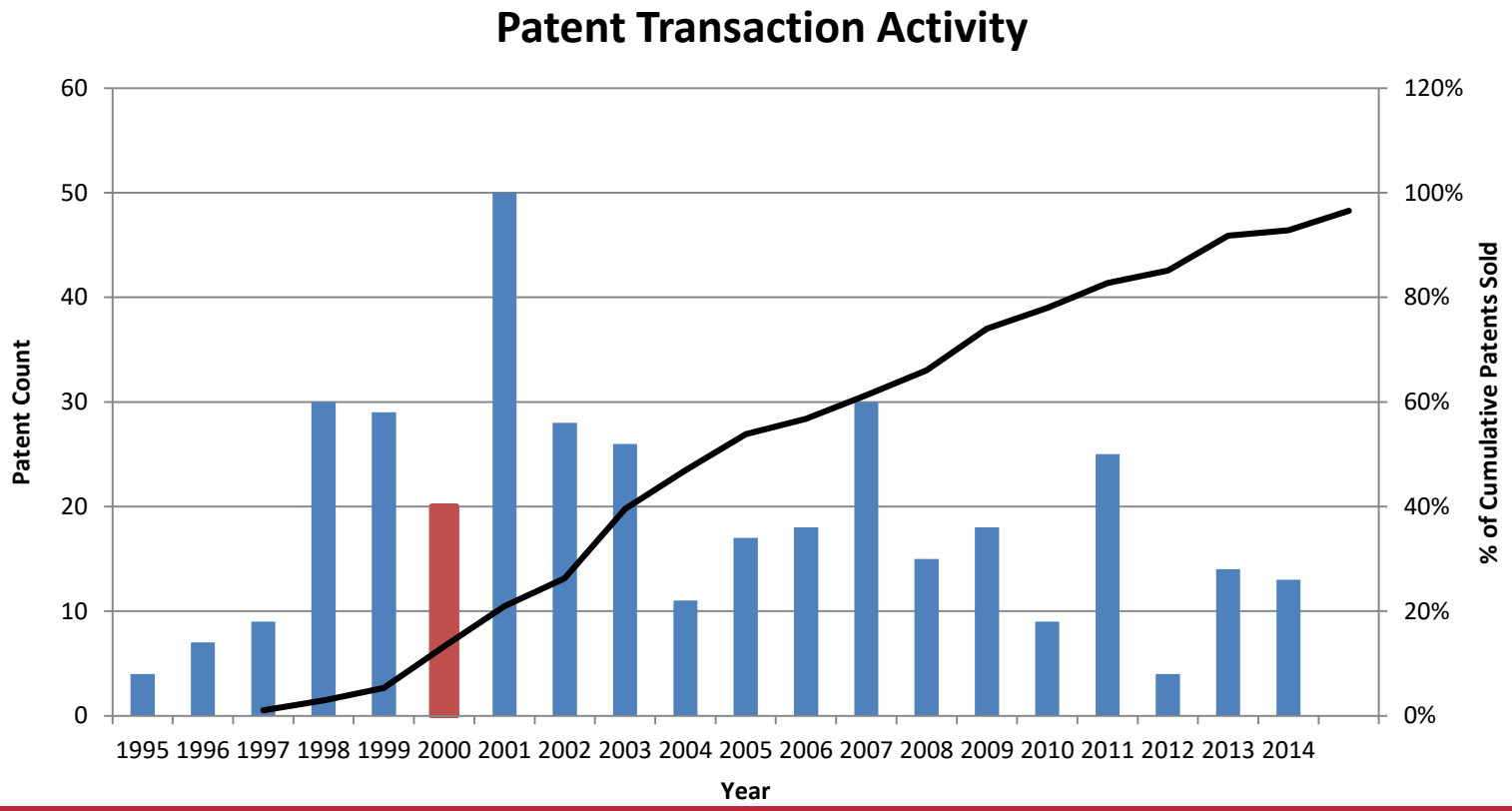
- A high degree of citations is indicative of market significance
  - That intelligence can be valuable
  - Helps identify possible licensees and acquirers
  - Provides basis for inspiration to other inventors in the market
- There is tenuous direct connection between patent citations and patent quality or patent value
  - Market players like metric though
- **Impact:** Highly cited patents generate greater market interest

Patent Citations

- Pros
  - Cheap data source
  - Easy to use data source
  - Lots of published research
    - Not necessarily “good” research
  - Some mixed use precedent in court
- Cons
  - 1980’s thinking
  - Weak and imprecise correlations
  - Generally poor and abused metric

Patent Transaction Activity

- **Thesis:** Companies actively transact for valuable patents
- **Impact:** Art classes with assignments = market interest/value



Transaction Activity

- Transactions may comprise:
  - Mergers
  - Assignments
  - Security interests (e.g., corporate financing)
  - And other rights conveyances…
- Searches that yield many transactions may indicate:
  - List of possible licensees or buyers for given technology
  - Active interest and market relevance in related technologies
- Quality of companies buying patents may provide significant credibility boost to patented concept
  - NPE acquisitions highlight relevant downstream risk areas

Maintenance Rates

- Patents are enforceable only when maintained
  - If patent owner does not maintain patent, then no enforcement lever exists
  - Patent maintenance is expensive
    - Gets incrementally more expensive at each maintenance event
  - Large companies can spend tens of millions of dollars per year on maintenance fees
- Strong relationship between valuable patents and maintained patents
  - Foolish to let a patent lapse that is generating value
- Patent maintenance rates can inform on economic lives of assets
  - Communications companies maintain >98% of their patents
  - Large pharmaceutical companies abandon >70% of their patents

Maintenance Sidebar

- IBM is late on > 70% of maintenance fees in 2012 timeframe
  - > 10,000 late payments, paid about $1.6 million in late charges
  - Quite surprising given IBM's sophistication
- **Answer:** Creative financing:
  - IBM defers >$40 million in expense
    - Assumes average cost of $4,000 per payment
  - 8% annualized financing cost
    - Pretty expensive debt for IBM, who borrows at lower amounts
  - However, constitutes off-balance sheet financing arrangement
    - Hidden from relatively unsophisticated auditors, allows IBM to defer expenses
  - 1 billion shares in play
    - Enables earnings management to tune of a penny or two per share

What Do We Do With The Data?

- Patent valuation does not start or end on statistical analysis
  - No direct connection in absolute terms (e.g., dollars)
  - Statistics inform on a variety of factors important to valuation process
- New insights and value influencers may include:
  - Litigation value
  - Licensee analysis
  - Economic life of the patent
  - Exit analysis (i.e., possible buyers)
  - Competitors at the company level
  - Competitors at the product or service level
  - Market interest in the technology
    - This may impact forecast growth rates