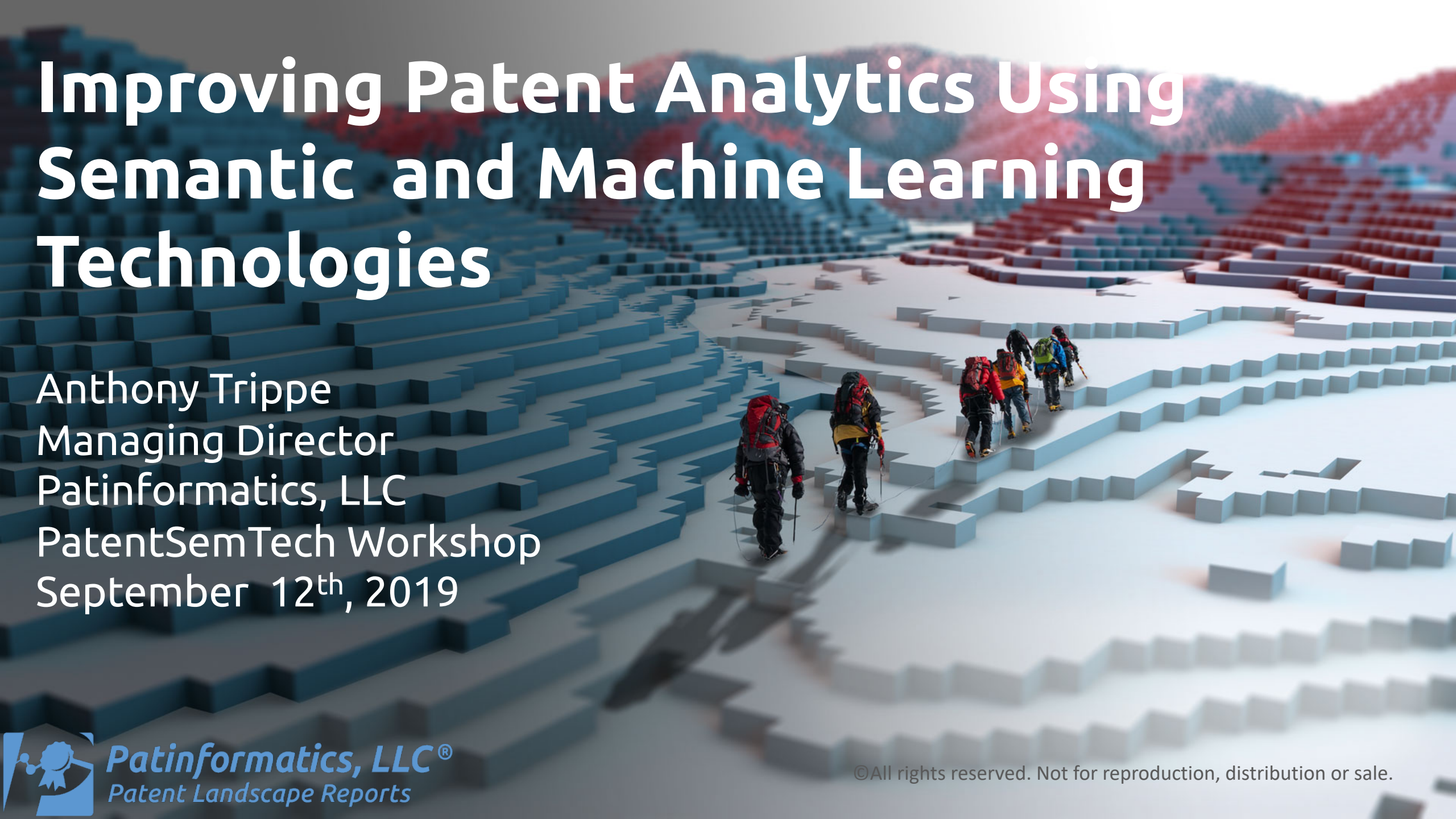
Improving Patent Analytics Using Semantic and Machine Learning Technologies



Anthony Trippe
Managing Director
Patinformatics, LLC
PatentSemTech Workshop
September 12th, 2019

Patinformatics, LLC®
Patent Landscape Reports

- **Why is patent analytics critical from a business perspective?**

- Too many decisions are made without proper intelligence or analysis
- “if all you have is a hammer, everything looks like a nail” – Abraham Maslow, 1966
- The “old boy” network or rolodex model applies
- Too often analysis is being done by individuals who do not understand the nuances of patent information
- Analytics lower the risks associated with business decisions and ensure higher returns

- **Why is patent analytics important from an R&D perspective?**

- It's a tool to assist with long term strategic technical planning

- It involves work processes for helping technical decision makers make smarter decisions faster

- It's an analytical process that transforms disaggregated technological information into relevant strategic knowledge about your competitor's, or a subject's technical position, size of efforts, and trends

• What's so special about patent analytics?

- Also from 1966 -"We have the choice of using patent statistics cautiously and learning what we can from them, or not using them and learning nothing about what they alone can teach us." – Schmookler, Innovation and Economic Growth pg 56

- **So why should organizational strategy be influenced by patent information?**

- 80% of the information in patents is never published anywhere else
  - "Eighth Technology Assessment and Forecast Report" – USPTO, 1977
  - Actually, 95% of the substances from the patent collection in CAplus did not have a corresponding non-patent literature reference associated with them

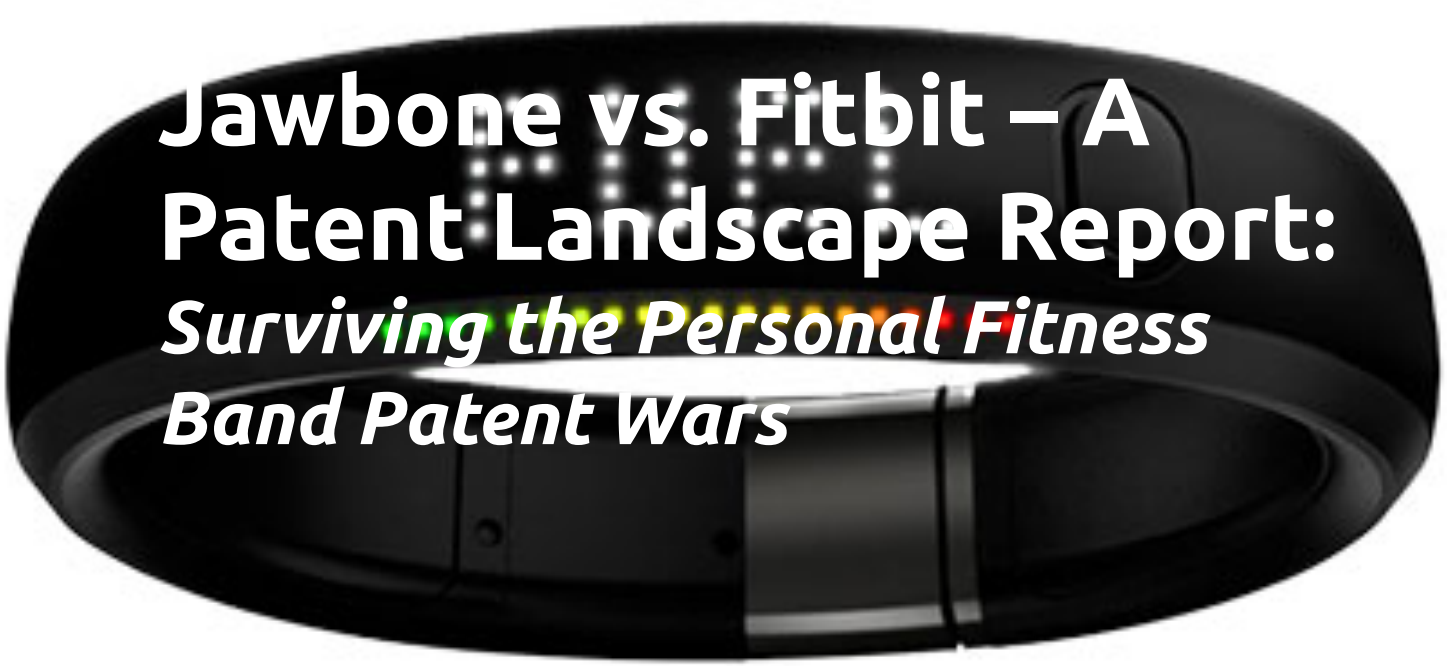
- "Over the next few years, we will either see the emergence of rational markets for patent trading, which have the potential to deliver trillions of dollars in value, or an opportunity lost as markets fail to engage effectively." – AISTEMOS CEO Nigel Swycher

• The world's patent offices are on board

- The rise of the Chief Economist
- WIPO and the UK Patent Office have devoted significant resources to the development of patent landscape reports, infographics and patent analysis workshops
- Australia and the Swiss Patent Office also provide services
- IP ValueLab will promote and develop IP management and strategy, IP commercialization and monetization, and IP valuation in Singapore
- European Patent Office efforts
  - EPO & USPTO collaborate for Patent Statistics for Decision Makers
  - Releases PATSTAT
  - "Patent information is a top priority for the EPO" – EPO President, Benoît Battistelli – 2013 EPO Patent Information Conference

Jawbone vs. Fitbit – A Patent Landscape Report:

Surviving the Personal Fitness Band Patent Wars



Anthony Trippe
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Patent Landscape Reporting

• Law of Linear Patent Analysis

- Develop a Collection of Analysis Tools
- Understand the Need Behind the Need
- The Need Drives the Question
- The Question Drives the Data
- The Data Drives the Tool

Why is this important?
“if all you have is a hammer, everything looks like a nail” - avoid this at all costs

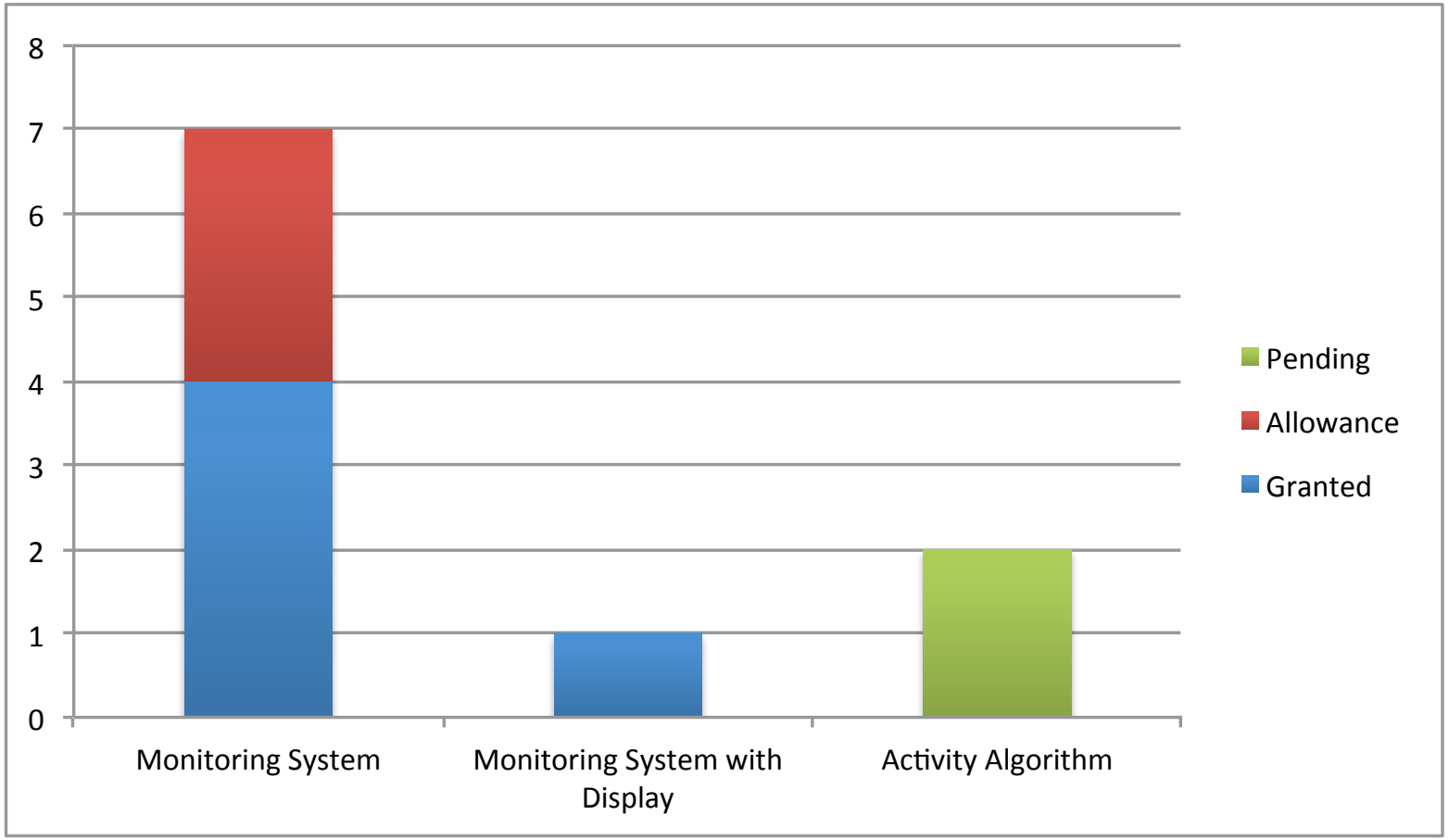
Project objectives

- Complete a high-level competitive analysis of the fitness monitor IP landscape
- Assess Fitbit's specific position in fitness monitors
- Identify the main IP strategy opportunities and threats to Fitbit's business

- This case study was developed at the beginning of 2013 when Nike was still selling the Fuel fitness band, and before Apple released their watch
- At the time the market for personal fitness bands was a fraction of what it is today, and it was anyone's guess as to who was going to become the leader in this category
- Fitbit was doing well with its first product in the area, and Jawbone had just released the first version of their Up product line
- Patinformatics predicted that patent litigation would eventually take place, and a well-designed patent portfolio was going to be critical for future success

• Breakdown of Fitbit portfolio by Technology Category as of Feb. 2013

- At the beginning of 2013 Fitbit had a very small portfolio consisting of about ten patent families
- A variety of analyses were conducted, but the chart on the right, which looks at the technology covered in the first claim of each unique application number tells us that this was a very narrowly defined portfolio

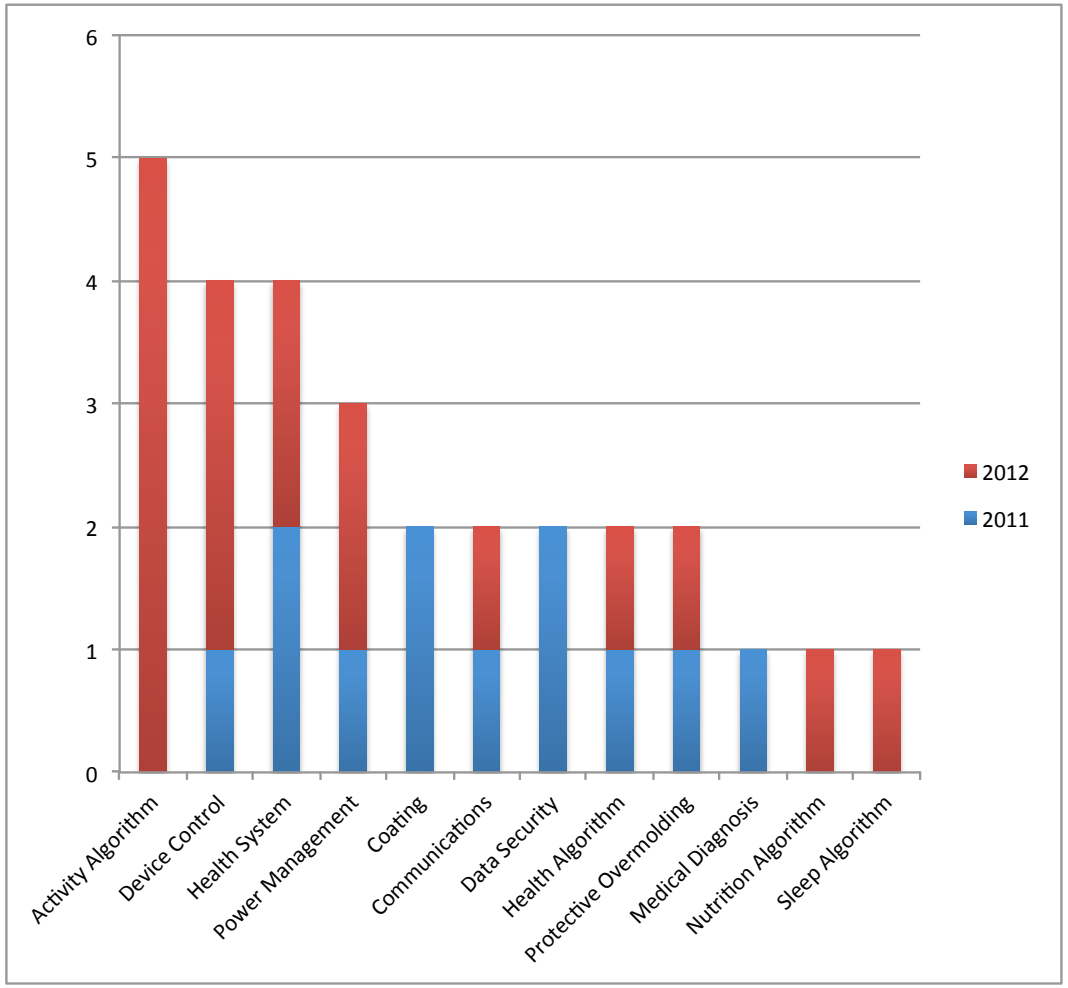


• Our perspectives of Fitbit as of Feb. 2013

- Very narrowly focused on an activity monitoring device primarily for counting the number of stairs that a user climbs
- US filings only
- Reasonable number of granted patents, but no depth
- Nothing on established chokepoints, or components of the device
- Calorie burning calculations still pending
- No forward citations
- Fair number of independent claims but several steps, and all on small variations of the same theme
- **Should consider an IP buying program to protect themselves as market and share increase**
- Already been sued by Sportbrain – this was dismissed and, hopefully the corresponding patent was licensed (it wasn't and Sportbrain has since gone on to sue almost everyone in this space)

• Breakdown of Jawbone portfolio by Technology Category as of Feb. 2013

- At the beginning of 2013 Jawbone (Aliphcom) had a little larger portfolio than Fitbit consisting of twenty nine patent families
- A variety of analyses were conducted, but the chart on the right, which looks at the technology covered in the first claim of each unique application number tells us that this is portfolio has considerably more breadth that the one from Fitbit at the time



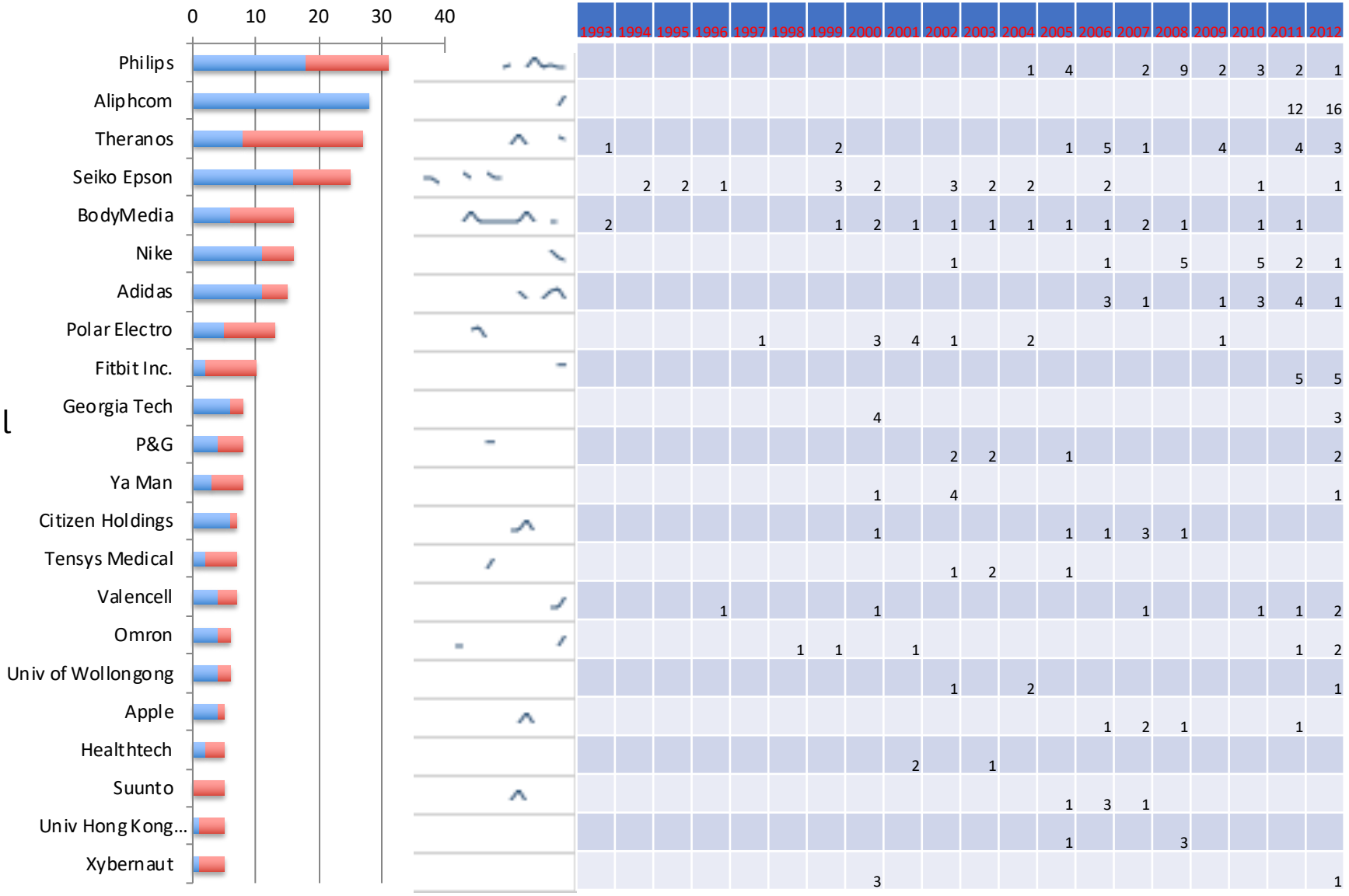
• Our perspectives of Jawbone Up as of Feb. 2013

- Most applications had not granted yet!
- They had the potential for foreign coverage with WO filings
- They had coverage on power management
- They had coverage on manufacturing
- They had coverage on variety of activities, including wellness and sleep
- Device control could be very interesting
- Have Bluetooth elements in other products but don't use it in Up product, why?
- No forward citations, yet
- Should consider an IP buying program to protect themselves as market and share increase
- Have already had to recall first generation, and re-issue product due to issues with waterproofing

OVERALL PATENT LANDSCAPE

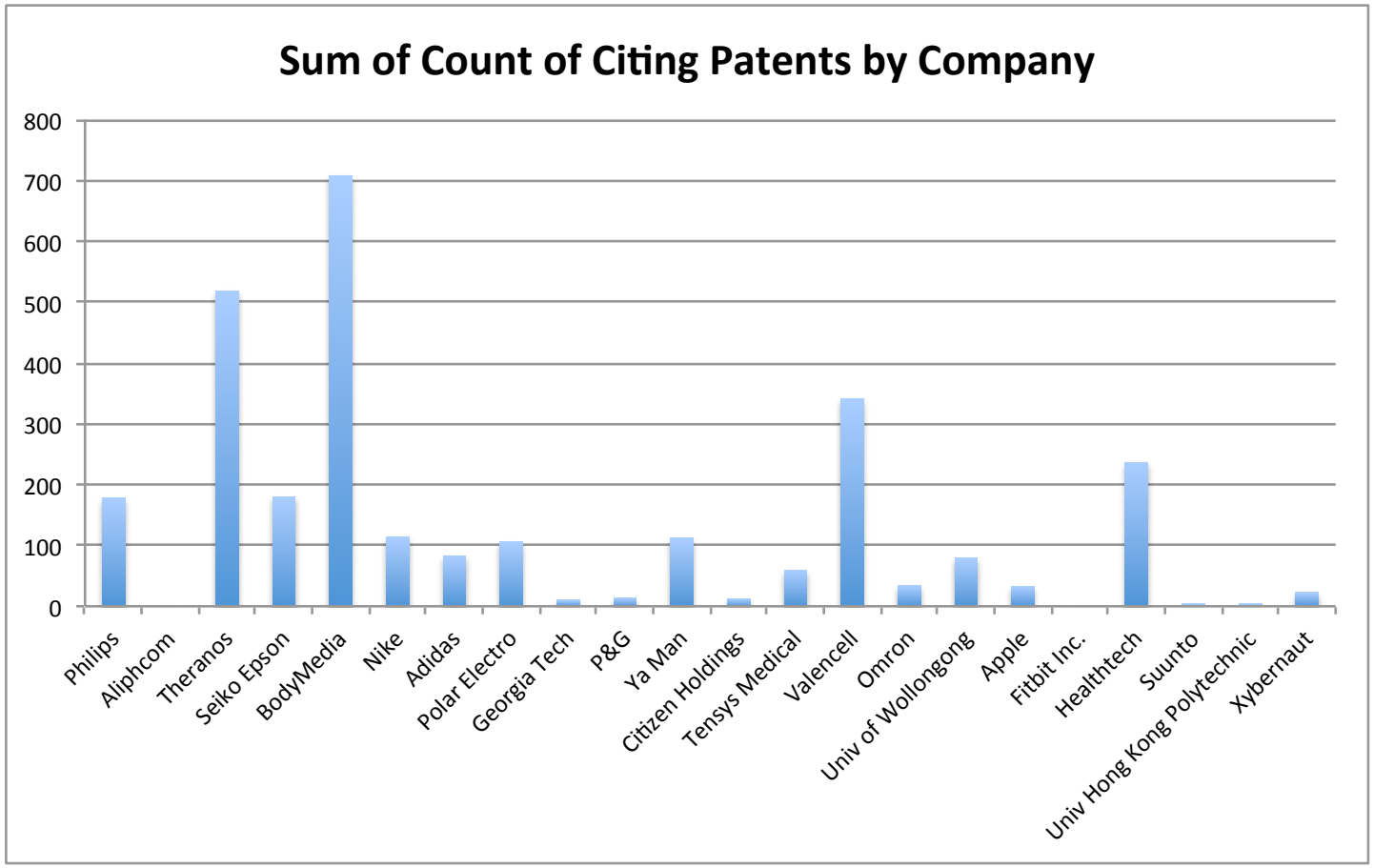
An industry wide look at fitness band patent families by organization

- We frequently use “Spark Charts”, to provide more context that a single chart alone could provide
- In this case we not only see which organization has the highest number of patent families, we also see how many of those contain a granted patent, what their individual trend by year looks like, and what the actual number of families per year are
- This allows us to make meaningful comparisons between major patent holders in this area



• An industry wide look at fitness band patent families by forward citations

- Forward citations are often used as one way to measure the potential value, or usefulness of a patent family
- In this particular example the listing of organizations was intentionally kept in the same order as the previous chart, which listed organization from largest to smallest portfolio
- So while Philips had the largest number of patent families it did not have the highest number of forward citations at that time
- Theranos, BodyMedia, Valencell, and Healthtech had a disproportionally large number of forward citations for family size

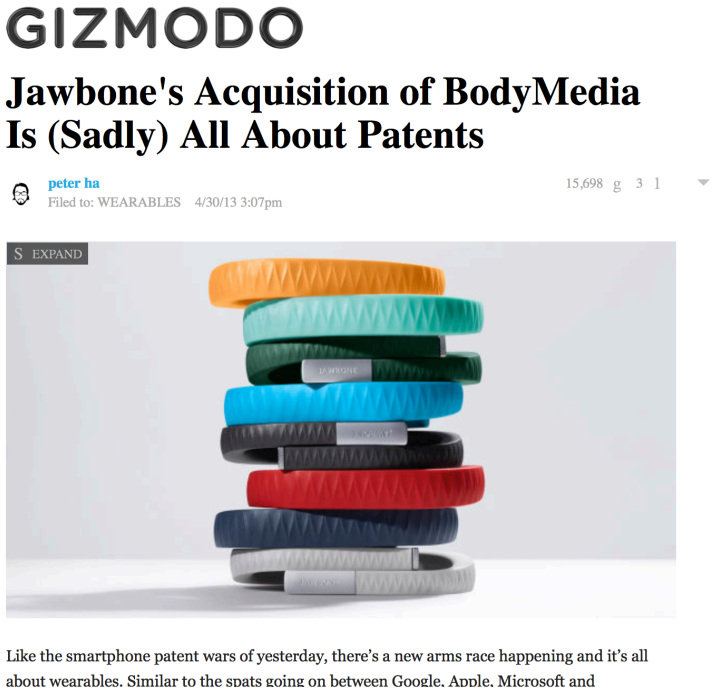


• Our perspectives of patent landscape as of Feb. 2013

- After spending time looking at the major players using a variety of methods we made the following observations:
  - Nike – They have partnered with Apple and were willing to acquire patents from Phatrat – good portfolio for wristband
  - Adidas – Partnership with Polar, and acquired Vivometrics – also have a strong portfolio but more involved with clothing than wristband
  - BodyMedia – Probably the best portfolio with regards to maturity, breadth and depth
- We would normally run searches, and perform similar analysis for additional chokepoint areas – power consumption & Bluetooth connectivity for instance
- Early priority dates for low power consumption and low power Bluetooth or alternative short distance communication standards will be very important in this area
  - Buying programs should focus on this

What happened next?

- The original case study was completed on April 17th, 2013 and presented during a workshop at the 2013 PIUG Annual Conference on April 27th
- On April 30th 2013 Aliphcom d.b.a. Jawbone acquired BodyMedia for $110 million dollars
- BodyMedia was suggested in this study as having one of the best portfolios in this area, and that Aliphcom was exposed
- Within six months Jawbone files 16 continuation patents based on the BodyMedia filings
- On May 27th 2015 Aliphcom sues Fitbit for hiring away five employees, and for theft of trade secrets
  - The lawsuit comes on the eve of Fitbit's IPO
- During June & July of 2015 Aliphcom sues Fitbit for patent infringement and files a complaint with the US ITC to bar imports of Fitbit fitness bands from entering the US using some of the patents acquired through the BodyMedia purchase


GIZMODO

Jawbone's Acquisition of BodyMedia Is (Sadly) All About Patents

peter ha
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EXPAND

Like the smartphone patent wars of yesterday, there's a new arms race happening and it's all about wearables. Similar to the spats going on between Google, Apple, Microsoft and

Where do we stand today?

- In response to the patent infringement lawsuit Fitbit claims to have more than 200 issued patents and patent applications in this area
- But in 2013 Fitbit had a weak portfolio, which left them exposed to these types of situations
- In October of 2013 Fitbit buys the portfolio of a small NJ company called Switch2Health
- Many of Fitbit's recent patents, including the one's they counter-sued Jawbone with are based on Switch2Health cases
- Ultimately, Fitbit prevailed in the litigation, which is still ongoing
- Jawbone announced in July of 2017 that they were liquidating, and the CEO announced he was forming a new business called Jawbone Health Hub
- Undoubtedly, the fitness related patent portfolio Jawbone has built over the years will be the cornerstone of this new venture, and is likely the source of the majority of the value in this new organization

NJ Health Startup Switch2Health Has Partial Exit, Continues Corporate Platform

Switch2Health founder Seth Tropper | ST

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By ESTHER SURDEN, Oct. 17, 2013, 10 p.m.

Citing a booming market and interest by many companies in digital healthcare intellectual property (IP), Switch2Health (S2H) — a New Jersey healthcare startup with a mission to motivate individuals to lead a healthy lifestyle — has made a partial exit, shuttering its consumer platform and selling its considerable IP portfolio.

PATENT ANALYTICS USING SEMANTIC AND MACHINE LEARNING TECHNOLOGIES

Steps in preparing a patent landscape report

- Taken from: Guidelines for Preparing Patent Landscape Reports
  - http://www.wipo.int/edocs/pubdocs/en/wipo_pub_946.pdf
- Building a collection
  - Conducting a patent search
  - Determining relevance
- TIDYing the collection
  - Patent family reduction
  - Deciding on type of year to use
  - Standardizing key fields
  - Creating categories

Steps in preparing a patent landscape report

- Analyzing the collection
  - Building the models
  - Looking for trends
- Visualizing the collection
  - Charts & Graphs
  - Network diagrams
  - Spatial concept maps
- Sharing conclusions

Patent Search/Determine Relevance

- In searching during the preparation of a PLR, information retrieval methods usually look at precision and recall simultaneously and measure their effectiveness looking at both elements
- Even though this is the case, precision and recall are normally opposed to one another such that with an increase in recall there is usually a subsequent drop in the level of precision
- In generating collections for PLRs it might be more productive to begin with creating sets using methods that produce high recall exclusive of precision
- Once an initial collection with high recall is built different methods can be used to increase the precision of the collection by determining relevance of the families
- From a practical perspective, if the level of recall can be established at higher than 90%, while the precision kept above 70%, then the likelihood of finding statistically relevant, but conceptually irrelevant items in the subsequent analysis steps is reasonably small

Semantic Tools for Patent Search/Determine Relevance

- Improving recall
  - Cosine similarity
  - Latent semantic analysis
  - More like this / Practical scoring function
  - https://cloudblog-withgoogle-com.cdn.ampproject.org/c/s/cloudblog.withgoogle.com/products/data-analytics/expanding-your-patent-set-with-ml-and-bigquery/amp/
  - Others?
  - How does this really compare to Boolean/traditional patent queries? –will be discussed at EPOPIC
- Determining relevance – https://github.com/swh/classification-gold-standard
  - Binary classification
    - Support vector machines / vector space models
  - Neural networks
  - Others?

TIDYing the Collection

- Field Cleanup
  - Patent Assignee Standardization – fuzzy logic, rules-based
    - disambiguation
- Family or Invention Reduction
- Reconciling Forward Citations
  - Based on family reduction method
- Determining Reporting Year
  - Using earliest publication year

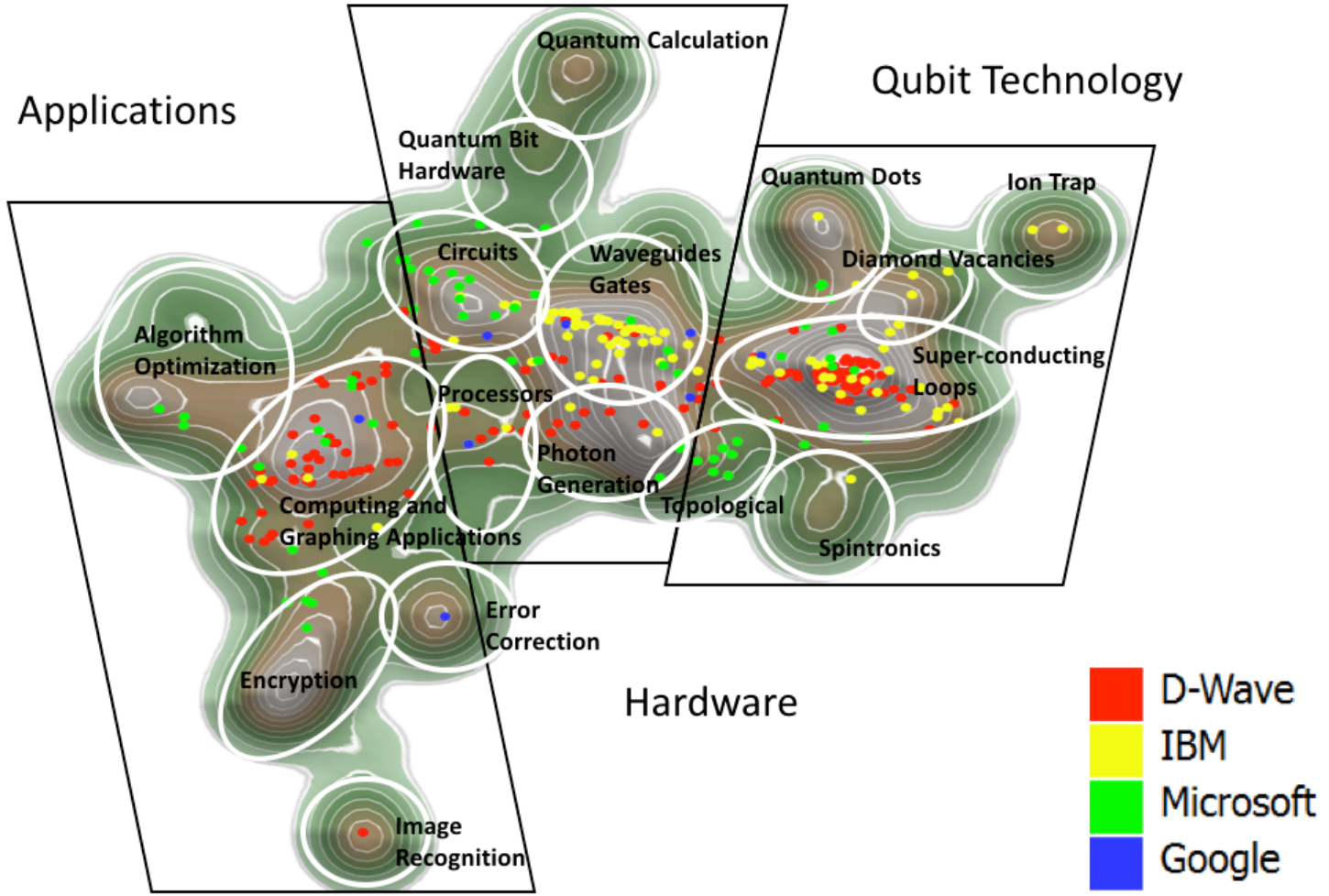
Creating Categories for the Collection

- Binary classification provides a means for categorizing large collections of patent documents into the references that are likely to be of highest interest to the information professional, and those that are likely not related, but were still retrieved in a broad search
- A training set will be made up of references that are highly relevant to the interests of the analyst
- In training the classifier, the analyst will need to identify documents that are off-topic as well, so the classifier can establish a hyperplane that will distinguish between the two categories
- Technology categories are sometimes identified using the patent data itself, for instance, with classification codes, but ideally, they should be generated based on input from a subject-matter expert based on an industry standard view on how approaches are categorized
- Using a market or industry-based approach to creating categories will make it easier for the clients of the PLR to identify with the technology

SAMPLE PATENT VISUALIZATIONS

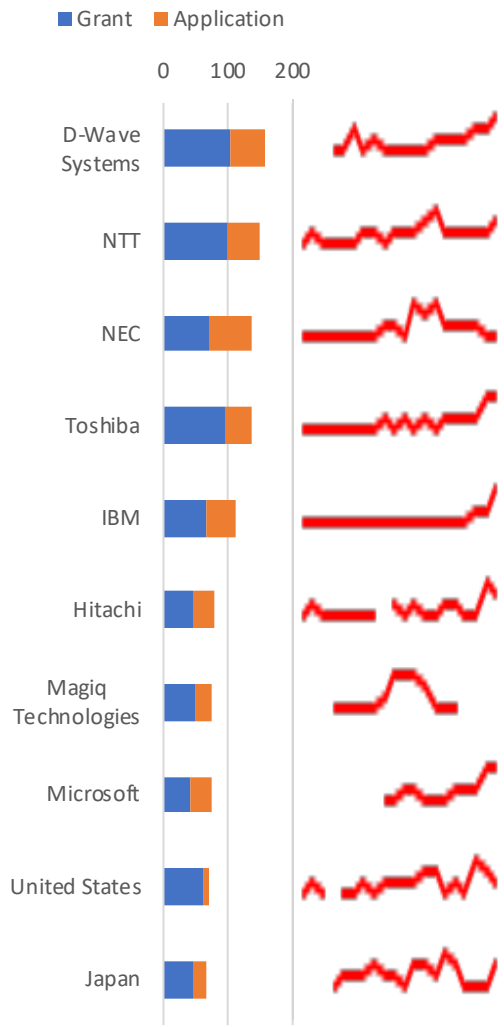
Spatial Concept Maps

- Patents that are similar to one another based on their language are organized close to one another on the map
- Relative distance between different technical subjects show which concepts are related to one another
- Labels are added to identify the sub-sections within a technology field
- Colored dots are used to provide comparisons within the context of the map
  - In this case, the dots provide a means to compare different companies in the space
  - Colored dots can also be used for distributions over time



• Quantum Information Technology Patent Families by Top Organization

- Half of the top ten organizations in the quantum information technology field are Japanese; These organizations have been working in the QIT field on average longer than other organizations
- IBM, D-Wave, Toshiba and Microsoft (highlighted in red) appear to be investing heavily in the quantum information field as all are projected to publish over 20 documents in 2017
- Hitachi, NTT and the Japanese Gov. have also shown an increase in activity related to QIT over the last two years, just not to the same degree as the top five organizations
- The United States has been decreasing activity while MagiQ has not published anything in QIT since 2012

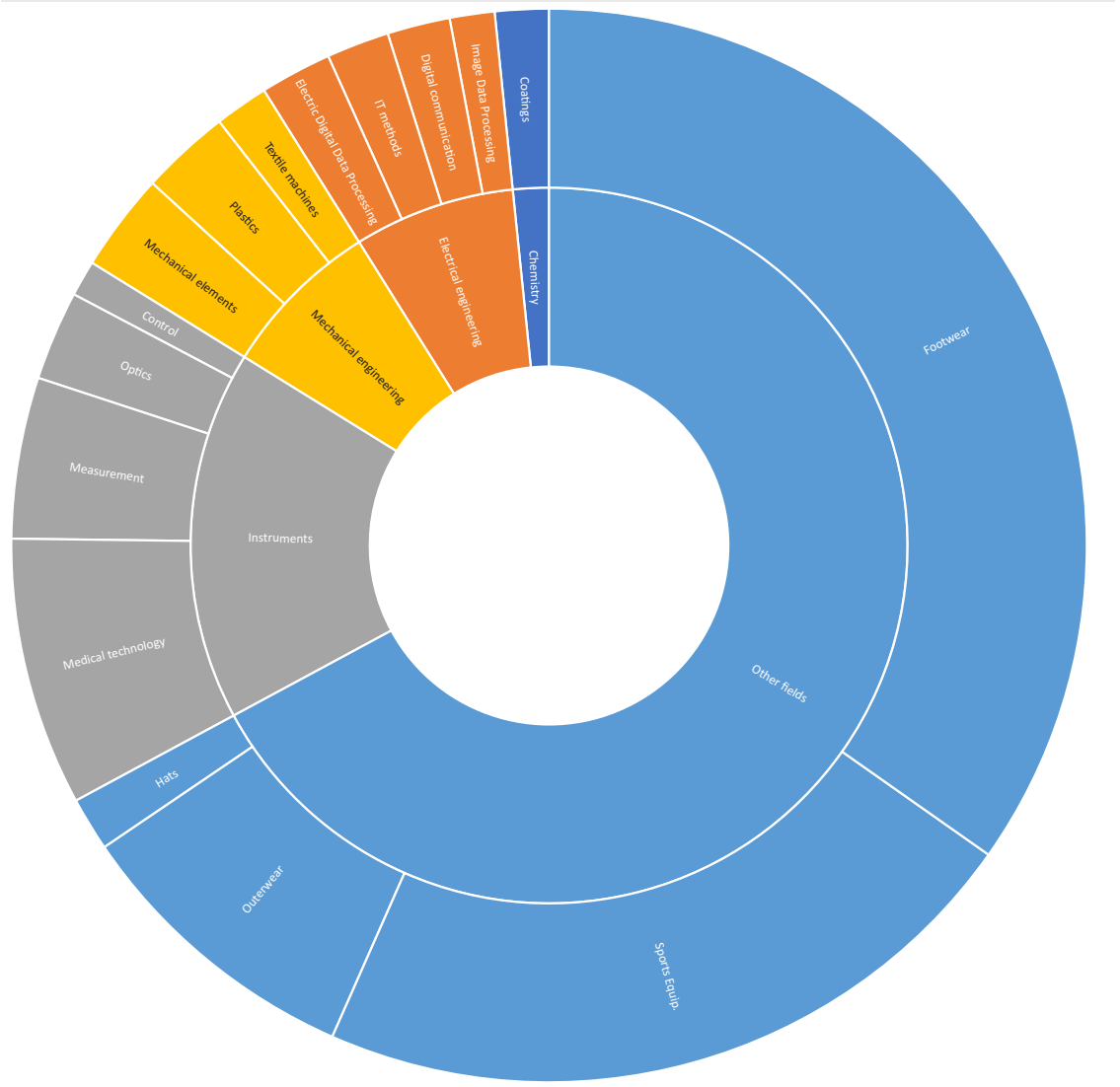


	1980s	1990s	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017p
D-Wave Systems					1	18	7	9	5	5	5	5	2	13	12	9	8	19	18	29
NTT		6	4	1		3	7	6	2	7	10	11	12	23	11	8	10	10	6	15
NEC	3	5	5	2	1	3	2	1	6	9	3	21	11	21	10	10	10	6	5	5
Toshiba		1			1	6	1	4	8	2	10	6	9	4	11	8	12	12	22	27
IBM		4		3	2	3			1		3	3	1	4	6	1	4	15	16	60
Hitachi	1	7	1	1	1	2	2	1		7	4	5	4	4	7	6	2	2	14	11
Magiq Technologies					1	1	1	3	7	14	14	17	11	4	2					
Microsoft										1	5	5	1	4	2	8	5	8	19	21
United States		4				1	3		5	3	3	4	8	7	1	4	1	12	9	5
Japan					3	4	3	6	5	5	2	7	7	3	10	6			1	5

Note: Based on 1,054 Quantum Information Technology patent documents from a worldwide search in Derwent Innovation from Clarivate Analytics; limited to one document per family, based on DWPI with US as primary country; Currently 133 documents for 2017.

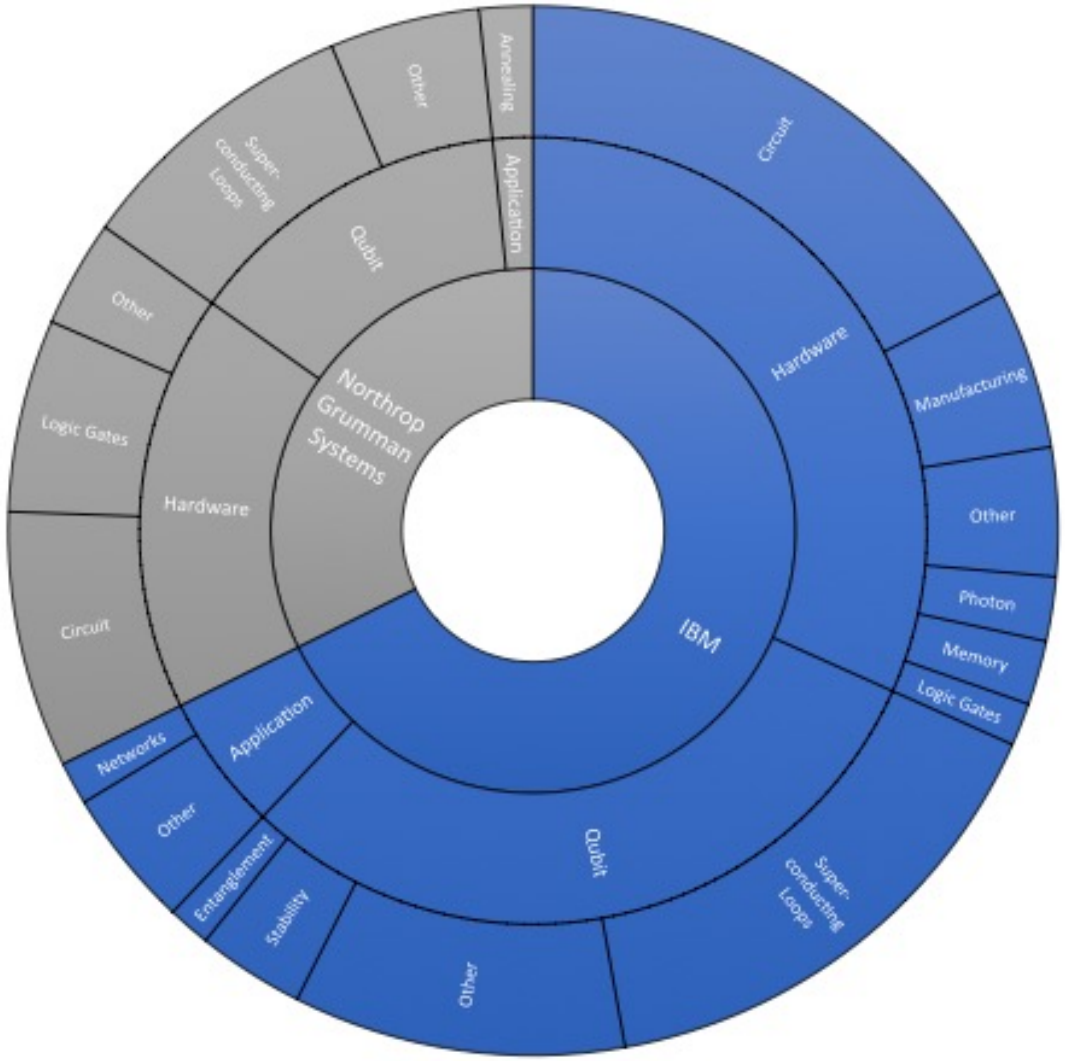
Sunburst diagram – single company

- A 3-D version of this diagram is used as the center visualization on our Stat Sheet examples
- When used with a single company, or technology area this visualization allows for a quick assessment of the relative distribution between major categories, and their corresponding sub-categories
- While Adidas is primarily interested in footwear, as would be expected they also have a reasonable number of patent filings associated with sports equipment, material science, and various methods of manufacturing including assorted instruments



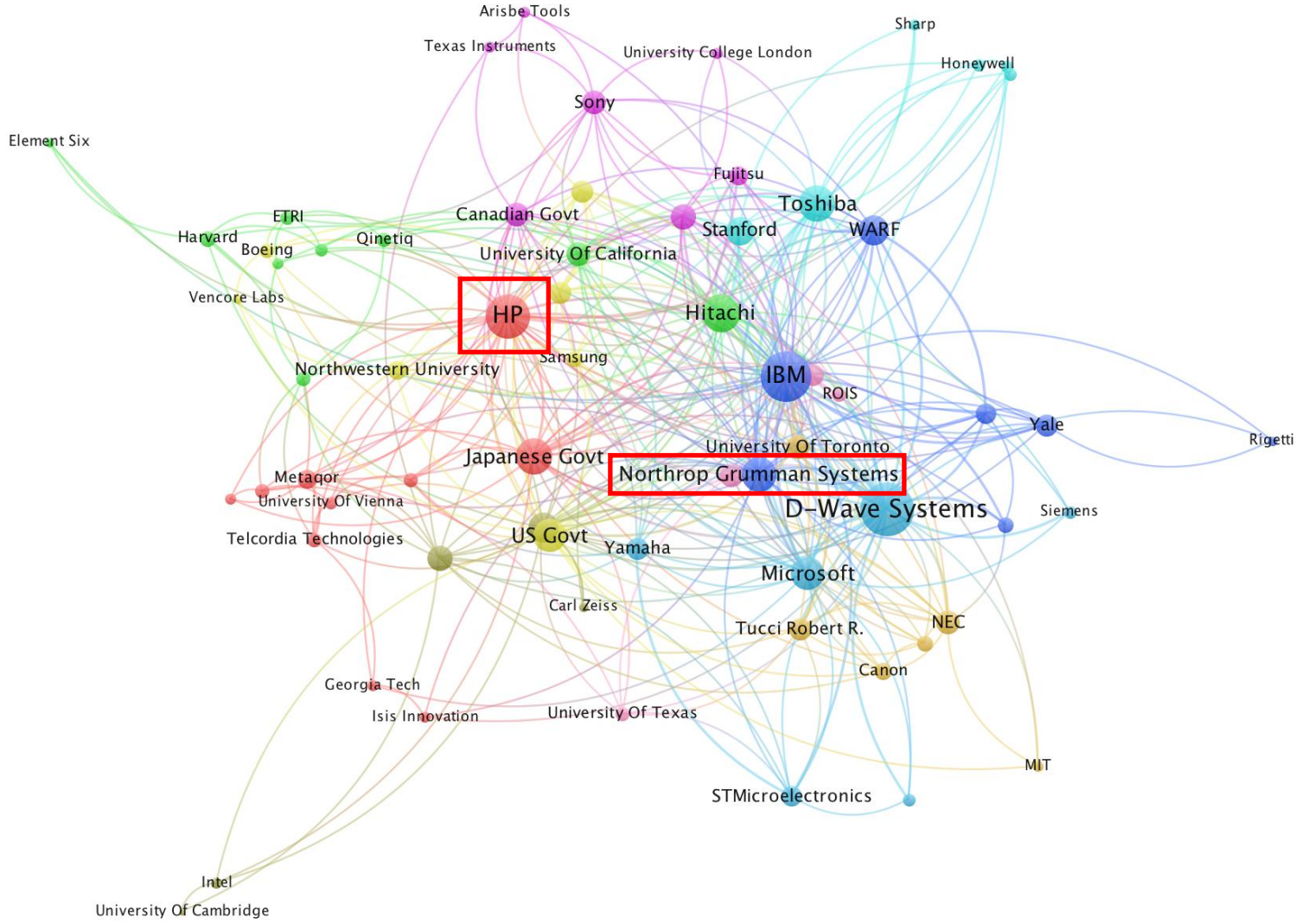
Sunburst diagram – multiple companies

- As opposed to a stacked column, or bar chart, which can only handle two variables, a Sunburst can use multiple rings to represent each respective variable
- Compared to the single company version this one allows a comparison between multiple companies while still providing the relative distribution between major categories, and their corresponding sub-categories
- In this case, Northrup, while smaller than IBM based on portfolio size has a similar distribution to them looking at the categories, and sub-categories they are filing in



Patent Citation Network Maps™

- When a patent is referenced in a future patent it's called a forward citation
- Patents that have a large number of forward citations, especially from other organizations can be considered influential
- These citations can be aggregated by the organizations that own the patents in question
- Using a network diagram the connections between organizations can be found, and the most influential groups identified
- In this case, the HP and Northrup portfolios are not as large as the ones for D-Wave, and IBM, but they are very influential



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