

Why Big Data is Key to Wearables for Sport

Introduction

The Wearables industry is ripe for innovation, as new enabling technologies are increasingly causing disruptions across the hardware and software technology spaces. Innovation is key for companies of all sizes in establishing and maintaining their market position. As a nascent industry, most of the innovation in wearables is in the form of enabling technology, which is poised for a period of incremental change. Wearables, however, are creating a foundation on which entirely new business and technology modes will be built. The quantity and increasing quality of data created by wearable devices will underpin the next generation of revolutionary products and services.

Artificial Intelligence (AI), an intelligence exhibited by machines that perceives its environment through data and correlations, will be at the center of this next generation. Helping to decide on actions that maximize the chances of success at some goal, AI uses "learning" and "problem solving" based on reasoning, knowledge, planning, learning, natural language processing, mathematical optimization, logic, and methods based on probability and economics. To execute these tasks, AI draws upon computer science, mathematics, psychology, linguistics, philosophy, neuroscience, and artificial psychology.

AI needs data to work, though. Preferably Big Data. Big Data are data sets that are so large or complex that they won't work with traditional data processing applications. This presents challenges in analysis, capture, data curation, search, sharing, storage, transfer, visualization, querying, updating, and information privacy. Use of predictive analytics, user behavior analytics, and certain other advanced data analytics methods, however, can extract value from the data. Thus, increased accuracy of Big Data can lead to more confident decision-making; and better decisions can result in greater operational efficiency, cost reduction, and reduced risk.

Finding new areas for innovation in this space and protecting them, however, can be difficult or elusive. The new Virtualized InnovationSM technique sorts through the clutter and is driven by insights derived from patent data, non-patent data, and crowd-sourced data from unique analysis techniques that support systematic virtualized inventing. Virtualized InnovationSM provides an inventive process that generates inventions that can be protected quickly with high quality and relevance to business. By disrupting the normal course of innovation development (e.g. R&D, M&A, open innovation, JVs, licensing, etc.,) Virtualized InnovationSM enables companies to respond much more rapidly and cost-effectively to declining product life cycles, accelerating technological change, and intensifying competition, including that from non-traditional sources.

In this paper, we demonstrate how applying Virtual InnovationSM techniques to the emerging Wearables space can generate hundreds of inventions.

How Companies Struggle with Innovation

Rapid disruption pressures companies to innovate.

New technologies can completely redefine the nature of competition (e.g., IoT, Mobility, Telematics & Sensors, Cloud, Big Data, Deep Learning, AI, Drones, 3D printing, etc.) Startups often launch with technology-driven innovation. Until recently, large companies had an IT advantage over their smaller rivals. Using new technologies in novel ways through innovation will be essential to meet the challenges presented by the rapidly growing wearables space.

New service models and connectivity are disintermediating business models and traditional distribution/marketing channels (e.g. “On Demand”, Peer-to-Peer, Crowd, Always-on, Dynamic routing, real-time visibility, etc.)

The effective life of products and services is in rapid decline (e.g., twelve months for smartphones in China) from sequential to continuous innovation models.

New, non-traditional competition is entering rapid-changing markets (e.g., Apple and Google with Automotive; China with OTT Messaging & Quantum Dot Displays, etc.)

Huge amounts of funding are available to support these disruptions (e.g., \$8.2 Billion total funding for Uber, Facebook \$2 Billion purchase of Oculus Rift, etc.)

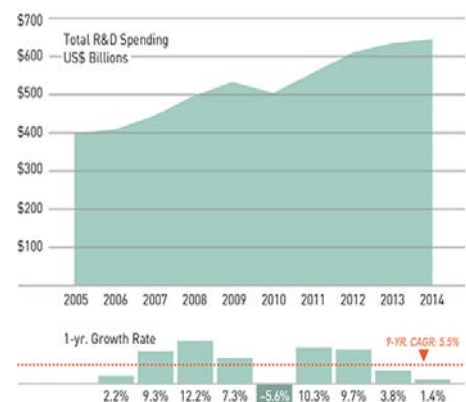
R&D investment does not correlate with Innovation

Traditional innovation drivers such as R&D are losing their effectiveness. Only half of the 10 Most Innovative Companies from Strategy’s 2015 Innovation 1000 Study are also named in the Top 10 for R&D spenders. Apple, which is ranked #1 on the Most Innovative Companies list didn’t even make it onto the Top 15 of R&D spenders. This study also shows that the “Most Innovative” beat Top R&D Spenders on key financial metrics.

Even with R&D spending continually increasing, R&D on its own is no longer enough to drive innovation. So if R&D isn’t driving innovation, what is?

Exhibit 1: R&D Spending Growth, 2005–14

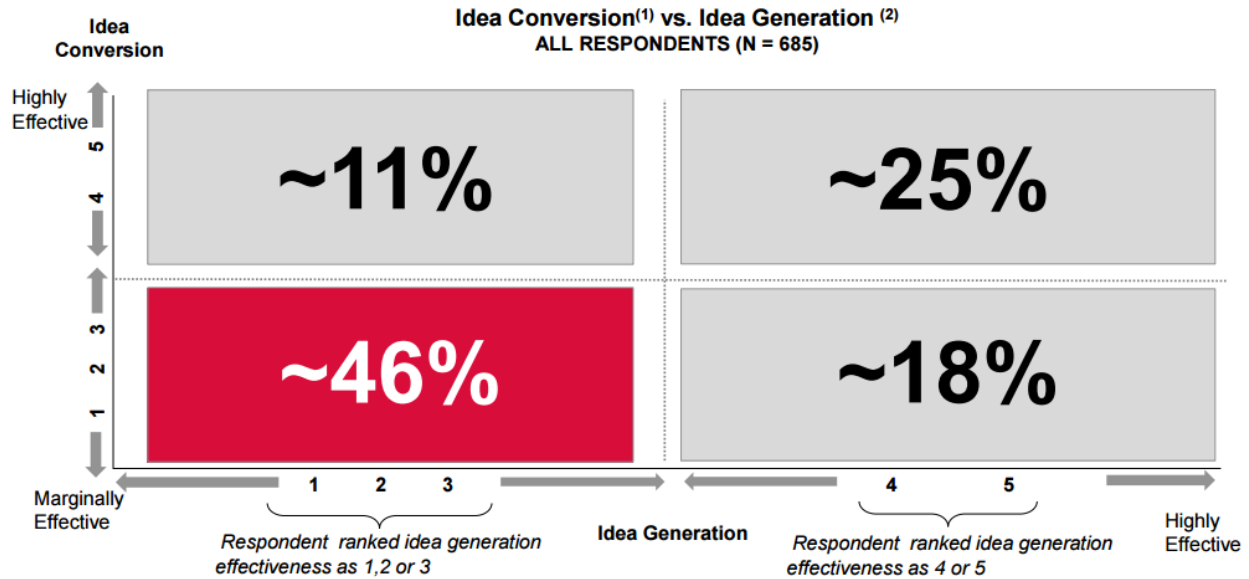
With one exception, each year of the Global Innovation 1000 study has witnessed an increase in R&D investment.



Source: Bloomberg data, Capital IQ data, Strategy& analysis

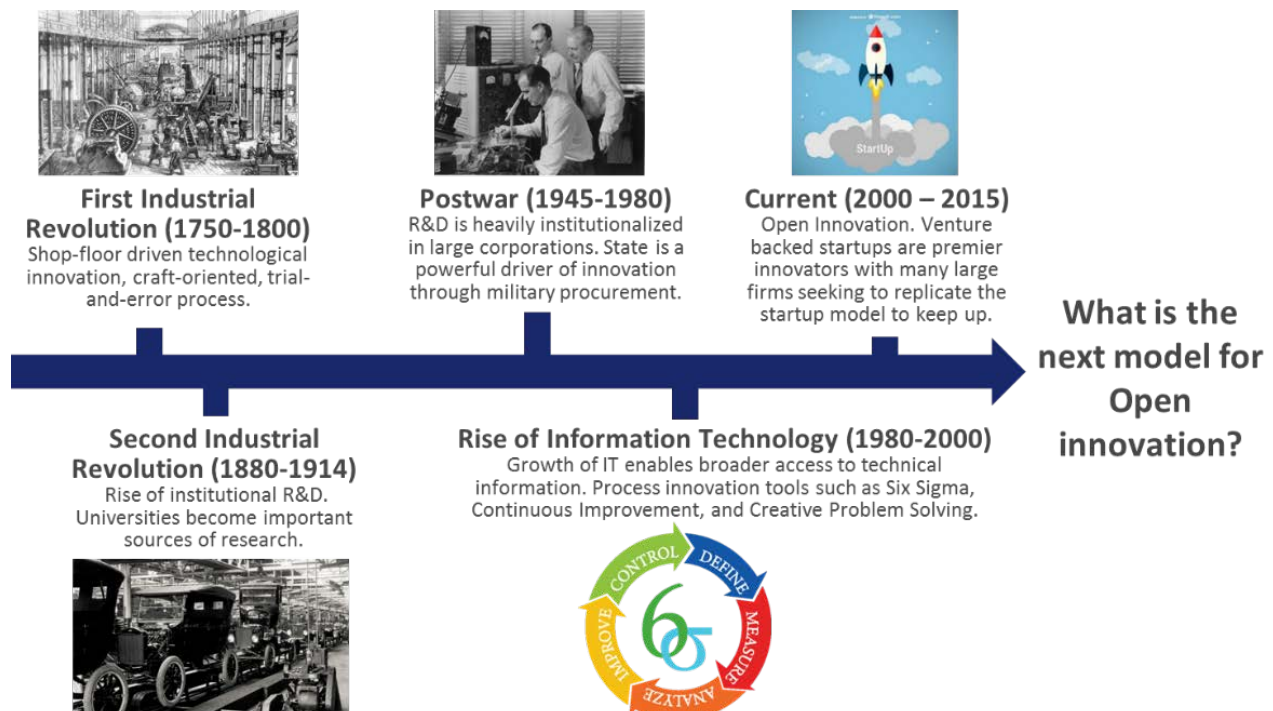
Companies struggle to come up with ideas, the seed corn of innovation

Nearly half of PwC's "Global Innovation" survey participants viewed their company as bad at idea generation and idea conversion.



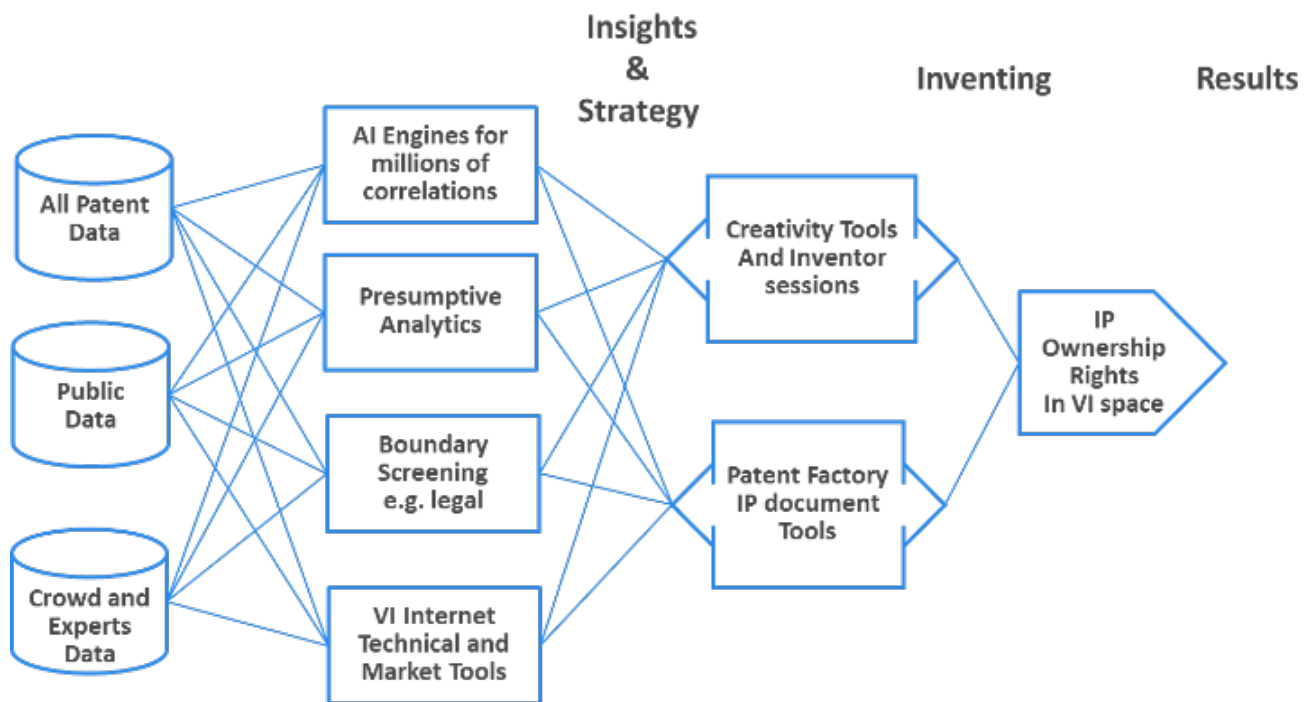
Source: PwC 2012 Global Innovation Survey

Innovation Models have changed through history



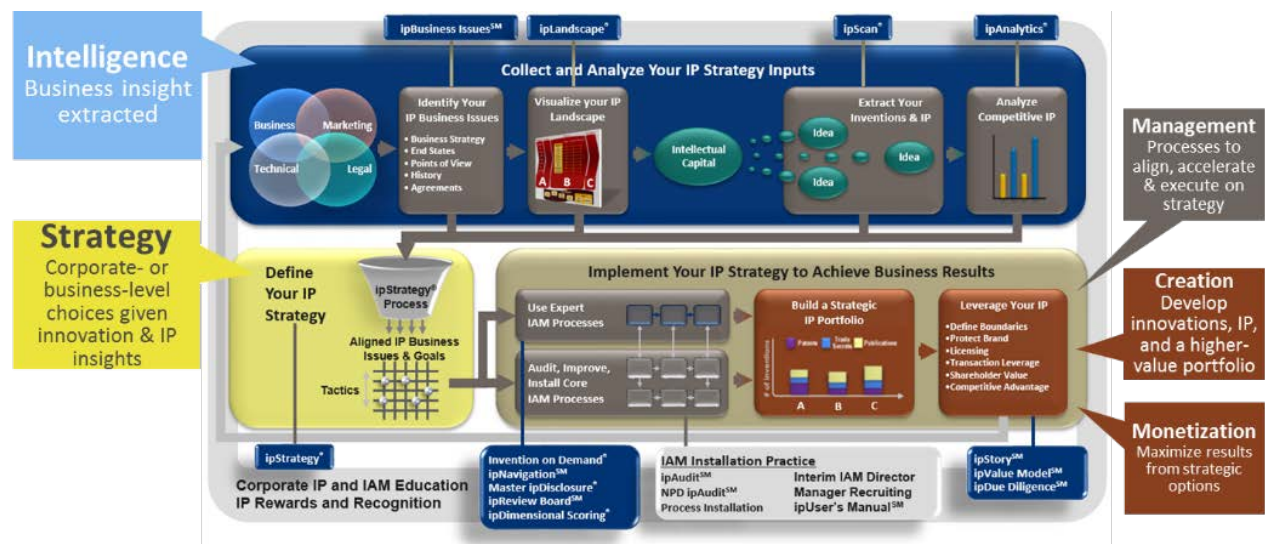
Virtualized InnovationSM

Virtualized InnovationSM is the process of using systematic invention creation methodologies and carefully selected situation-specific idea/creativity tools to leverage Invention on Demand[®]. Virtualized InnovationSM utilizes the entire resources of the internet, including multiple search tools, language translations, instant access to experts, integrated knowledge databases, crowd innovation tools, and market sizing tools (e.g. Survey Monkey), etc., to create product or service change, alteration, revolution, upheaval, transformation, metamorphosis, or breakthrough at the business, market, product, or technology level, Using a patent factory approach, Virtualized InnovationSM then enables the documentation and ownership of new product and service creations through rapid IP protection.



Applying Virtualized InnovationSM Techniques

First we need a framework for innovation, invention, and IP capabilities.



An IP strategy is only as good as the information and input that goes into it:

- Align your business issues with the content and direction of the competitive landscape, and the IP strategy will support your business objectives.
- Document the greatest concerns to your business for clarity and consensus.
- Capture your unique business issues in a framework for communications.
- Strategically target and compile the right set of IP for your business concerns.
- Understand the business impact of IP trends in your space. Uncover new revenue and cost savings opportunities through IP strength analytics.
- Perform comprehensive analysis of external IP to better understand and inform investment or acquisition decisions.
 - ipStrategy[®] is a collaborative process in which your business-wide (or division-wide) IP actions are mapped to your business strategy, in order to align your IP actions with the company's strategic objectives.
- Build a strategic IP portfolio using best-in-class invention creation processes.
- Harvest, strengthen, invent, and document business-critical IP.
- Support monetization objectives throughout the invention lifecycle.

Virtualized InnovationSM – Systematic Process

The Virtual InnovationSM Process and patent factory yield 30 strategic product or service inventions in 90 to 120 days.

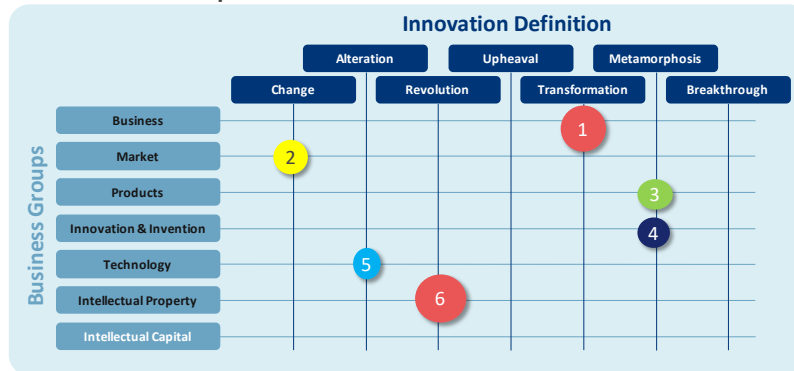


Virtualized InnovationSM Applied to Wearables in Sports

The following details the application of Virtualized InnovationSM to create inventions and produce innovation in the wearables market. This is a high level overview intended only to demonstrate the process. All of the data utilized in this analysis is housed on the ipCG Innovation Integrator cloud platform. This data and fully functioning access to ipCG Innovation Integrator is available for a free two-week period.

1. Find the Innovations Types Needed in Business

Wearable Tech in Sports:



IP Insight: Innovation in Wearables will:

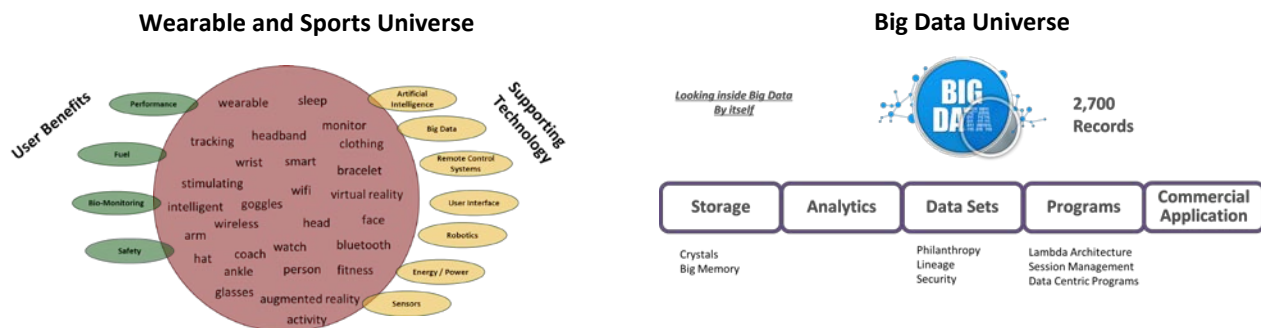
1. transform business models by
2. changing the market with
3. metamorphosis of products and
4. metamorphosing innovation, with
5. minor changes in existing technology but by
6. having a real revolution in the way sports wearables companies treat IP sports wearables integrates hardware and big data ownership.

Based on this review of the “Types of Innovation” and where innovation will occur in the business, ipCapital Group predicts that the business of Sports Wearables using Big Data will be driven by transforming business models (e.g., context and content coming from AI engines) so that there will be a battle for ownership and use of the data. This will drive changes in the market that will require comfort with data use in sports wearables by different actors (e.g., cloud AI services; branded Big Data Wearable Apps). This should result in the metamorphosis of products to enable the storage of some Big Data in sports wearables (considering privacy to release some Big Data, e.g., metadata). This will also drive metamorphosing innovation as sports wearable companies will have to partner with companies on the boundary of what Big Data will be available and how to integrate Big Data. Perhaps flexibility will need to be built into sports wearables to change Big Data outputs on the fly. In order to do so, there will need to be an alteration in existing technology more at the software and communications level rather than with the sensors or sports wearable hardware itself. This will then drive revolutionary changes in IP for sports wearable companies to integrate Big Data software layer algorithms and develop IP for ownership of these software layers to protect their business.

Sports wearable companies need to be ready to leverage the creation of new inventions and innovations across the Big Data/software/algorithms levels. ipCapital Group predicts this will be vital to future success or else opportunities will be missed.

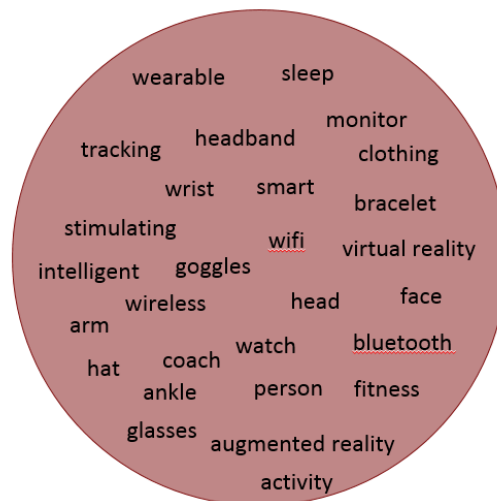
2. Search the Patent Literature for Insights

Using a search strategy (worldwide since 2001) on patent databases, we look for insights in patent filing trends. Patent landscape insights support informed decision-making. Patents are also critical sources of information that may not be found anywhere else. Patent maps are usually focused on a single attribute associated with a data collection such as the classification of documents based on the topics covered within them. Surprisingly, there are so few patents at the intersection of Wearable/Sports/Big Data that we had to study both and predict directions!



The Wearable Tech space has a high level of invention. The patent universe studied contained more than 32,000 records that belong to more than 20,000 patent families. Some of the terms that were used to define the space are show below:

Wearable Tech Universe

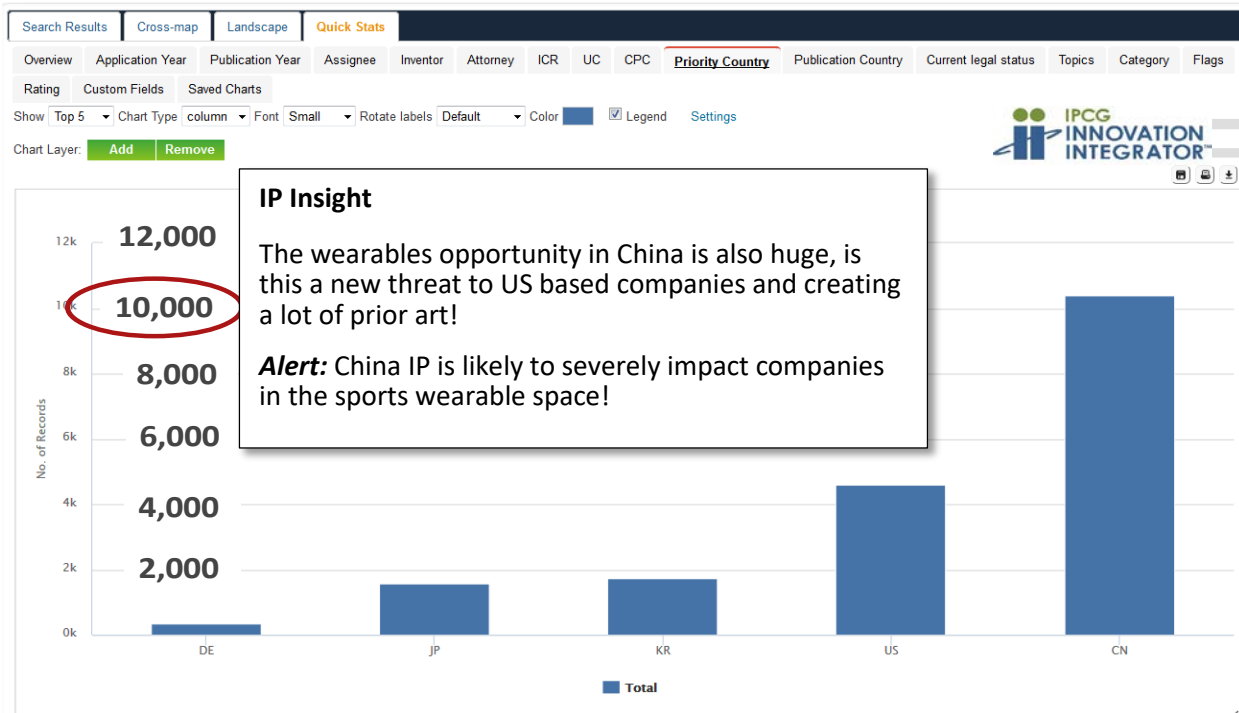


32,600 Records → 20,600 Families

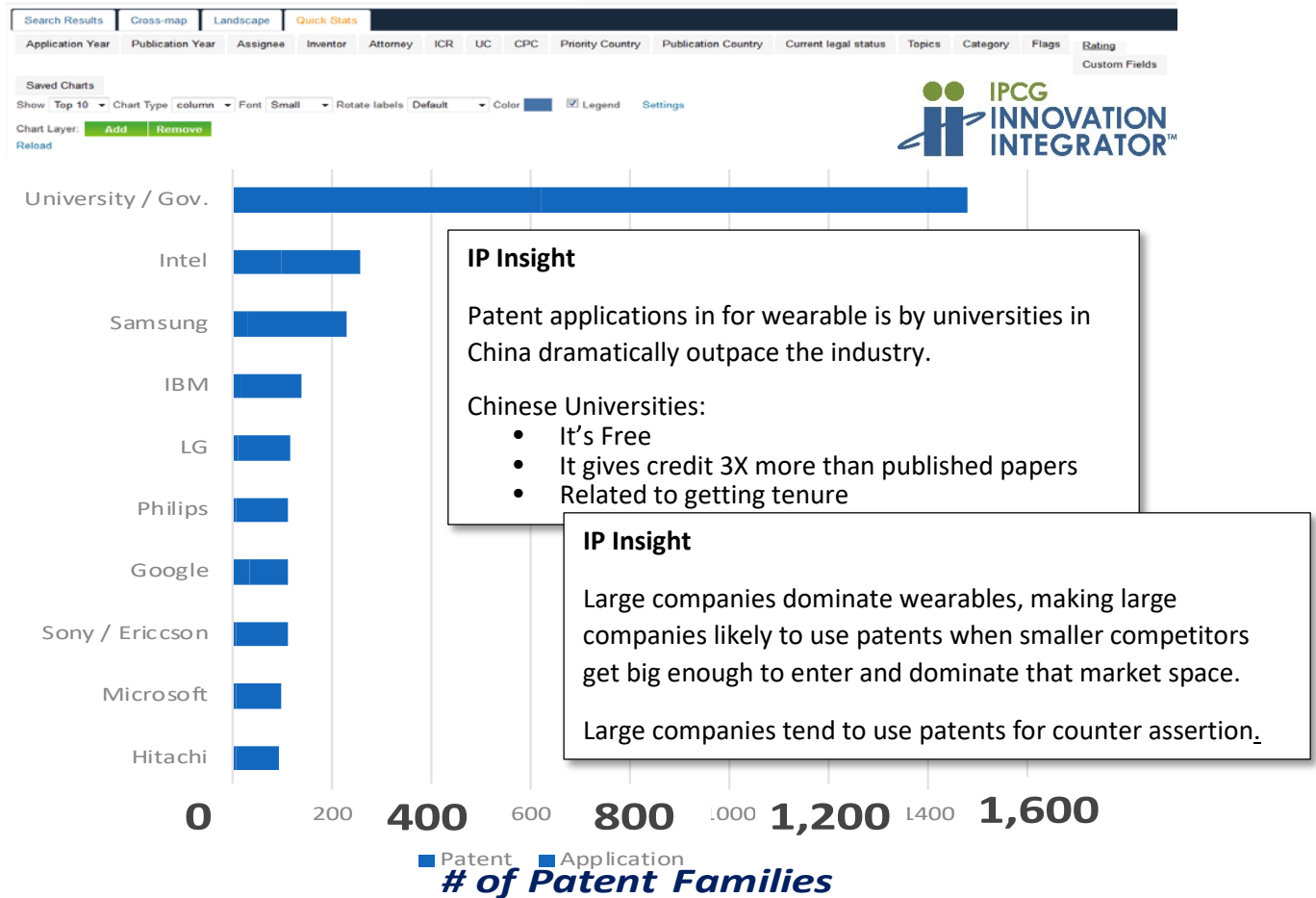
Much of this high level of activity has occurred in the past five years. From 2010 to 2015, patent volume in the Wearables space has increased by 400%. To put this in perspective, the typical patent growth rate is usually expected to be about 30%.



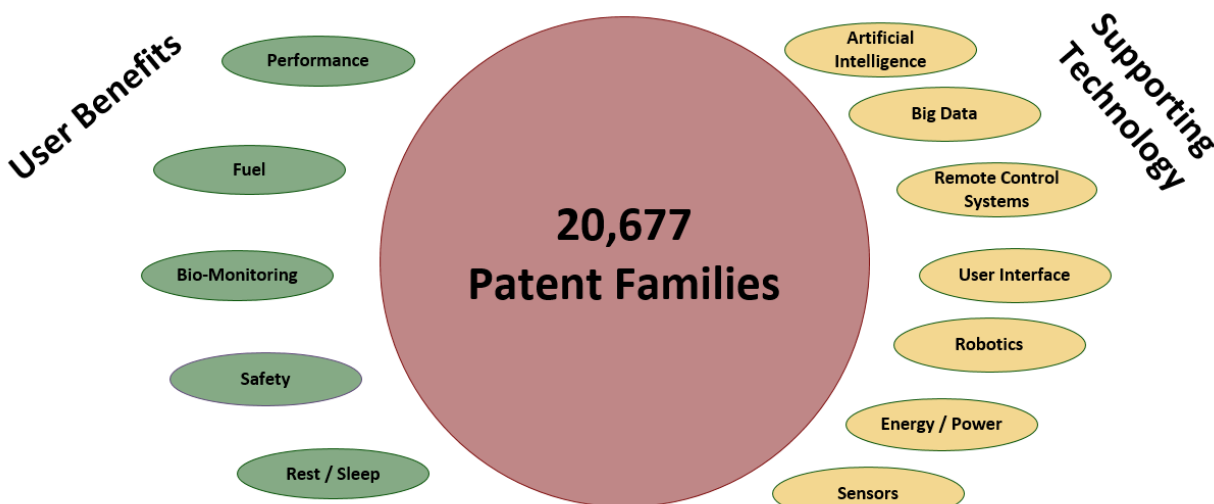
One result of this increase in filing is an enormous amount of prior art which will impact the ability to patent new inventions. Because the United States now uses a “First-to-File” approach to IP, speed is needed when applying to claim an invention. Another IP strategy is to take advantage of the huge new IP resource that China is developing. As they gain expertise in patents, this will be increasingly important.



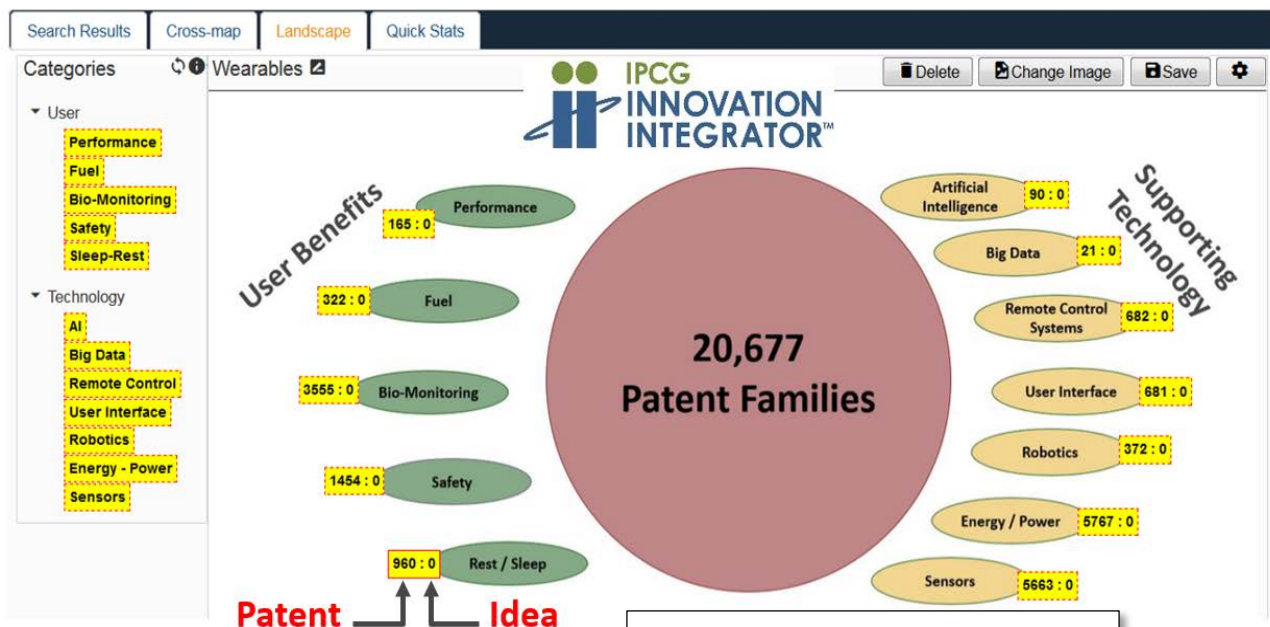
Looking closer at the assignees and jurisdictions of the patents in the wearables space, there is a clear influence by Chinese and university patent activities. Although the vast majority of the Chinese patents are by universities, even with China removed, university and government organizations are still the largest patent holders. Interest by the academic community is to be expected in a nascent industry in search of foundational technology and no single university would be a major player in the space. Freedom to operate will be available as universities (especially Chinese universities) begin to sell patents (or rights) to those who may need them.



Within the defined universe, there are a variety of technology and use categories that can help us to understand the wearables space. The ipLandscape® provides context for the patents.



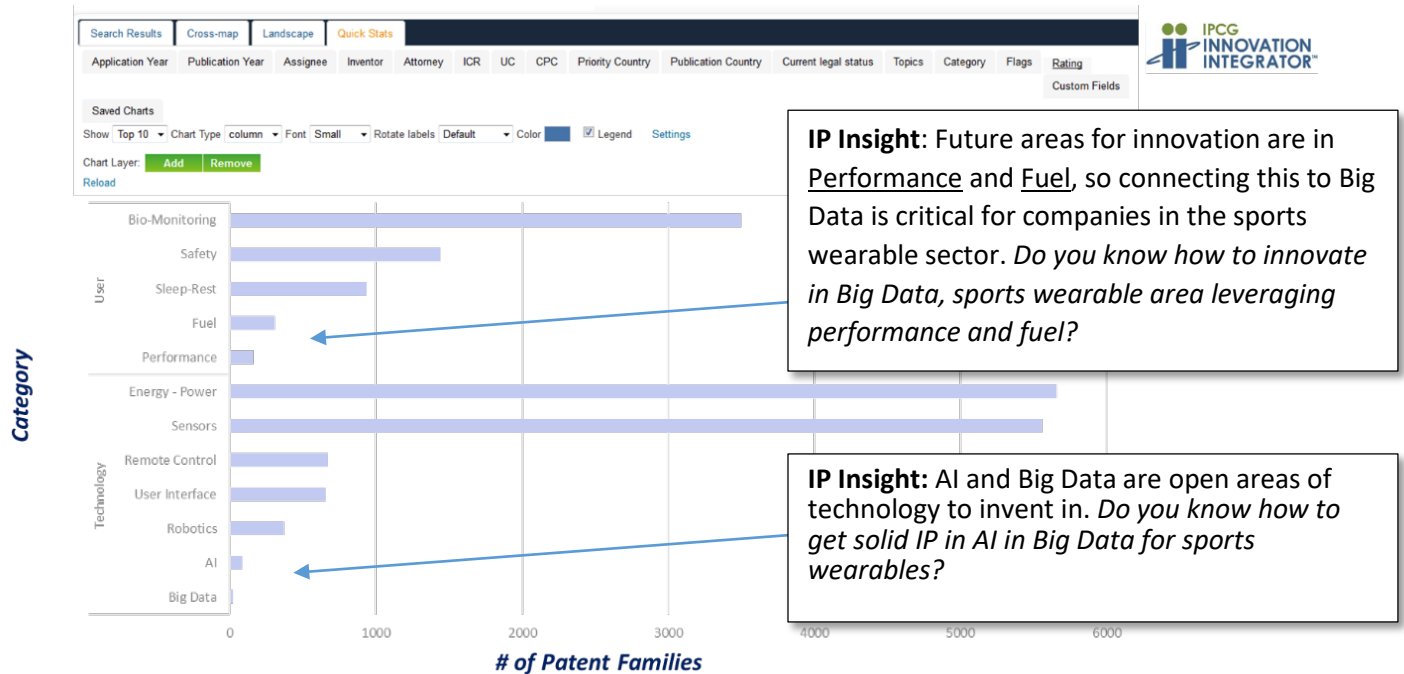
The ipLandscape® is imported into ipCG Innovation IntegratorSM and the patents are categorized based on their benefit and technology characteristics. This is just one way to view the space. ipCG Innovation Integrator allows for quick analysis and visualization to provide the most useful view of the landscape and also allows for the incorporation of *NEW* ideas to see where they land in the ipLandscape®.



IP Insight

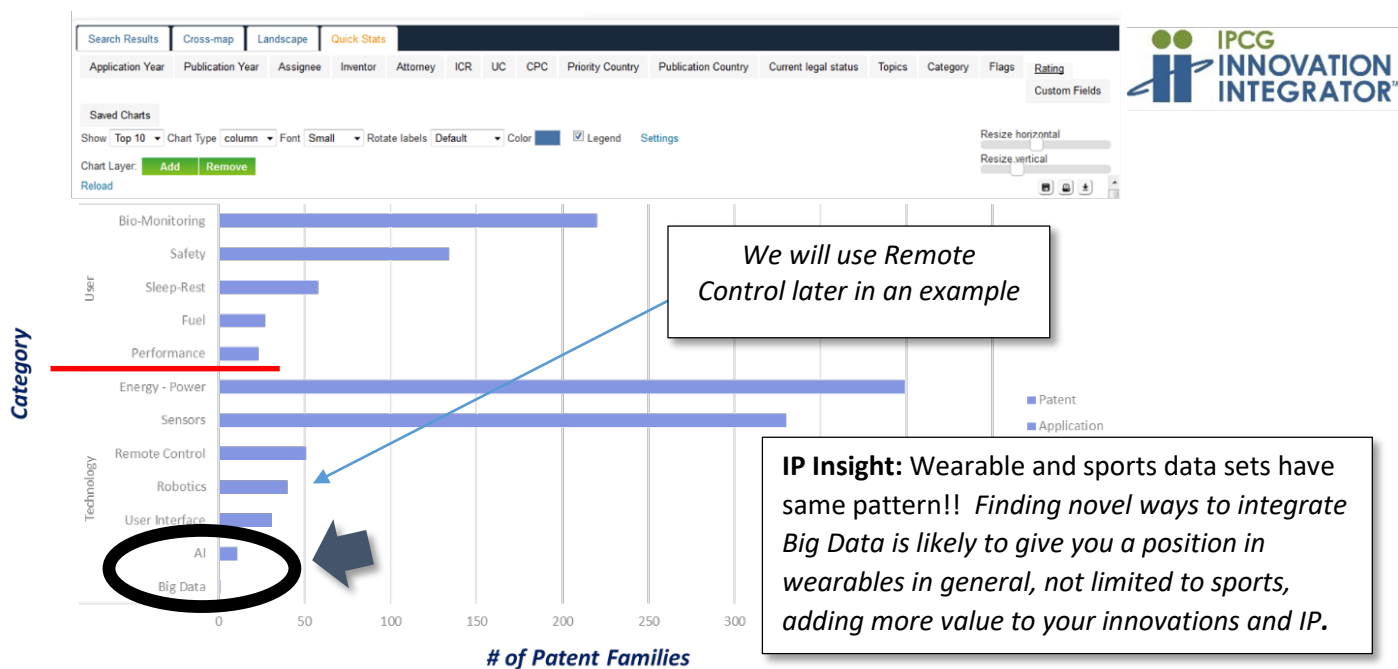
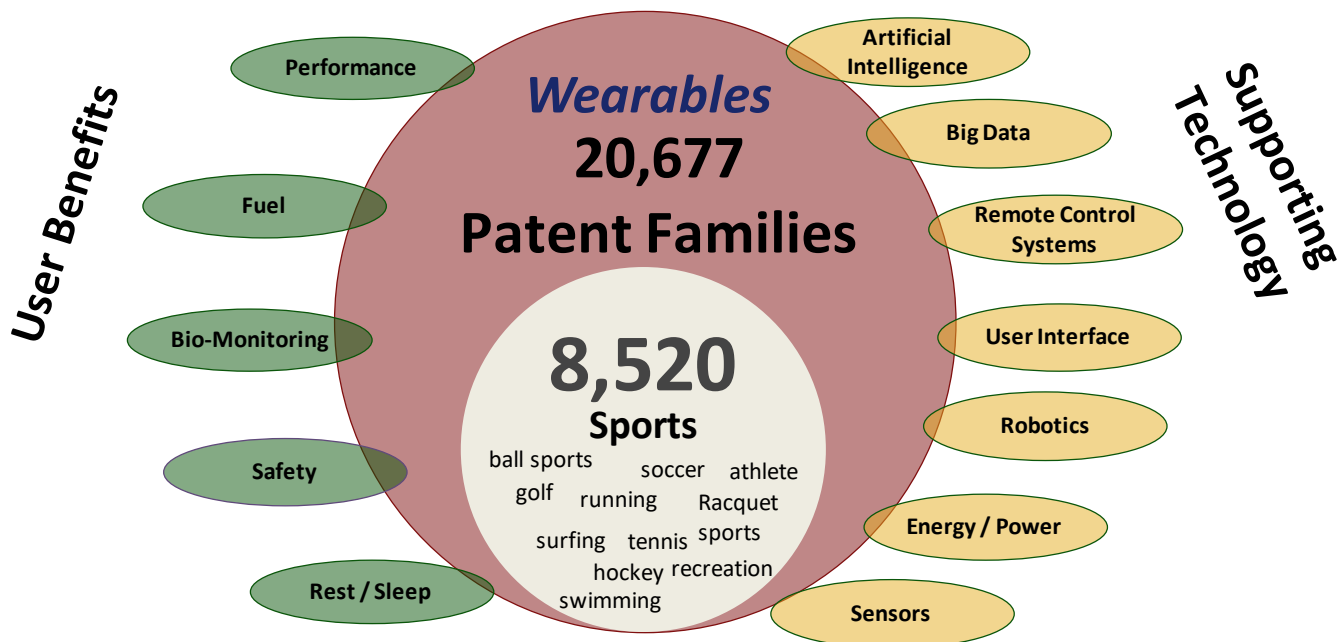
Big Data is a huge new whitespace in Wearables per se, and it *will likely* drive innovation differentiation!

The iPLandscape® then provides the foundation for analytics that support industry insights. Notable in the chart below is that safety and monitoring are currently the most active uses supported by energy and sensor technologies.



Improvement to fuel use and personal performance will be driven by Artificial Intelligence. The combination of parallel computation, Big Data, and sophisticated analytics are the driving force of modern day AI. Big Data and the AI that it supports are going to hugely impact how products are designed, sold, and used.

But how will this affect technology that address the wearables specifically for sports? Is innovation in wearables for sports different that wearables in general? With nearly half of the wearables patents specifically mentioning sports, this is important to understand. The following analyzes the sub-set of data that specifically mentions sports related wearables.



Note that the trends in sports-related wearables are nearly identical to those in the general wearables space. Again, Big Data is a space with very little activity. Considering the importance of Big Data in support of AI (also small, but notably bigger than AI), let's consider Big Data.

Data in general is a heavily patented space with millions of records. Big Data, on the other hand, is a much smaller space and can be better understood as reflected in an ipLandscape®:



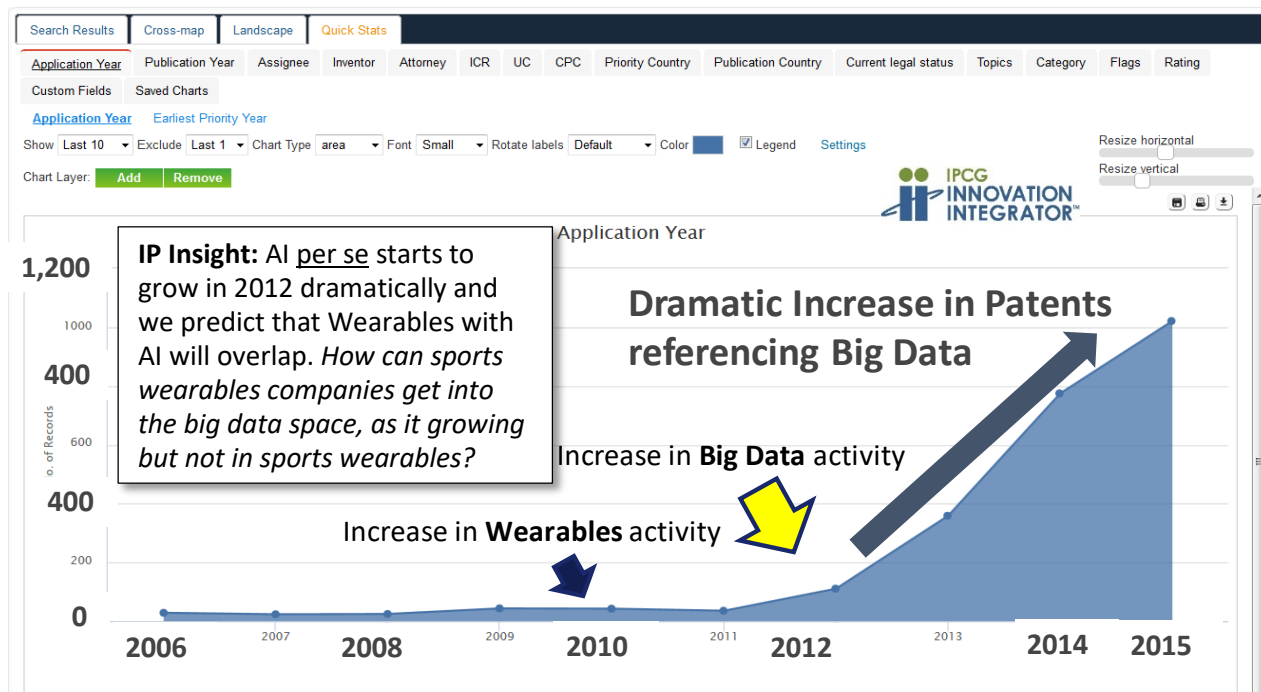
Commercial Applications

Datasets

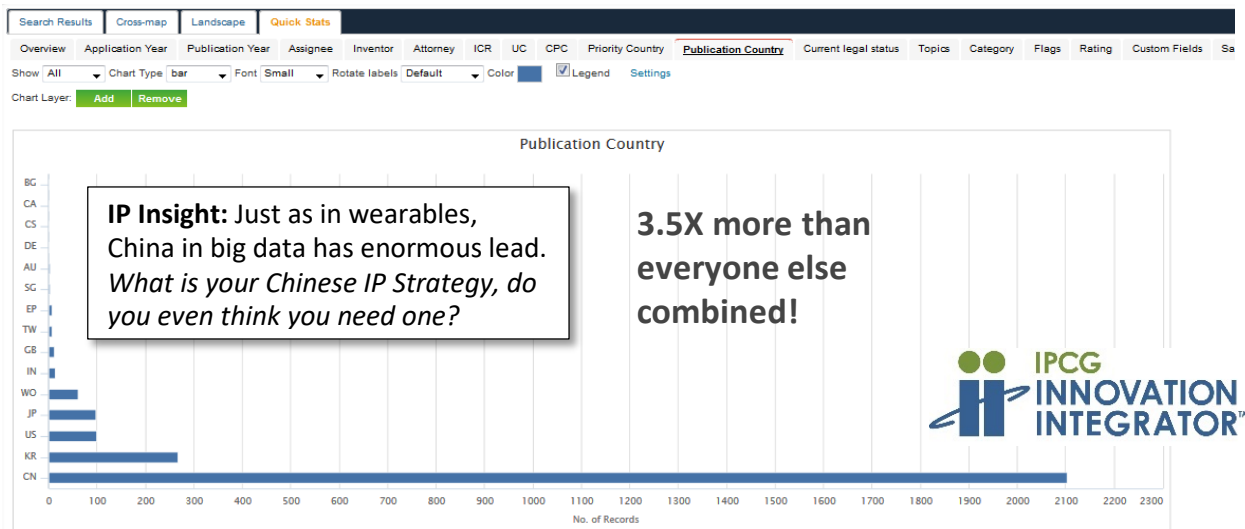
Analytics

Programs

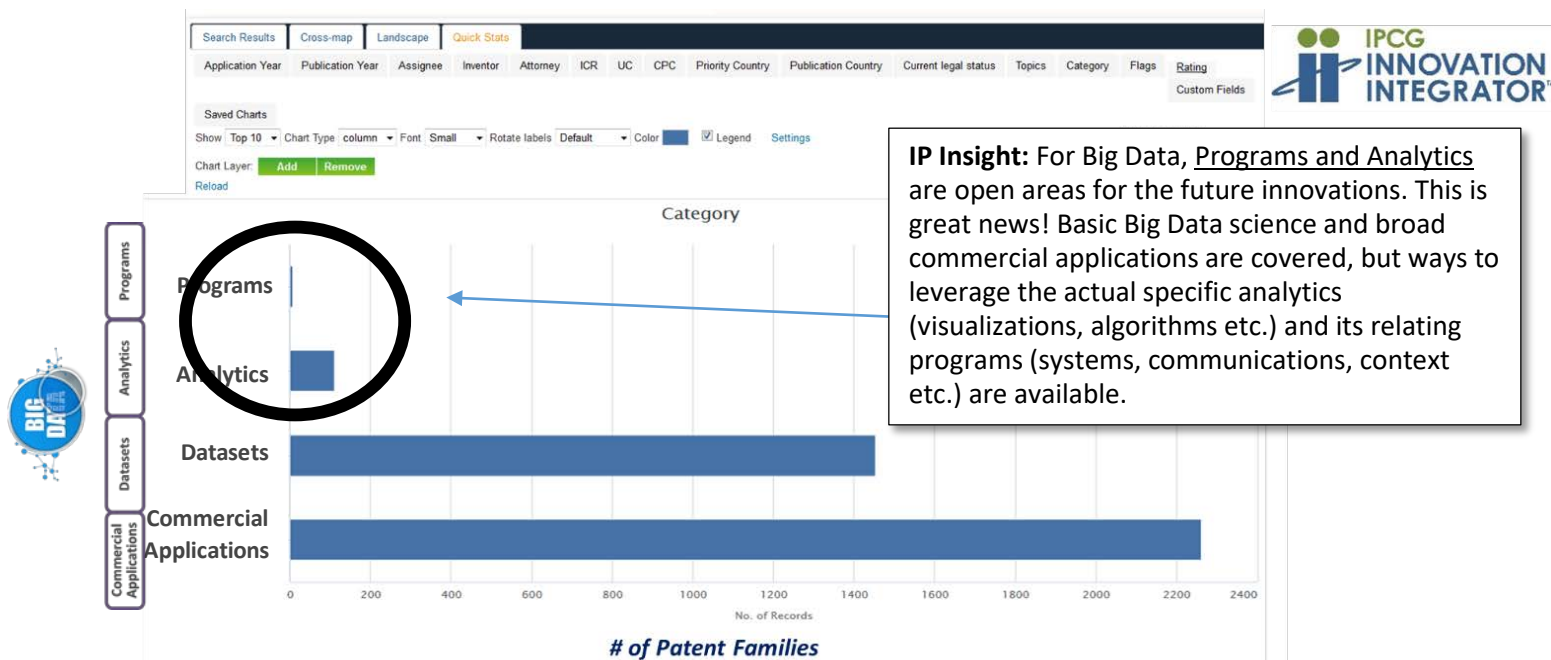
Review of the filing history reveals the dramatic emergence of Big Data in the lexicon of patents and the impact of wearables. Remembering that the increase in wearables occurred in 2010, it is no coincidence that the increase in Big Data technology occurred roughly two years later – almost exactly the typical lag between application and publication. This makes it clear that Wearables are driving Big Data technology.



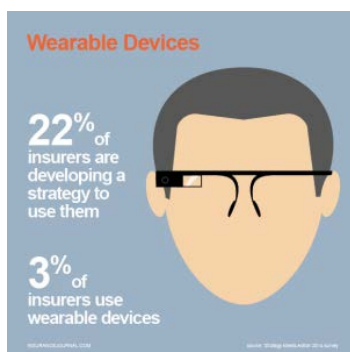
This connection is interesting, but more important, again, is who is patenting and where. Again, the “who” is China (as shown in the map below) and there remain questions about the true impact of this volume.



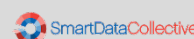
So looking beyond who is applying and the value or strength of these patents, what parts of Big Data are being patented? That is more telling. Despite the explosion of the wearables space and the preference of data patents, there is still opportunity to invent in Wearables and related Big Data space. Review of the non-patent data can give us an idea of the future of the industry.



3. Search the Non Patent Literature for Insights



Wearables create Big Data that can be used by insurance companies to better understand their customers' habits. This understanding could allow for more refined rate structures and new services for their customers. Innovations are needed, however, to overcome challenges in incentivizing participation and security of the Big Data collected.



Data Collection – Wearable “devices provide insurance companies with the much needed data to not analyze the health of the insured, but they may also use predictive analytics to project future ailments that could affect the insured customer. For instance, big data analytics of millions of customers could help insurance companies draw a link between lifestyle and potential ailments”

IP Insight: Insurance companies are a market for the Big Data created by Wearables. Do you have a systematic way to take you sports wearable and link the data to the interested business models?

Analytics – Big Data can help insurance companies warn “customers of the impending risks and also raise the premium for specific ailments as these. At the same time, customers with an active lifestyle could see a drop in their premiums as their risk of developing such ailments is relatively lower.”

Innovations are needed in Wearables and Big Data management – “Despite the benefits that Big Data provide in this instance, the bottom line is that wearable technology, especially those that pass on data to third party businesses like insurance companies, is deeply intrusive. Even if we were to not deliberate on the morality of the issue, hosting such deeply personal details about customers can potentially open insurance companies to a host of lawsuits.”

IP Insight: Wearables are still perceived as too intrusive. Do you have innovations that make your sports wearable less intrusive?

<http://www.insurancejournal.com/news/national/2015/05/06/367014.htm>

<http://www.smartdatacollective.com/anandsmartdata/395348/how-big-data-wearable-technology-transforming-insurance-sector>



Wearables create Big Data that is being used by Healthcare providers to better understand the health status of their patients. This understanding could allow for more targeted treatment. The ease of creating longitudinal studies with Big Data will provide insights that could also avoid unnecessary treatment.

DATA ECONOMY

Forbes

Real World Data – “Lab studies often involve being hooked up and spied on, and only absorb a small portion of daily life. If companies can turn billions of numbers and data points into usable information, the future may include anything from smart pillows, to details on how our actions during the day affect our nights.”

IP Insight: Healthcare providers are a market for the Big Data created by Wearables.

Do you recognize the benefit of sports wearables big data for long term studies?

Data Sets – The market isn’t expecting wearable companies to be involved in data analysis: “In reality, ... a wearables company ... is not likely to crack the complex biological functions that could be at play by themselves—but they’re procuring all the data needed for researchers to move the discussion forward.”

Wearable Enable Scientific Application – The volume of data provided by Wearables provides the resolution needed to implement scientific principles. For the U.S. women's cycling team: “The U.S. Women’s Cycling Team utilized wearables; “[b]y making seemingly small, data-driven changes, their individual performances went through the roof.”

<http://dataconomy.com/can-big-data-wearables-help-us-sleep-better/>

<http://www.forbes.com/sites/bernardmarr/2015/06/08/big-data-not-doping-how-the-u-s-olympic-womens-cycling-team-competes-on-analytics/#4be2cd881ab3>



Wearables provide the gateway to a new type of relationship between customers and companies founded on Big Data. Although participation may come with a cost, there are new opportunities to provide new and better services to customers.



TheStreet

Compensation is necessary – “The findings show that 51 percent of Millennials and 30 percent of people overall are very or extremely likely to consider wearing an activity tracker and share those results with a life insurance company in return for financial rewards for healthy behaviors; the number more than doubles (to 65 percent) when considering consumers who already use an activity tracker.”

Relationships Matter – “The results reveal that more than a quarter of Americans (27 percent) and a third of Millennials (33 percent) cite the potential to build a long-term relationship with an insurance company as a reason to share biometric data from a wearable activity tracker.”

New Opportunity – “New technologies, such as wearable activity trackers and smart scales are not only able to help Americans live healthier lives, but can be the key to developing relationships between insurance companies and policy owners throughout their lives and into retirement.”

IP Insight: Data provided by wearables creates a new relationship with customers, especially compensation.

Do you recognize there are business model patents that can be created? Its unlikely Chinese Universities would invent business models, so this presents a great new area for invention.

<https://www.thestreet.com/story/13523885/1/would-you-share-wearable-activity-tracker-data-with-insurance-companies.html>
<http://www.lifehappens.org/press-releases/2016-insurance-barometer-study-shows-an-improving-climate-for-life-insurance/>



Even anonymized wearables data can be decoded. The very Big Data sets that provide insight to health and welfare can be used to extract the personal identity of the “anonymous user.” The wearable companies that own the data will be increasingly exposed to the risk of a data breach. Consumers need help properly **protecting their data.**



Variety of Uses – “The myriad of ways the company can use your personal data is where things get complicated. “It varies on a case-by-case basis from device to device and from software to software,” says Anura S. Fernando, principal engineer of medical software and systems interoperability at UL. “

IP Insight: The security of data generated by wearables is an ongoing risk for companies.

Stronger protection is needed – “... ‘anonymizing’ data via a simple distortion or removal of identifying features does not provide adequate levels of anonymity and is not sufficient to prevent identity fraud.”

Regulation Can’t Keep up – “While some regulations govern the world of wearables, the huge number of devices makes it difficult for government legislation to keep up.” “There’s so many out there, it’s difficult to enforce through legislation.” “So [consumer] awareness and understanding ... is as important or possibly more important than legislation itself.”

IP Insight: Consumers need help protecting themselves.

<http://www.safebee.com/tech/wearable-fitness-devices-who-owns-your-data>
<http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001953>

4. Filter based upon specific innovations needed

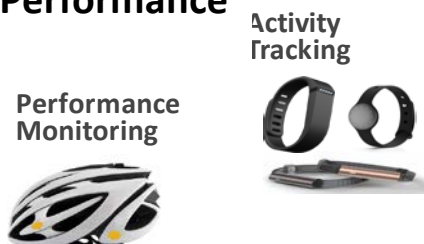
Along with the patent data and non-patent literature, it is important to look at the demands of the market and assess the threats and opportunities related to IP. To conduct this high-level review, the sports wearables space was grouped into five categories: Motion Capture, Visual, Feedback, Monitoring, and Performance.



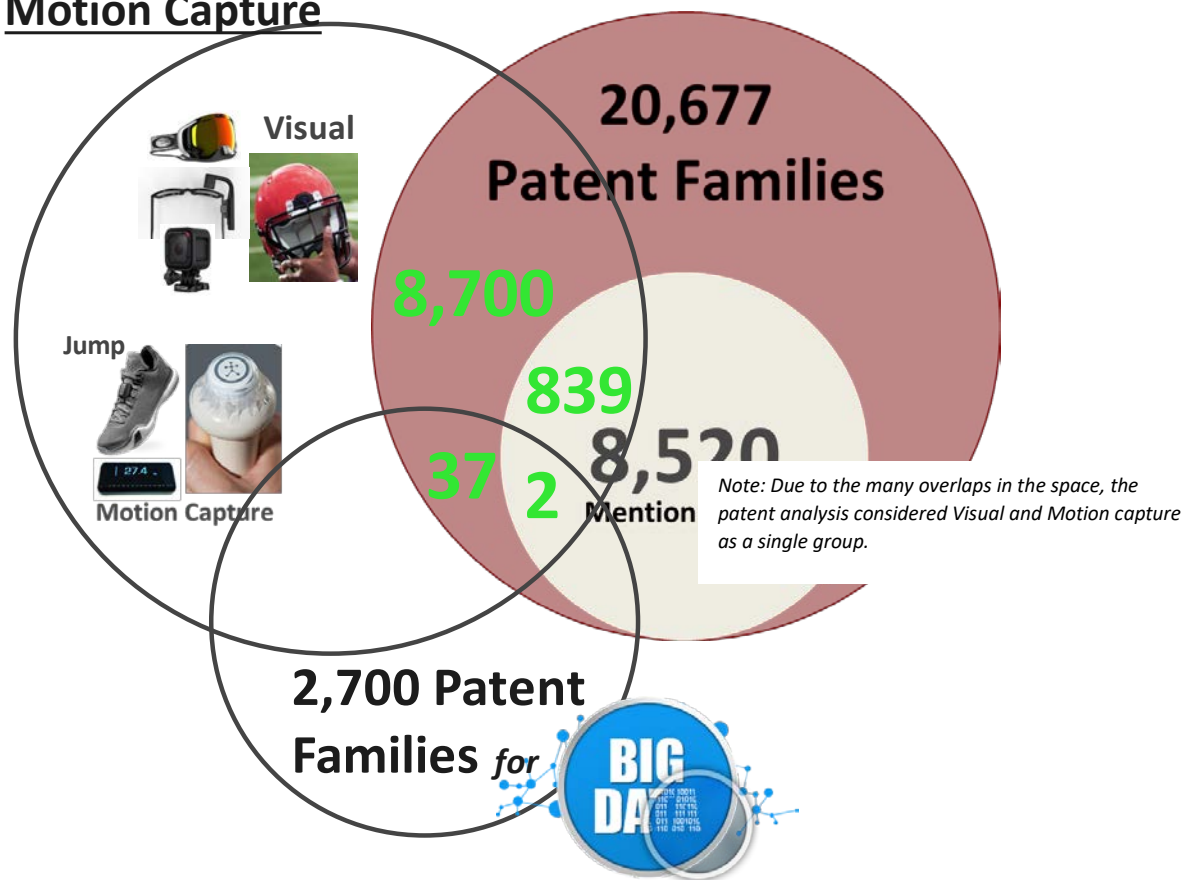
Motion Capture



Performance



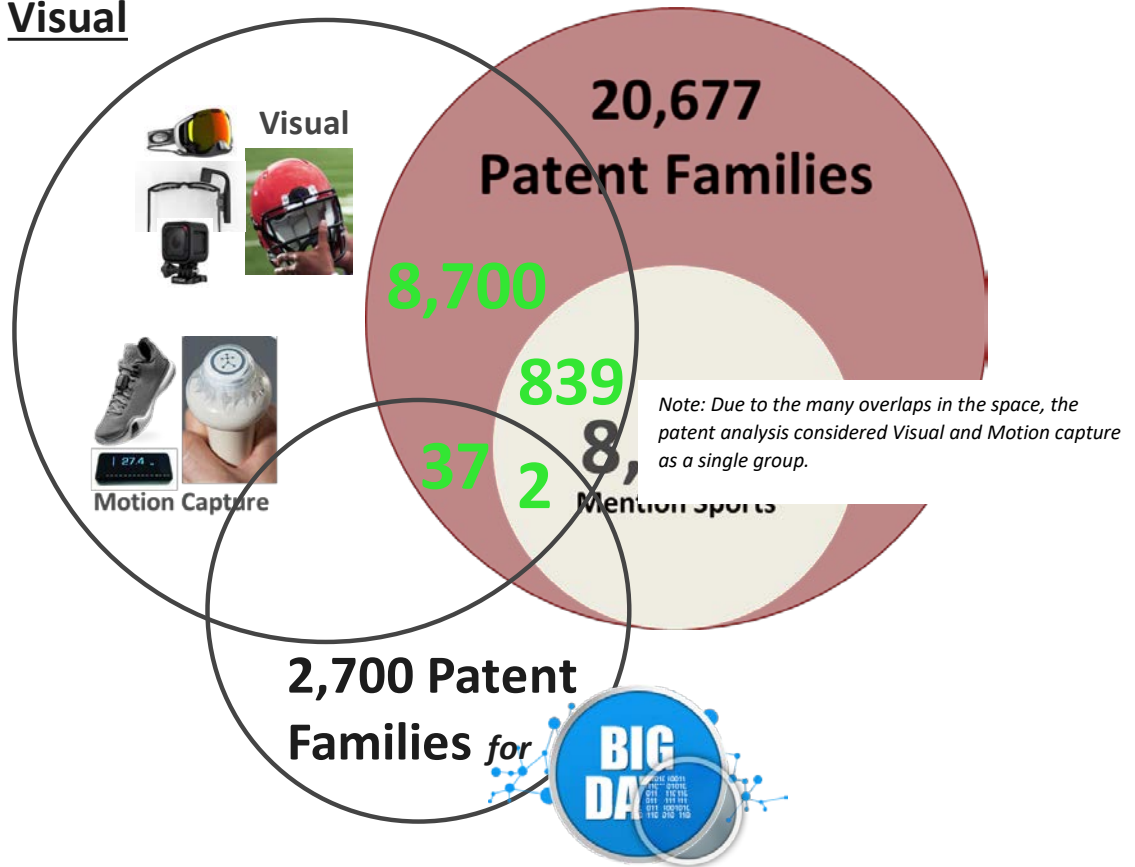
Motion Capture



1. Practice and workout data will need strong “on the fly” analysis. Can a trade secret at the right level in the software stack to do this?
2. Media Libraries will likely need “tag along” statistics and hence hyperlinks to cloud analysis. Can this “tag along” set of statistics be user interface IP?
3. Individual motion analysis will need performance metrics (e.g., “Fuel” vs calories). Do you own the “language” (tradenames) of your Big Data?
4. Team motion capture data likely use big data “proxies” (e.g., virtual teams) or “social media” (e.g., fantasy teams) to create comparisons quickly. Can you own (i.e., data rights) the virtualized data programs, particularly comparing professional’s data?
5. Injury prevention in sports wearables is key and big data will be leveraged in healthcare and insurance. Can you define the business model IP (where significant money will be made) for your sports wearable?

Threats/Opportunities in Visual and Big Data

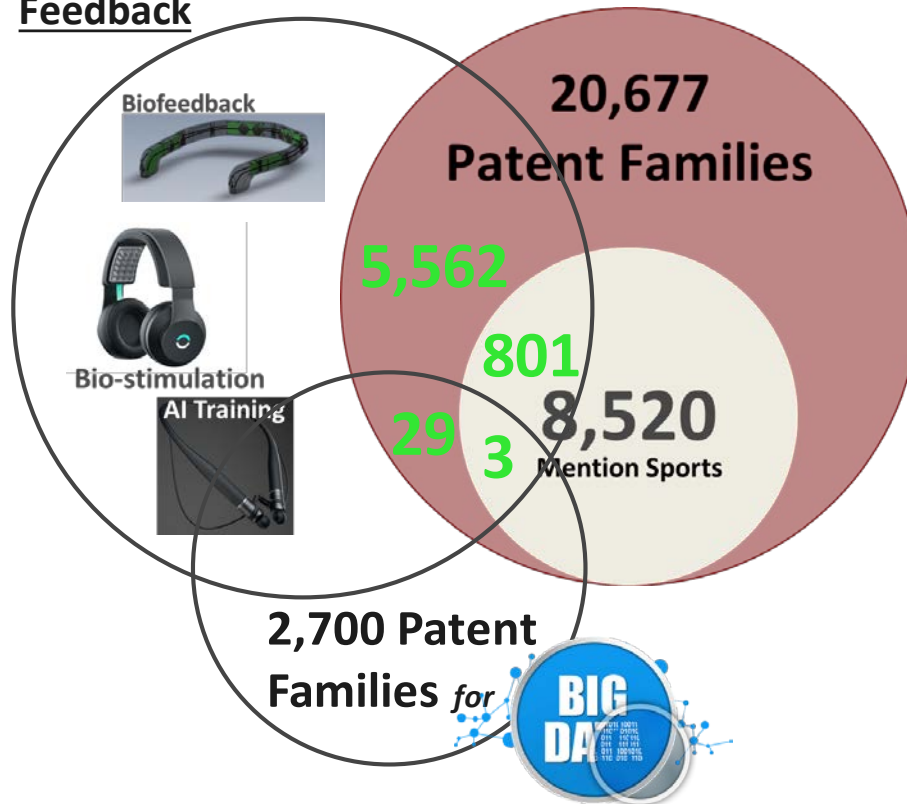
Visual



1. Immersive 3D Big Data outputs will lead to “award winning effects.” Do you know how to patent an Immersive 3D effect?
2. Whole scene “capture and stitch” will move to a Big Data-driven AI in the cloud and will likely be sports-dependent (individual “capture and stick” programs; at a high level these can be patented without prototypes, so speed to patent will be everything).
3. Wireless action motion “point of view” motion data will be challenged by streaming data, stitching, and replay techniques, and player’s camera data needs to be real-time controlled. Because Big Data modules must reside partially within player’s devices, data structures will be a battle ground for new patents.
4. Extra screens/displays add convenience and control, and real-time streamed data to a screen can be used for “analysis” and hence control of remote devices. System level patents will be key to this space.
5. The personal “heads up display” data tracking revolution will need ubiquitous platform level APIs and flexible “data typing,” based on IP available for APIs and Big Data.

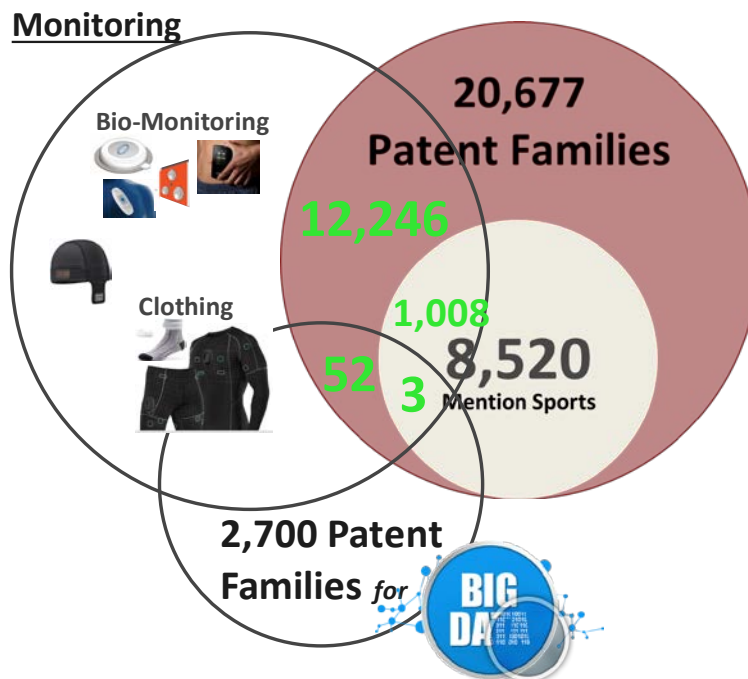
Threats/Opportunities in Feedback and Big Data

Feedback

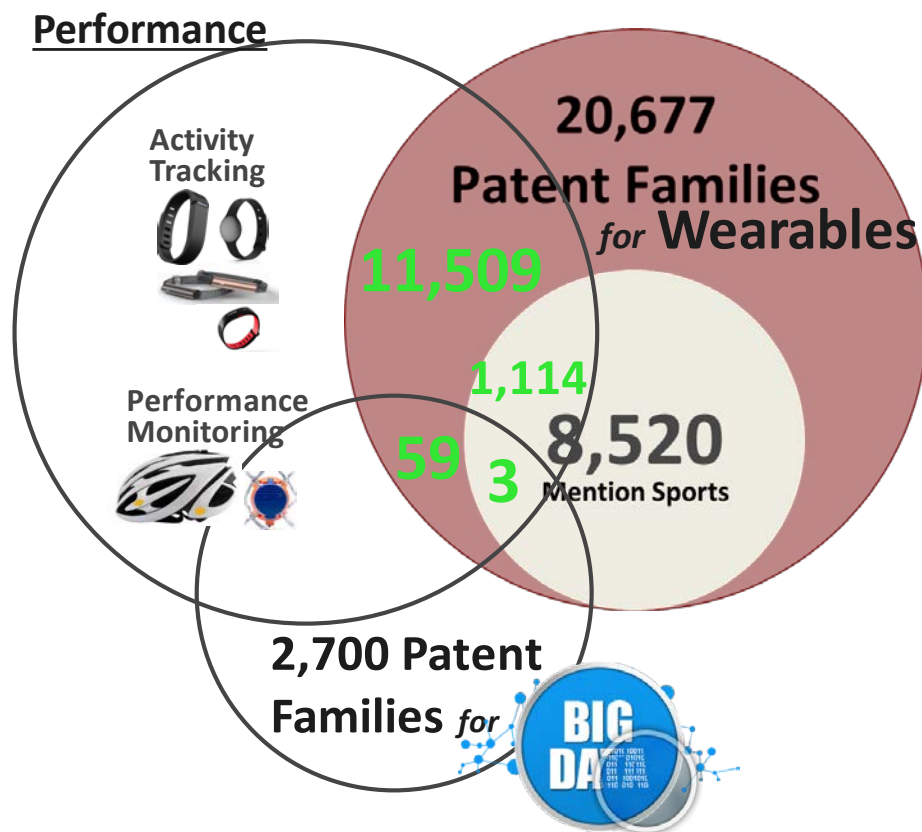


1. Brain relaxation and rebalancing devices are likely to enhance sports visualization and training. Big Data driven AI will likely be needed to create and support claims for improved results. This could be a wide open area for functional claims!
2. Neuro stimulation for brain training during workouts will rely on Big Data neural networks to provide close loop feedback. High value trade secrets likely be defined and capture needed.
3. AI training in sports wearables will form a unique connection between sensors, coaching, and feedback mechanisms. Big Data and its AI will likely need to be bifurcated in “AI groupings” likely to result in a plethora of software methods.
4. Combining biofeedback and bio stimulation as end points in an overall sports wearable becomes the future for AI and big data. This “prophetic IP” can be owned quickly!
5. Big Data in Sports Wearables with meaningful personalized biofeedback may result in standards for data privacy and security issues such as in HIPAA. Owning the IP before the standard regulations may be enormously valuable!

Threats/Opportunities in Monitoring and Big Data



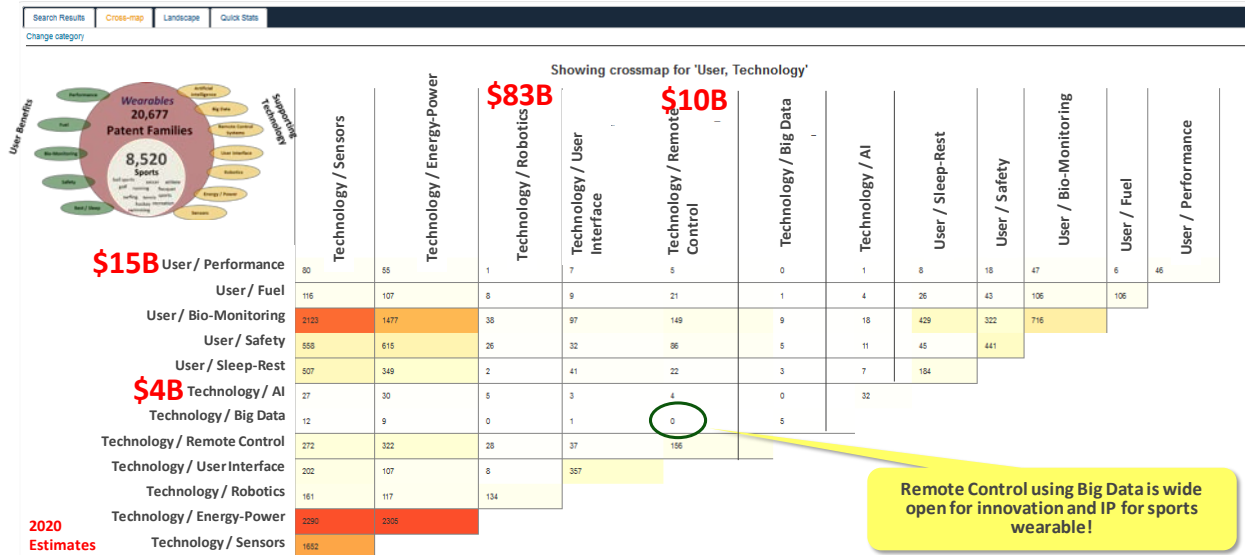
1. Continuous monitoring of blood and skin through Big Data in sports will be a challenging IP battle. Given the lead in health and medical fields, opportunity for white space in sports would be before and after training outside the event, leaving great business models IP opportunities.
2. Non-obtrusive “muscle and skin measurements” will likely need gamification or user-incentive type business models to engage users. By making slight changes to the data, Big Data can help add to this novelty.
3. Novel sensor positioning (i.e., not ear, temple, etc., as they are heavily patented) is being integrated into sports applications and is less protected, but the true value will be in the context and feedback only achieved by Big Data, and the future of that IP is wide open.
4. Trauma alerting (e.g., head, back, knee, etc.) sensors in sports exist, but are controversial due to limited understanding of the true risks and warning signs. Big Data can be used to minimize controversy because it can drive an AI that better correlates alerts, contexts, and individual health data. Relating trauma alerts to Big Data health records through AI is wide open for IP.
5. Mobile wireless cardiac devices can assist sports wearables. Big Data cardiac analysis is well-known and likely to be standard in the future, but relating Big Data cardiac to sports will allow a new AI-based IP treasure chest!
6. Clothing monitors in Sports Wearables will align with clothing brands or usher in new ones. Big Data doesn’t affect the current article of manufacturing or design patents strategies; new ones will be needed!



1. Wearable “Performance Monitoring” that interacts with sports devices, such as bats, basketballs, skating rinks, etc., provide new challenges for Big Data analysis. As context is more well-defined, less AI is needed. However, Big Data can then be linked to sports team results and drive new fantasy programs in IP, where the big money is!
2. The activity tracking “wave” is cresting. New needs for activity tracking includes better data (sensors), better metrics, and meaning. Big Data may overcome sensors’ limits by analyzing much more context. This is whitespace that should constitute the next wearables IP wave.
3. Connected fitness devices likely will go the way to an App store model, where the fitness device is linked to the type of sport, level of personal skill, and individual needs (e.g., training versus event tracking, etc.). Those companies that can lock down the Big Data-based sports fitness App model will stand to win.

5. Develop Innovation Strategy – Cross Map

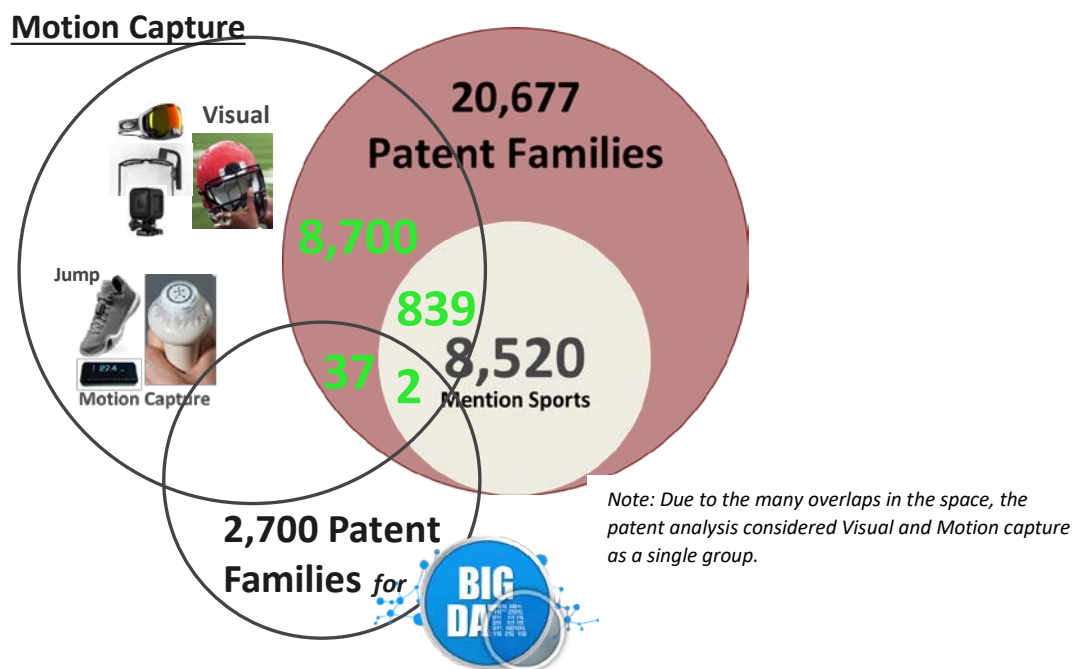
With this understanding of the space, we can then build an Invention Cross Map. This cross map identifies opportunities for invention by crossing known technologies. Because these technologies exist, we can also begin to understand the scope and scale of the potential market for a new invention. There are areas that show high patent activity like energy/power, sensors, and bio-monitoring. As shown below, there is potential whitespace for Big Data intersecting with Remote Control. There is also a substantial existing market for Remote Control that could be leveraged with a new invention tied to Big Data.



6. Develop Inventions from all insights

Based on the various views of the market and the IP driving the technology, it is possible to begin developing inventions that are both in whitespace and predictably viable in the marketplace. The following are example inventions generated using the Virtualized Innovation® approach outlined in steps 1-5 to explore opportunities in the Sports Wearables Space at the intersection of Remote Control and Big Data.

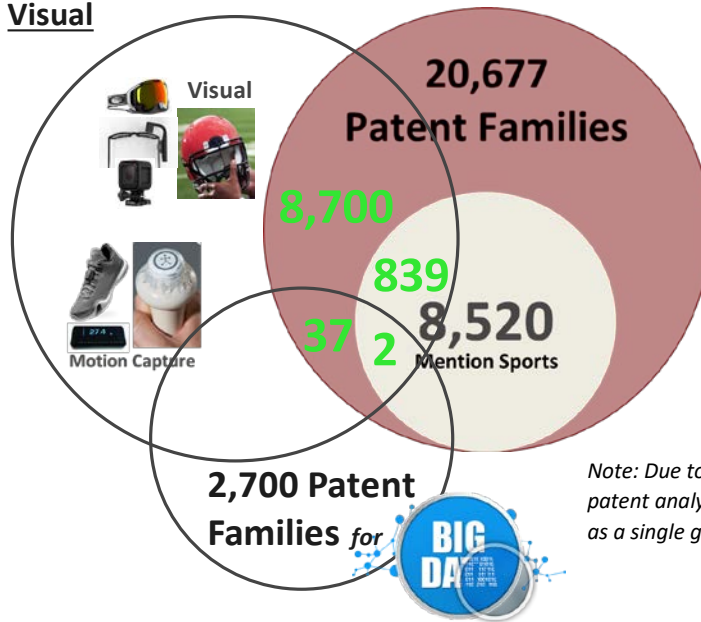
Ideas in Motion Capture



1. Big Data Analysis will trigger remote control of motion capture in practice and workouts to minimize all non-interesting data.
2. Media libraries searching for specific motions will use AI and Big Data to control and determine the best scenes to find based upon loaded remote sports wearable data.
3. Individual motion analysis will yield performance metrics (e.g., “fuel” vs calories) and Big Data results will issue remote controlled alerts to sports wearables.
4. Team motion capture Big Data will likely use (1) daisy chain or (2) most unique movements to trigger remote controls for motion capture.
5. Injury prevention in Sports Wearables is key and Big Data will analyze and create a remote control for calling a hierarchy of help from notifying the player to calling 911.

Ideas in Visual

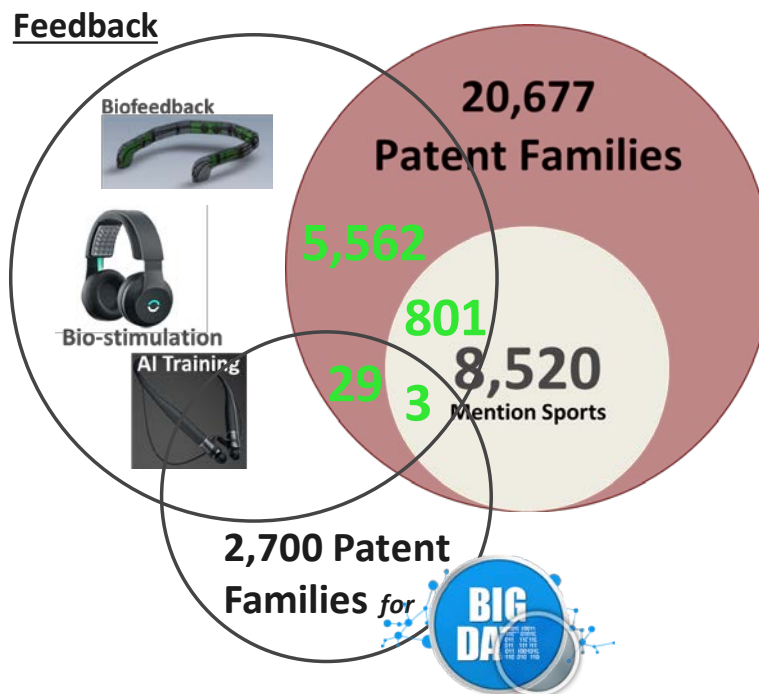
Visual



Note: Due to the many overlaps in the space, the patent analysis considered Visual and Motion capture as a single group.

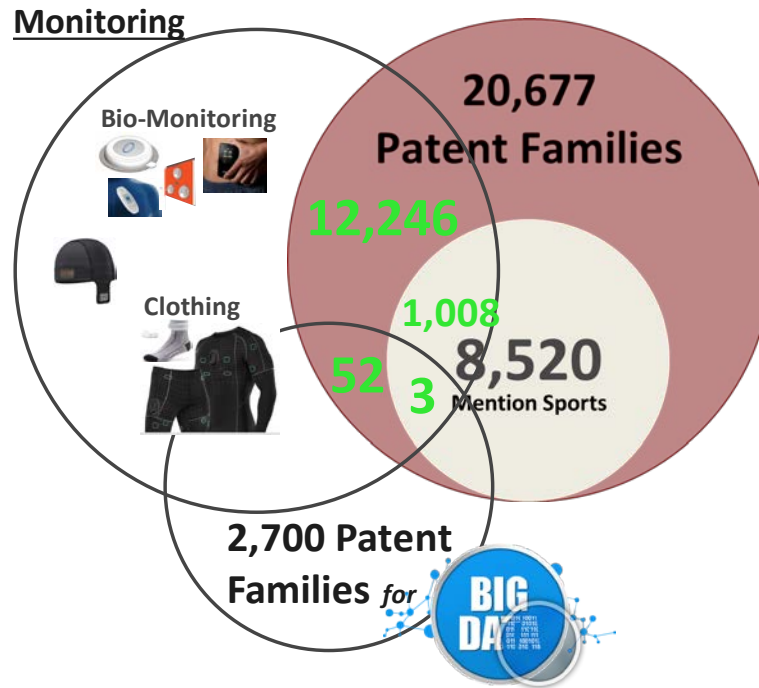
1. Immersive 3D Big Data outputs are used to find novel “events” which are then used to create remote control tags for the motion capture equipment. Thus, in real-time correlations of new 3D Data to history, triggers tag to trigger remote control of motion capture device – creating a virtual remote controller.
2. Whole scene “capture and stitch” will move to big data AI; poor stitching feedback will alert user for a remote control recapture.
3. Wireless action motion “point of view” motion data, when combined to a larger event, will provide “remote control” of professional cameras direction.
4. Extra screens and displays add convenience and control. Real-time streamed data to screen can be used for “analysis” and hence control of remote devices.
5. Personal “heads up displays” data tracking will be rules-based and remotely controlled hands-free new “display information,” e.g., going past a certain speed around a curve (analyzed by Big Data). will alert “heads up display” to display safety metric warning.

Ideas for feedback



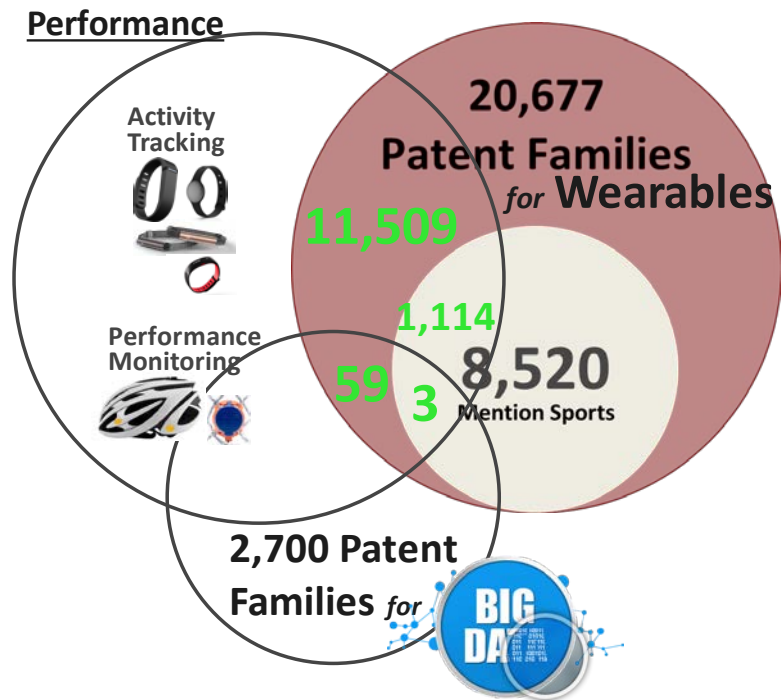
1. Brain relaxation and rebalancing devices are likely to enhance sports visualization and training. Big Data-driven AI results can be used to remotely control background IOT environment (music, havoc, etc.)
2. Neuro stimulation for brain-training during workouts will rely on Big Data neural networks to provide close loop feedback. The feedback can inter-cooperate with other sports wearables for remote controller (i.e., trigger visual capture)
3. AI training in sports wearables will form a unique connection between sensors, coaching, and feedback mechanisms. Big Data, when analyzed, will remotely trigger which coach, what type of coach, etc.
4. Combining biofeedback and bio-stimulation as end points in an overall sports wearable becomes the future for AI and Big Data. This will allow for remotely controlled frequency of biofeedback/stimulation.
5. Big data in sports wearables with meaningful personalized biofeedback may result in standards for data privacy and security issues; breaches will remotely control shut off of connections.

Ideas in Monitoring and Big Data



1. Sensors for continuously monitoring blood or skin in a sports wearable will remotely trigger connections to a trainer or doctor or provide suggestions for hydration or even ordering of remediation's consumables.
2. Non-obtrusive "Muscle and skin measurement" devices can use position/data from individual and from Big Data to remotely trigger finding/creating "like groups" of individuals to communicate.
3. Novel sports wearable sensors (ear) can non-obtrusively use other inputs (speech being heard) and Big Data can remote control user's situations (e.g., high blood pressure and crowd cheering is ok, but high blood pressure and silence provides an alert)
4. Trauma alerting (head, back, knee, etc.,) sensors in Sports Wearables can remotely enter events in a medical history log.
5. Mobile wireless cardiac devices can assist sports wearables on performance and Big Data analysis and can remotely trigger medical or trainer checkups.
6. Big Data from clothing monitors in sports wearables can remotely trigger active clothing (breathability, sweat, comfort).

Ideas in Performance and Big Data



1. Wearable “performance monitoring” that interact with sports devices (bats, basketballs, skating rinks, etc.) can remotely control vibrators in devices for best positioning etc.
2. Activity tracking Big Data can be analyzed and remotely trigger other related health needs (e.g., declining workout frequencies triggers rules set up by user, e.g., start sending motivational emails or to notify doctor)
3. Connected fitness devices likely will figure out what sport is being used at the current time and Big Data analysis will remotely control downloading the best App for the user ... the best, just in time, App!

Conclusion

This paper explored the Sports Wearables space from a variety of perspectives, all viewed through the lens of Intellectual Property. Each perspective provided a variety of insights on the space and gave us a glimpse of the future of the technology of Sports Wearables and the IP that protects it. The following is a brief overview of the conclusions:

- From both an IP and non-IP analysis, the Wearables space is a crowded, fast growing space; and so is Sports Wearables.
- The Big Data space as it relates to “analysis and programs” is wide open for inventions.
- Chinese universities and government agencies are a huge player which should impact your innovation strategy, if you understand the data.
- Big Data crossed with user benefits and supporting technology reveals specific areas for innovation.
- The new Virtual InnovationSM process used existing data to provide specific Sports Wearable/Big Data insights and challenges, and supports invention
- Upon request, detailed data on your company can be analyzed in a trial use of our ipCG Innovation Integrator software tool.

About the Author

This paper was originally presented by John Cronin at the Wearable Tech in Sports Summit, August 2016 in San Francisco. Mr. Cronin is the Chairman & Managing Partner of ipCapital Group, a business consulting firm specializing in IP and Innovation strategy and has nearly 40 years of experience creating innovation and effective strategies for protecting it. www.ipcg.com