USPTO AI Innovation Journey

Adventures in change management

Intellectual property and the U.S. economy

27.9m

IP intensive jobs (2014)

38.2%

IP intensive industries share of total US GDP (2014)

$6.6 trillion

Value add of IP-intensive industries (2014)

$1,312/week

(46% higher)

Avg. weekly wages for workers in IP-intensive industries

$115.2 billion

Revenue specific to the licensing of IP rights totaled (2012)

28 industries

Deriving revenues from licensing

Source: Department of Commerce. 2016. "Intellectual Property and the U.S. Economy: 2016 Update". September 26. www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf (January 3, 2018).

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The USPTO at a glance - FY20

12,928 employees

- **8,434** patent examiners
- **622** trademark examining attorneys
- **221** Patent Trial and Appeal Board team
- **24** Trademark Trial and Appeal Board team

Patents

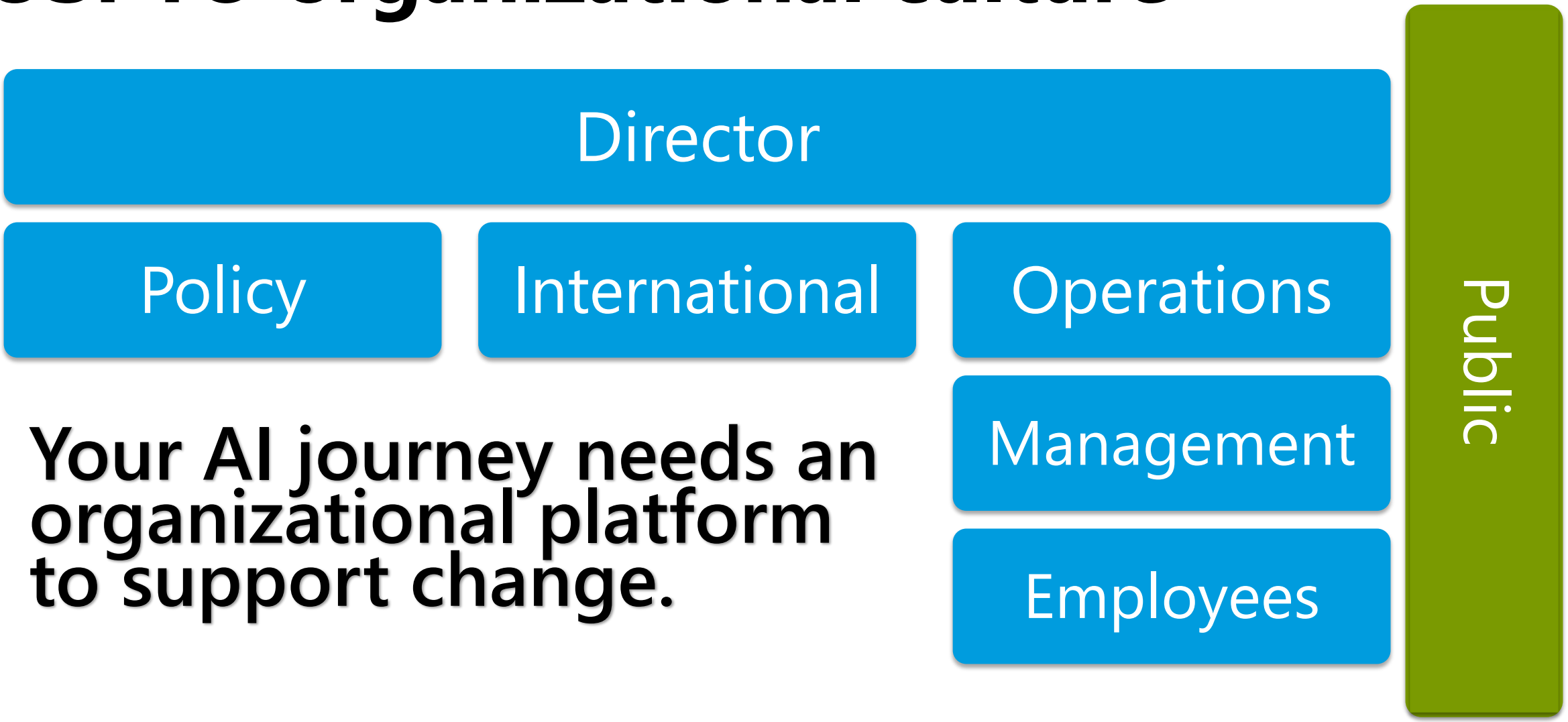
- **653,311** applications filed
- **399,055** patents issued

Trademarks

- **553,505** trademark applications
- **295,728** Certificates of Registration

Fostering innovation, competitiveness, and job growth in the United States by conducting high-quality and timely Patent and Trademark examination and review proceedings in order to produce reliable and predictable intellectual property rights, guiding intellectual property policy and improving intellectual property rights protection, and delivering intellectual property information and education worldwide.

USPTO organizational culture



Your AI journey needs an organizational platform to support change.

AI journey across USPTO leadership

Chapter One	Chapter Two	Chapter Three	Chapter Four
			
David J. Kappos **2009-2013**	Michelle K. Lee **2015-2017**	Andrei Iancu **2018-2021**	TBD **?**
The Architect	The Engineer	The Investor	

UNITED STATES PATENT AND TRADEMARK OFFICE

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Chapter one –
The architect thinks big

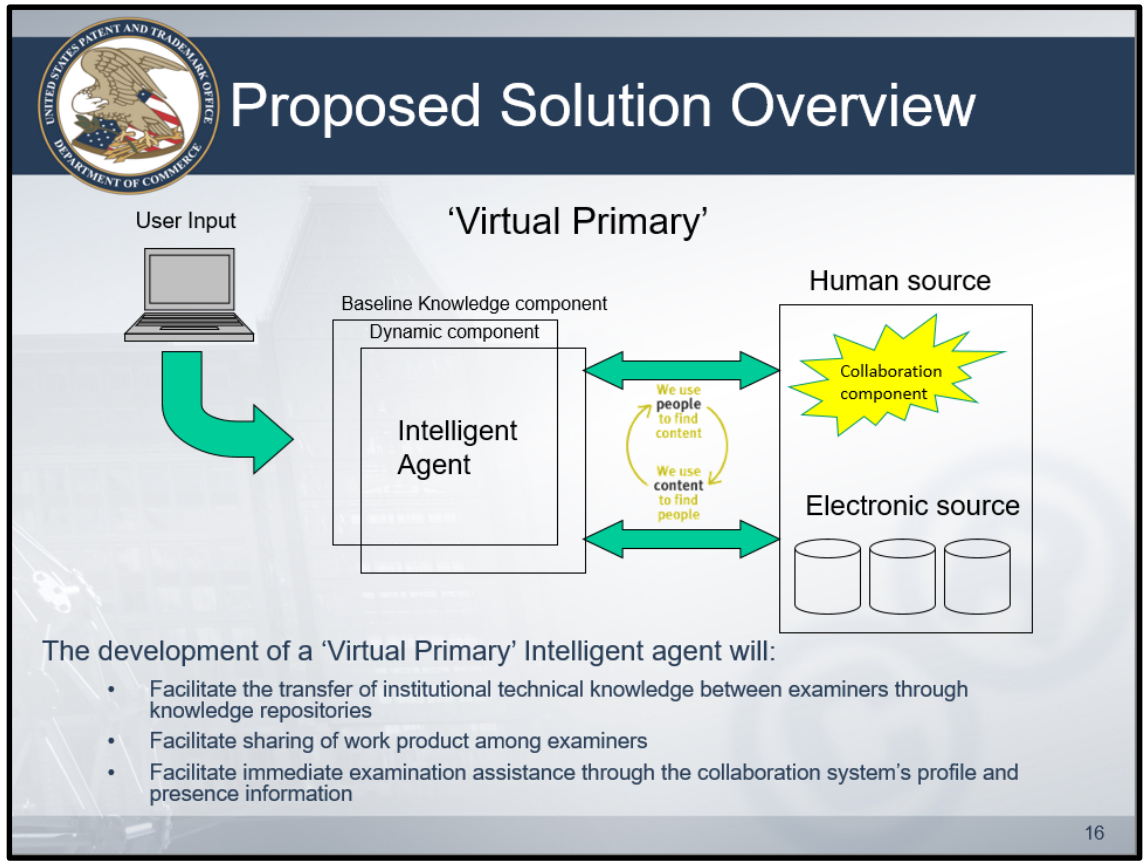
When President Barack Obama tapped IBM's top worldwide intellectual property lawyer for the post, he was picking someone who would shake up the PTO. If the White House wanted to capitalize on the notion that America is an "innovation economy," then it was going to have to do something to reform an office that had a tremendous patent backlog and a record for many patents being challenged in court.

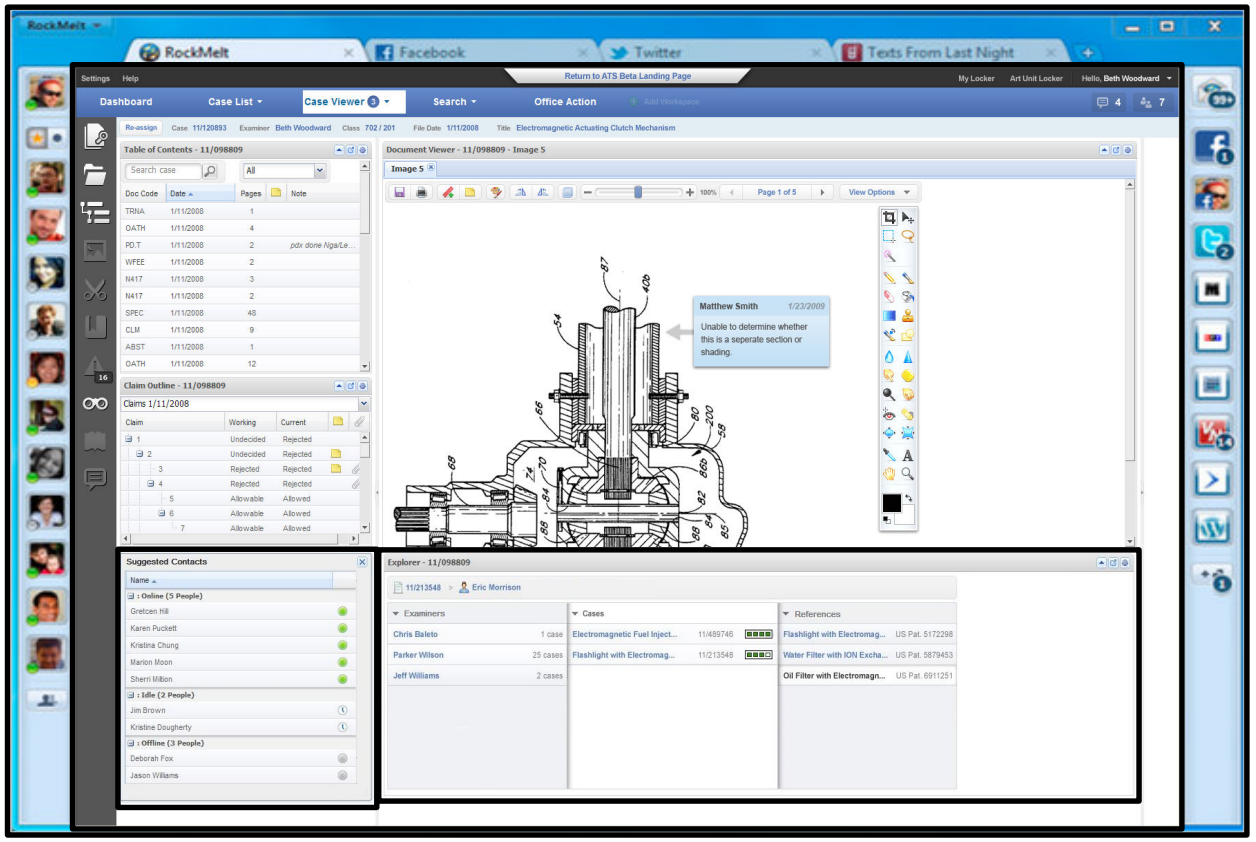
Kappos: Patent system's reinventor
https://www.politico.com/story/2012/01/kappos-the-patent-systems-reinventor-071412

"Let's be clear: **patent quality does not equal rejection.**"

Remarks by Director Kappos: Director's blog
https://patentlyo.com/jobs/2009/08/director-kappos-patent-quality-equals-granting-those-claims-the-applicant-is-entitled-to-under-our-laws.html

Designing an intelligent agent





Use people to find content ←→ Use content to find people

Thinking big to . . .

Dynamic Knowledge

- Search Assistance
- Similar Applications / Art
- Pre-examination
- Smart Docketing

Baseline Knowledge

- Contact Information
- Search based information
- Relevant art information

Collaboration

- Examiner profile
- Related application news feed
- Discussion forums

The Patent Process Reengineering team reviewed the top recommendations from all working groups and recommended the development of this effort based on having the highest impact Corps-wide in terms of people, volume of work affected, and highest benefits to the quality of examination.

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Architecting change at the USPTO

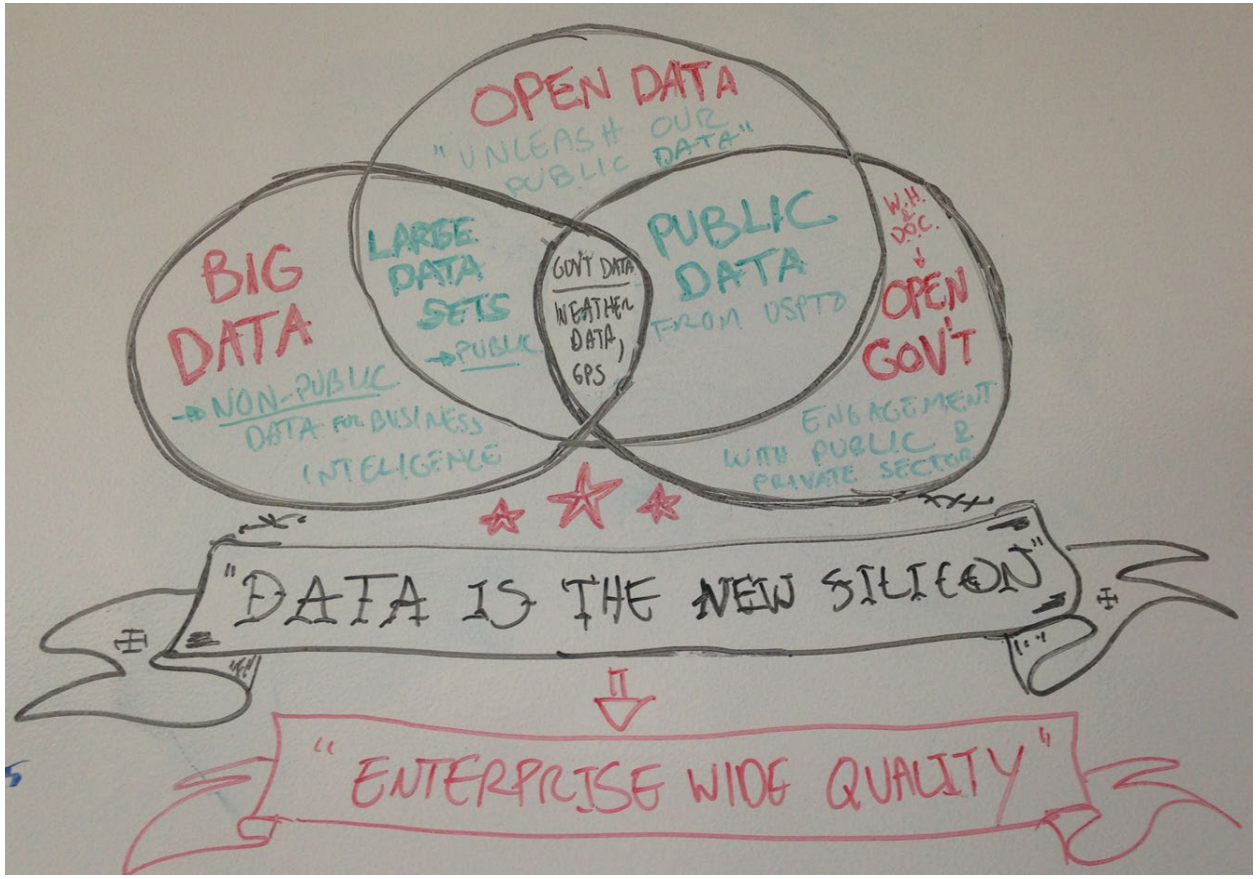
Lesson #1: Organizational buy-in is never optional

Chapter two –
The engineer and her scrappy team build the foundation

For Michelle K. Lee … the path to the corridors of power in Washington began in the garage of her family's Saratoga, California, home. That's where her father, a Silicon Valley electrical engineer, kept his workshop and where amid the resistors, circuit boards, and soldering irons, young Michelle developed a passion for science and technology. Building a hand-held radio or programming a computer, she was in her element.

Head USPTO Sets Innovation Agenda
https://law.stanford.edu/stanford-lawyer/articles/michelle-k-lee-first-woman-to-head-uspto-sets-innovation-agenda/

Thomas Beach



Vikrum Aiyer

I challenged a small internal team to act like a "start-up" and develop some new ideas on how to use the vast reserves of data the USPTO gathers to help solve some of the agency's age old challenges. . .

Embarking on a New Adventure
https://www.huffpost.com/entry/embarking-on-a-new-advent_b_10116076

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Essential to Innovation

Part One: Open Data

(* An annual subscription for the current Calendar is available on Blu-ray discs for $10,400. Contact idp@uspto.gov for ordering information.)

Before

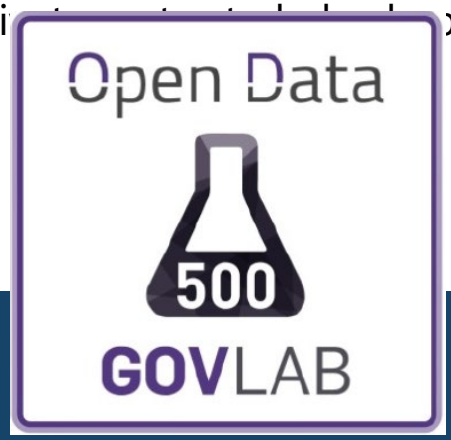
USPTO Open Data Initiative

Open data is at the heart of the USPTO's mission of delivering intellectual property information to foster innovation, competitiveness and economic growth. The USPTO Open Data Initiative is an agency-wide initiative that seeks to nurture a culture change that sees transparency and open data as a central part of the agency's mission. This change requires the USPTO to increase its understanding of its customer data needs.

Through this event, we seek to share the work that we are doing and gain valuable feedback from you to set the stage for further engagements. We want to broaden the base of our user community and build an active developer community though public-private partnerships. Together we will make our data more transparent and more accessible to encourage innovative use.

The Open Data & Mobility Roadmap is our plan to chart our progress from where we are to where we would like to be in terms of APIs, data access, use and quality. The Roadmap has three main facets.

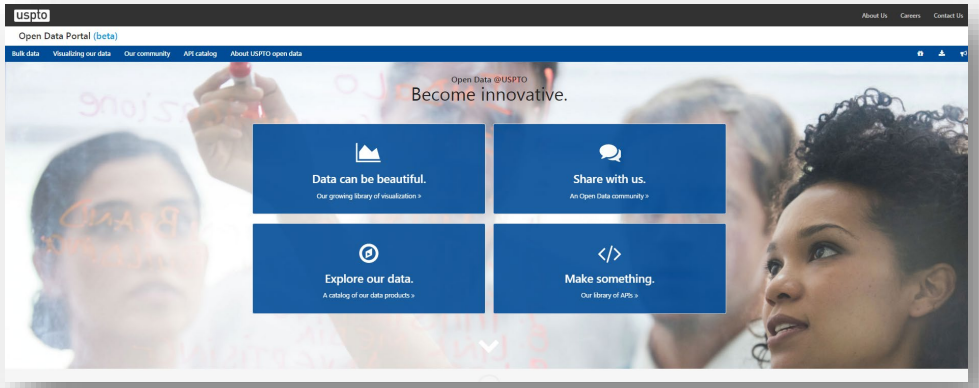
Deliver: The USPTO will provide data and application programming interfaces (APIs) to the public.
Engage: The USPTO will work with the community to do innovative things with our data and APIs.
Collaborate: The USPTO will partner with the pri[illegible]pe the direction of open data at the USPTO.

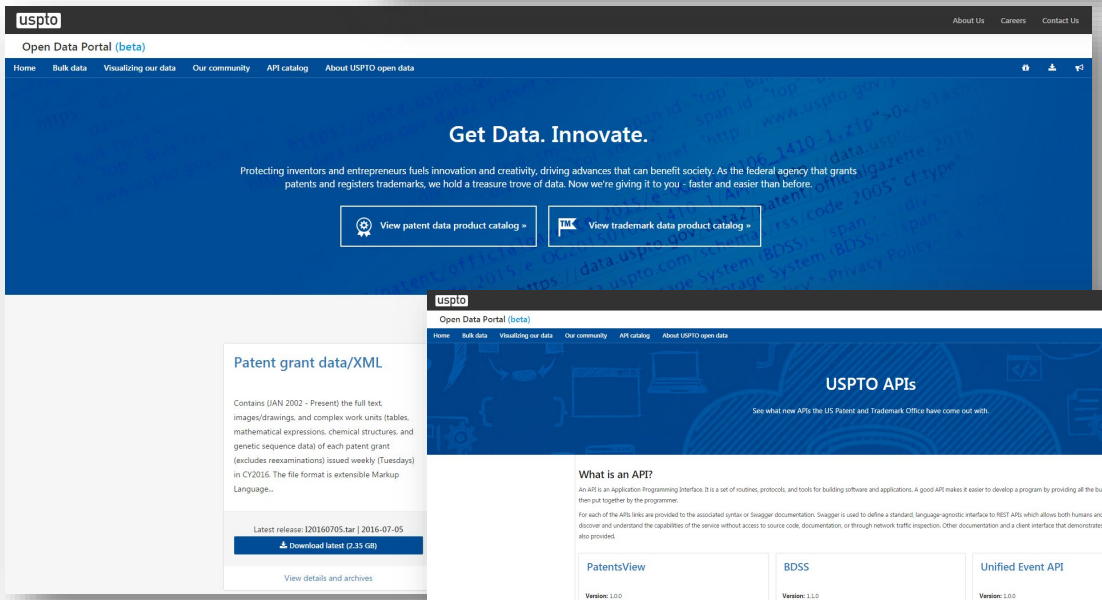


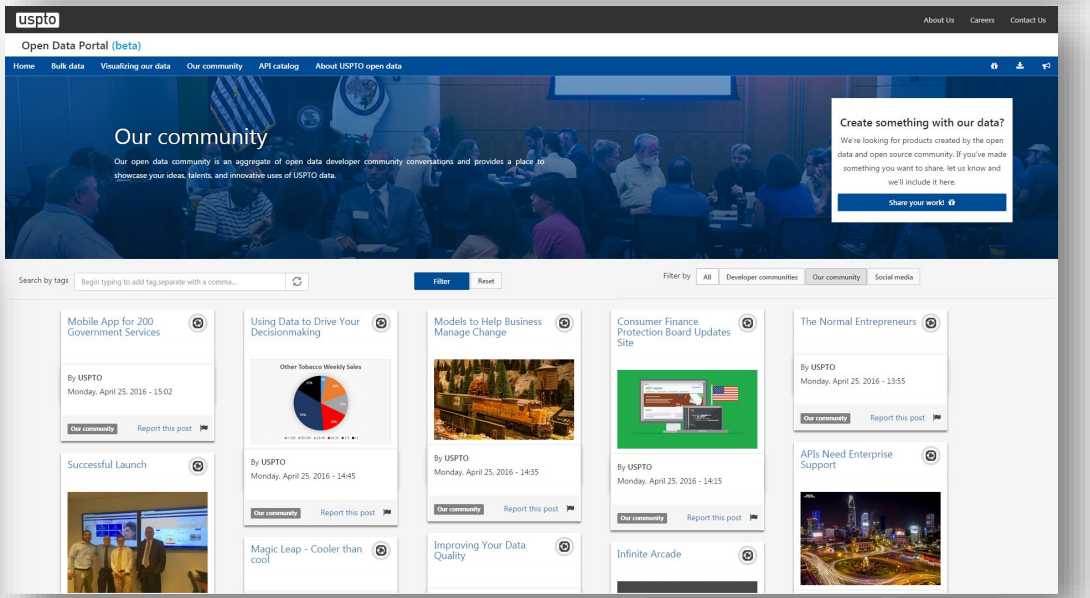
USPTO open data & mobility roadmap

	Q1 FY15	Q2 FY15	Q3 FY15	Q4 FY15	Q1 FY16	Q2 FY16
Deliver	**Launch Beta USPTO.Gov NextGen** **Update existing Trademark APIs Documentation** **Add new datasets to Data.Gov**	**Publish Technical Architecture** • Shared Services • Data Formats • Documentation • API Standards • Security/Access • Toolset • Collaboration Tools	**Public Pair API Beta** **PatentsView Beta** **Developer Sandbox** • USPTO Datasets • Documentation • Development Tools • Sample Code	**Public Pair API Released**	**Assignments Data API Beta**	**Assignments Data API Released**
Engage	**USPTO Data Roundtable** **Organize Open Data Affinity Group**	**USPTO Data Jam:** Public Pair Data **Roundtable Presentation**: Community Feedback	**USPTO Hackathon:** Public Pair API **Roundtable Presentation**: USPTO Monitoring Reports Review	**USPTO Data Jam:** Assignments Data **Roundtable Presentation**: Market Opportunities	**USPTO Hackathon:** Assignments Data API **Roundtable Presentation**: Best Practices: UX/Visualization	**1st Annual Datapalooza** **Roundtable Presentation**: Best Practices: Mobile Development
Collaborate	**Launch Open Data Roadmap** **Public Facing Data Inventory** **Draft Community Governance Plan**	**Community Governance Kickoff** • Structure • Roles/Responsibility • Communications Plan • Security/Privacy Plan • Data Management **Prioritize Data Pipeline**	**Community Partnerships** • Business • Government • Developer • International**	**Taking Stock** • Governance • Operations • Communications • Improvement Needed		

After







https://developer.uspto.gov

2015 – USPTO Hackathons

2016 – USPTO-DARPA Hackathon

2015 – USPTO Iconathon

Microsoft Google facebook intel SAMSUNG amazon QUALCOMM

2016 – Commerce Data Advisory Committee

USPTO data engagements

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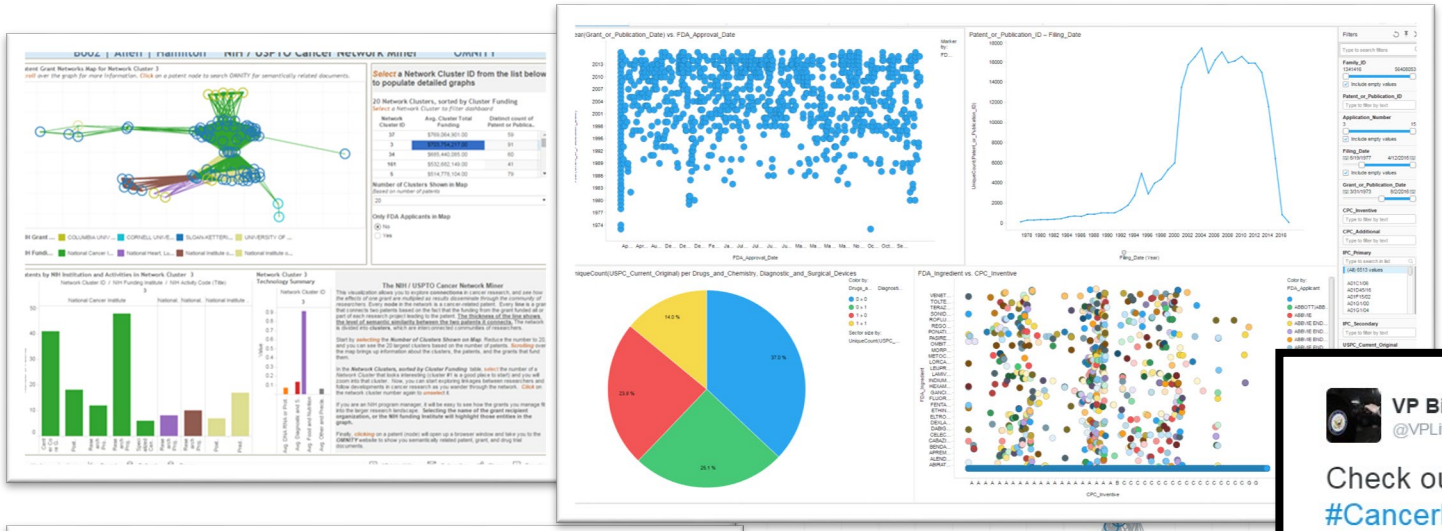
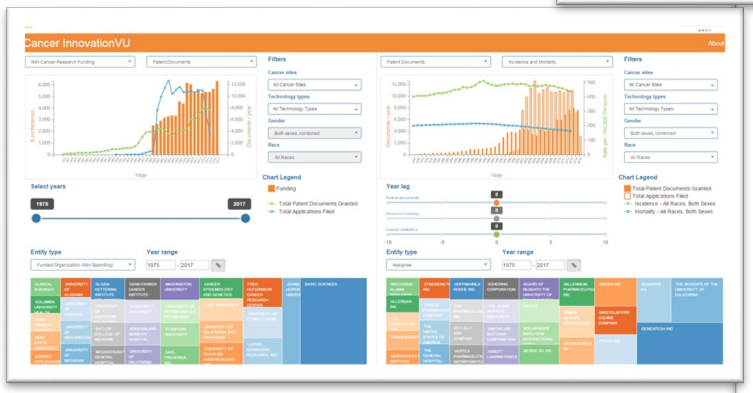
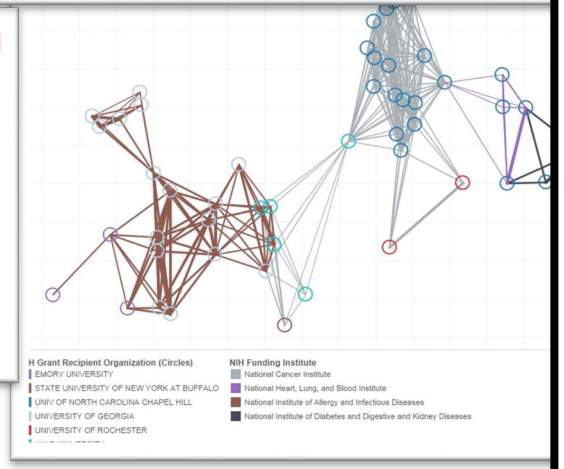
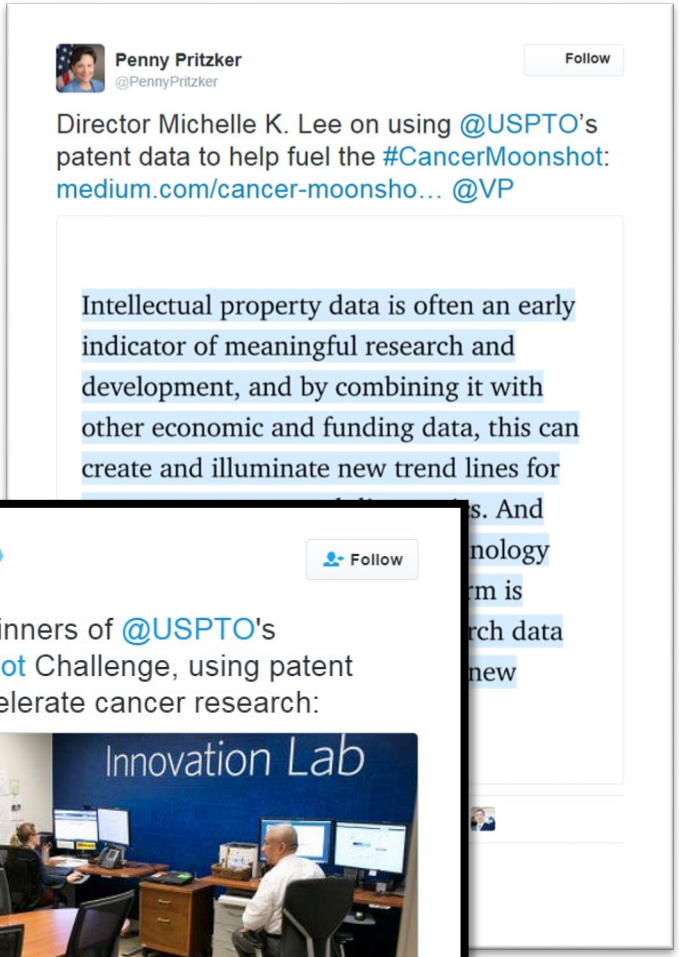
WH Cancer Moonshot

Importance of Patent Data to guide policy and research





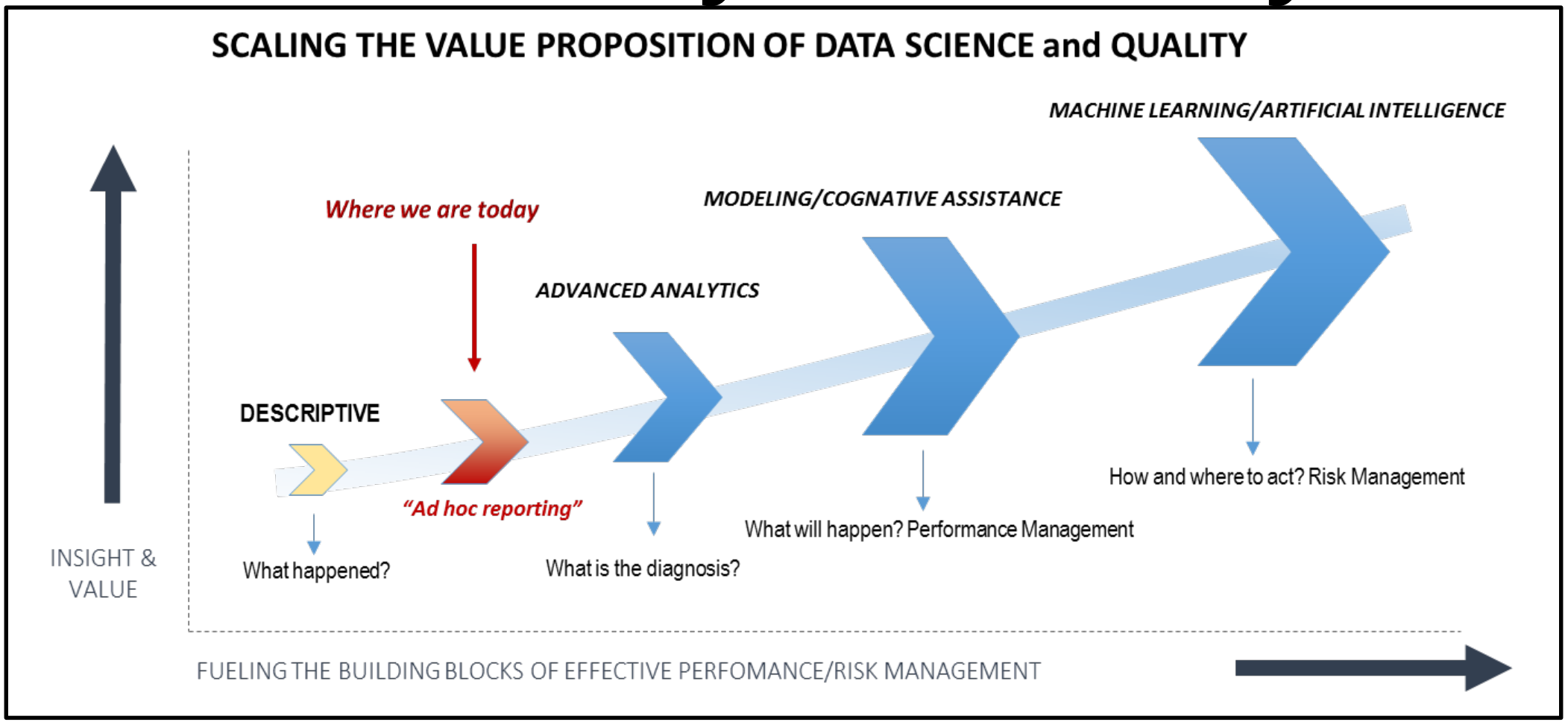


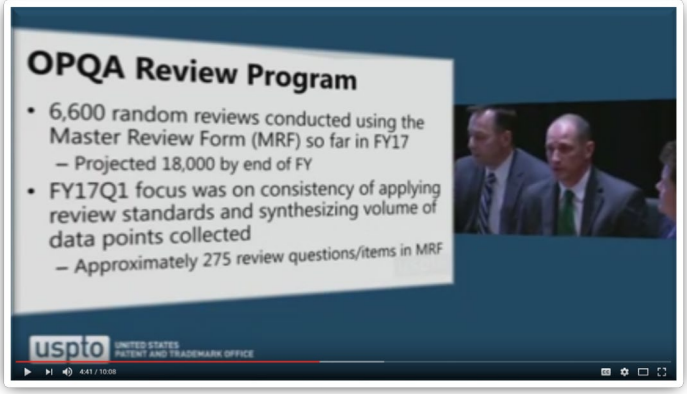


Essential for becoming data driven

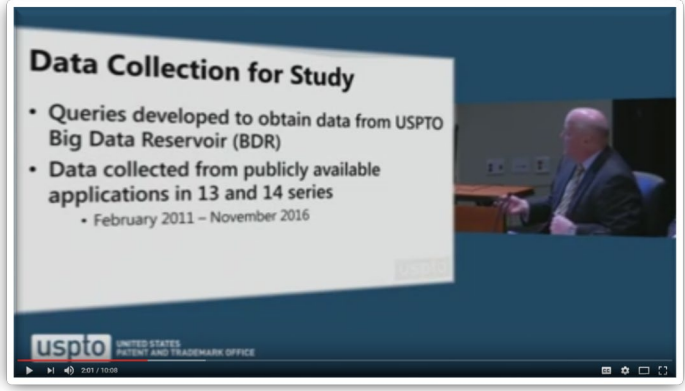
Part 2: Big Data

USPTO data/analytics maturity

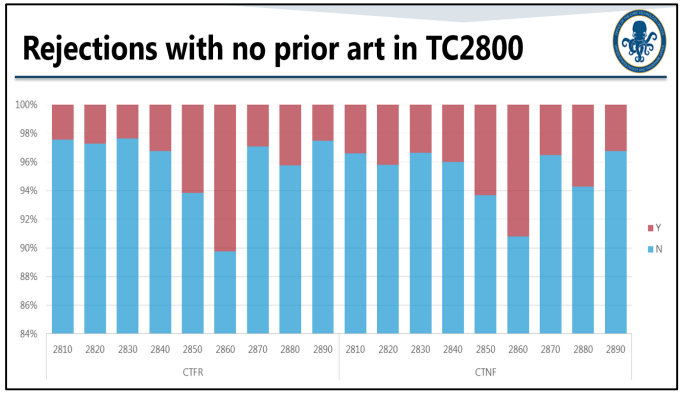




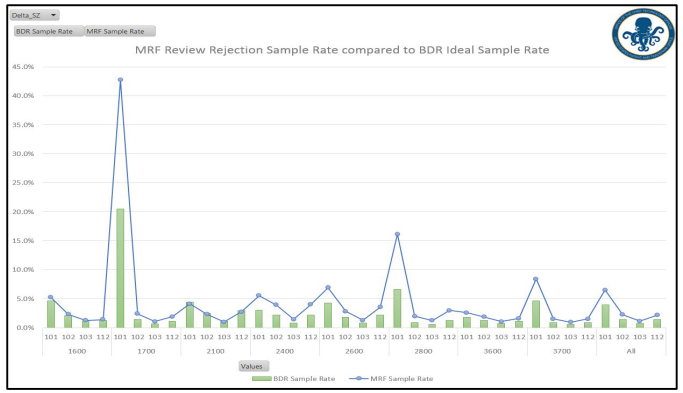
We need to give you enough data points so you can really understand these compliance rates targets . . . are reflective of what's going on



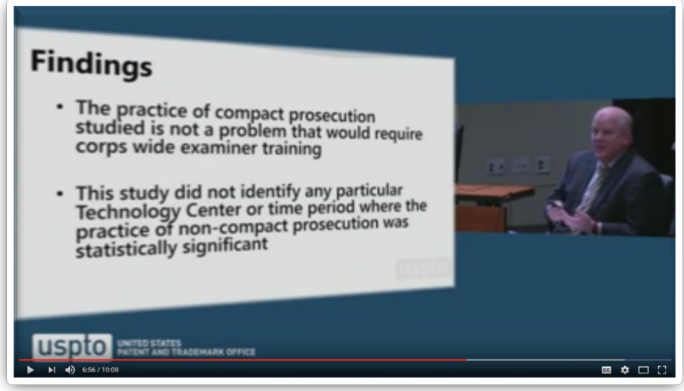
We really used our big data team . . . to determine 0.26% [out of 1.5 million] applications did not practice compact prosecution



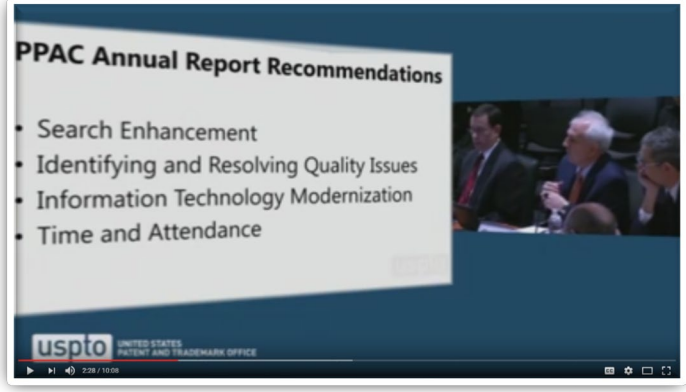
We need to leverage data to identify hotspots and . . shine the light on trying to get more consistent in our determinations



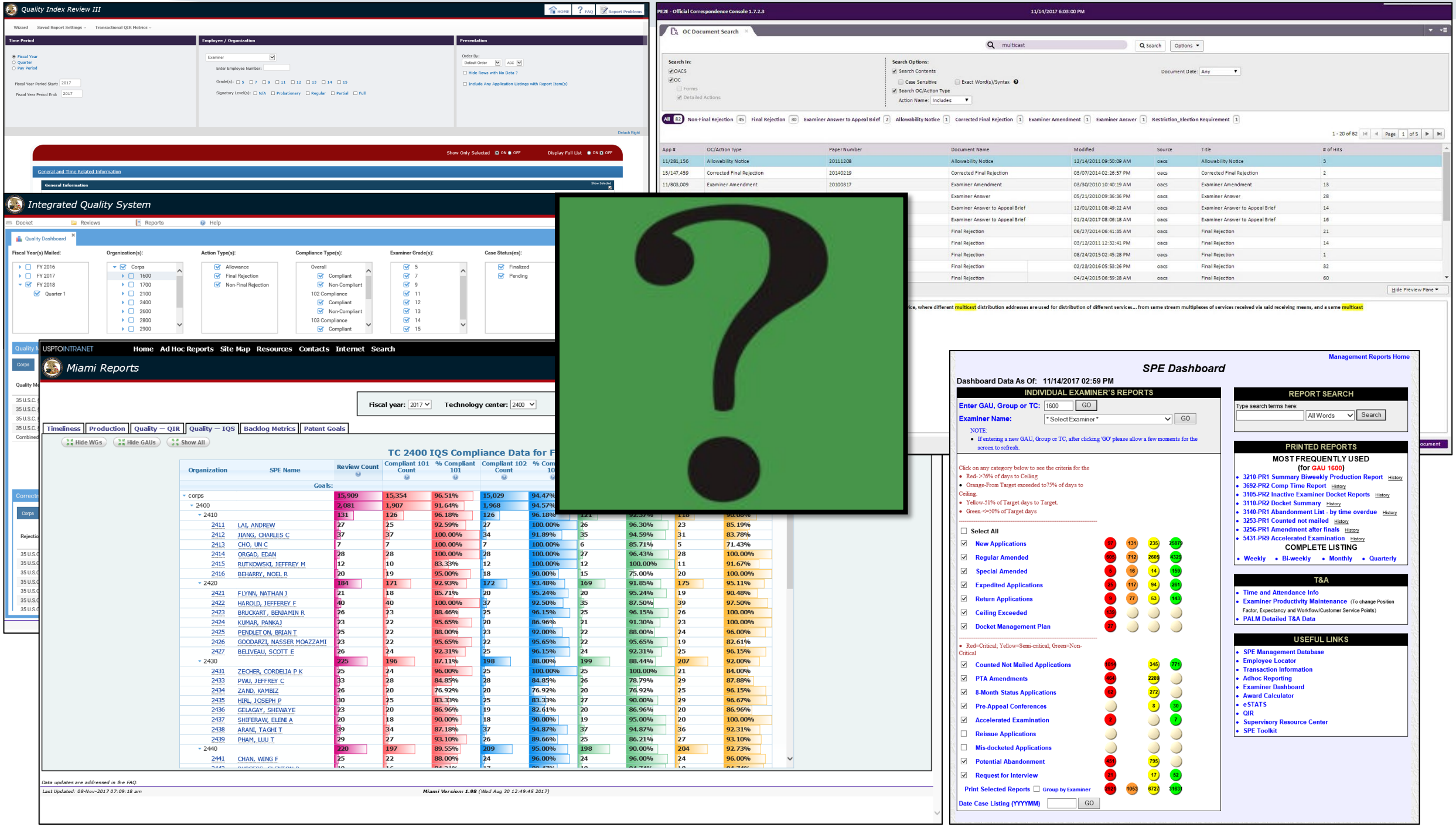
MRF sample rate confidence study



Compact Prosecution Topic Submission study



Identification of consistent work study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Red- >76% of days to Ceiling
Orange-From Target exceeded to75% of days to Ceiling.
Yellow-51% of Target days to Target.
Green-<=50% of Target days
Select All
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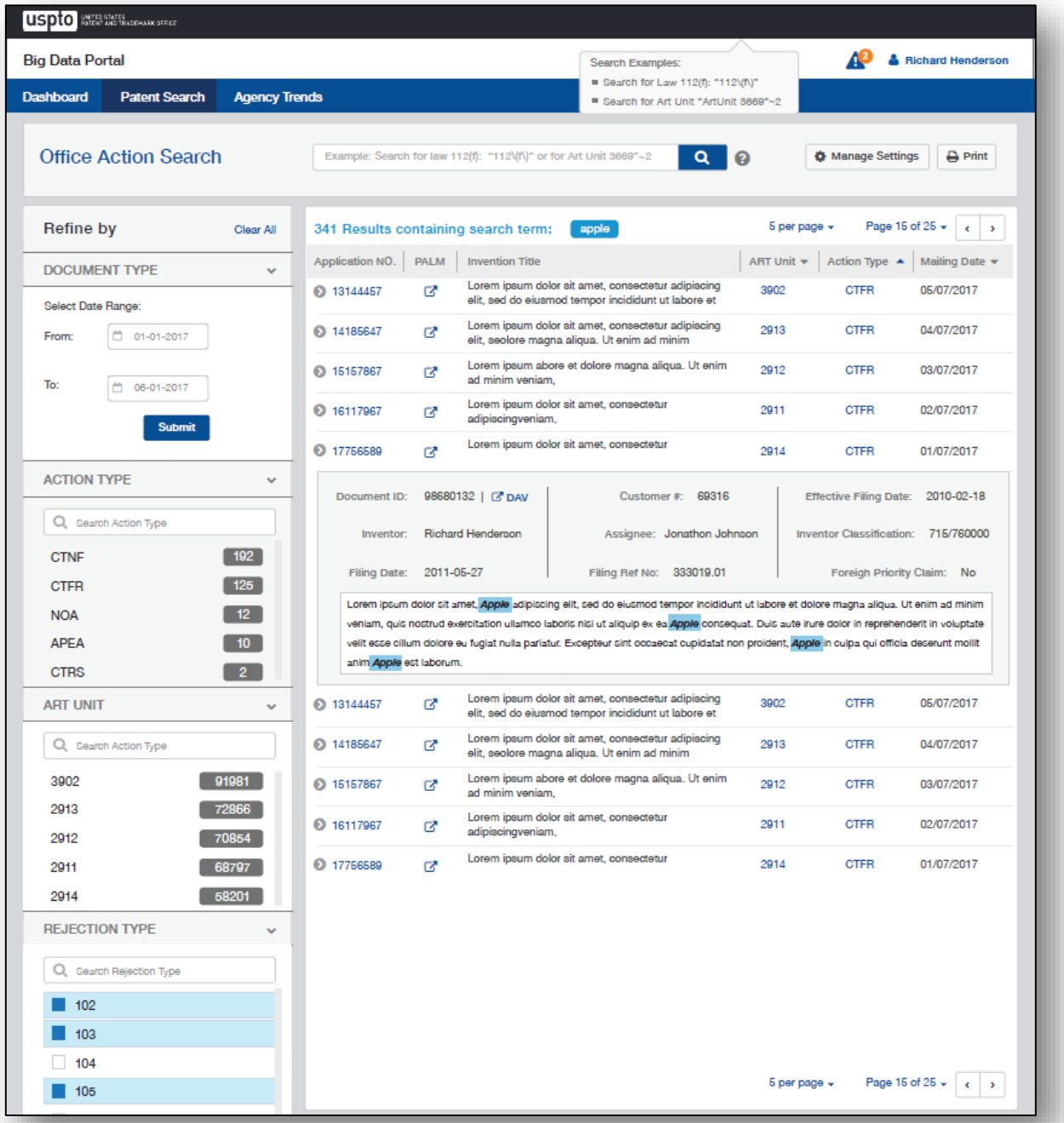
Award Calculator
eSTATS
QIR
Supervisory Resource Center
SPE Toolkit

Self–service analytical tools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Inventor: Richard Henderson
Assignee: Jonathon Johnson
Inventor Classification: 715/760000
Filing Date: 2011-05-27
Filing Ref No: 333019.01
Foreign Priority Claim: No
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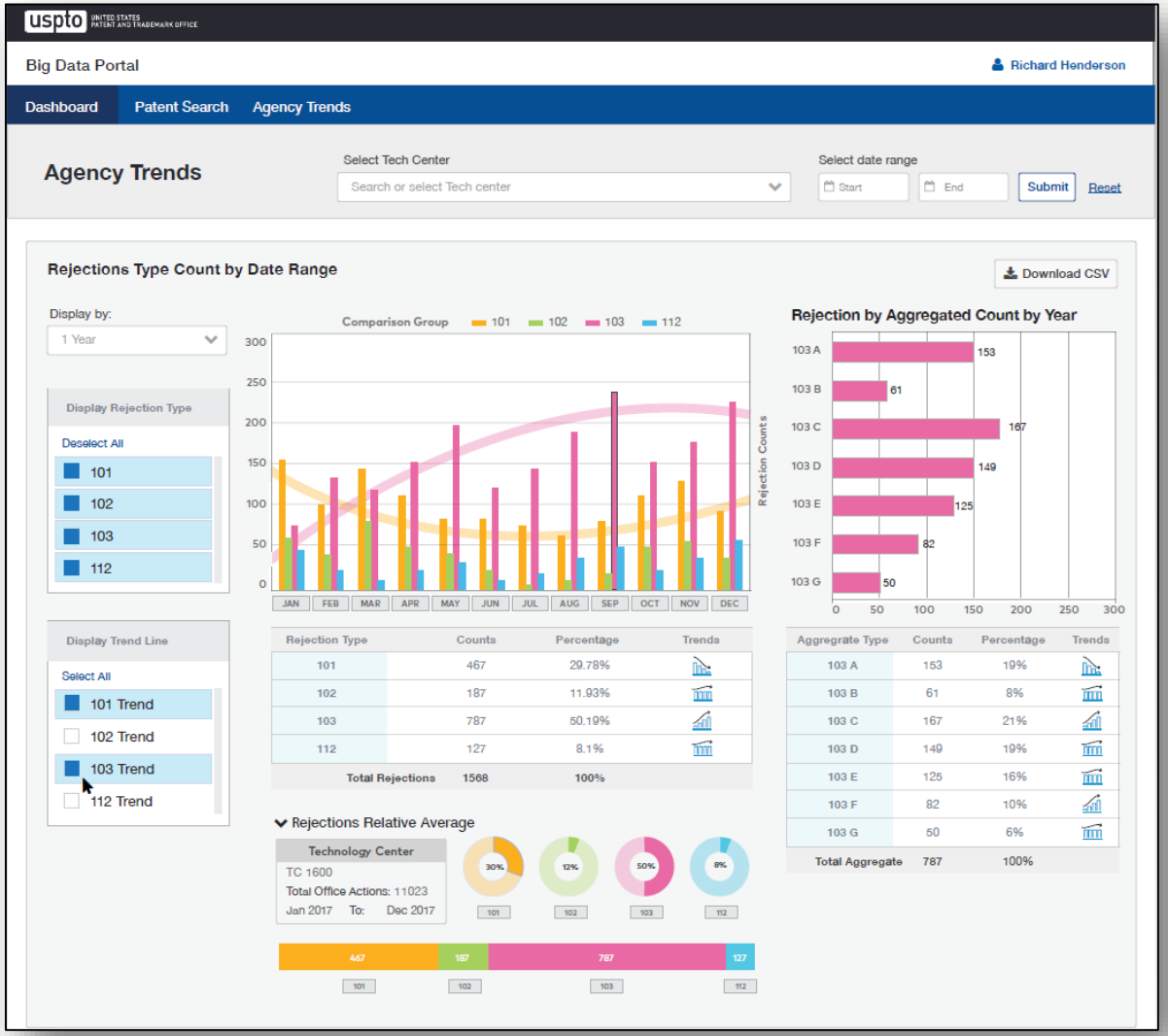
Page 15 of 25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Patent Search
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Agency Trends
Select Tech Center
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Start
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Rejections Type Count by Date Range
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102 Trend
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112 Trend
Comparison Group 101 102 103 112
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50
0
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Rejection Counts
Rejection Type Counts Percentage Trends
101 467 29.78%
102 187 11.93%
103 787 50.19%
112 127 8.1%
Total Rejections 1568 100%
Rejections Relative Average
Technology Center
TC 1600
Total Office Actions: 11023
Jan 2017 To: Dec 2017
30%
12%
50%
8%
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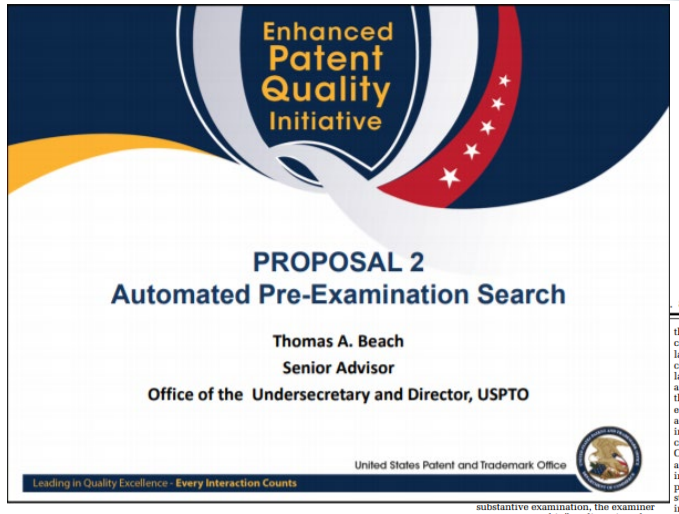
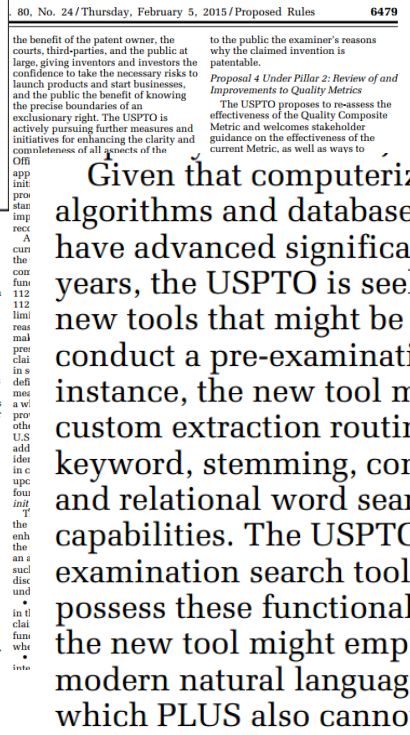
102
103
112
467
187
787
127
Rejection by Aggregated Count by Year
103 A 153
103 B 61
103 C 167
103 D 149
103 E 125
103 F 82
103 G 50
0 50 100 150 200 250 300
Aggregate Type Counts Percentage Trends
103 A 153 19%
103 B 61 8%
103 C 167 21%
103 D 149 19%
103 E 125 16%
103 F 82 10%
103 G 50 6%
Total Aggregate 787 100%





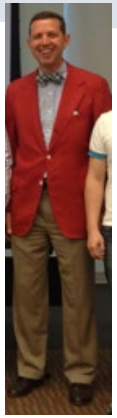
substantive examination, the examiner may request, at his/her discretion, that the USPTO's Scientific and Technical Information Center (STIC) perform an automated pre-examination search. To do so, STIC uses a computerized linguistic tool, called the Patent Linguistic Utility Service (PLUS), which includes an algorithm to analyze an application for the presence of frequently-used terms. STIC then searches a database of prior art limited to U.S. patents and U.S. patent application publications for references containing those terms to generate a list of possible references for the examiner's consideration with the frequently-used terms highlighted. With these references in hand as a starting point, the examiner is positioned to begin substantive examination, which includes their own search of the prior art done based upon a review of the specification and actual claim language (as opposed to mere frequently-used terms).

Given that computerized searching algorithms and database technologies have advanced significantly in recent years, the USPTO is seeking input on new tools that might be useful to conduct a pre-examination search. For instance, the new tool might utilize a custom extraction routine that enables keyword, stemming, concept-semantic, and relational word searching capabilities. The USPTO's current pre-examination search tool PLUS does not possess these functionalities. Likewise, the new tool might employ more modern natural language search queries, which PLUS also cannot do.

Given that computerized searching algorithms and database technologies have advanced significantly in recent years, the USPTO is seeking input on new tools that might be useful to conduct a pre-examination search. For instance, the new tool might utilize a custom extraction routine that enables keyword, stemming, concept-semantic, and relational word searching capabilities. The USPTO's current pre-examination search tool PLUS does not possess these functionalities. Likewise, the new tool might employ more modern natural language search queries, which PLUS also cannot do.

2015/2016 – Automated Pre-search (APES)

Start of AI search efforts



Finding Prior Art for Patent Examination: A Machine Learning Approach

Joe Bailey, PhD
Edison Scholar, USPTO

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N9-617-027

FEBRUARY 2, 2017

PRITHWIRAJ CHOUDHURY
TARUN KHANNA
SARAH MEHTA

The Future of Patent Examination at the USPTO

2016/2017 – Sigma Plus

The first "use case" my team decided to address with a big data approach was "consistency" of patent examination. .... we can still do more with **our wealth of data**—for example, supplementing the examiner's manual searches of prior art **with automated searches using artificial intelligence techniques**.

- Michelle K. Lee

Serco Awarded $95 Million Patent Classification Contract with the U.S. Patent and Trademark Office

November 30, 2015

RESTON, VA – November 30, 2015 – Serco Inc., a provider of professional, technology, and management services, announced today the Company has been awarded a patent classification services contract with the United States Patent and Trademark Office (USPTO). Serco will provide initial patent classification and reclassification services to support USPTO's core mission of examining, granting, and disseminating patents and trademarks. The recompete contract has a one-year base period with four one-year option periods, and is valued at $95 million over the five-year period, if all options and award terms are exercised.

$$\text{score}(C|\text{claim text}) = \Sigma_i \ \text{idf}(\text{word}_i) * \log(\text{tf}(\text{word}_i|C))$$

Start of AI efforts to predict classification

```
NBC_weights('A computer with a flat screen.', weights_reg, top20_codes, idf=idf, rmv_stop_words=False)

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    .10070392573702), ('514', -121.84196478069018)]
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Building the foundation

Lesson #2: Roadmaps will be fluid

Chapter three –
The investor turns up the heat

It's an honor to share the stage with my immediate predecessor, Michelle Lee, who initiated a Big Data program that not only supports what we currently do at the USPTO, but also serves as the foundation for future AI development at the agency.

As director of the USPTO, one of my top priorities is making sure the United States remains the market of choice when it comes to innovation, especially in the emerging technologies of the future, including AI and machine-learning technologies.

Remarks by Director Iancu: 2018 National Lawyers Convention
https://www.uspto.gov/about-us/news-updates/remarks-director-iancu-2018-national-lawyers-convention

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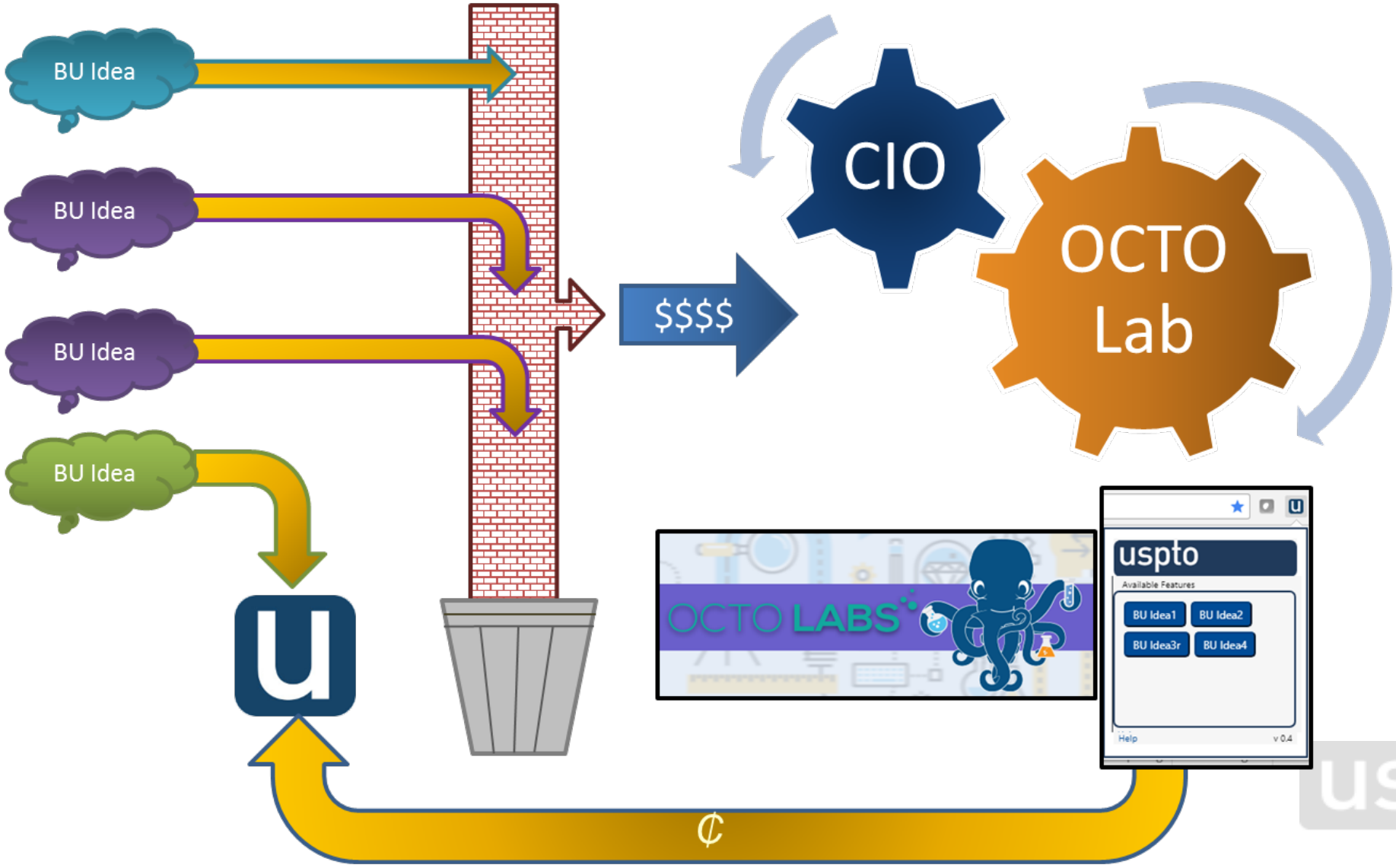
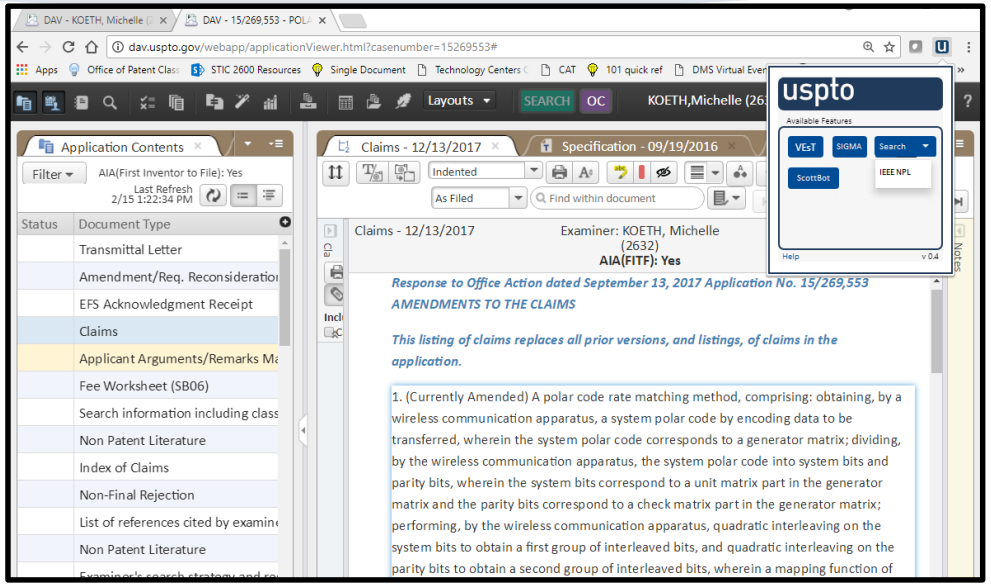
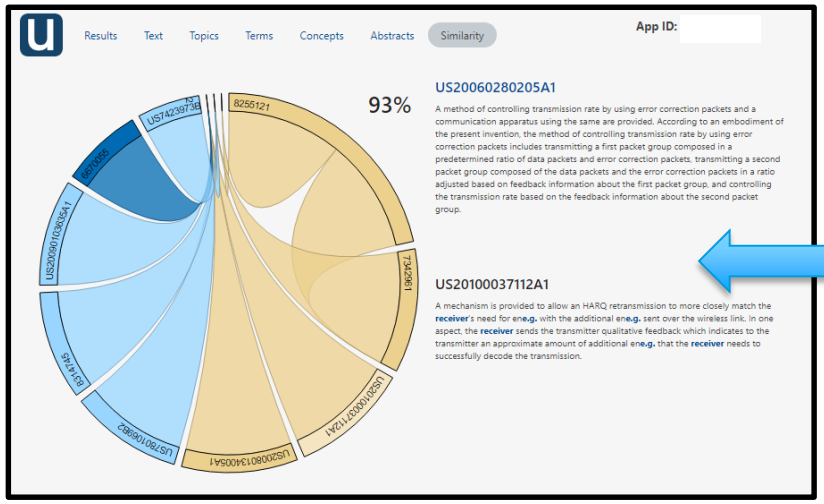
New relationship approach





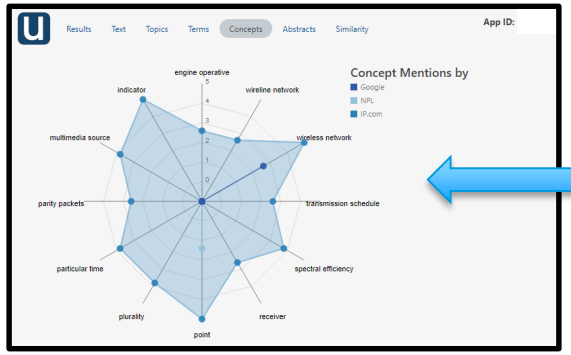
- Chrome extension provides extensible architecture to rapidly deliver ‘BETA’ features
- Cognitive assistant to augment PE2E or other web-based tools
- Integrated IDE to support business unit development of features

Analysis of application to provide starting point for patent search/examination



"One-Click" Patent, Pre-Grant, Foreign and NLP Through ensemble AI ranked relevancy federated search results

AI search



Application 15/

Metadata

Title:
Status:
Examiner #:
Application #:
Inventors
Effective Date:
Applicants:
USPC:
AIA:
Filing or 371:
Art Unit:

Prior Art Recommendations

Image Search

Doc ID	Figure	Title
20120213283	4	Method of decoding a sequence of encoded digital images
20130044331	7	Overlay metrology by pupil phase analysis
20120219064	2	Hierarchy of motion prediction video blocks
20150117531	4	Method of decoding moving pictures in intra prediction
9445127	4	Method of decoding moving pictures in intra prediction

Federated Search

Pub #	Source	Title
US20170005753	ipcom	Polar code rate matching method and rate matching apparatus
US20170012739	ipcom	Polar code rate matching method and apparatus
US20170012740	ipcom	Polar code rate matching method and polar code rate matching apparatus
EP3073660A1	ipcom	Polar code processing method and device

Global Dossier

Pub #	Title
CN101557283A	Approach and system for alternating retransmission bits
CN101442383A	Bit priority mapping method for high-step modulation
WO2008119048A2	CIRCULAR BUFFER BASED RATE MATCHING
US20090049359A1	CIRCULAR BUFFER BASED RATE MATCHING
CN101119182A	Bit priority selection method of high-order modulation

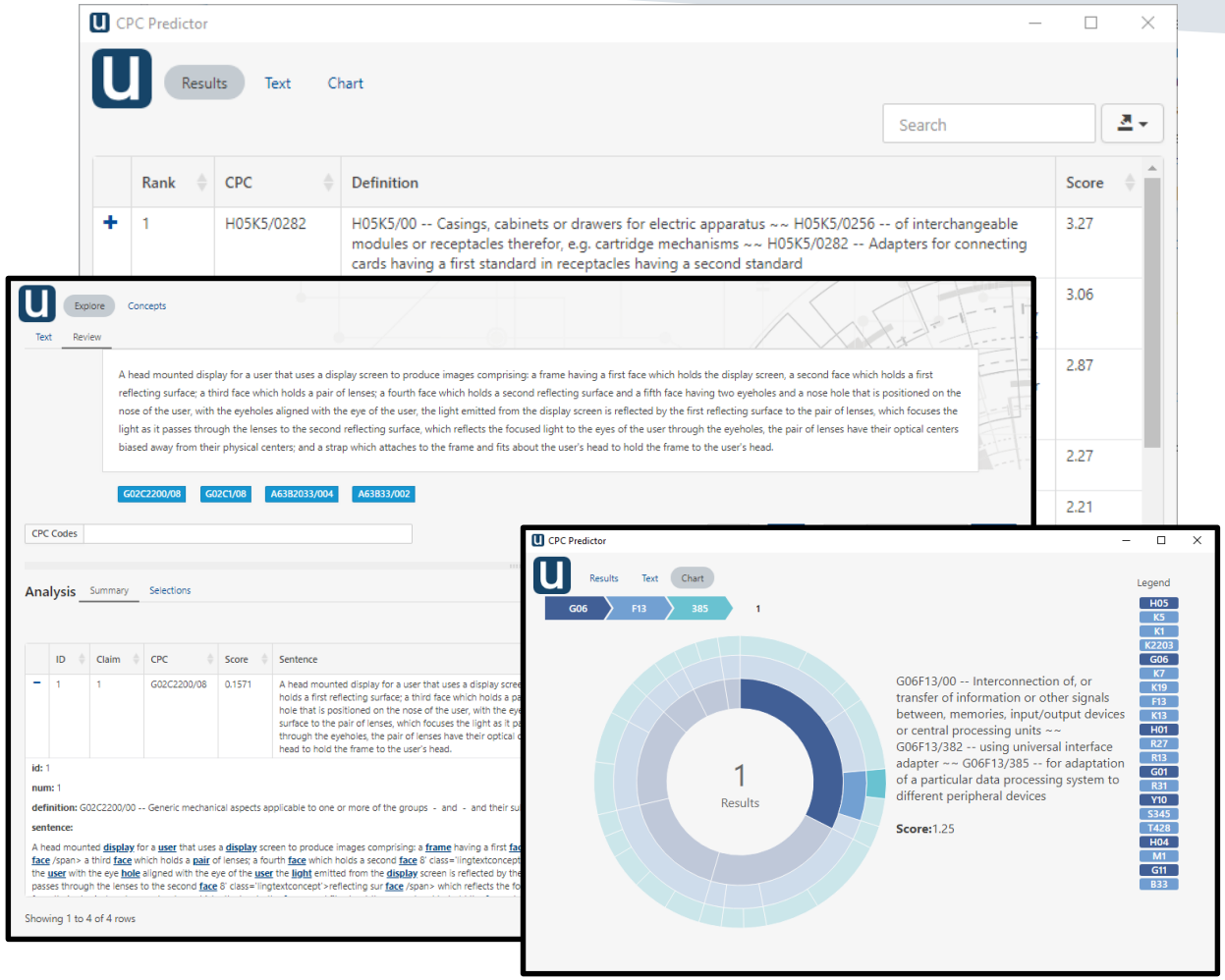
Non-Patent Literature

Source	Title
ieee	Circular Buffer Rate-Matched Polar Codes
ieee	HARQ Rate-Compatible Polar Codes for Wireless Channels
ieee	Bit-interleaved polar-coded OFDM for low-latency M2M wireless communications
ieee	BER comparison between Convolutional, Turbo, LDPC, and Polar codes
ieee	BER performance of a polar coded OFDM over different channel models

Topics & Areas to Search

Related Information

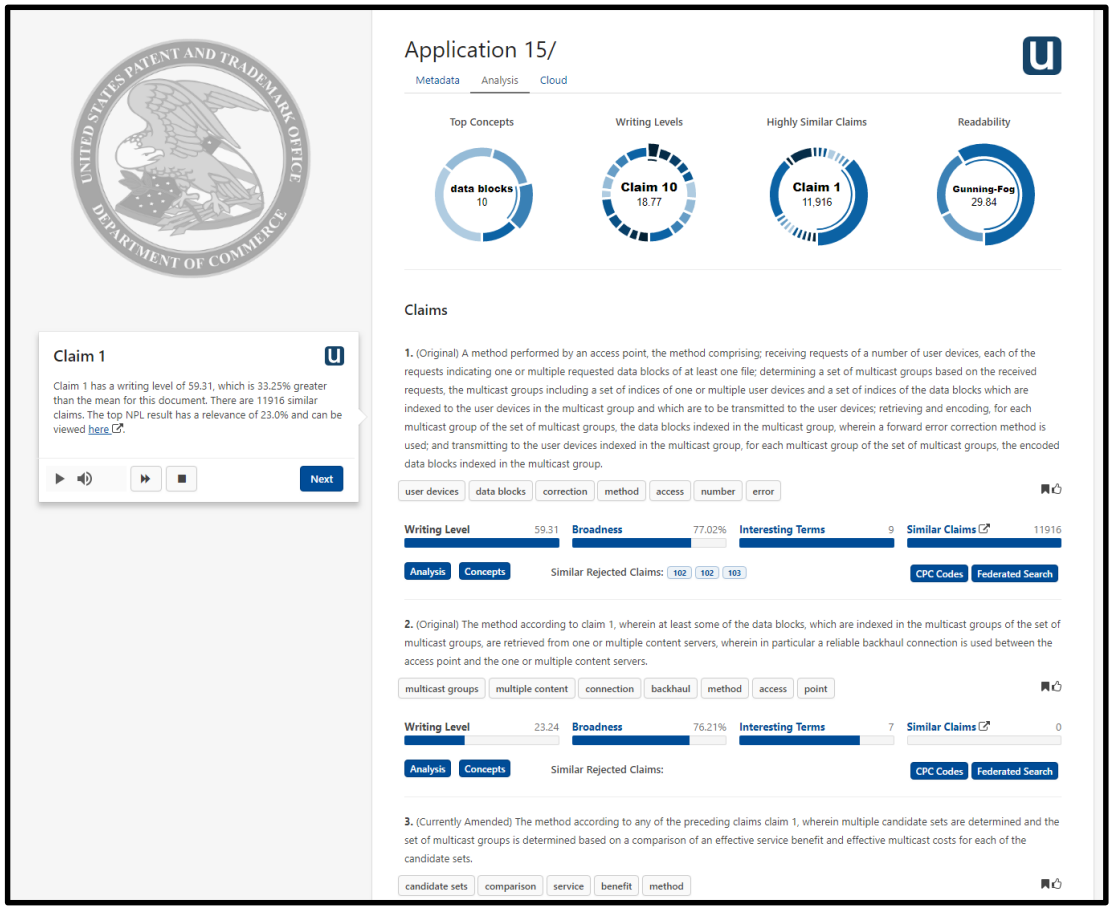
Back to top



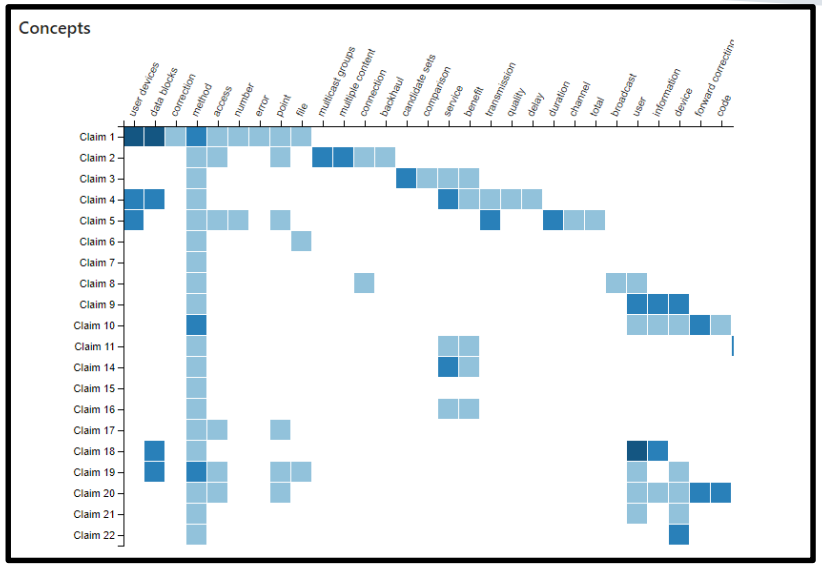
Ensemble Supervised/Unsupervised Machine learning explaining classification for any user selected text or document

Classification

Automatic application analysis for immediate discovery of related information



Application analysis



Density of inventive features/phrases by claim

Similar Figures

	DocID	Title	ID	Figure1
1	20130128980	Motion vector predictive encoding method, motion vector decoding method, predictive encoding apparatus and decoding apparatus, and storage media storing motion vector predictive encoding and decoding programs	1	

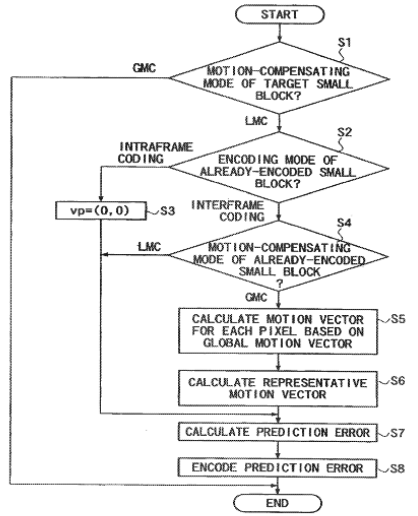
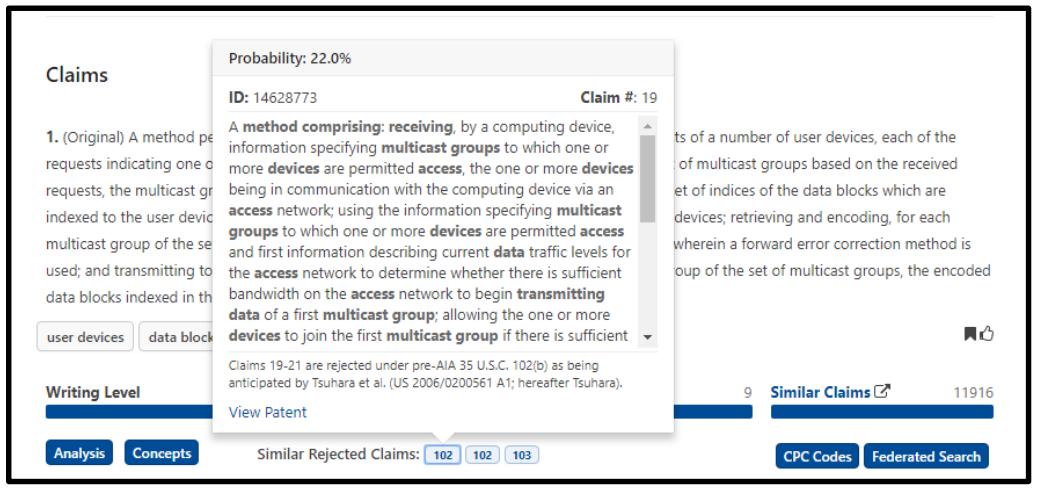
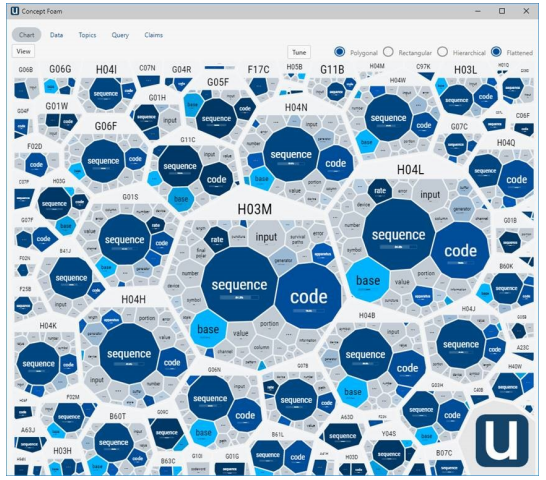


Figure similarity to other applications

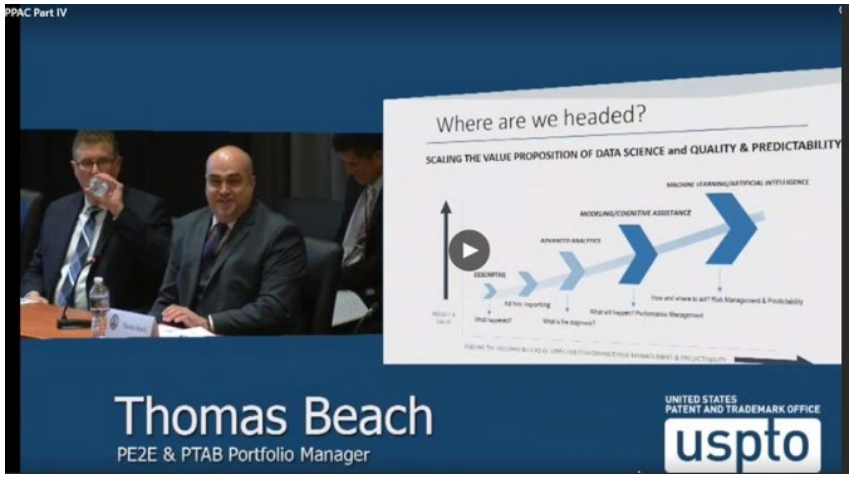


Basis of similarly rejected claims



Application concepts

The investment realized



August 2018 – 1st PPAC Presentation on AI efforts

January 2019 – AI: Intellectual Property Policy Considerations Event

(Next Slide)

September 2018 – RFI to improve Patent search

The RFI aims to "explore developing market interest-capacity in supplying a lightweight plugin(s) and/or widget technology to augment current USPTO search capabilities."

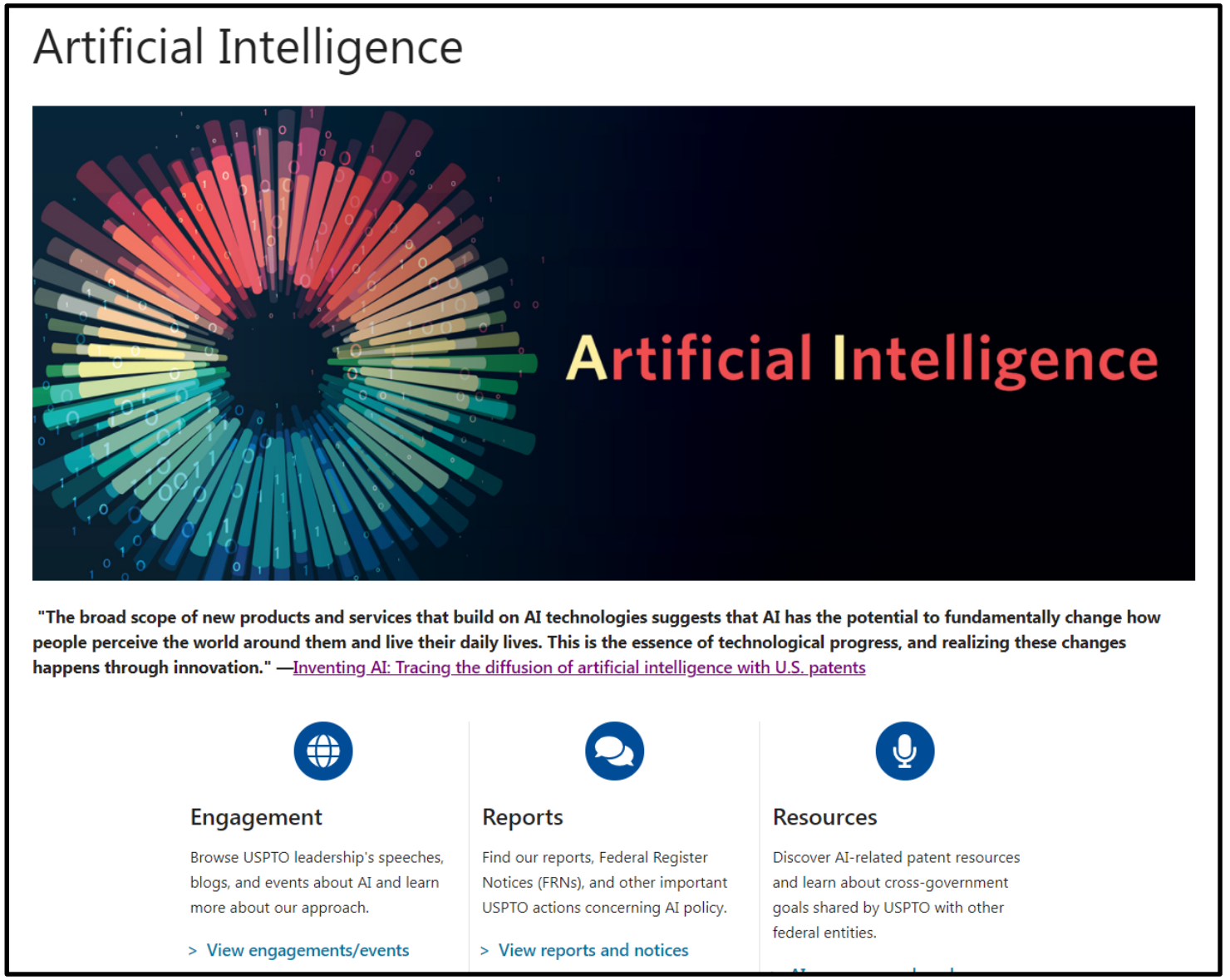
November 2019 - Patent AI Plugin (PAIP) award and codebase Accenture/Google

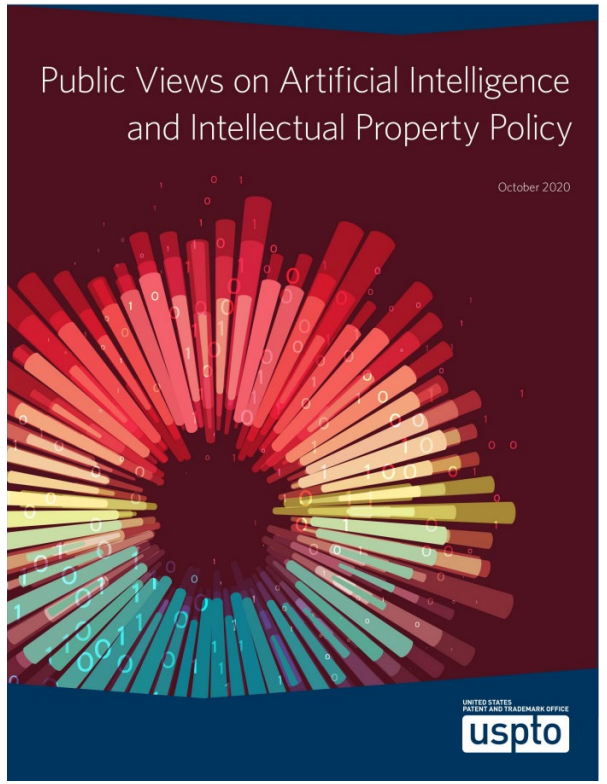
April 2019 - 1st USPTO AI Production delivery: Enriched Citation

December 2019 - Auto-classification production delivery

October 2021 – 1st AI Search feature examiner production delivery

The investment realized





https://www.uspto.gov/initiatives/artificial-intelligence

Melting the middle

Lesson #3: Innovation injections work

Director

Policy

International

Operations

Management

Employees

Public

Chapter four – The future

**“Aim for the moon.
If you miss, you may hit a star.**

W. Clement Stone

Chapter four – The future

“Good entrepreneurs don’t set out to disrupt”, Harvard Business Review, May 8, 2020

Jim McKelvey

The focus of the entrepreneur is on the horizon beyond the wall. If we glance at the system, it is neither to copy it nor to destroy it, but simply to see how much more can be done.

“Getting AI to Scale”, Harvard Business Review, May-June 2021

Tim Fountaine / Brian McCarthy / Tamim Saleh

To capture the full promise of AI, however, companies must reimagine their business models and the way work gets done. They can’t just plug AI into an existing process to automate it or add insights.

Key lessons from the journey

1. Buy-in is never optional
2. Roadmaps will be fluid
3. Innovation injections work

<--- Your AI journey needs a platform to support change!

uspto

Special thanks to travelers on the Journey

Ajay Kundaria
Amanda Myers
Chungchen Yen
Darren Govoni
Dominic Nguyen
Don Cenkci
Elaine Greene
Gray Achiu
Heather Hogue
Henok Mikre
Jesse Frumkin
Jill Leyden
Jocelyn Ram
Ketki Dhanesha
Kiran Gunda
Michelle Koeth
Qiang (John) Lu
Rob Harris

And many more!

Thank you!

Scott Beliveau

Chief of enterprise advanced analytics

Director of enterprise data architecture

Lead product owner for data and analytics

USPTO AI program lead

Scott.Beliveau@uspto.gov

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www.uspto.gov