Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada
Canada

# 2019 Intellectual Property Awareness and Use Survey

Teodora Cosac - MFPB

March 2021

# IP and Innovation

- IP protection is credited with significant contributions toward innovation and economic growth. IP constitutes one *measurable* component of innovation.

- Studies have used the number of patents or registered trademarks as proxy measures of country innovativeness. However:
  - Not all inventions are formally protected by an IP right
  - Not all IP rights have economic value
- Little research and analysis that addresses key policy questions as related to IP, i.e.
  - Is there a link between use of formal IP and firms' economic performance?
  - Is IP ownership by Canadian firms benefiting the economy? If yes, how?

Firm level analysis can shed light into whether and how IP contributes to business success

# Canadian data on IP

- Canadian Intellectual Property Office (CIPO) administrative data
  - Data not collected with a view to support policy development
  - Limited to IP filed/registered in Canada (not by Canadians)
  - Not focused on businesses (large part of CIPO clients are individual inventors and creators)

- Statistics Canada
  - Innovation surveys collect little info on IP
    - Survey of Innovation and Business Strategies (SIBS) – focus on companies with more than 20 employees
    - Survey on Financing and Growth of Small and Medium Enterprises – focus on SMEs
  - Survey of Intellectual Property Management (SIPM, 2010) – data on select innovative industries only
  - LFE linked patent record data (CIPO, USPTO, PATSTAT)

- WIPO
  - Aggregate data on patents, trade-marks, industrial design *by Canadians* and *in Canada*

- Other data
  - Collected by government programs at either the application or post-funding phases

# Why a new survey on IP?

- Complement existing data on IP (CIPO, surveys, WIPO etc.) and Statistics Canada LFE
- Establish a baseline for the effectiveness of the IP strategy
- Address both Awareness and Use of IP
- Profile the "non-users", identify challenges and understand IP decisions
- Get a better understanding of whether and why businesses think IP is relevant for growth
- Collect data on under-represented groups (businesses governed/owned by women, new Canadians, and Indigenous entrepreneurs).

# Collaboration with Canada's National Statistical Agency

- ISED and CIPO collaborated with Statistics Canada to sponsor the Survey of Intellectual Property Awareness and Use (IPAUS)—the first survey of its kind in Canada
- Benefits of working with Statistics Canada
  - ✓ Canada's National Statistical Agency with reputable statistics
  - ✓ Access to Business Register of all businesses in Canada to ensure proper coverage
  - ✓ Content development and questionnaire testing
  - ✓ Electronic Questionnaire as collection vehicle
  - ✓ Advanced Scientific methodology for sampling, weighting and estimation
  - ✓ Well-developed processing system for edit and imputation
  - ✓ Experienced data analysts
  - ✓ Quality estimates
  - ✓ Dissemination on Statistics Canada's website
  - ✓ Data linkage in Statistics Canada's Linkable File Environment
- Results:  thousands of data points available for input into evidence-based policy making.

# Intellectual Property Awareness and Use Survey (IPAUS)

- Project commenced in 2018, part of the National IP Strategy
- The IPAUS survey targets
  - 16,000 enterprises in Canada in all sectors of the economy (including 2 special groups: ICT and clean tech)
  - small, medium and large firms (by employment)
  - 4 regions (Atlantic, Quebec, Ontario, rest of Canada)
- Survey in the field from November 2019 to February 2020
  - Response rate over 75% (consistent across size/sector/geography segments)
- Release date: February 2021

# IPAUS collected data on…

## … business structure and executive demographics;

- age of the business, governance, owner and executive demographics

## … intellectual property awareness

- familiarity with different types of IP
- consultation/use of experts on IP
- sources of information consulted
- type of information sought
- availability of information

## … intellectual property use

- by types of IP; inside and outside Canada
- Recent filings of IP by type and by international jurisdiction
- challenges and obstacles to IP use and with filing/registration process
- strategic business activities associated with IP use, including licensing
- contribution of IP to business performance

## … business structure and activities

- geographic markets for sales, type of products [goods vs services], innovation activities including R&D, funding

# Business Familiarity with IP is…

… positively associated with firm size

… associated with international trade

- Exporters: 76% vs 60% of non-exporters
- Importers: 76% vs 55% of non-importers

… associated with growth

- High-growth firms: 64%, compared to 51% no growth

… associated with obtaining funding

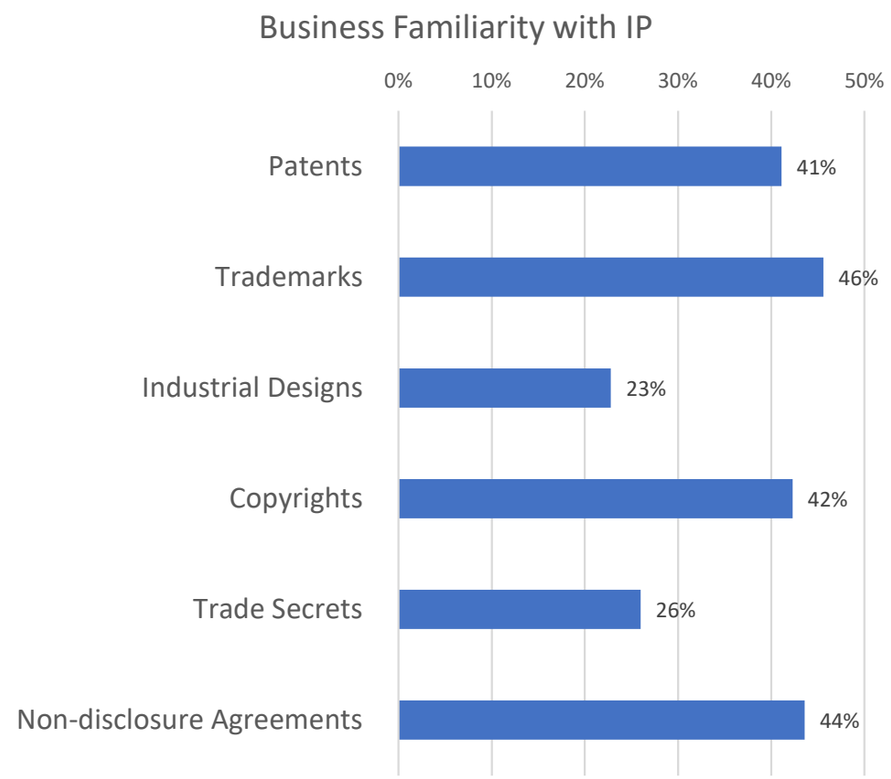
- Firms having received public sector funding: 72%
- Firms having received private sector funding: 70%

… associated with R&D spending

- Firms spending R&D: 84% compared to 55% not spending on R&D

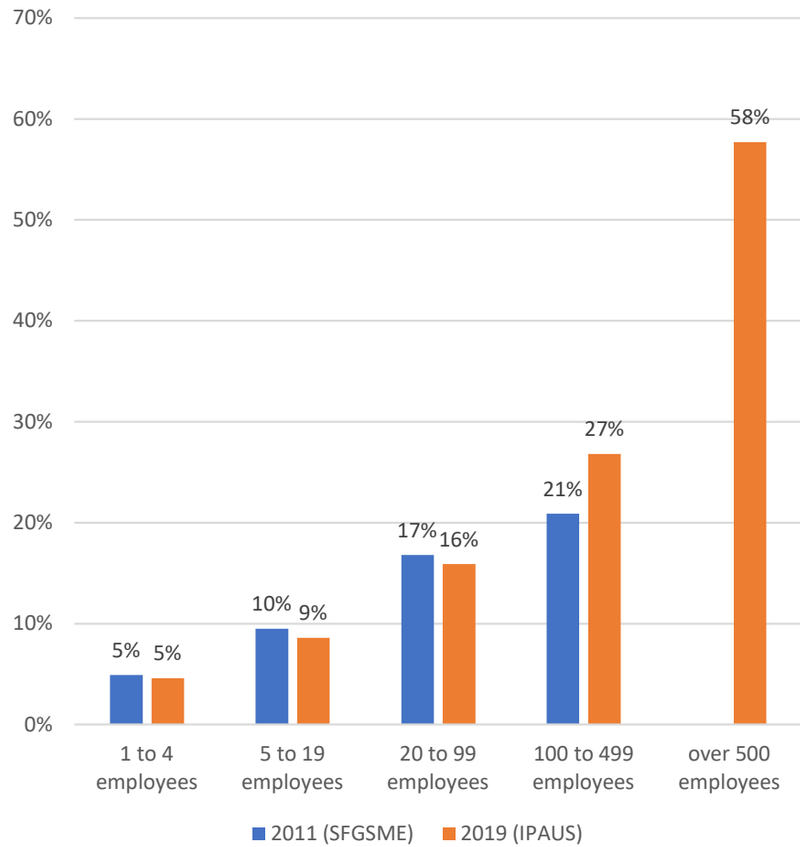
16.3% of enterprises with female primary decision makers were familiar with IP, in comparison with 23.9% of enterprises with male primary decision makers

58% of businesses in Canada are familiar with at least one type of IP



# IP Guidance and Advice

- 7% of businesses sought IP information, guidance or advice
  - 90% of those businesses indicated it was sufficient for their needs
- Exporters were 3.6 times more likely to seek IP information than non-exporters
- High-growth firms were 1.8 times more likely to seek IP information than the average firm
- Innovators (in general) were 4.8 times more likely to seek IP information than non-innovators
- Firms spending in R&D were 6.4 times more likely to seek IP information than those not spending on R&D



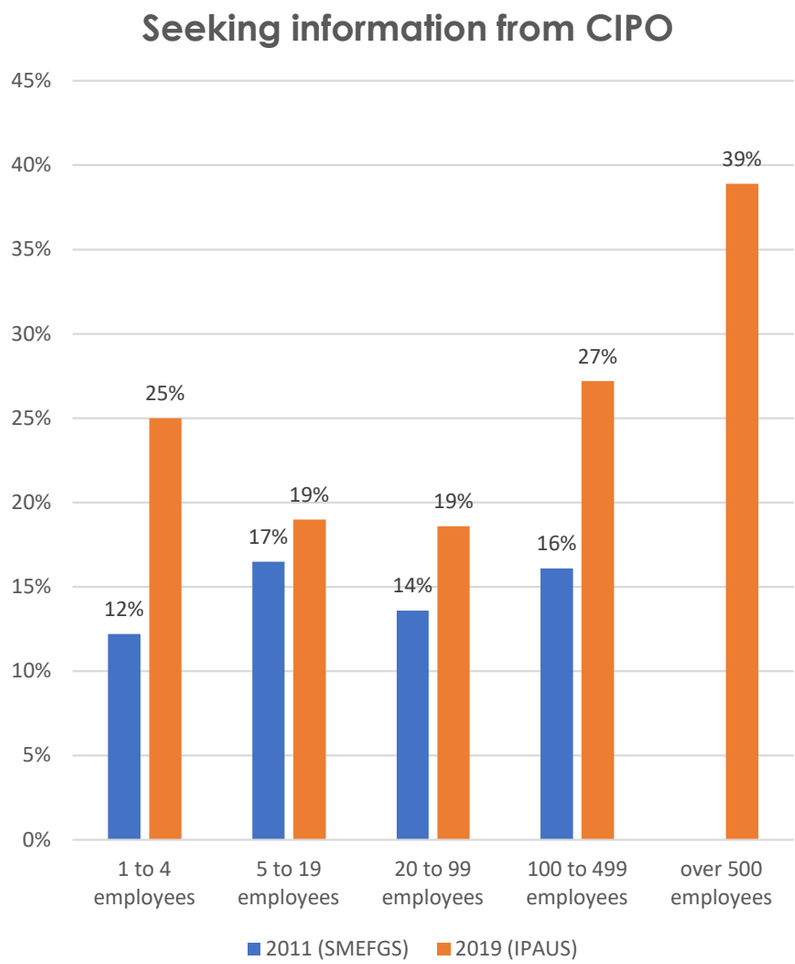

*Data sources: Survey of Financing and Growth of SMEs (SFGSME) and IPAUS*

# Where IP Advice was sought

Of the 7% of businesses that sought IP information, guidance or advice

- 66% - external law firms or lawyers
- 27% - patent or trademark agents
- 22% - CIPO
- 21% - other Canadian government offices
- 13 % - in-house legal counsel
  - Large firms 4.8 times more likely than the average
- 12% - foreign IP offices
  - Large firms 2.5 times more likely than the average
  - Exporters 1.8 times more likely than non-exporters

9.8% of enterprises with female primary decision makers sought advice from IP Strategists, in contrast to just 4.3% of enterprises with a male primary decision maker



# IP topics queried

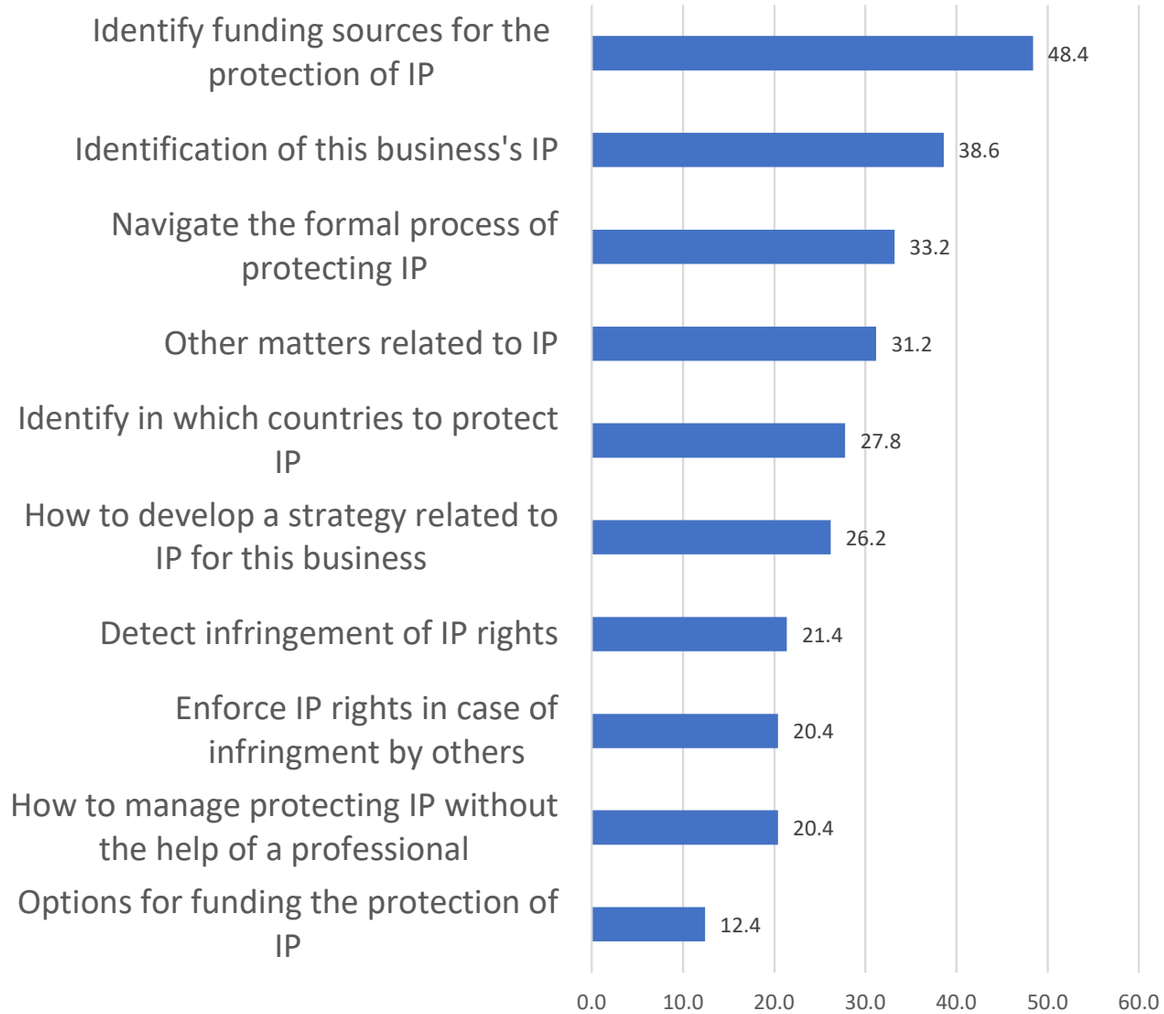
7% of businesses sought IP information, guidance or advice

*How to protect IP without the help of a professional*

*Information on funding IP protection*

*Both*

*negatively associated with firm size*



# Business formally protect their IP…

18% of businesses in Canada own at least one type of formal IP in Canada

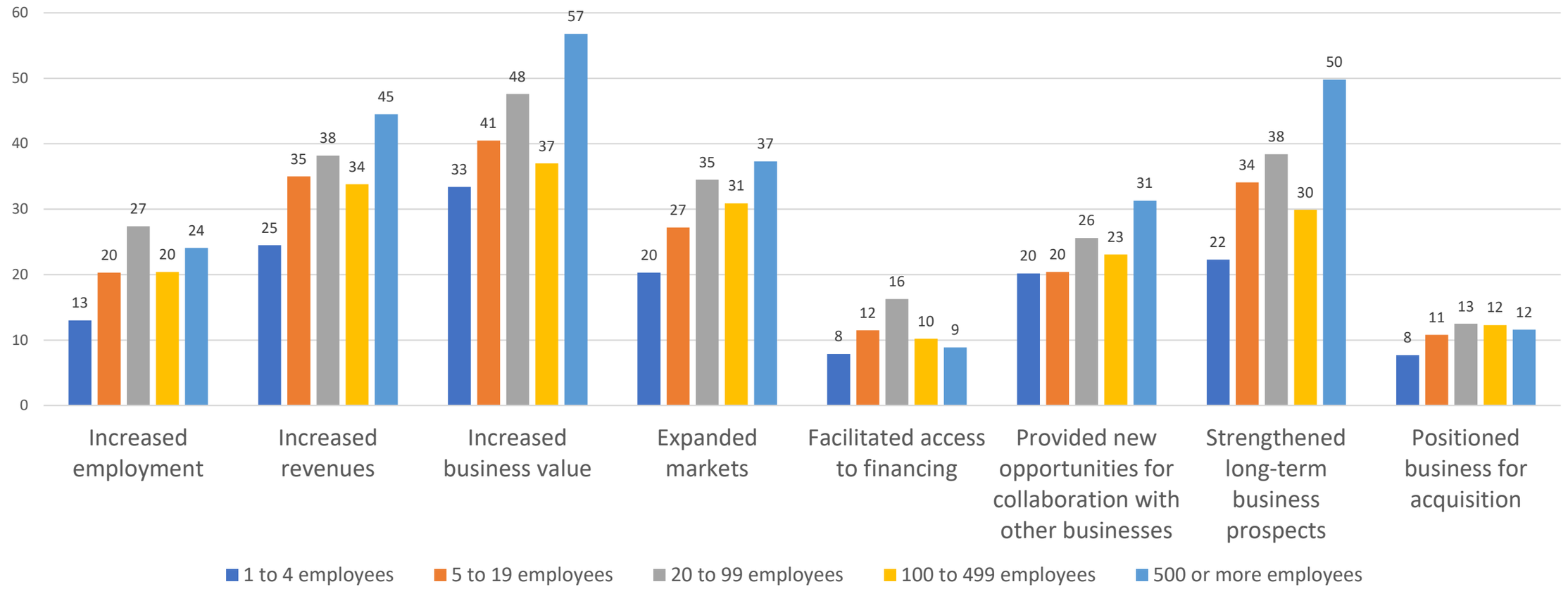
5% of businesses own at least one type of formal IP outside of Canada

- IP ownership is positively associated with firm size; ranges from 14% (firms with 1 to 4 employees) to 73% (large firms)
- IP ownership varies across industries
  - ownership in both Clean Technology Industries and Information and Cultural Industries is 48%
- High-growth firms are twice more likely to own IP than no-growth counterparts
- Exporters are 2.4 times more likely to own IP than non-exporters
- Innovators in general are 2.8 times more likely to own IP than non-innovators
- Firms spending in R&D are 3.4 times more likely to own IP than those not spending in R&D

The degree to which women have ownership in an enterprise is not directly correlated to the propensity of the enterprise having IP in Canada, or abroad.

# IP contribution to business performance

59% of businesses that own IP reported it contributed to their performance



# Recent filing behaviour (2017-2019)

- 4% of businesses in Canada filed for IP protection
  - positively associated with firm size: from 2% (firms with 1 to 4 employees) to 46% (large firms)
- IP filing varied across industries
  - Clean Technology Industries were 5 times more likely to have filed for IP
  - Manufacturing: 2.9 times more likely
- IP filing seems positively associated with:
  - firm growth
  - international trade
  - innovation and R&D spending
- There is almost no difference in filing behaviour of businesses where the primary decision maker is male (4.1%) or female (3.3%).

# Recent filing behaviour (2017 to 2019)

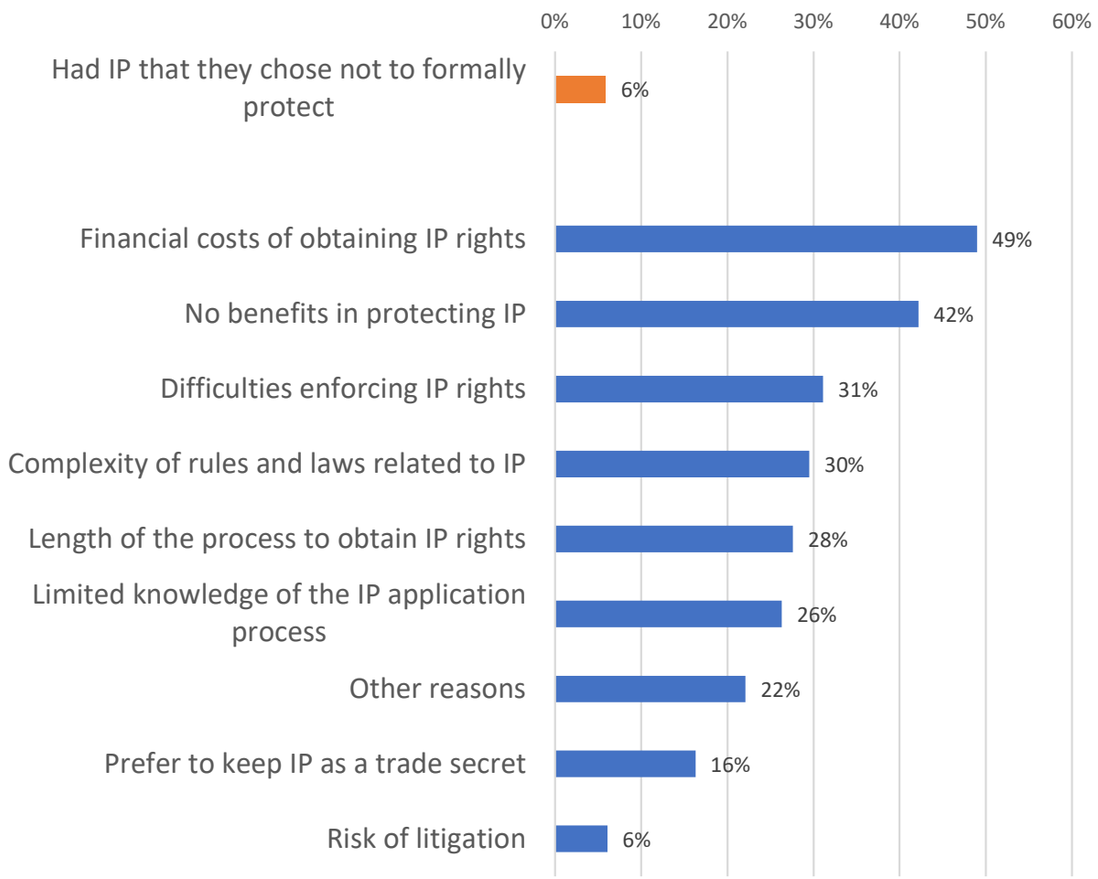
## 4% of businesses in Canada filed for IP protection 2017 - 2019

- 27 % filed for patents
- 73 % filed for trademarks
- 5 % filed for industrial designs
- 15 % filed for copyrights
- 4 % filed for other IP rights

- 96 % filed in Canada
- 47 % filed in the US
- 18 % filed in Europe
- 8 % filed in China
- 4 % filed in Japan
- 11 % filed in other countries or regions

## 86% of businesses encountered no difficulties when filing for IP

# Businesses have IP they decide not to formally protect

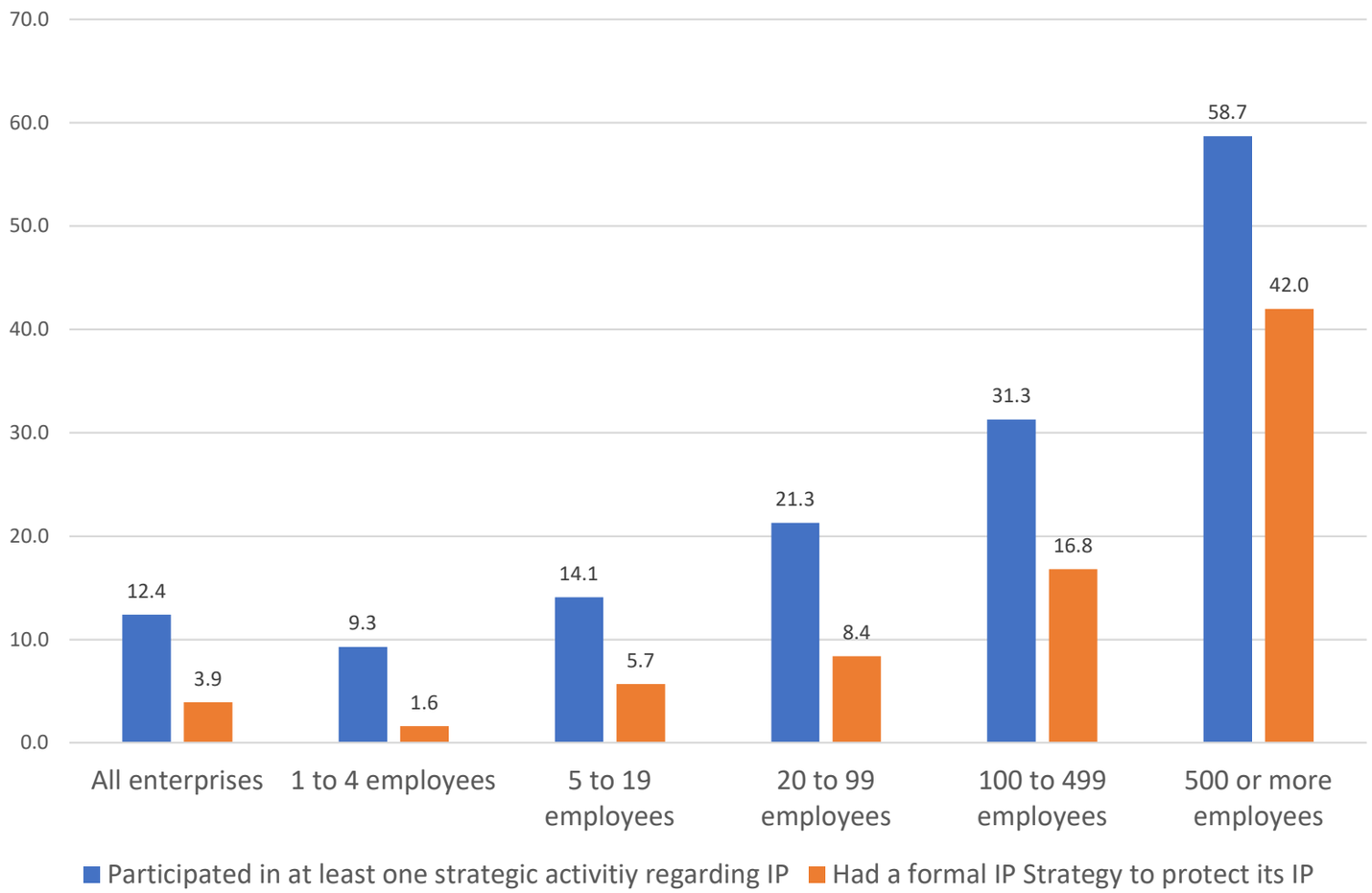



6% of businesses had IP that they chose not to formally protect

16% of those businesses prefer to keep IP as trade secret

Half of those businesses cite financial costs as main reason for not protecting IP

# Strategic Activities Regarding Intellectual Property




12% of businesses participated in at least one strategic activity regarding IP

4% of businesses in Canada had a formal IP strategy to protect their IP

# Having an IP strategy…

## … is associated with firm size

- from 2% among smallest firms to 42% among large firms

## … is positively associated with international trade

- Exporters are 4 times more likely to have an IP strategy than non-exporters
- Importers are 3.2 times more likely than non-importers

## … is positively associated with firm growth

- High-growth firms are 2.5 times more likely to have an IP strategy

## … is positively associated with innovation

- Innovators in general are 4.9 times more likely to have an IP strategy than non-innovators. Product innovators are 7.2 times more likely to have an IP strategy

## … is positively associated with R&D spending

- Firms spending in R&D are 5.9 times more likely to have an IP strategy

# Next steps

- Ongoing collaboration with Statistics Canada, CIPO, ISED-SRRB on further research and analysis using data from the IPAUS and the LFE linked data

- Identify new research partners and opportunities inside and outside the department and the government

- Develop and implement approaches to disseminate research results with a view of increasing impact and raising awareness of research opportunities

# Thank you!

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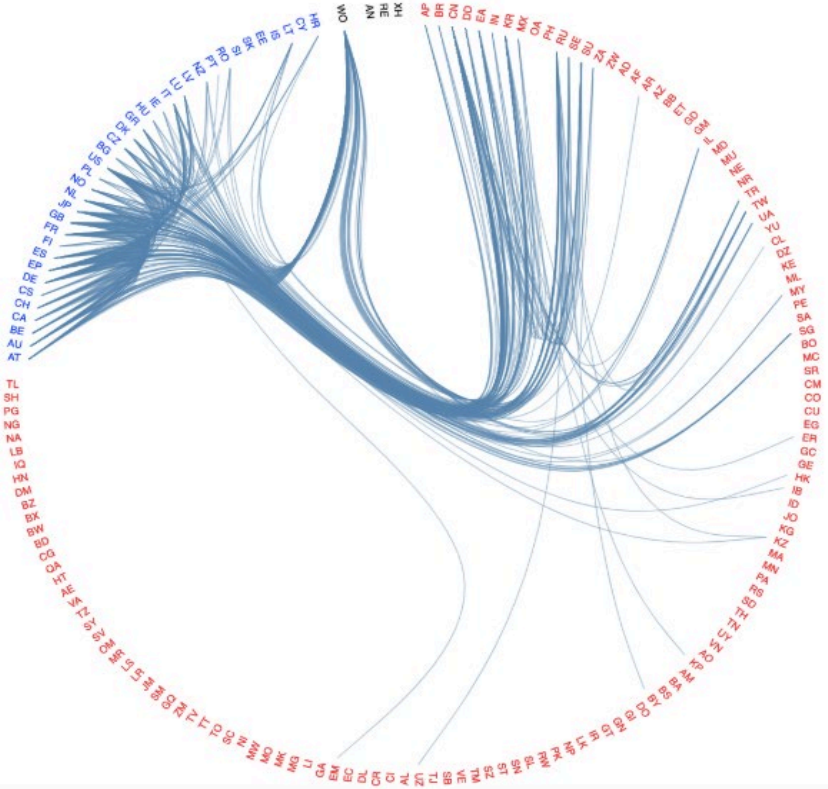
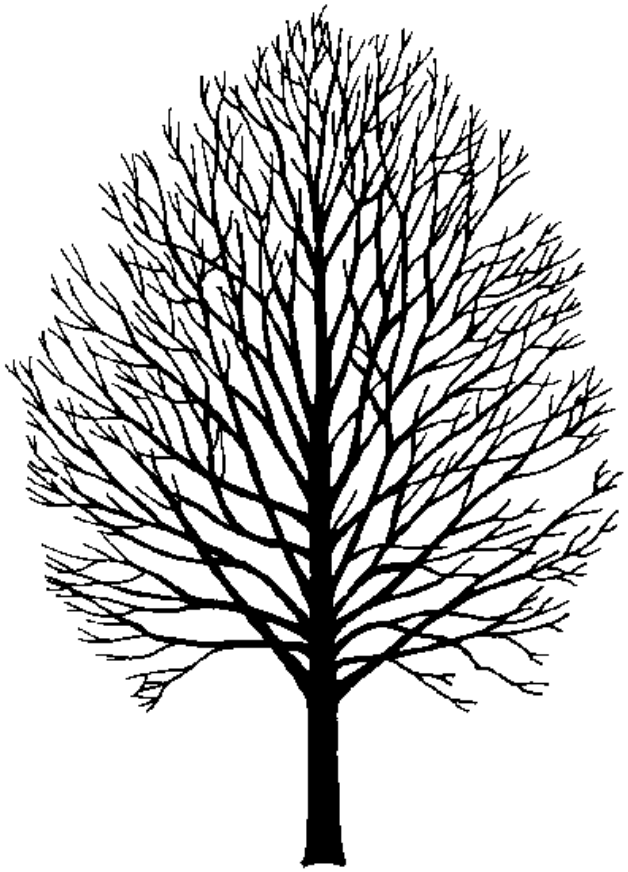
# IMPORTANCE OF PATENTS
## (AND HOW TO CALCULATE IT)

**DR. ANDREW W. TORRANCE (BROAD INSTITUTE OF MIT AND HARVARD)**
**DR. LISA C. FRIEDMAN (PATENTVECTOR LLC)**
**DR. JEVIN D. WEST (UNIVERSITY OF WASHINGTON)**



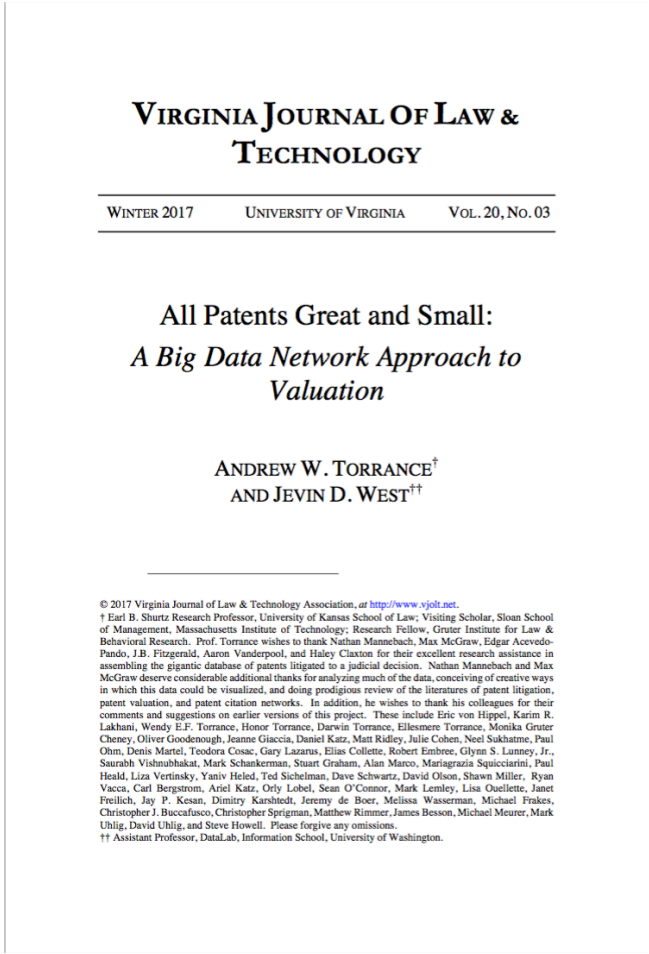
# NETWORK ANALYSIS

- Patent publications and citations among them form vast network
  - Publications are “nodes”
  - Citations are “links”
- Network represents millions of choices inventors have made about how to situate their new ideas within the context of existing knowledge
- We use eigenvector centrality and hierarchical graphing approaches to construct comprehensive citation networks
- Structure of this network holds a wealth of information about where knowledge is generated, where it flows, and how patterns have, and likely will, change



# ALL PATENTS GREAT AND SMALL

- Article *All Patents Great and Small: A Big Data Network Approach to Valuation* (Torrance & West 2017) describes our database and network analysis methods and is available as free PDF download on SSRN
- This study confirmed that Eigenvector centrality and hierarchical graphing approaches work especially well for analyzing patent documents
- Early on, we used bulk data from USPTO, but we now use worldwide patent bulk data from PATSTAT
- Thank you very much to my wonderful colleagues at PATSTAT, Geert Boedt and Martin Kracker



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All Patents Great and Small:

*A Big Data Network Approach to Valuation*

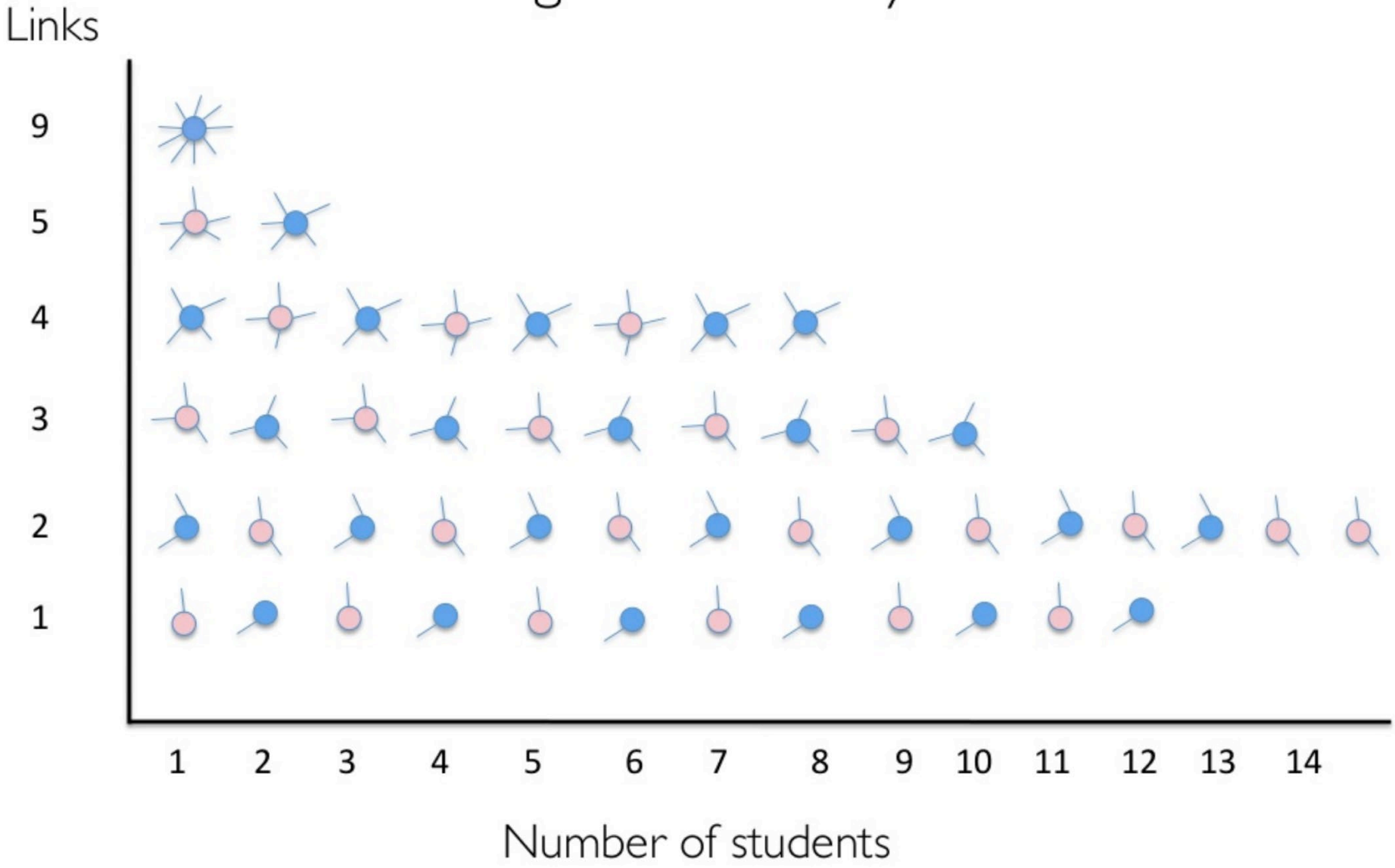
ANDREW W. TORRANCE† AND JEVIN D. WEST††



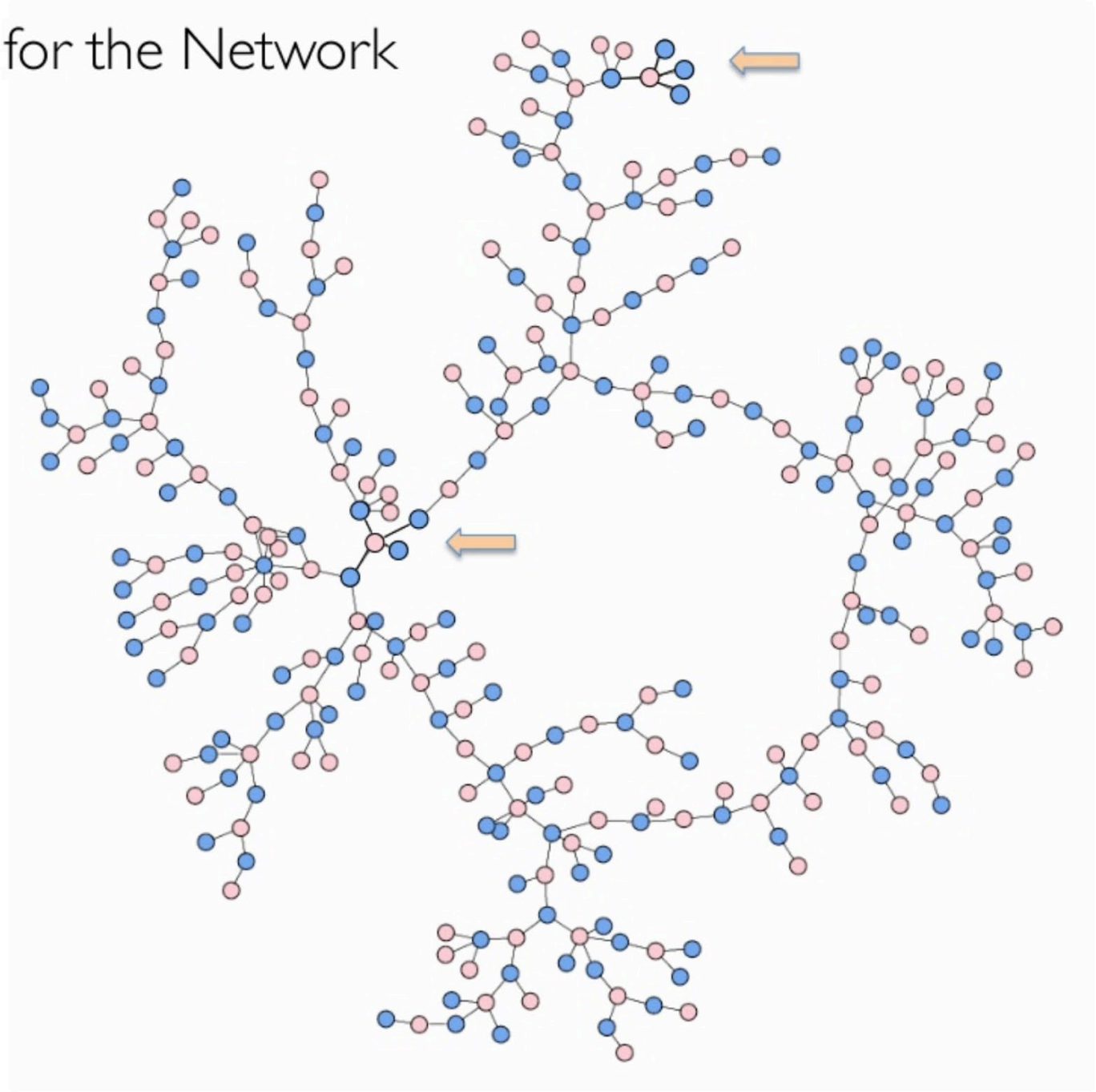
† Earl B. Shurtz Research Professor, University of Kansas School of Law; Visiting Scholar, Sloan School of Management, Massachusetts Institute of Technology; Research Fellow, Gruter Institute for Law & Behavioral Research. Prof. Torrance wishes to thank Nathan Mannebach, Max McGraw, Edgar Acevedo-Pando, J.B. Fitzgerald, Aaron Vanderpool, and Haley Claxton for their excellent research assistance in assembling the gigantic database of patents litigated to a judicial decision. Nathan Mannebach and Max McGraw deserve considerable additional thanks for analyzing much of the data, conceiving of creative ways in which this data could be visualized, and doing prodigious review of the literatures of patent litigation, patent valuation, and patent citation networks. In addition, he wishes to thank his colleagues for their comments and suggestions on earlier versions of this project. These include Eric von Hippel, Karim R. Lakhani, Wendy E.F. Torrance, Honor Torrance, Darwin Torrance, Ellesmere Torrance, Monika Gruter Cheney, Oliver Goodenough, Jeanne Giaccia, Daniel Katz, Matt Ridley, Julie Cohen, Neel Sukhatme, Paul Ohm, Denis Martel, Teodora Cosac, Gary Lazarus, Elias Collette, Robert Embree, Glynn S. Lunney, Jr., Saurabh Vishnubhakat, Mark Schankerman, Stuart Graham, Alan Marco, Mariagrazia Squicciarini, Paul Heald, Liza Vertinsky, Yaniv Heled, Ted Sichelman, Dave Schwartz, David Olson, Shawn Miller, Ryan Vacca, Carl Bergstrom, Ariel Katz, Orly Lobel, Sean O'Connor, Mark Lemley, Lisa Ouellette, Janet Freilich, Jay P. Kesan, Dimitry Karshtedt, Jeremy de Boer, Melissa Wasserman, Michael Frakes, Christopher J. Buccafusco, Christopher Sprigman, Matthew Rimmer, James Besson, Michael Meurer, Mark Uhlig, David Uhlig, and Steve Howell. Please forgive any omissions.

†† Assistant Professor, DataLab, Information School, University of Washington.

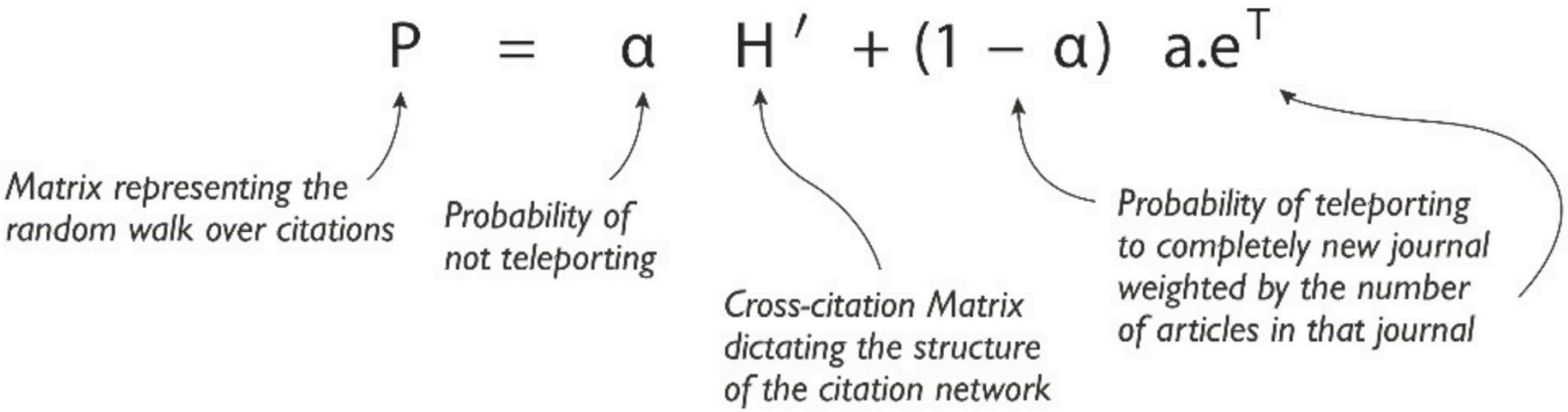
# Degree Centrality



# Accounting for the Network

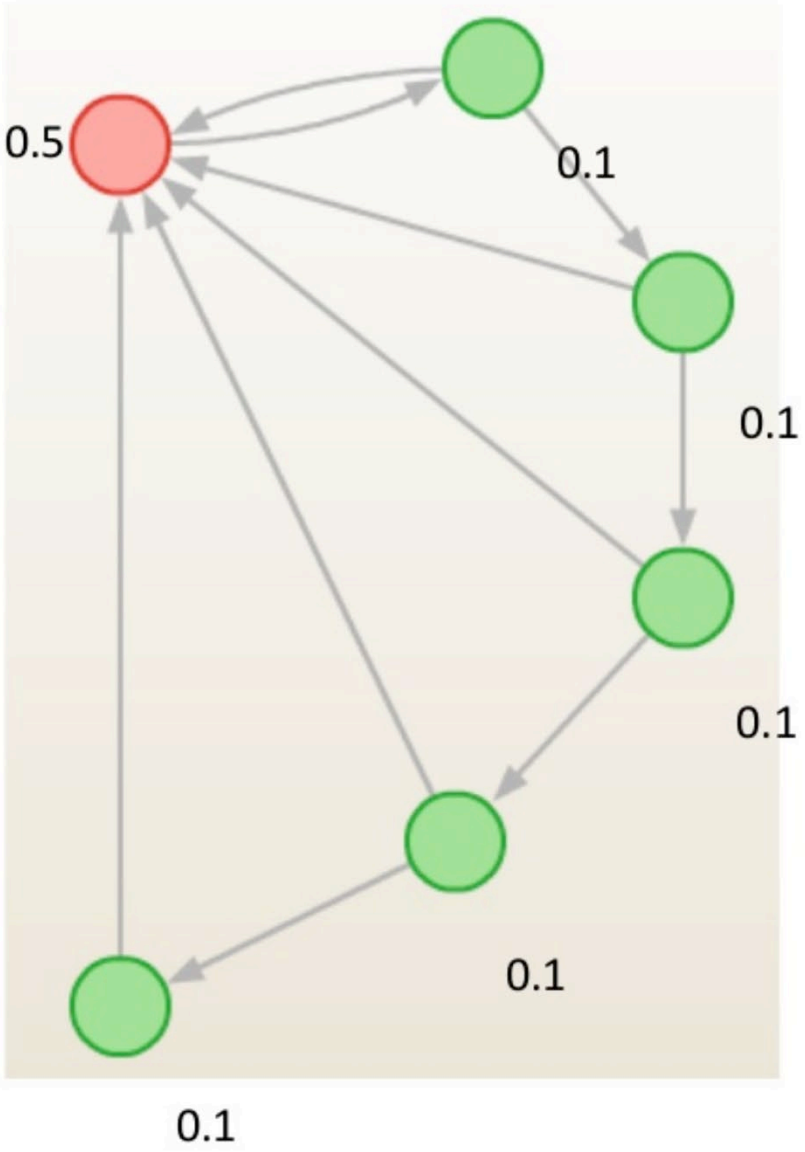


# Eigenfactor algorithm

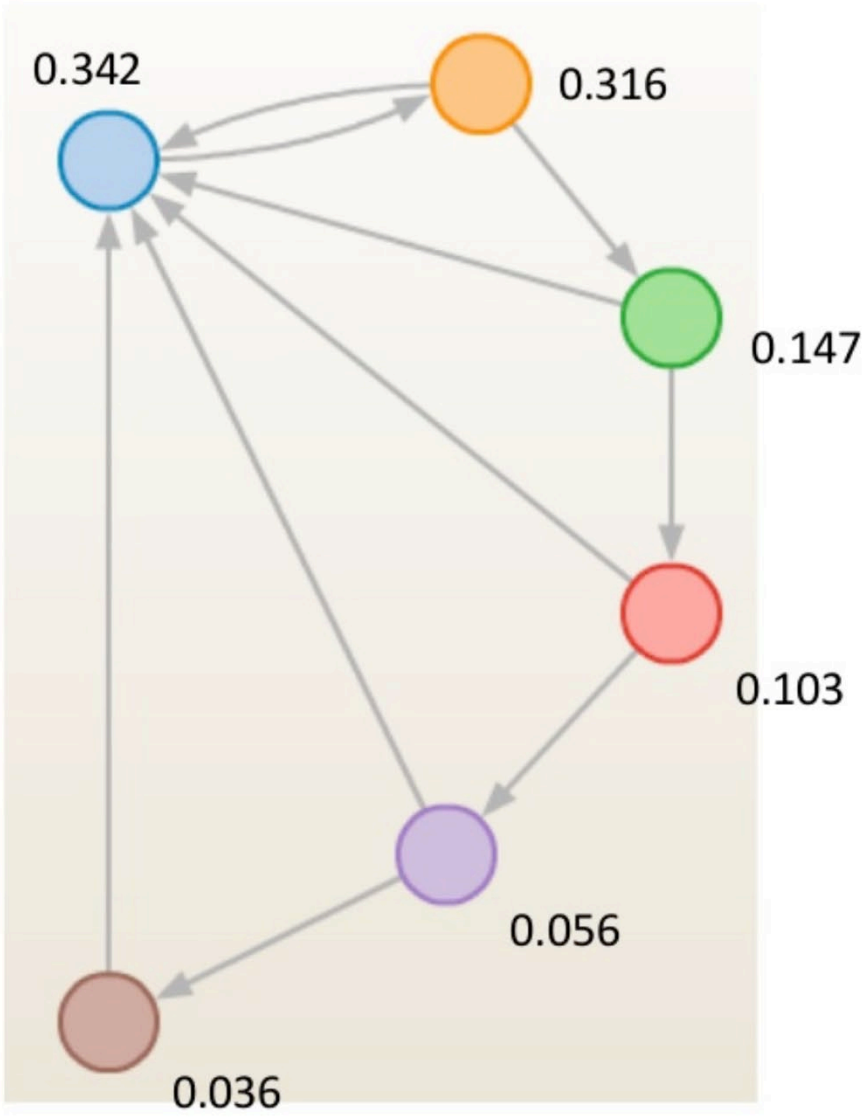


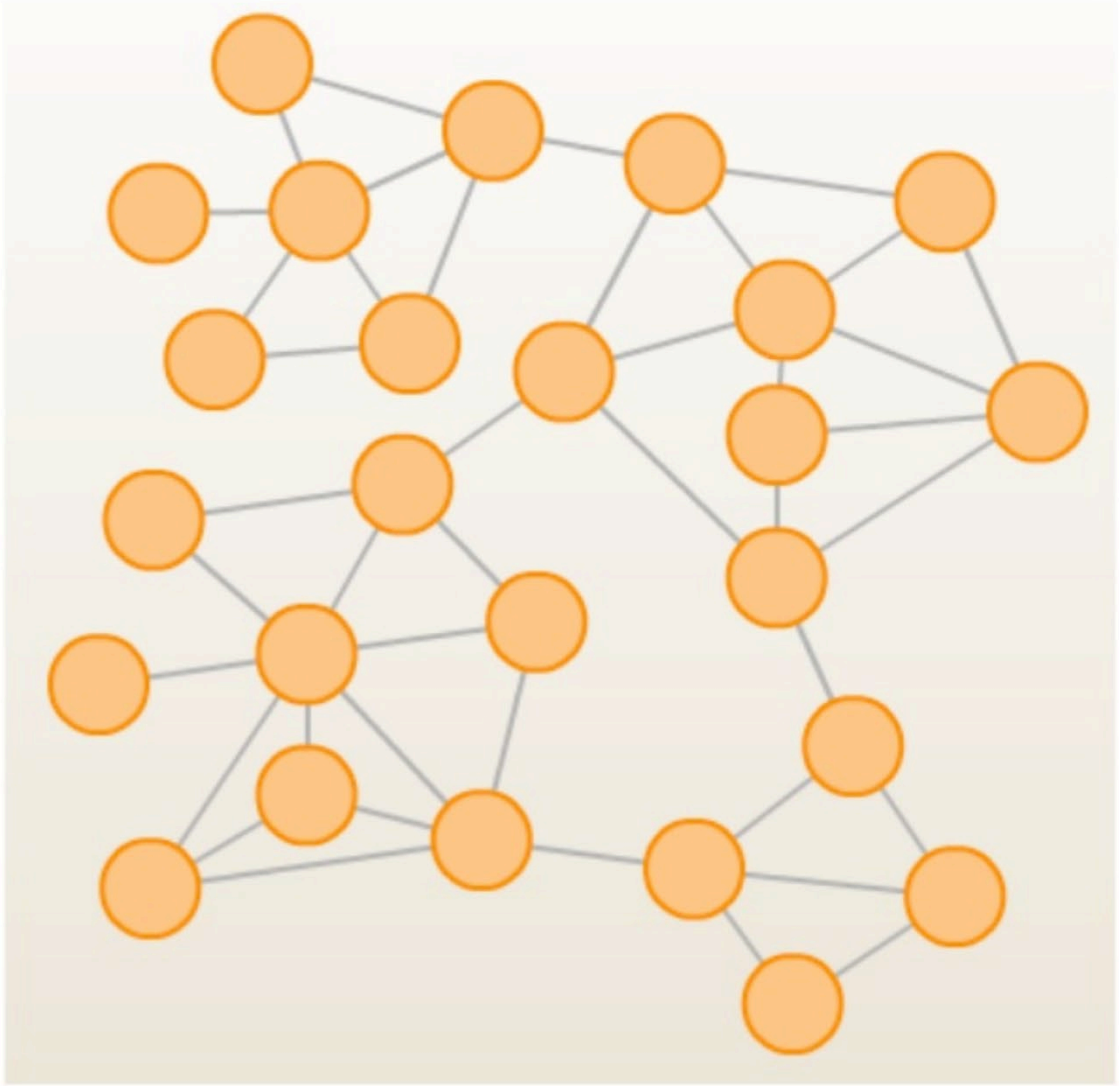

Eigenfactor – taking into account the network

# Impact Factor

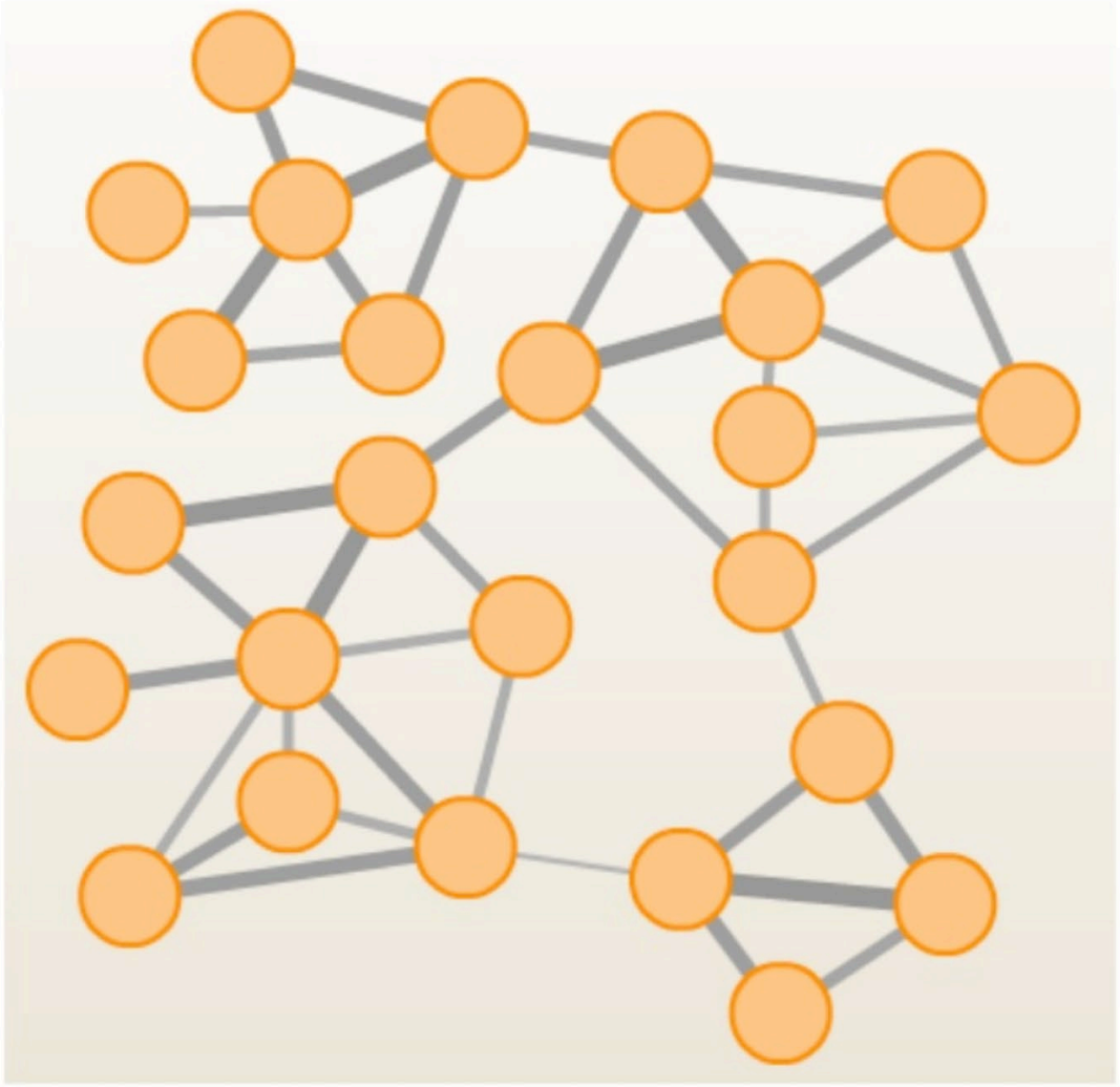


# Eigenfactor



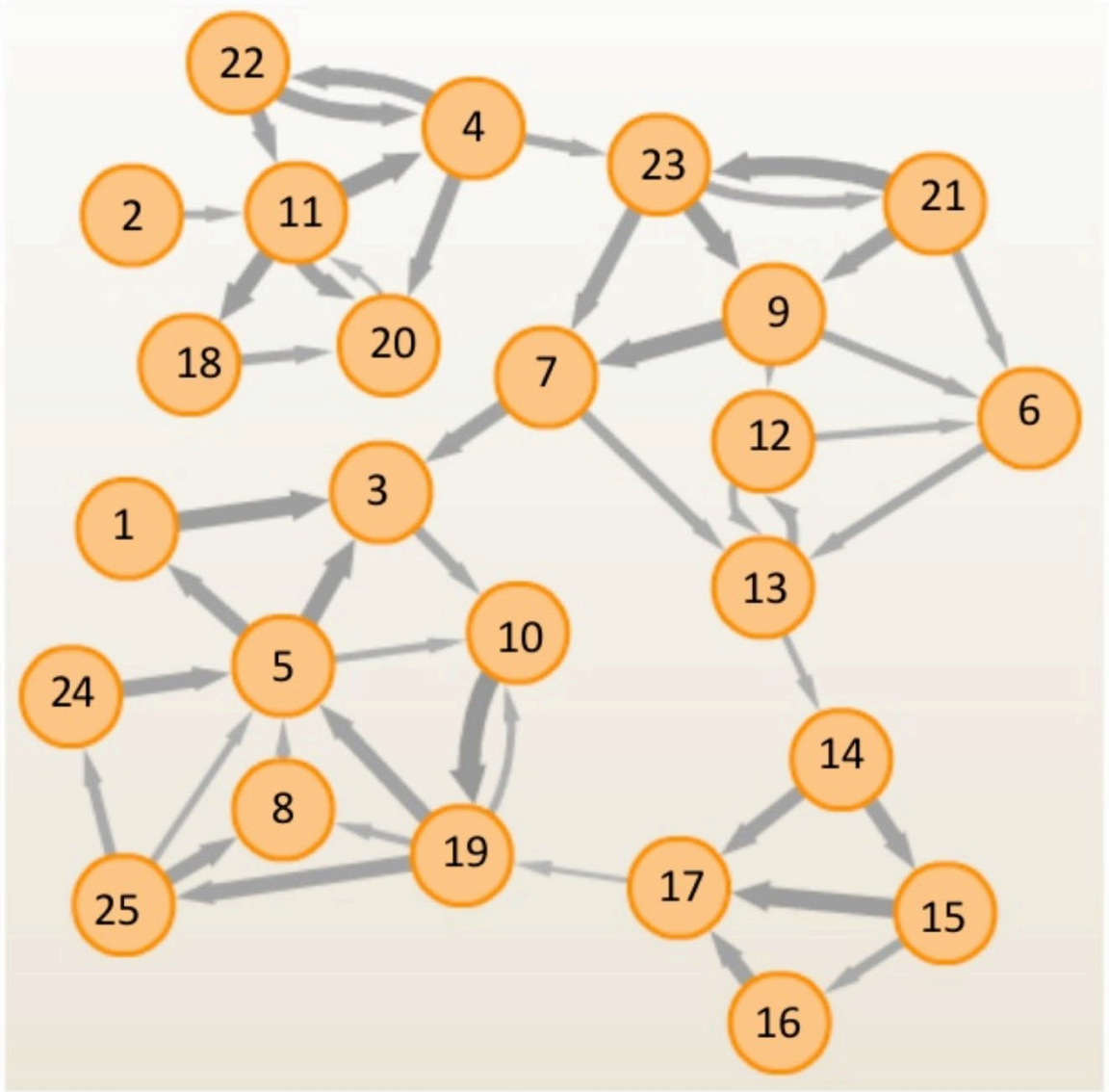


25 nodes and 42 unweighted, undirected links



25 nodes and 42 **weighted**, undirected links

# Which node is the most central?



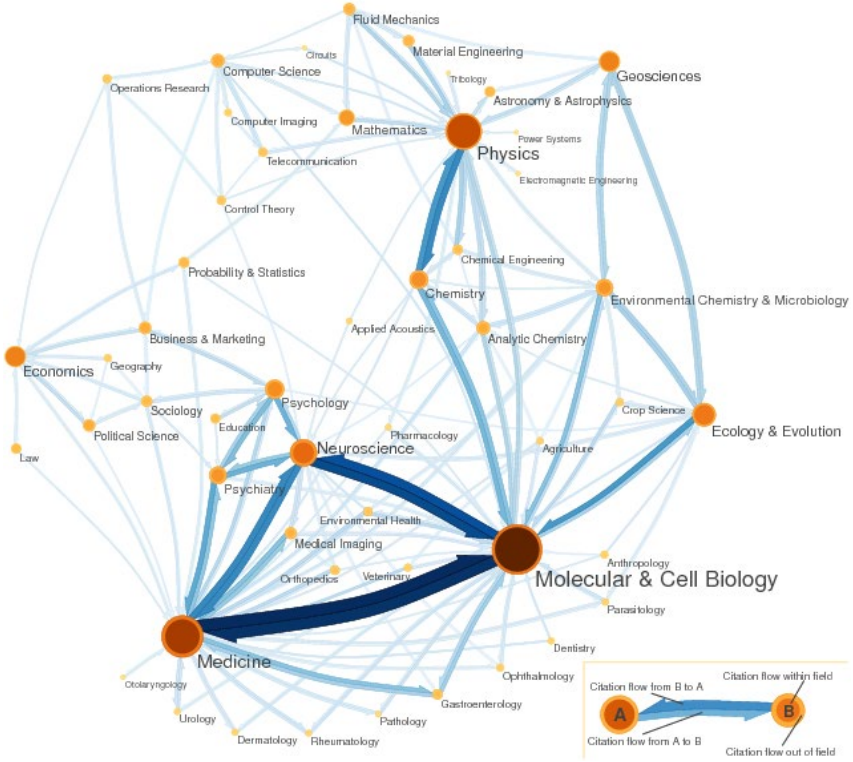

25 nodes and 42 **weighted, directed** links

# PATENTS IN THE NETWORK

| PATENT TYPE | TOTAL NUMBER |
|---|---|
| ALL PATENT DOCUMENTS | ~127 000 000 |
| PATENT DOCUMENTS IN NETWORK | ~62 000 000 |
| REGULAR *(E.G.*, U.S. UTILITY) | ~25 000 000 |
| DESIGN (U.S.) | ~712 000 |
| PLANT (U.S.) | ~28 191 |
| REISSUE (U.S.) | ~36 063 |
| APPLICATIONS | ~37 000 000 |
| TOTAL CITATIONS | ~328 000 000 |

# DATA AND NETWORK

- Resulting network includes rich internal structure
  - Patents disclosing closely-related technologies cluster closely together
  - There are clusters within clusters within clusters *et cetera*
  - One may zoom in to explore very specific technology clusters (*e.g.*, heated catheters) or zoom out to explore larger, more inclusive technology clusters (*e.g.*, medical devices)
- Using automated community ("cluster") detection, we identified 30 703 194 distinct technology fields
- Each technology field contains a mean number of ~80 patents



# THE TECHNOLOGY SEXTET

## Explore the Patent Network (Current)

| | | |
|---|---|---|
| **Technology Cluster 1** | | |
| semiconductor, display, light, power, film, circuit, thin, manufacturing, integrated, organic | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 25,219,723 | 12,745,334 | 0.505 |
| **Technology Cluster 2** | | |
| data, network, computer, information, electronic, management, communication, processing, access, user | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 9,632,274 | 10,617,492 | 1.102 |
| **Technology Cluster 3** | | |
| compositions, acid, derivatives, nucleic, containing, system, antibodies, apparatus, dna, device | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 4,130,284 | 2,630,198 | 0.637 |
| **Technology Cluster 4** | | |
| surgical, instrument, catheter, tissue, stapling, medical, implantable, prosthesis, assembly, body | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 1,806,089 | 2,474,166 | 1.370 |
| **Technology Cluster 5** | | |
| lens, optical, exposure, measuring, contact, intraocular, scanning, projection, surface, microscope | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 575,760 | 393,547 | 0.684 |
| **Technology Cluster 6** | | |
| magnetic, recording, optical, disk, head, information, medium, data, drive, disc | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 237,169 | 198,126 | 0.835 |
| **Remaining Technology Clusters** | | |
| Patent Documents: | TotalPVScore™: | AveragePVScore™: |
| 513,950 | 46,736 | 0.091 |

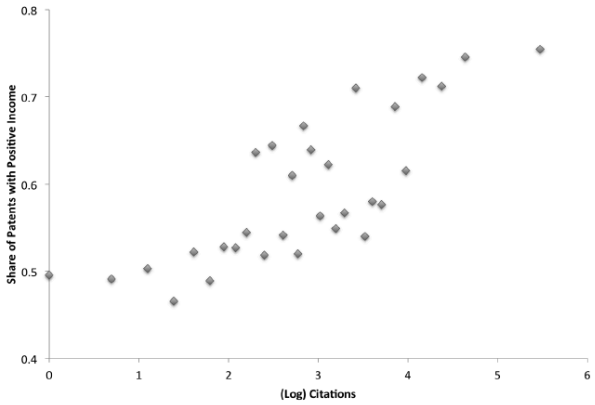
# NETWORK STRUCTURE

| LEVEL OF TECHNOLOGY CLUSTER | NUMBER OF TECHNOLOGY CLUSTERS |
|---|---|
| TOP | 469 103 (6 MAJOR) |
| SECOND | 233 944 |
| THIRD | 3 934 174 |
| FOURTH | 15 631 467 |
| FIFTH | 9 287 095 |
| SIXTH | 1 075 204 |
| SEVENTH | 68 934 |
| EIGHTH | 3 126 |
| NINTH | 147 |
| *TOTAL TECHNOLOGY CLUSTERS* | *30 703 194* |

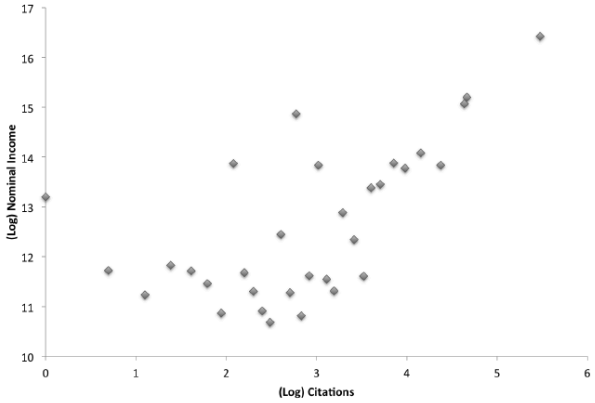
# CITATIONS AND VALUE

- Patent citations correlate with patent value
  - Trajtenberg (1989 & 1990)
  - Harhoff *et al.* (1999)
  - Hall et al (2005)
  - Sampat & Ziedonis (2005)
  - Moser *et al.* (2011)
  - Farranato (2016)
- One study found inverted-U distribution (Abrams *et al.* 2013)
  - Productive vs. defensive?
- **However, some citations are more important than others**

**Figure 2:** *Patent Citations and Value*




(a) *Probability of positive income and citations.*

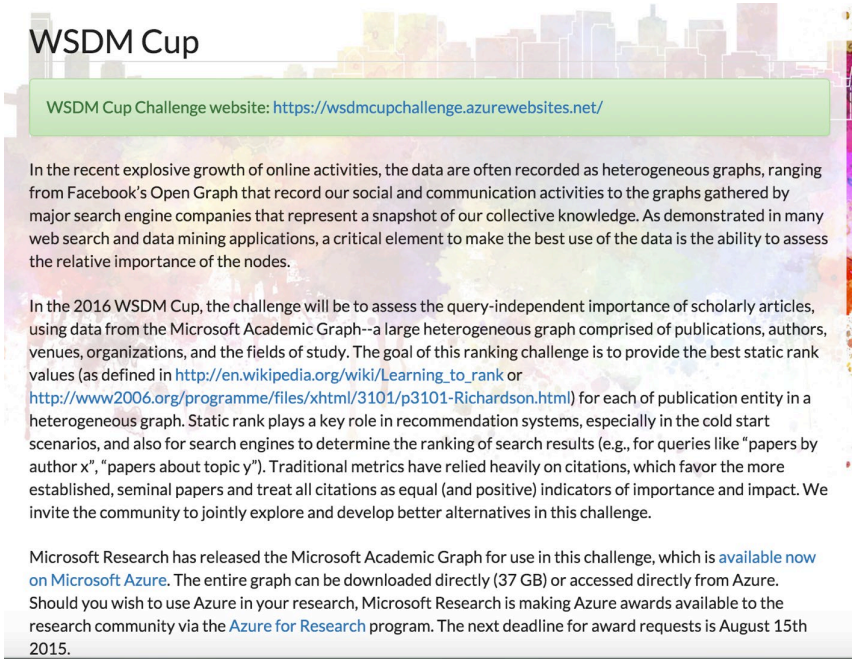



(b) *Income and citations.*

Farranato (2016)

# WHY THIS APPROACH?

- Method derived from Eigenfactor metrics
  - Gold standard in ranking scholarly journals
  - *E.g.*, Thomson-Reuters' Journal Citation Reports (JCR)
- Microsoft Research's 2016 WSDM Cup Challenge
  - Contest for efficient network-building algorithms
    - 1st place (North America)
    - 2nd place (Worldwide)



WSDM Cup

WSDM Cup Challenge website: https://wsdmcupchallenge.azurewebsites.net/

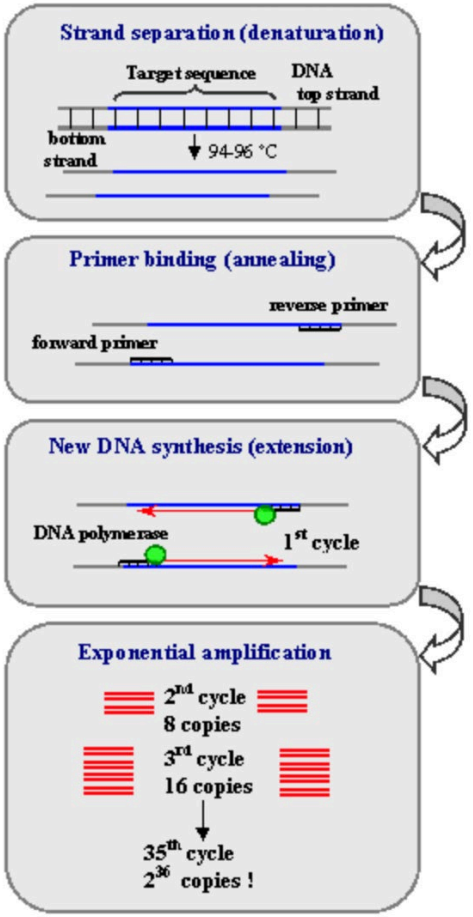
In the recent explosive growth of online activities, the data are often recorded as heterogeneous graphs, ranging from Facebook's Open Graph that record our social and communication activities to the graphs gathered by major search engine companies that represent a snapshot of our collective knowledge. As demonstrated in many web search and data mining applications, a critical element to make the best use of the data is the ability to assess the relative importance of the nodes.

In the 2016 WSDM Cup, the challenge will be to assess the query-independent importance of scholarly articles, using data from the Microsoft Academic Graph--a large heterogeneous graph comprised of publications, authors, venues, organizations, and the fields of study. The goal of this ranking challenge is to provide the best static rank values (as defined in http://en.wikipedia.org/wiki/Learning_to_rank or http://www2006.org/programme/files/xhtml/3101/p3101-Richardson.html) for each of publication entity in a heterogeneous graph. Static rank plays a key role in recommendation systems, especially in the cold start scenarios, and also for search engines to determine the ranking of search results (e.g., for queries like "papers by author x", "papers about topic y"). Traditional metrics have relied heavily on citations, which favor the more established, seminal papers and treat all citations as equal (and positive) indicators of importance and impact. We invite the community to jointly explore and develop better alternatives in this challenge.

Microsoft Research has released the Microsoft Academic Graph for use in this challenge, which is available now on Microsoft Azure. The entire graph can be downloaded directly (37 GB) or accessed directly from Azure. Should you wish to use Azure in your research, Microsoft Research is making Azure awards available to the research community via the Azure for Research program. The next deadline for award requests is August 15th 2015.

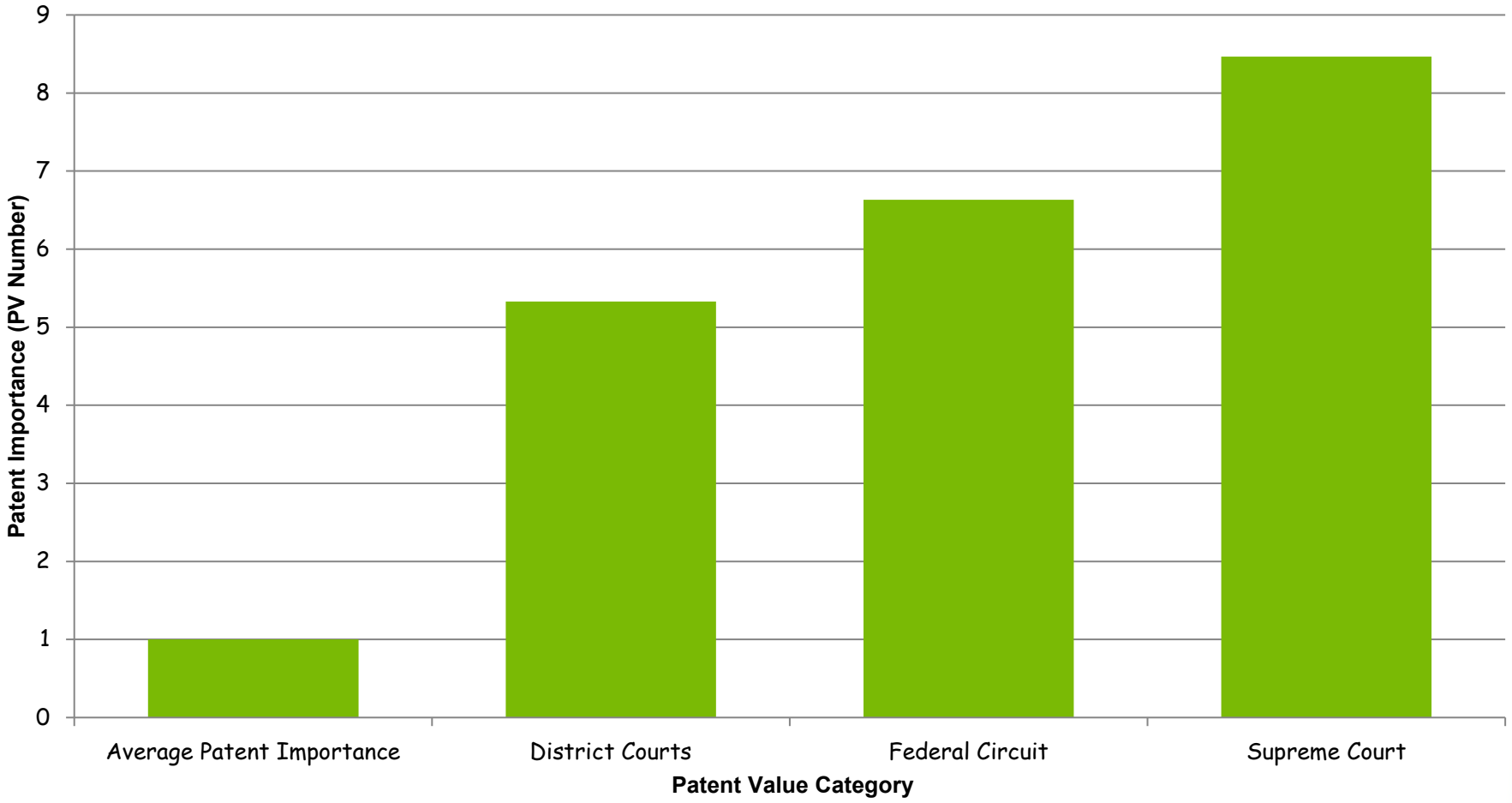
# THE MOST VALUABLE PATENTS ALSO TEND TO BE "IMPORTANT"

- United States Patent Number 4,683,202 is most important patent document in network
- "Process for amplifying nucleic acid sequences"
- Inventor is Kary Mullis
- Has more than 5000 citations
- Is this patent important?
  - Claims a foundational biotechnology
    - NYT: "virtually dividing biology in the two epochs of before P.C.R. and after P.C.R."
  - Mullis shared 1993 Nobel Prize in Chemistry

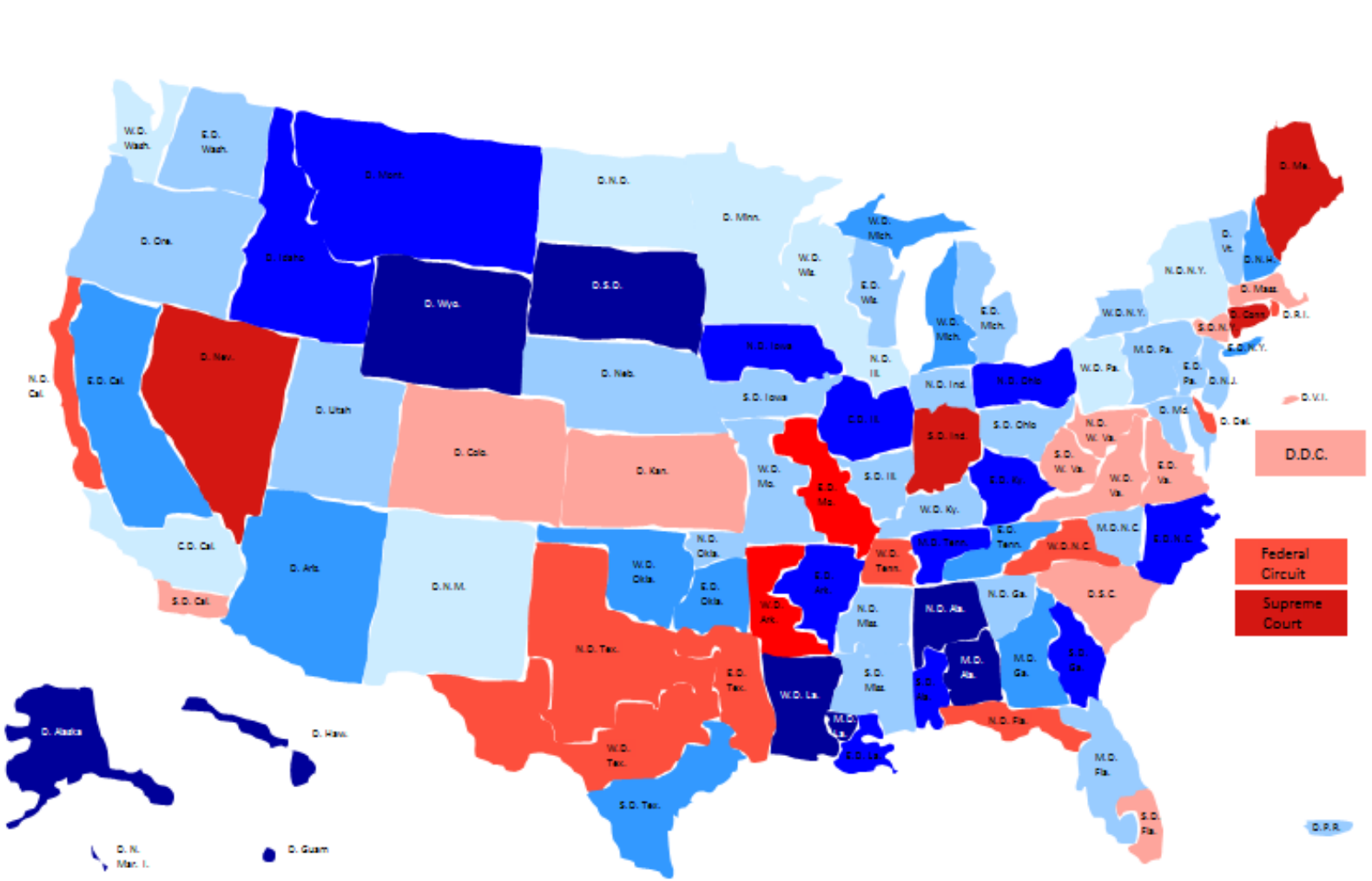



Source: NIH

# LITIGATED PATENTS TEND TO BE IMPORTANT



# PATENT LITIGATION HEAT MAP



# LITIGATION OUTCOMES

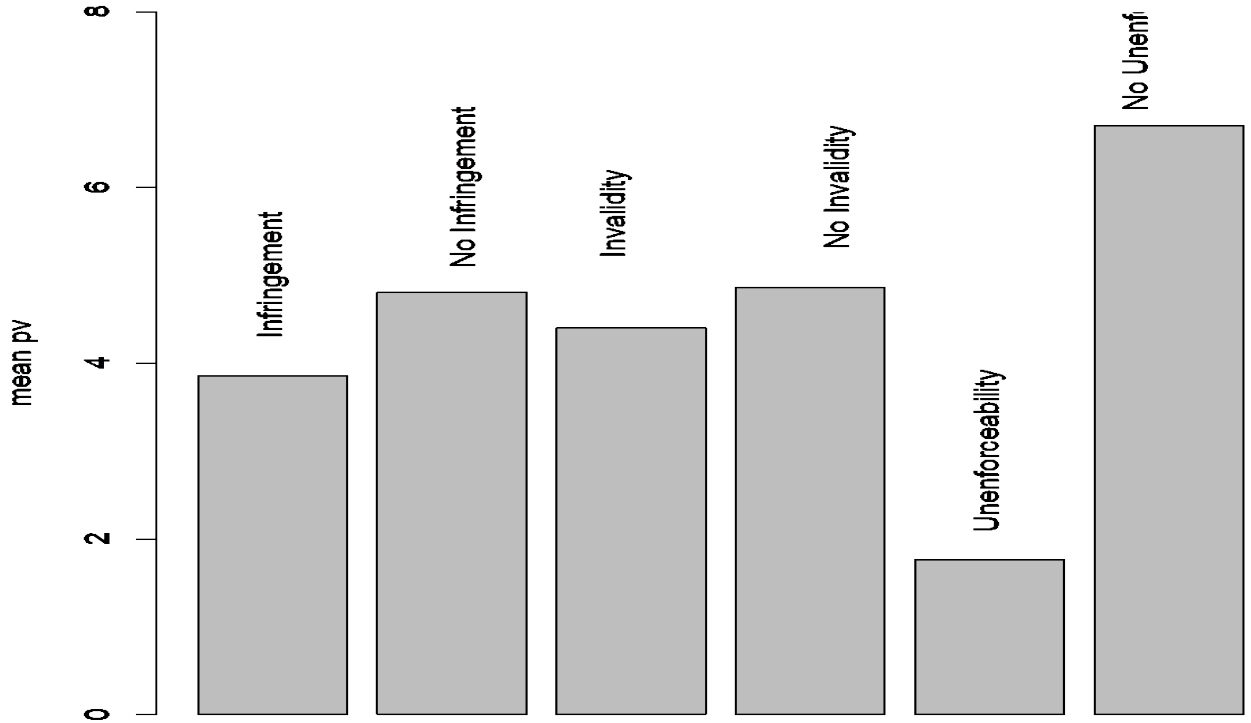
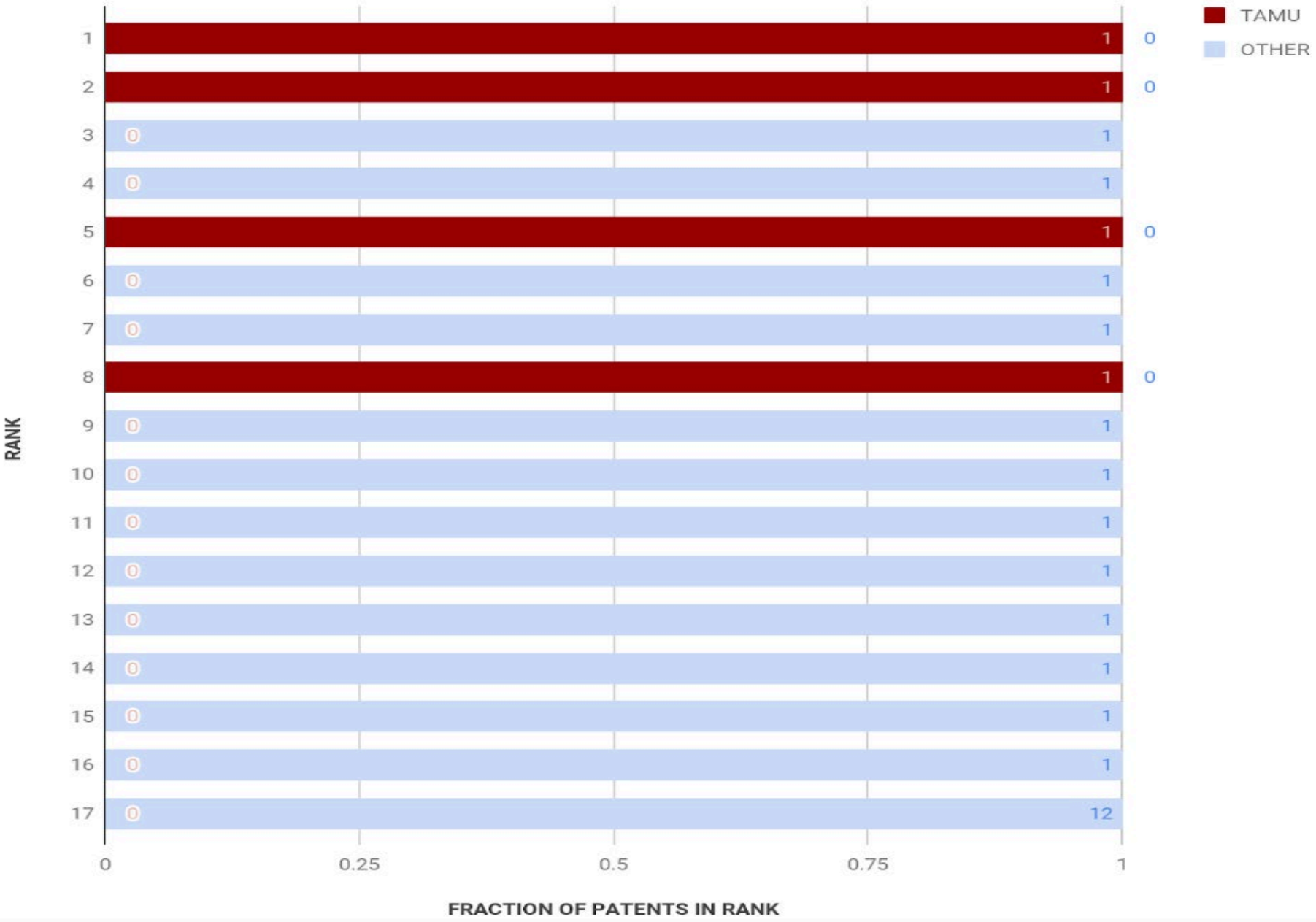


FIGURE 47. RANKING OF TAMU PATENTS IN THE MOST IMPORTANT CLUSTER

adrenocorticotropin-lipotropin precursor



## FIGURE 48. NO. 1 TECHNOLOGY CLUSTER FOR TAMU

adrenocorticotropin-lipotropin precursor

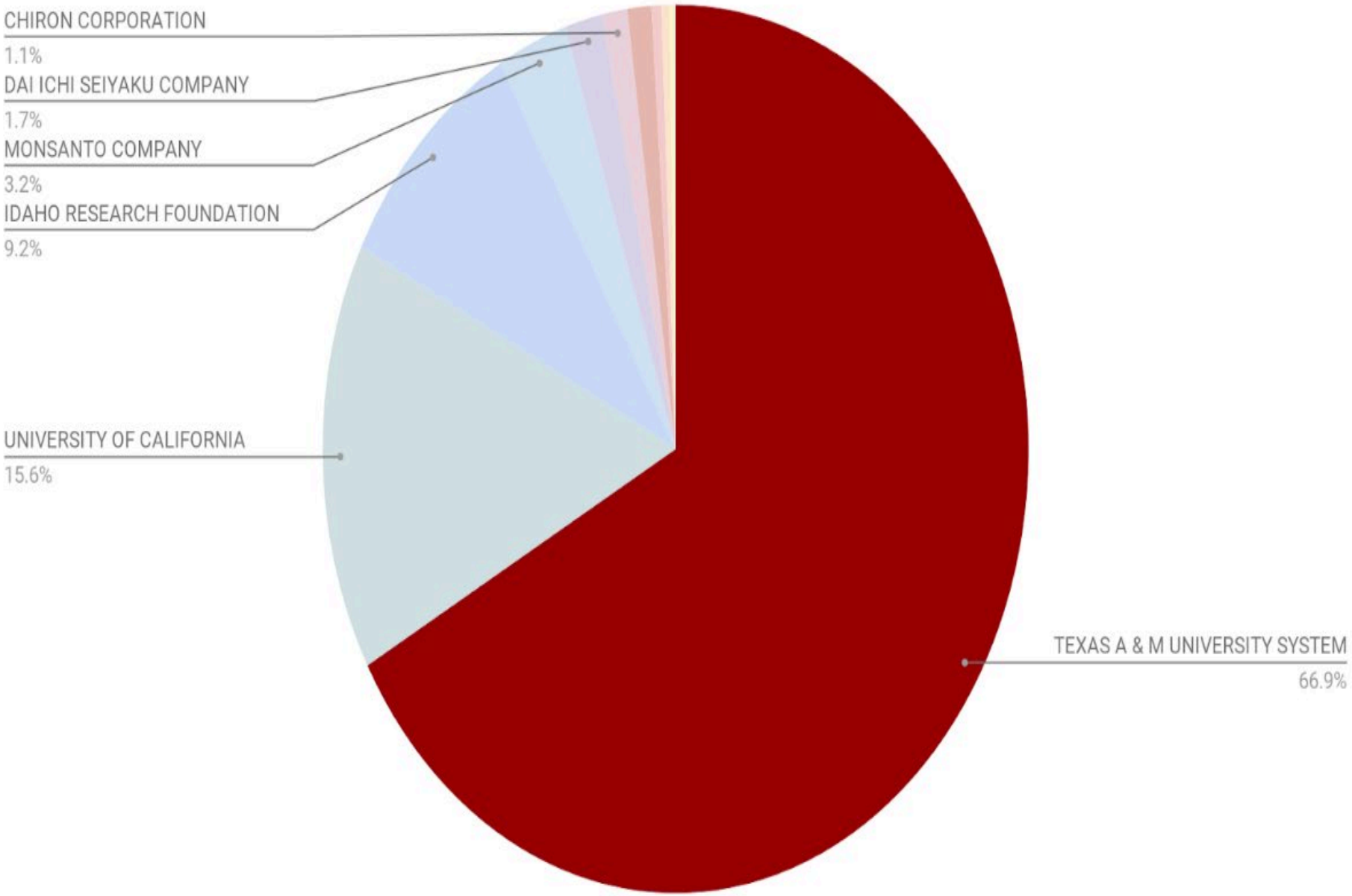
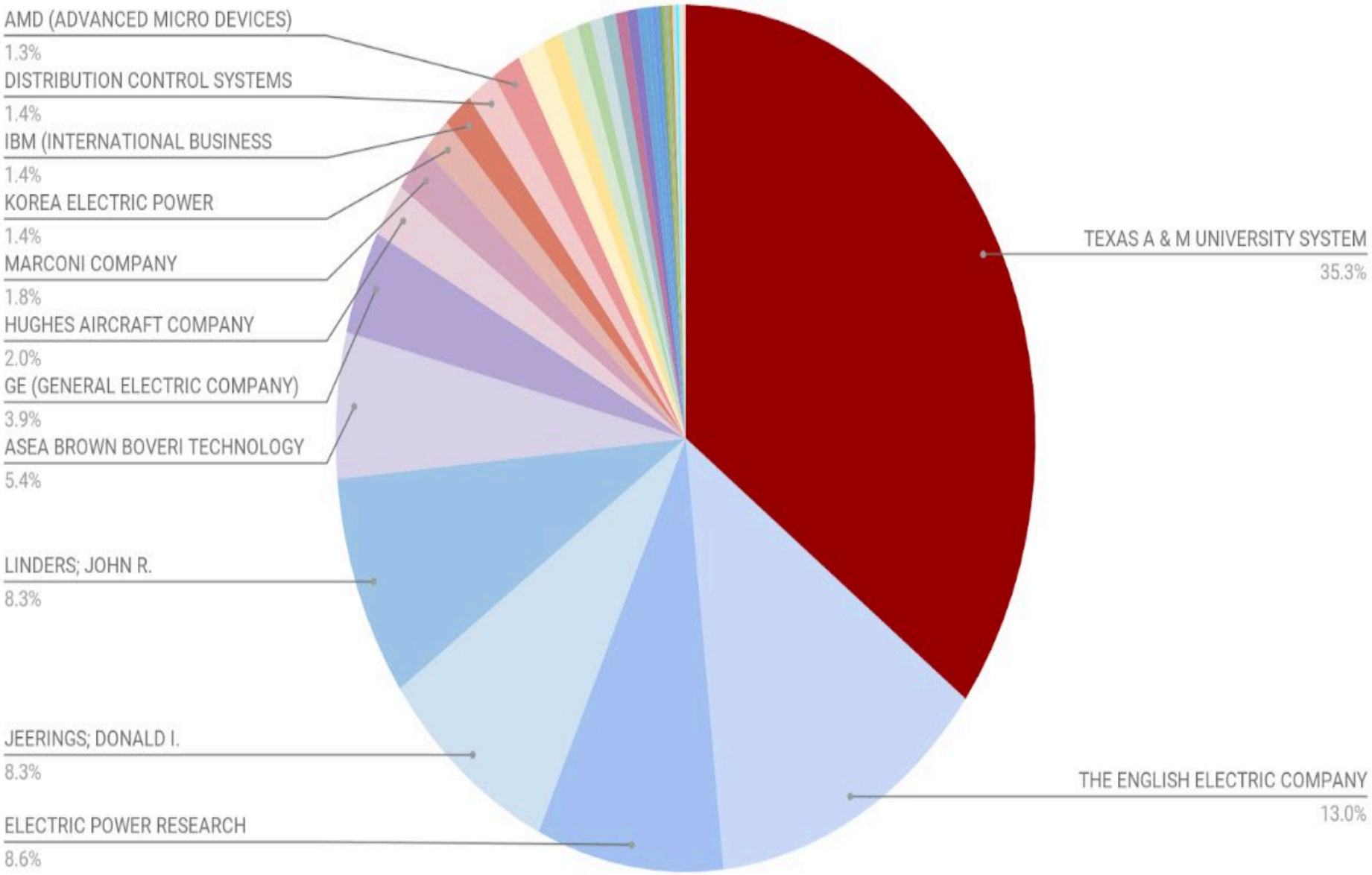


FIGURE 49. RANKING OF TAMU PATENTS IN THE 2ND MOST IMPORTANT CLUSTER

high impedance

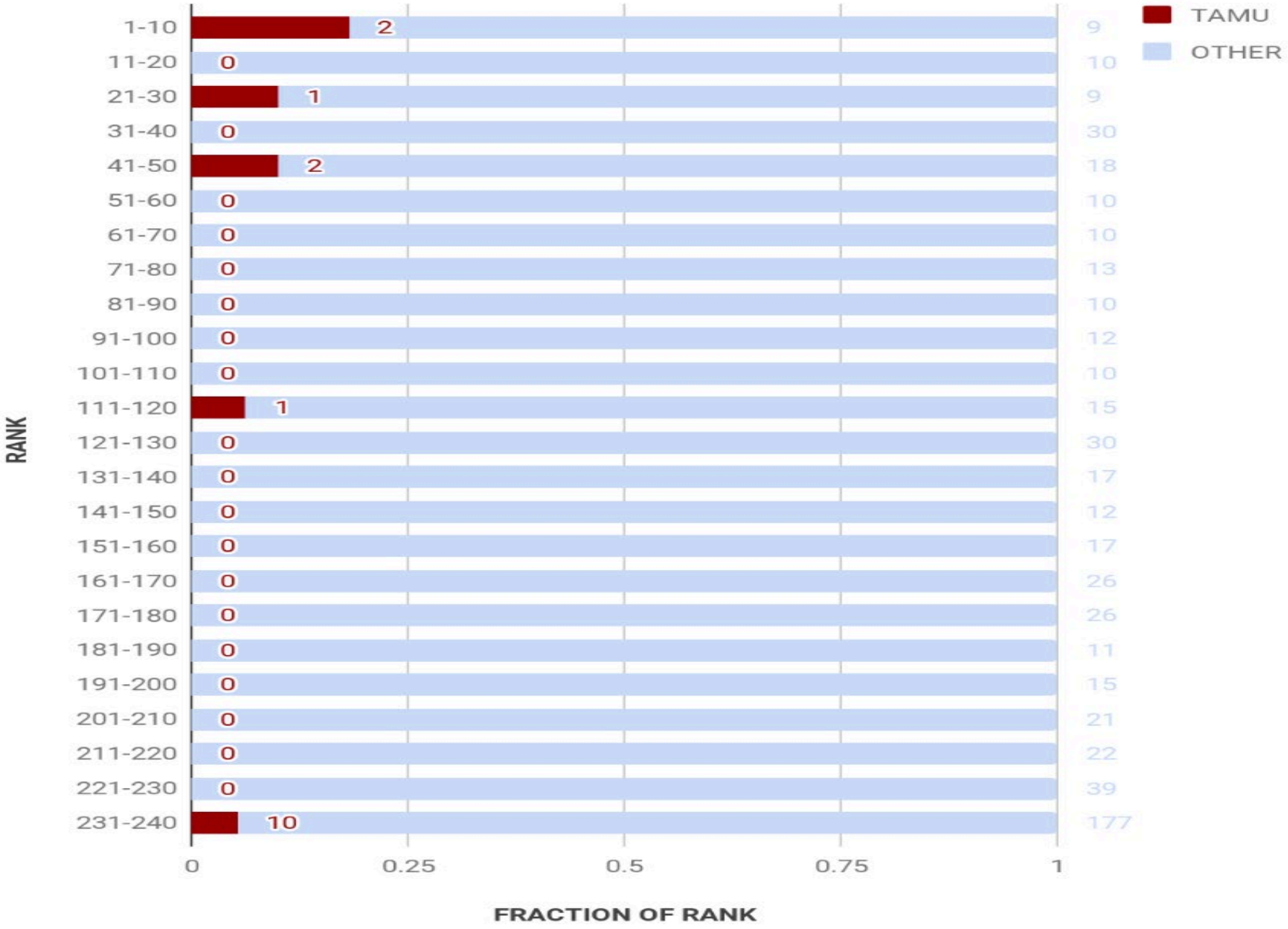
## FIGURE 50. NO. 2 TECHNOLOGY CLUSTER FOR TAMU

high impedance



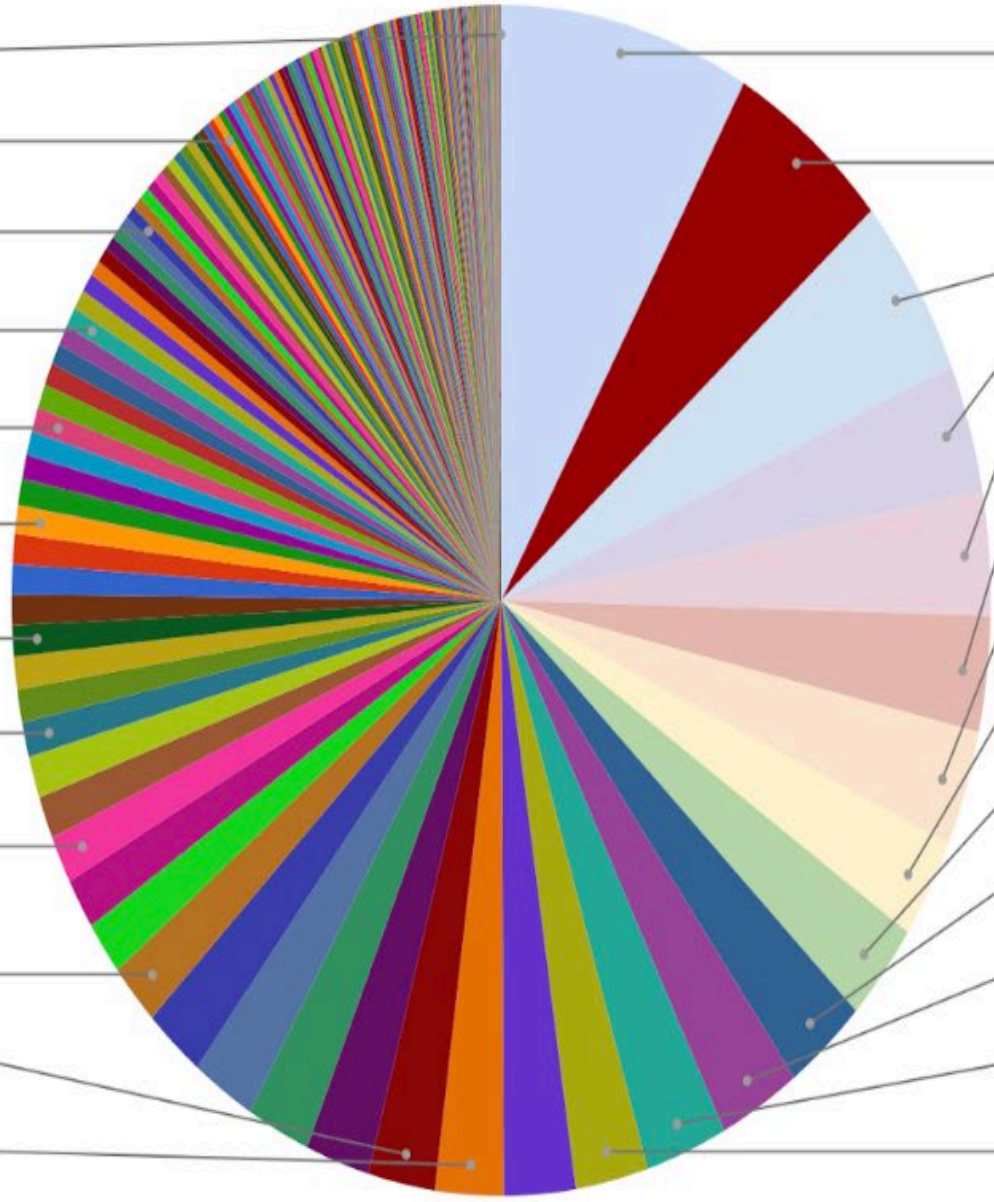
## FIGURE 65. RANKING OF TAMU PATENTS IN THE 10TH MOST IMPORTANT CLUSTER

soy protein

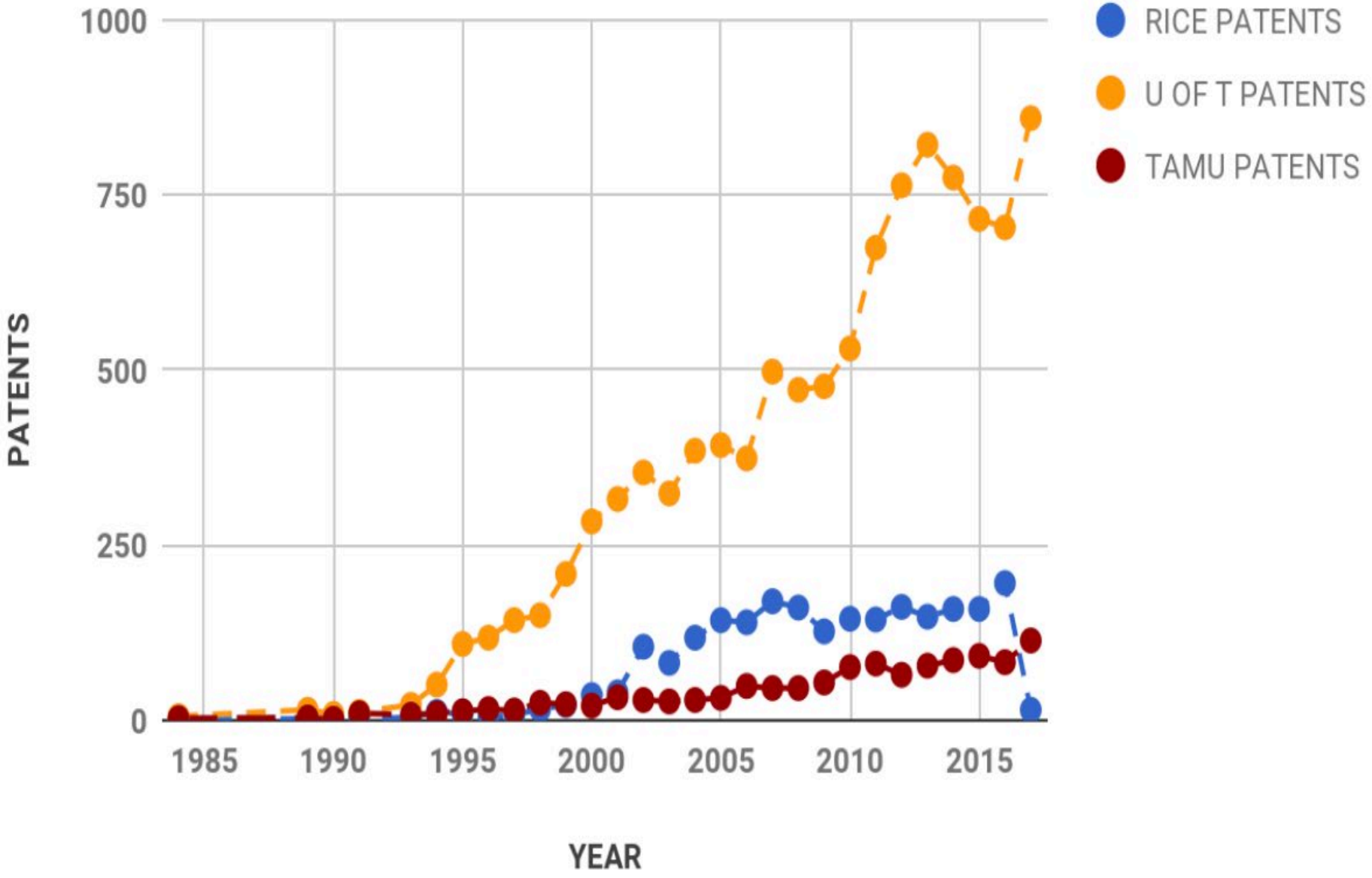


## FIGURE 66. NO. 10 TECHNOLOGY CLUSTER FOR TAMU

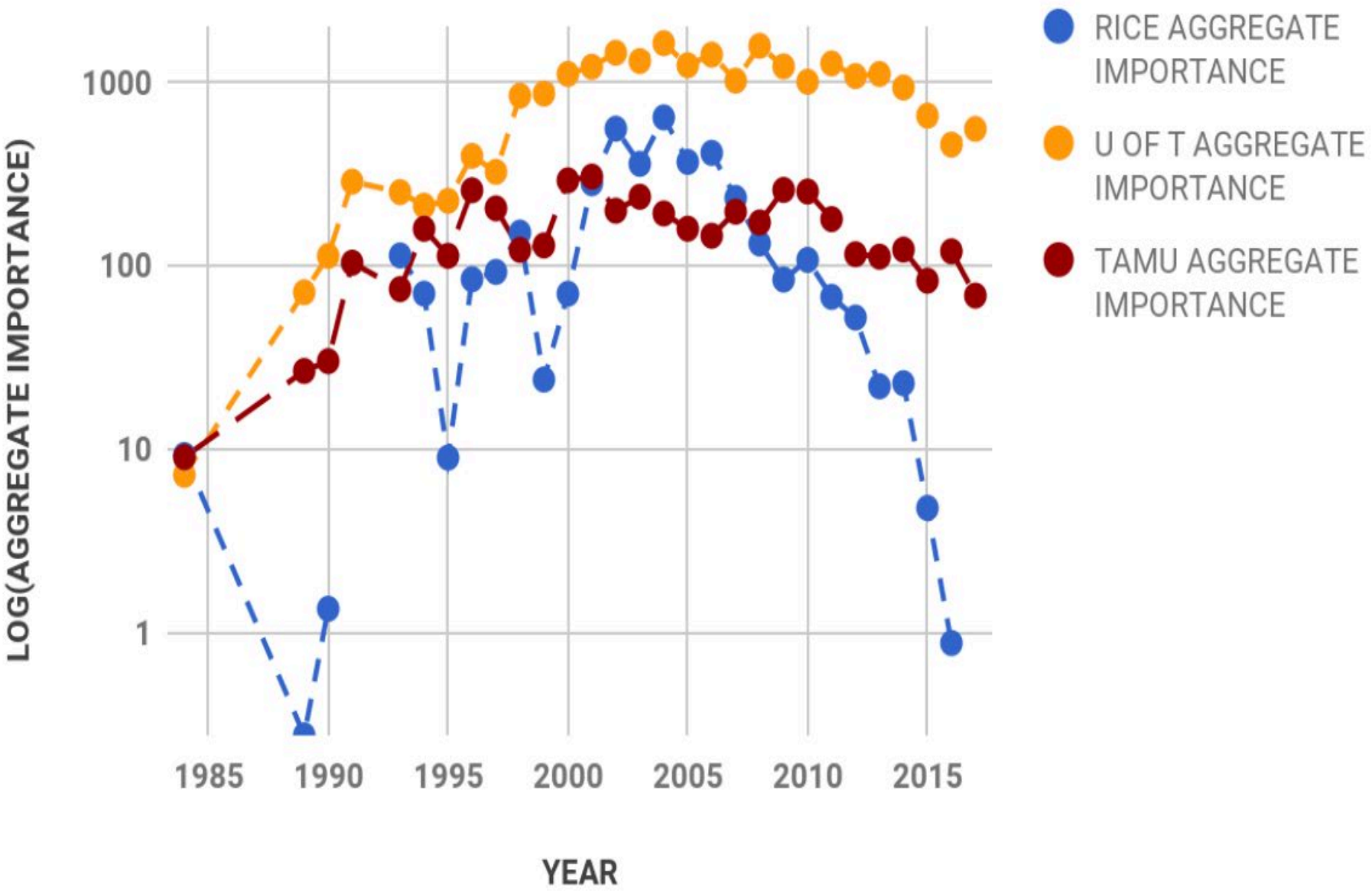
soy protein



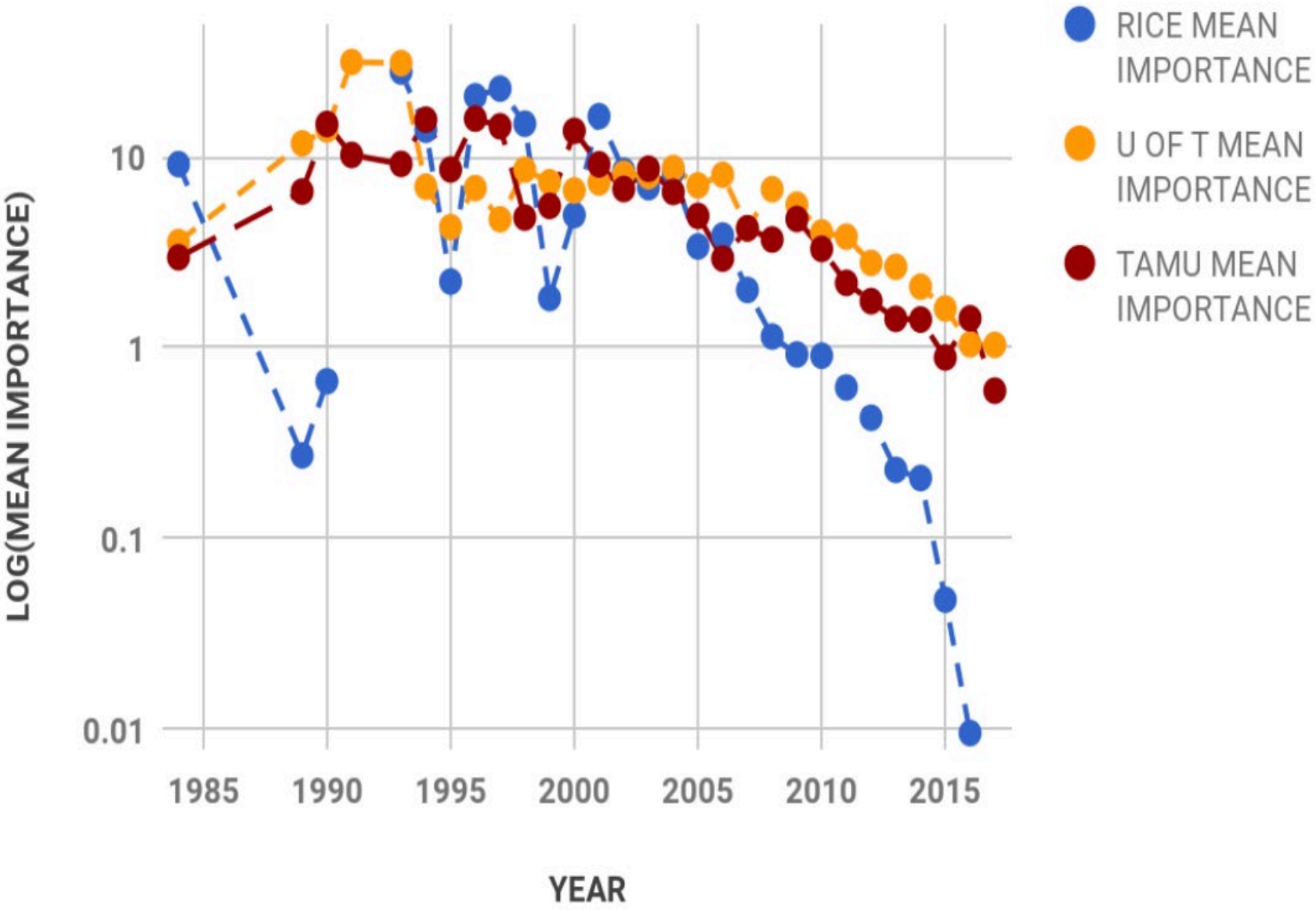
# FIGURE 67. TAMU, RICE & U OF T PATENT NUMBERS OVER TIME



## FIGURE 68. TAMU, RICE & U OF T AGGREGATE PATENT IMPORTANCE OVER TIME

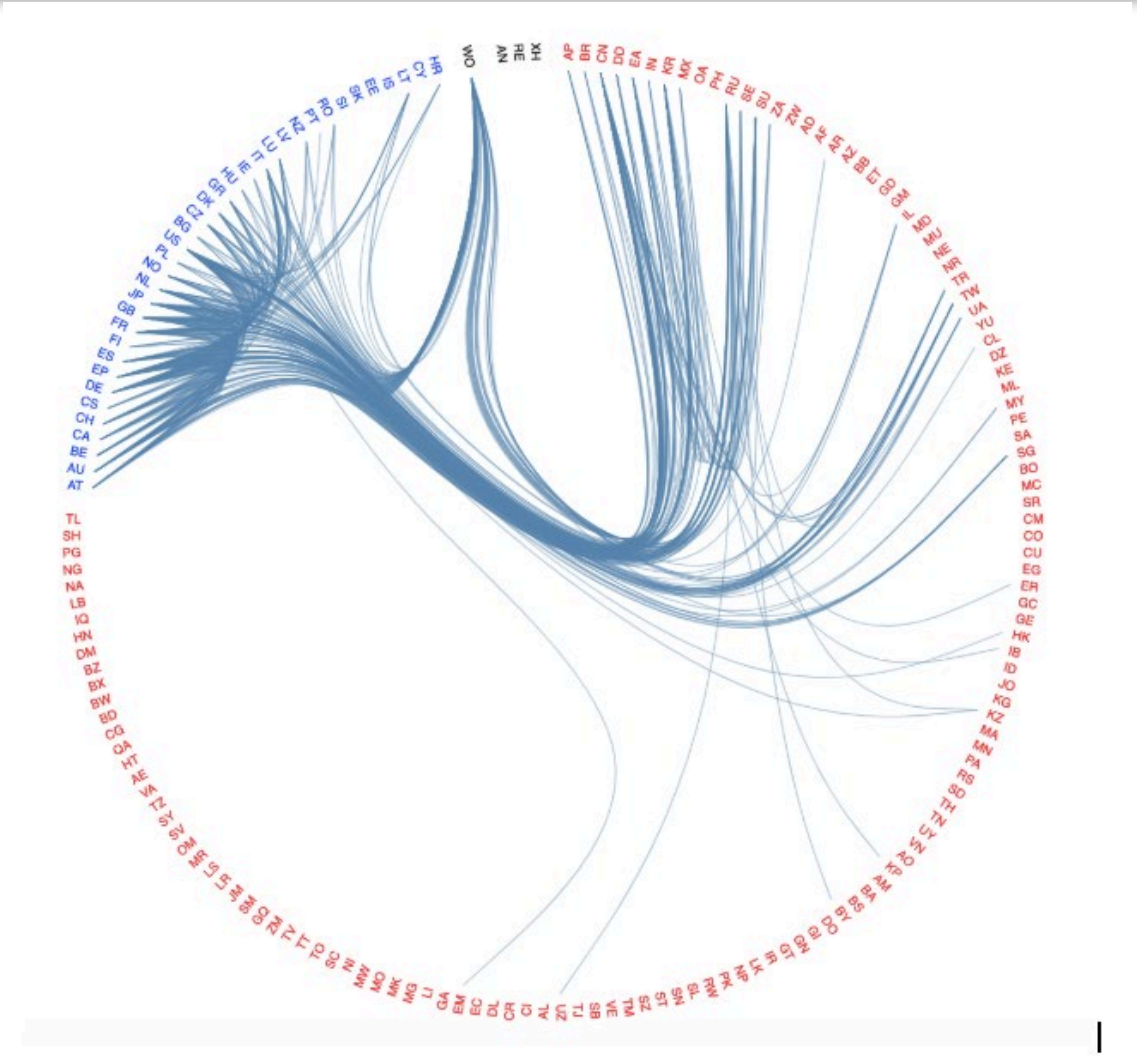


## FIGURE 69. TAMU, RICE & U OF T MEAN PATENT IMPORTANCE OVER TIME



WORLD TRADE ORGANIZATION

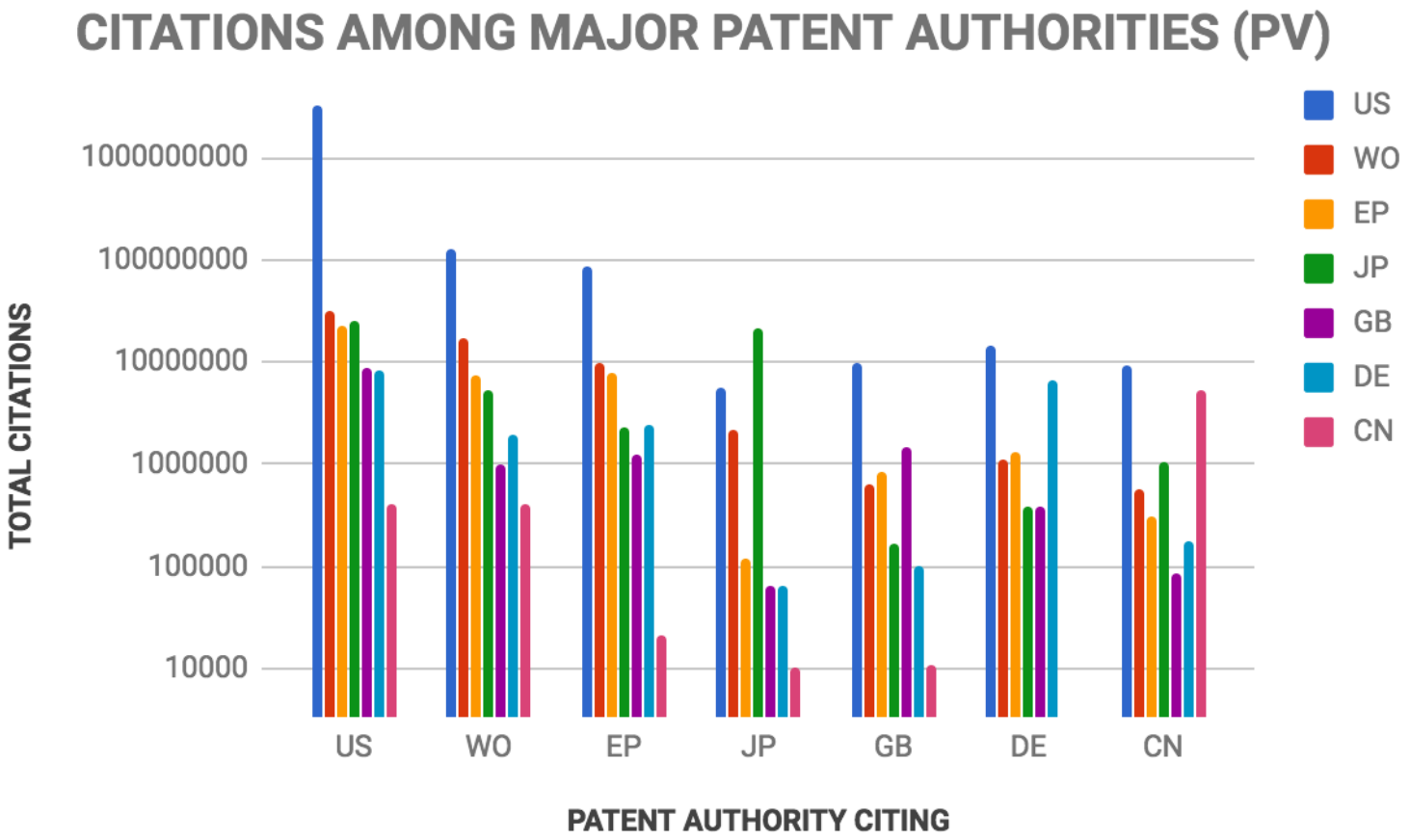
# GLOBAL PATTERNS OF PATENT TECHNICAL KNOWLEDGE FLOW



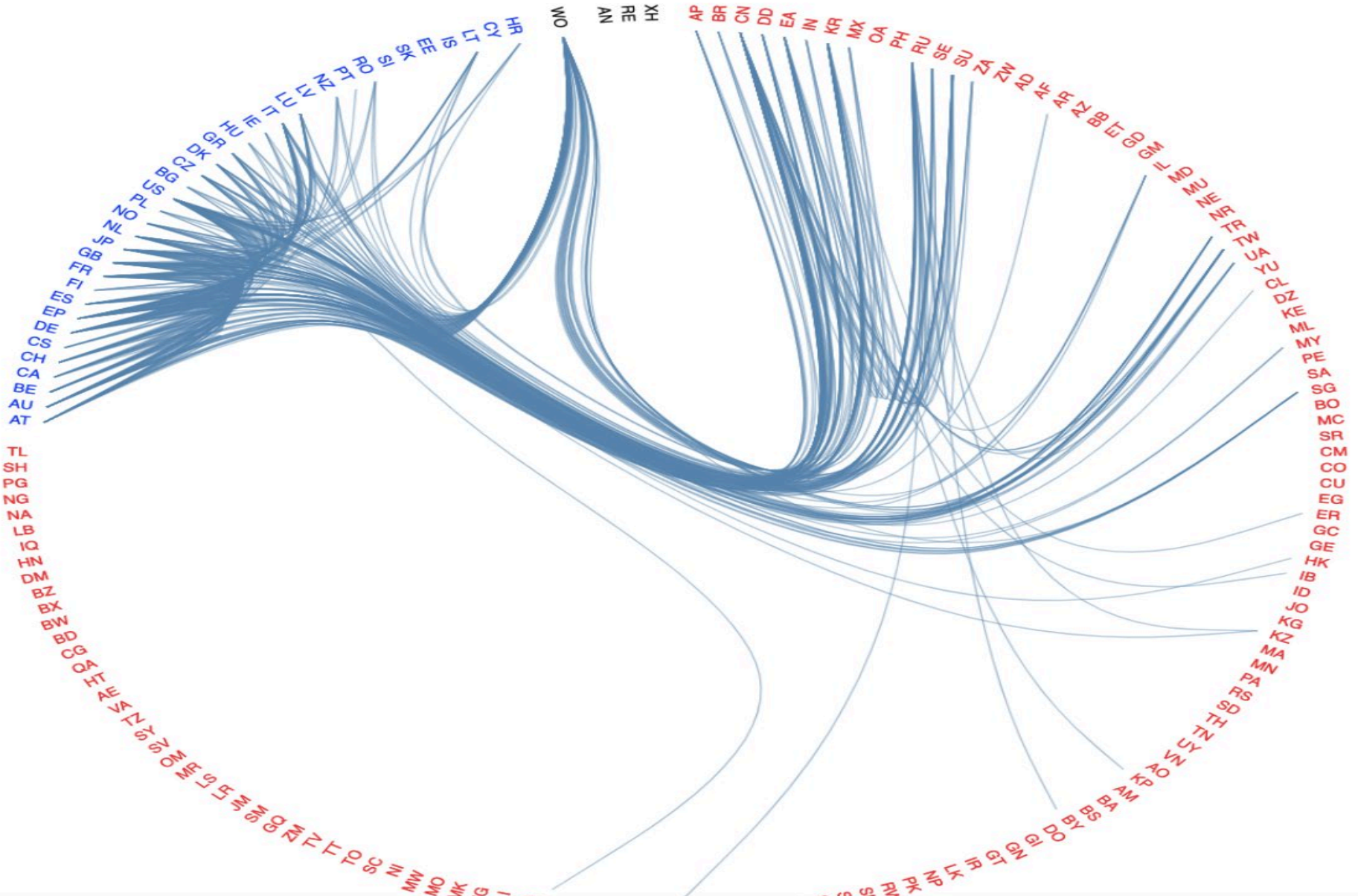
# CITATION HEATMAP (PV)

| | | | | | | CITED | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | COUNTRY | US | WO | JP | EP | DE | GB | CN | FR | KR | CA | SU | CH | AU | BE | IT |
| | US | 3242724829 | 32075414 | 25882883 | 22206340 | 8422018 | 8826251 | 403005 | 3299678 | 401407 | 881776 | 747793 | 437224 | 457809 | 183957 | 207421 |
| | WO | 129153585 | 17011232 | 5227974 | 7372422 | 1917352 | 972140 | 399876 | 560424 | 168645 | 34326 | 27538 | 40713 | 41458 | 12575 | 1890 |
| | EP | 84165388 | 9719342 | 2287636 | 7967045 | 2391518 | 1239578 | 21788 | 880475 | 13298 | 19679 | 13110 | 73308 | 10409 | 20422 | 1696 |
| | JP | 5758154 | 2155759 | 21361562 | 116736 | 65754 | 64780 | 10107 | 19113 | 5736 | 1526 | 923 | 2250 | 193 | 439 | 1 |
| | DE | 14750638 | 1103124 | 381740 | 1335065 | 6680029 | 382186 | 3293 | 233846 | 3343 | 3402 | 12047 | 97677 | 1084 | 20932 | 1077 |
| | CN | 9258899 | 578560 | 1040745 | 310466 | 172438 | 83973 | 5270325 | 26784 | 78574 | 5438 | 3122 | 2739 | 1783 | 710 | 167 |
| CITING | GB | 9947196 | 636235 | 166515 | 835910 | 103057 | 1495550 | 10936 | 40327 | 4022 | 3866 | 3953 | 2760 | 2780 | 1213 | 84 |
| | FR | 7876459 | 464748 | 139042 | 924595 | 586226 | 361784 | 2230 | 756943 | 950 | 4490 | 3700 | 31581 | 3514 | 11885 | 221 |
| | AU | 8832129 | 792688 | 76138 | 414598 | 56335 | 110107 | 3412 | 24572 | 1726 | 2571 | 1136 | 1550 | 28820 | 438 | 18 |
| | KR | 3067519 | 318833 | 1067104 | 97398 | 11701 | 8631 | 2252 | 1911 | 1046608 | 158 | 28 | 112 | 29 | 33 | 1 |
| | ES | 697605 | 50996 | 10652 | 60010 | 19058 | 21941 | 1222 | 15480 | 368 | 360 | 220 | 787 | 150 | 183 | 23 |
| | TW | 741352 | 26643 | 40379 | 8620 | 665 | 843 | 5295 | 111 | 438 | 23 | 1 | 9 | 3 | 2 | 1 |
| | NL | 543842 | 42662 | 10023 | 64511 | 28635 | 18261 | 189 | 12055 | 90 | 238 | 180 | 1118 | 168 | 432 | 6 |
| | IT | 402660 | 36941 | 7756 | 36852 | 25266 | 10979 | 815 | 8368 | 331 | 273 | 99 | 809 | 167 | 213 | 146 |
| | SG | 435102 | 27589 | 8795 | 28633 | 2057 | 5095 | 45 | 448 | 30 | 64 | 26 | 122 | 38 | 3 | 0 |

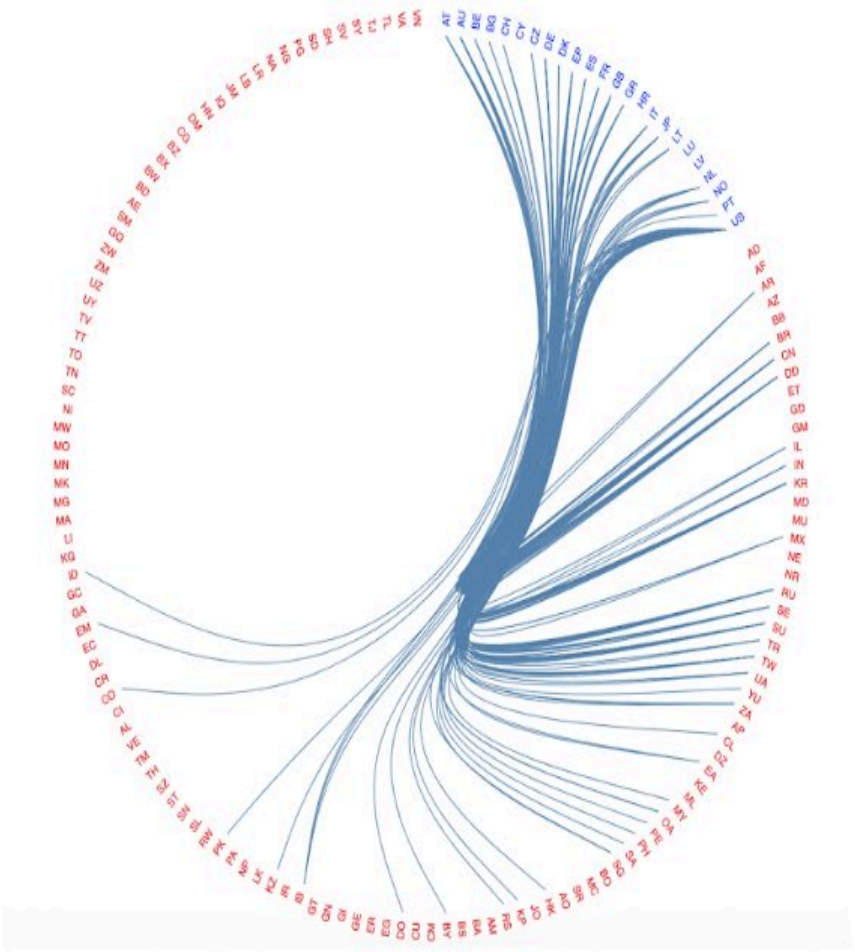
# CITING AMONG AUTHORITIES (PV)



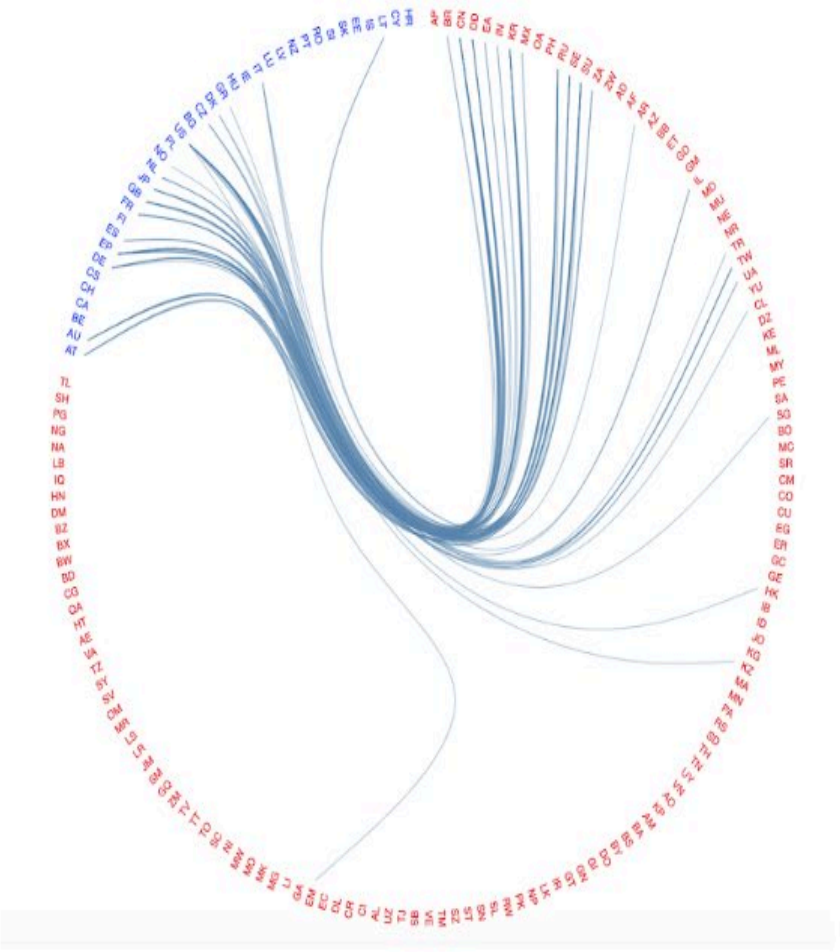
# FIGURE 23. RADIAL DIAGRAM OF INTERNATIONAL KNOWLEDGE FLOW



# FIGURE 24. DIRECTIONAL KNOWLEDGE FLOW BETWEEN DEVELOPED AND DEVELOPING WORLD COUNTRIES



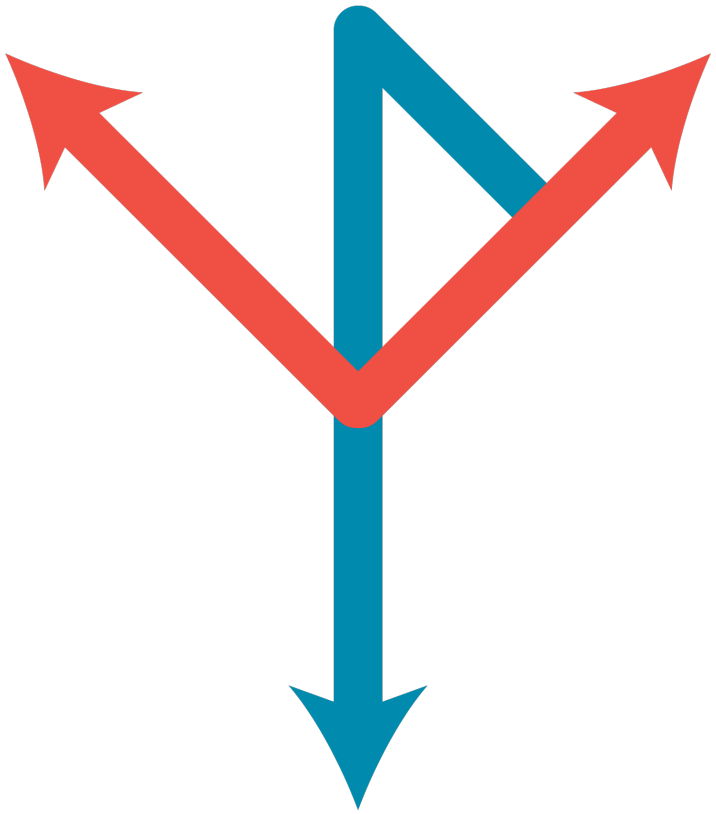
Developed → Developing



Developing → Developed

# CONCLUSIONS

- Network analysis of worldwide patent data allows calculation of patent importance, influence, and value
- Patent value correlates with citations, but raw citations can be misleading
- Eigenvector centrality is powerful method for determining patent importance, influence, and value
- Applications of patent importance
  - Identifying major players in particular technological fields
  - Assessing company and country innovation performance both generally and in specified areas of technology
  - Measuring flows of technical information from company to company and country to country
- Patent importance is important



# ISED's Data Strategy

## From Vision to Implementation

Canadian Intellectual Property Office
4th Annual IP Data & Research Conference
March 2021

Julie McAuley
ISED Chief Data Office & Results and Delivery Unit

Government cannot be successful in the next decade if it doesn't significantly improve its approach to data with respect to governance, funding, procuring, authorities, rule sets, skills and digital backbone

# Data Strategy Roadmap – Development timelines

## Federal Public Service

| Winter 2018 | Spring 2018 | Summer 2018 | Fall 2018 | First 9 months of 2019 | Fall 2019 onwards |
|---|---|---|---|---|---|
| **Listen** | **Envision** | **Assess** | **Share** | **Involve** | **Implement and Evolve** |
| Collect / Consult / Scan | Framework & Roadmap | Adjust & Review | Publish Roadmap | Departments / agencies develop data strategies that are relevant, scaled and customized to their needs and align with GoC direction | Iterate, review, assess, implement, share |
| Identify challenges, needs, successes, failures | Identify key components and vignettes | Identify timelines and leads | Overarching direction and feedback | | REPEAT! |

## ISED

### Impetus (Spring 2018)

- Launch of PCO/STC/TBS led work on development of *Data Strategy Roadmap for the Federal Public Service*
- Recognition that work on an internal ISED data strategy was needed

### Current State (Fall / Winter 2018)

- ISED wide consultations one *current data state*
- Need for Data governance, Data access, Data skill development, Tech support for data related work, Experimentation and pilot projects to harness the power of data

### The art of the possible (Spring / Summer 2019)

- Data strategy vision and framework created with key business drivers established
- ISED Data Strategy finalized and submitted to PCO (September 2019)

### Implement (Fall 2019 onwards)

- Action across six strategic pillars, staged by maturity
- Preliminary focus on developing awareness, understanding and literacy
- Share best practices and enable a data culture

# Data Strategy Roadmap for the Federal Public Service

- 21 recommendations covering 4 pillars:


- Some recommendations are related to ongoing initiatives while others are unique to the implementation of the GoC wide data strategy

- Each recommendation identified specified leads and timeframe

# ISED's Data Strategy



VISION: ISED leverages the power of data to foster a growing, competitive and knowledge-based economy.

MISSION: *By providing employees with the data, skills and tools they need, we will achieve excellence in serving Canadians and Canadian businesses.*

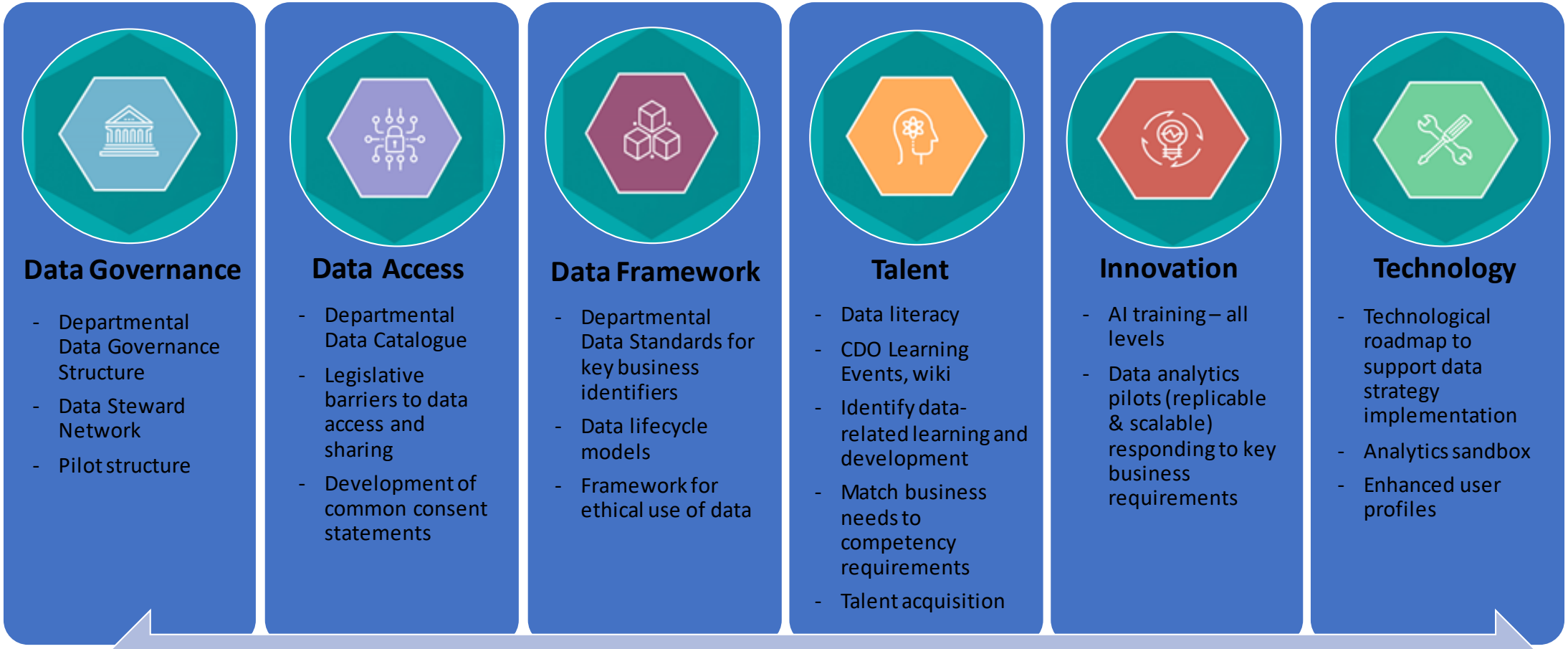
| BUSINESS DRIVERS: | | | | |
|---|---|---|---|---|
| Enhanced service delivery | Evidence based policies, research & evaluation | Strengthened reporting capacity & story telling | Enriched internal services | Improved regulation & enforcement |

GOALS:

- Canadians and Canadian businesses are better informed and served
- ISED adopts a data culture where data are discoverable, accessible, secure and of high quality
- ISED's talent base is enhanced with new skills and experimentation is promoted
- Public trust is honoured by ensuring that data are handled ethically and securely

| WHAT ARE WE DOING? | Laying the foundation | Building the momentum | Adopting a data culture |
|---|---|---|---|
| DATA GOVERNANCE | **Data-related leadership established**<br>Chief Data Office \| Data Governance Structure \| Identify key data stewards & champions<br>Identify processes to manage data at enterprise level (sharing & storing protocols) | **Culture shift across ISED**<br>Data Steward and Champion network established<br>Implement & oversee data processes | **People value their data and treat it as an asset**<br>Monitor adoption of data processes & standards aligned with GoC<br>Data Stewards facilitate access to data |
| DATA ACCESS | **Data access challenges are well understood**<br>Inventory & valuation of data assets \| Inventory data sharing agreements<br>Assessment of legislative & policy framework for data sharing | **Work on transformative data access initiatives**<br>Develop common consent statement for data sharing \| Create roadmap for a data sharing hub \| Partner with Sectors to pilot data sharing and data integration<br>Investigate data sharing opportunities across all levels of government | **ISED data are open by default**<br>Launch common consent statement for data sharing & monitor data sharing<br>Deploy self-service data sharing hub \| Expand data sharing to all levels of government |
| DATA FRAMEWORK | **Data framework and models are developed**<br>Data standards, including Common Business Profile and dictionaries, developed and piloted<br>Framework for ethical, secure use & storage of data developed \|Detailed data models for collection, acquisition, processing and storage conceptualized and piloted | **Put in place data framework and models**<br>Process to handle and use data are known \| Quality assurance standards developed<br>Data standards launched \|Framework for ethical & secure data use implemented<br>Data models in place across the department | **Protection of data via privacy by design**<br>Staff confidently conduct work with high quality data, with well-established data standards, definitions, and the privacy and security of Canada's data assured |
| TALENT | **Baseline and identify skills gaps**<br>Identify business needs \| Assess data literacy<br>Identify data-related learning and development | **Our workforce begins to transform**<br>Develop career path & data competencies \| Upskill and retrain new and existing staff<br>Recruitment strategy based on required data skills | **We have trained people to reach our goals**<br>Ongoing recruitment & development \| Talent retention initiative<br>Data as core competency for career development |
| INNOVATION | **Foundation for change is established**<br>Early opportunities identified \|First data analytics pilots undertaken<br>Success stories shared | **Experimentation begins to yield results**<br>Roll-out successful pilots to other sectors\| Continue to communicate approaches and use cases \| Identify mechanism for making decisions on proposed innovative solutions | **Innovation becomes common business practice**<br>Initiate departmental analytics support \| Develop Free Agent data talent matching service (data-skilled talent pool for short-term work) \| Establish data science pipeline |
| TECHNOLOGY | **Higher organizational awareness of existing solutions**<br>Determine technology requirements \| Establish technology strategy \| Experiment with technology solutions for data (management, sharing, creation, data analytics) \| Roadmap for Client Relationship Management (CRM) | **New tools and processes put in place**<br>Implement technology strategy — Business processes for use of new technologies, On-site storage, common data software suite, Business analytics tools available | **Internal technology keeps pace with innovation**<br>Integrated suite of IT tools for data and analytics \| Departmental Client Relationship Management with Common Business Profile \| Continual evaluation of Next Generation technology with new tech use on demand |

# Implementation to Date



# Future direction of Data Related Activities – Federal level and ISED

## Data Governance

- Data related decision making through all levels of government and organizations
- Robust data governance structures including accountabilities, roles and responsibilities with respect to data
- Alignment with other levels of government of organizations

## Talent (People and Culture)

- Data literacy and data skills
- Coordinated recruitment and development – where possible
- 'Having the right people and tools for the job'
- Online resources and best practices

## Data Access, Frameworks & Innovation (Data as an asset)

- Data catalogues and data access by default
- Privacy and security protocols
- Comprehensive data standards
- Data quality guidelines
- Better collection and interoperability of disaggregated data
- Ethical use of Data
- Pilot projects to showcase value of data

## Technology (Environment and Digital Infrastructure)

- Tools and techniques to support analytics, story telling and data visualization
- Adopting modern tools and Cloud technology to allow for the seamless sharing of data across organizations
- AI and other emerging technologies
- Alignment with / to overarching digital initiatives (Digital identity, Know your Client etc)

# Any Questions?