Linking data across university silos to support data-driven research development strategies

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Talk at a glance

- Background
- Case studies
- Challenges and opportunities

Data Science at Universities

- Advances in data science are transforming research at unprecedented rates

- Universities are leaders in this field

- But University administrative structures are lagging considerably

Why the gap?

- The transformative potential is clear
- The talent and capacity already exist
- Historical momentum?
- Institutional silos?

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Data follows organizational structure
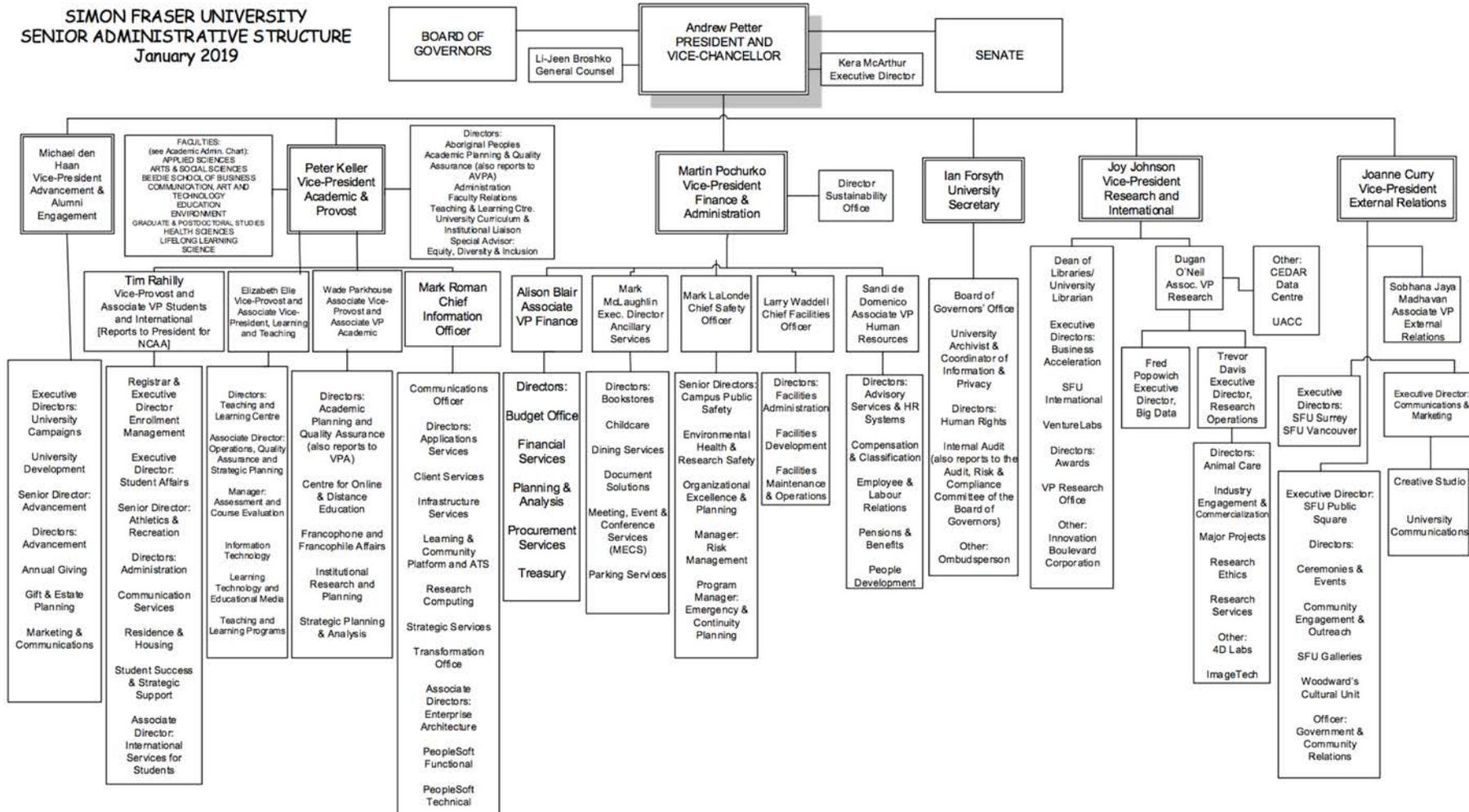
A few case studies

- Identifying competitive award candidates
- Targeted communications
- Equity, diversity, and inclusion initiatives
  - empirically assessing bias
- Research metrics for applications

1- Identifying strong award candidates

- Research awards bring prestige and opportunities to Universities and faculty
- Awards are associated with achievements
- Universities' submissions are limited, so they only want to put forward nominees that are likely to succeed

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1- Identifying strong award candidates

Can previous award data inform likelihood of applicant success and/or identify strong nominees?

Previous award success data (binary) + Multi-dimension research metrics → Model that best predicts success

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1– Identifying strong award candidates

Previous award success data (binary) + Multi-dimension research metrics → Model that best predicts success

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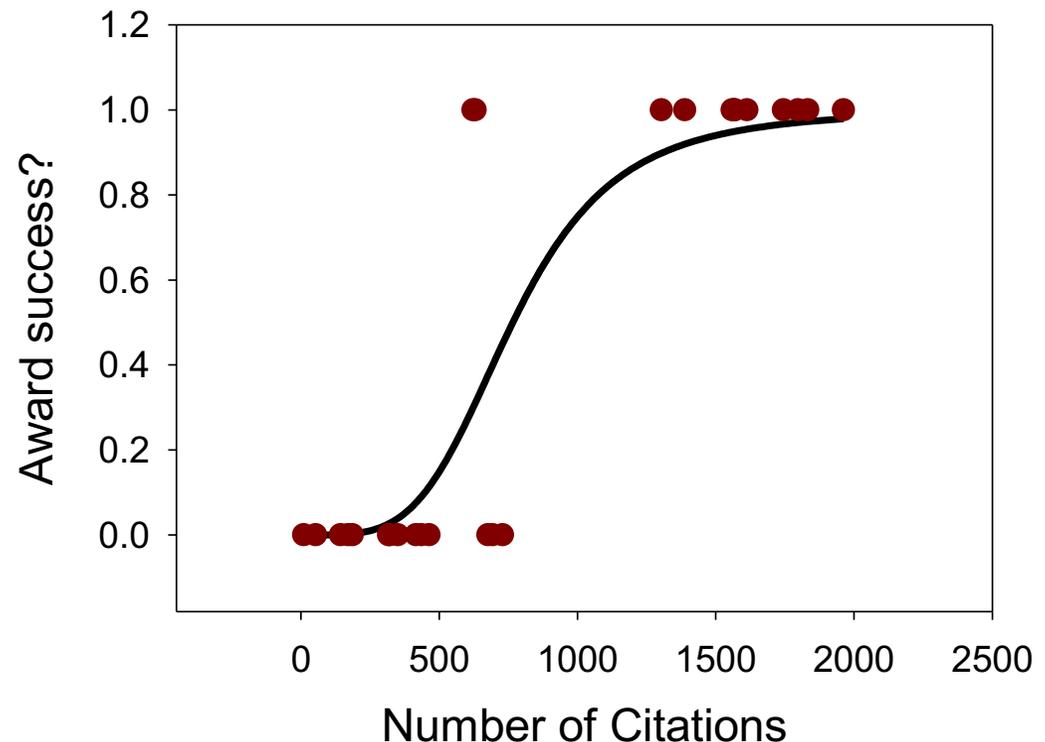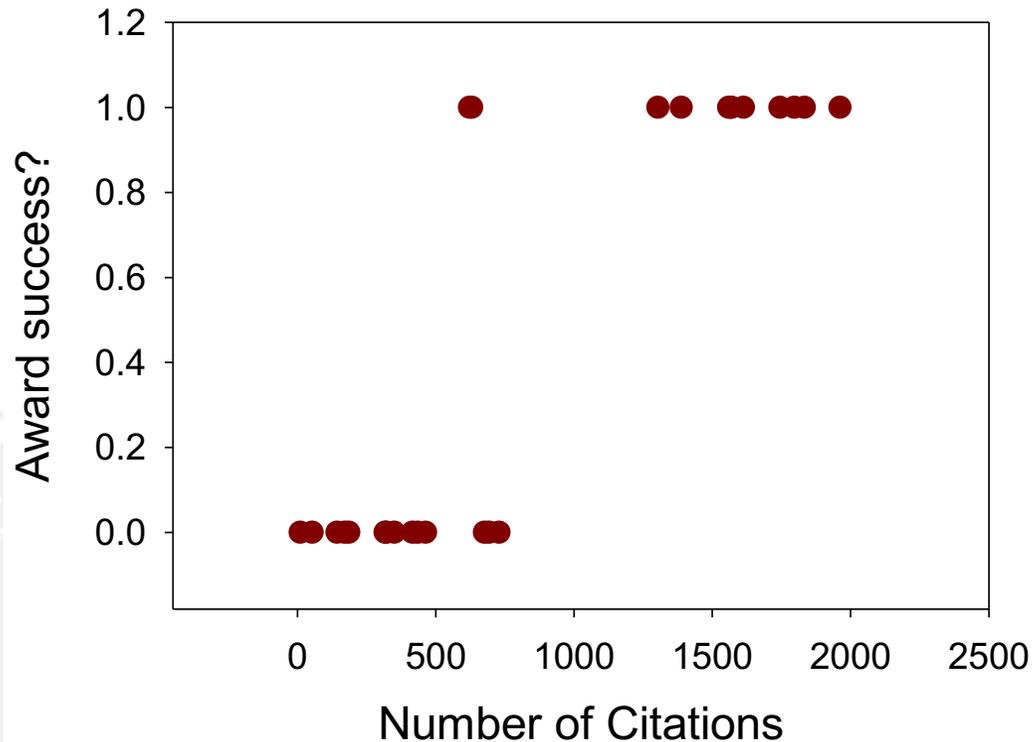
1– Identifying strong award candidates

No universal predictor; useful models require dozens of factors from all dimensions

| Name	Successful?	Year of PhD	Gender	Research $	Industry $	# Publications	FWCI	Significant Awards	Media mentions	HQP trained	Patents
Abel Andrzejewski	0	2008	Male	$ 13,154,756	$ 54,368	46	1	1	9	61	8
Kizzie Krawiec	0	2006	Female	$ 5,576,573	$ 90,268	250	2	3	29	73	15
Aleisha Alcala	0	2004	Female	$ 4,195,727	$ 129,630	45	1	6	30	36	13
Gayle Gaunt	1	2007	Male	$ 8,795,831	$ 137,561	34	1	2	41	23	8
Israel Infante	1	1991	Male	$ 13,724,166	$ 49,363	200	2	0	42	77	12
Bea Bracy	0	2008	Female	$ 9,205,192	$ 42,844	60	1	1	49	64	14
Daron Dieguez	1	2008	Male	$ 1,480,339	$ 80,085	46	2	4	31	76	0
Pierre Preusser	0	2009	Male	$ 3,032,928	$ 30,138	138	1	6	16	85	7
Scarlet Seagraves	0	1993	Female	$ 6,826,748	$ 52,641	369	2	6	40	9	15
Alysia Acheson	1	1993	Female	$ 9,647,920	$ 60,365	125	1	0	33	17	5

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Overlay labels: Faculty Relations | Awards office | Faculty Relations | Research Services | Industry engagement | 3rd party software | Awards office | Comms | Grad Studies | Industry engagement

2- Targeted communications

- Matching funding opportunities with researchers is a perennial challenge

- Researchers don't know about grants:
  - programs change and pop-up sporadically
 - we don't know what they need at any point

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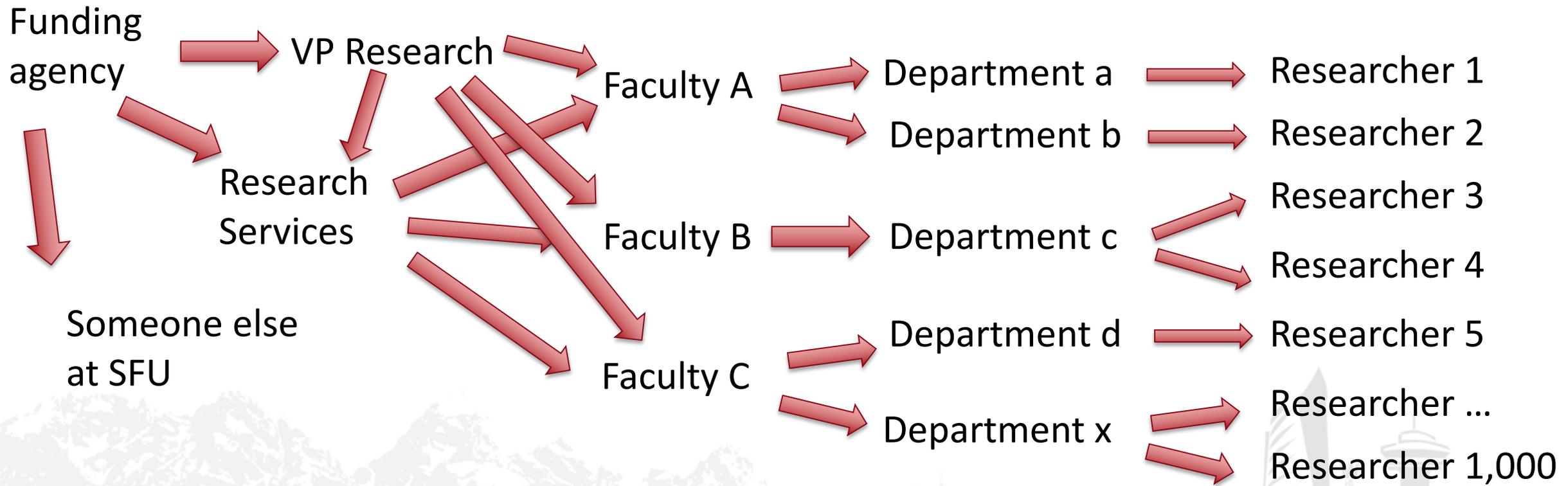
2- Targeted communications

2- Targeted communications

Funding agency

VP Research

Research Services

Someone else at SFU

Faculty A

Faculty B

Faculty C

Department a

Department b

Department c

Department d

Department x

Ineligible

Not a fit

Didn't see

On leave

Perfect!

Ineligible

Ineligible

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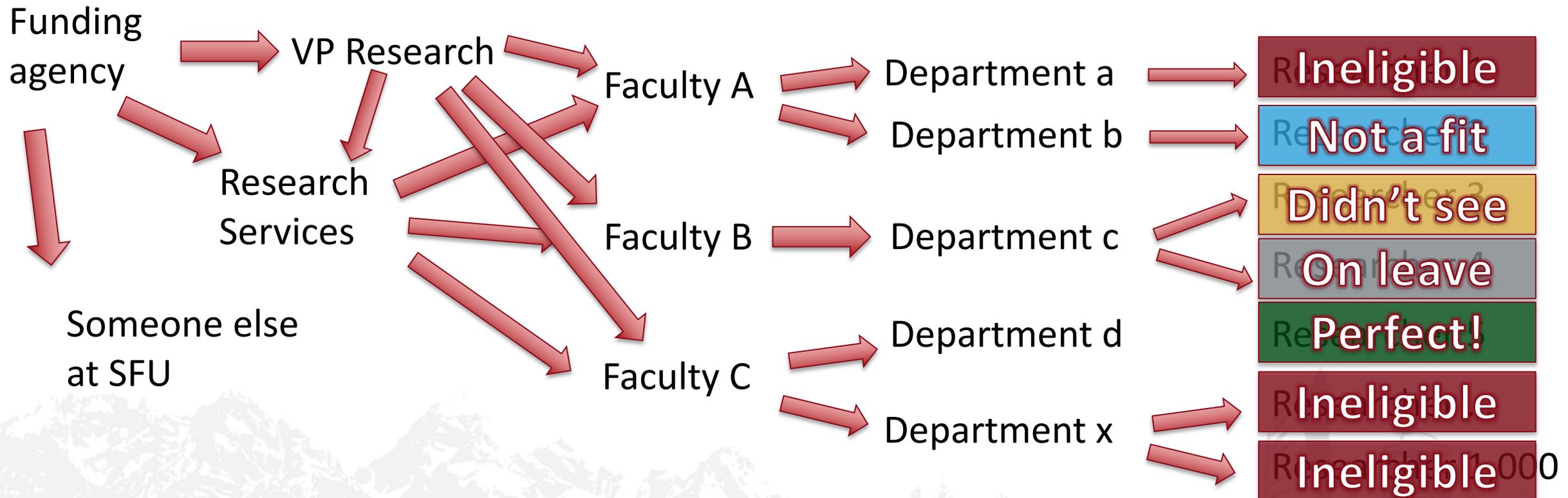
2- Targeted communications

- Blast e-mails for every competition not effective

- Administrative data can help us filter by:
  - eligibility (rank, career stage, funding, etc.)
  - research expertise/ interest

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2- Targeted communications

Funding agency

VP Research

Research Services
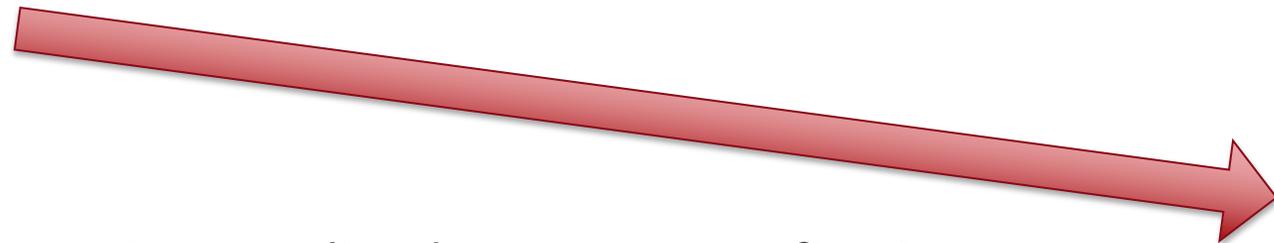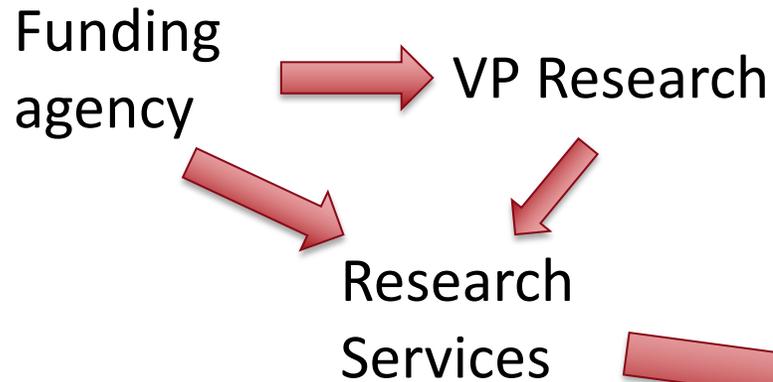
Personalized message confirming eligibility and fit and providing follow-up contact details

Ineligible
Not a fit
Didn't see
On leave
Perfect!
Ineligible
Ineligible

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3- Equity, diversity, and inclusion

- EDI is an increasingly prominent priority
- Overarching principle is to address, evaluate, and correct systematic biases
  - this requires access to novel data
  - often data collection is designed *ad hoc*

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3- EDI in hiring: bias or chance?

Possible applicants
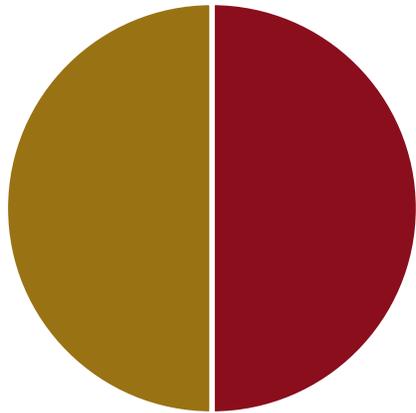
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Possible applicants
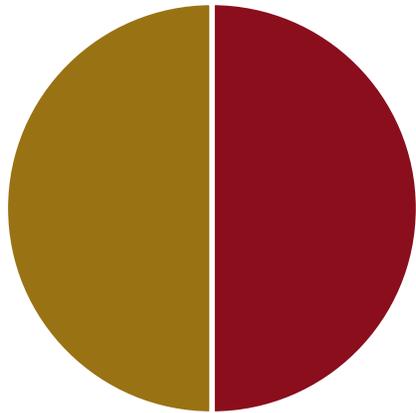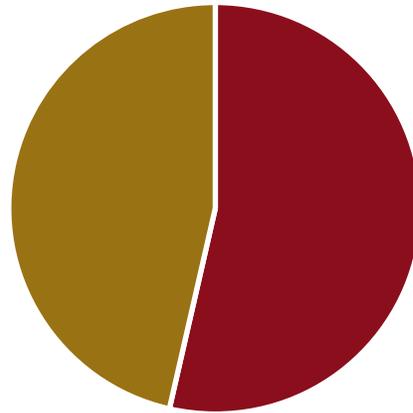
Applicant pool

Chance?
p >> 0.05

3- EDI in hiring: bias or chance?

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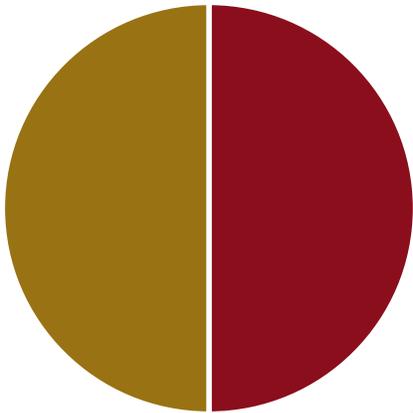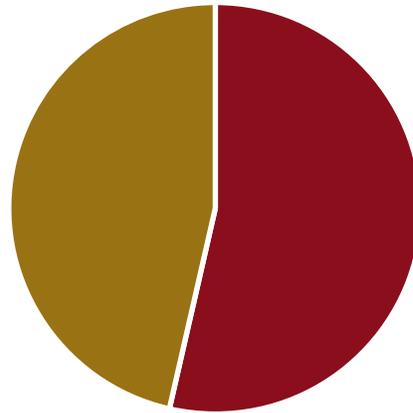
Applicant pool

Short list
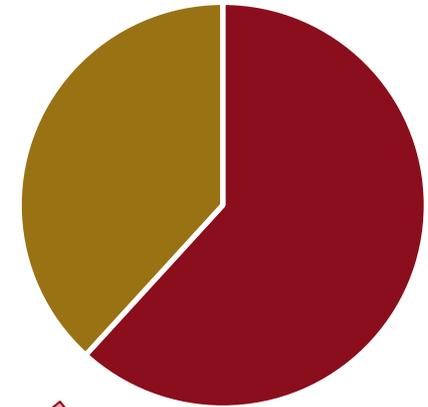
Chance?
p >> 0.05

Bias
p < 0.05

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3- EDI in hiring: evaluating strategies

Possible applicants

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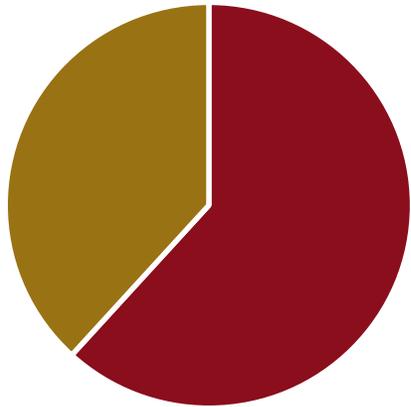
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Possible applicants
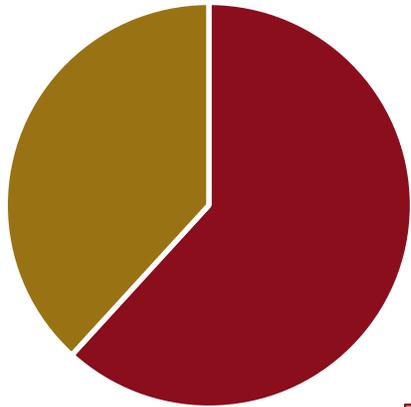
Applicant Pool

Strategic communication works
$p < 0.05$

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3- EDI in hiring: evaluating strategies

Possible applicants
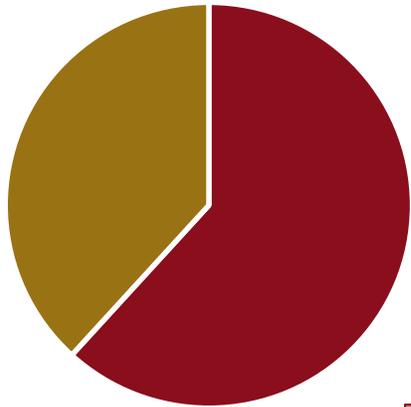
Applicant Pool
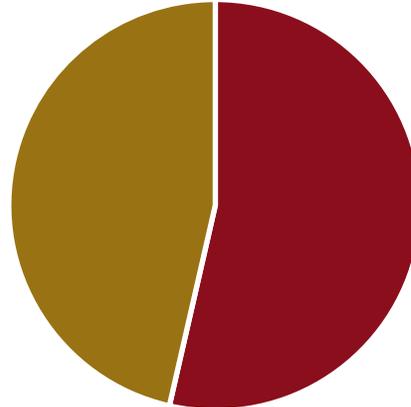
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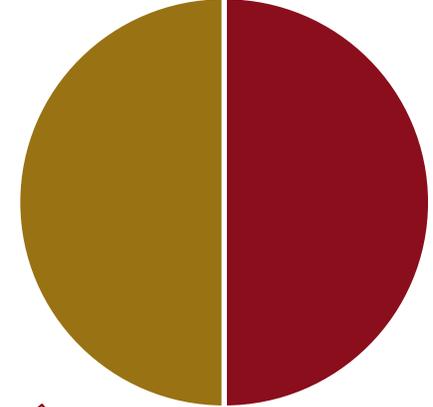
Strategic communication works
$p < 0.05$

Process favours equity-seeking group $p < 0.05$

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3- Bias in fellowship program?


Pie chart:
- Male 49%
- NA 27%
- Female 24%
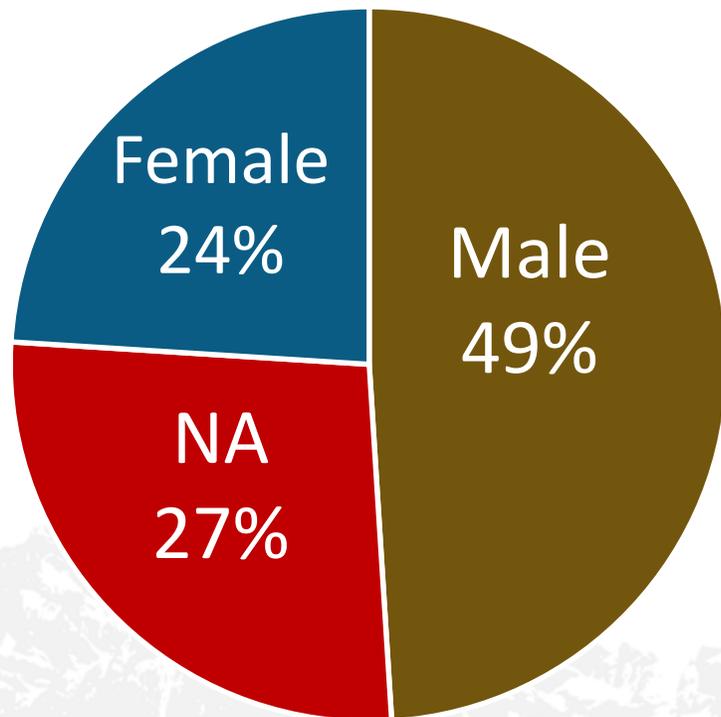
- Overall?
- Bias in applications?
- Bias in process?

Simulated data

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3- Bias in fellowship program?

Male : Female ratio in enrolment

Engineering

Law

0.1   1   10

Simulated data

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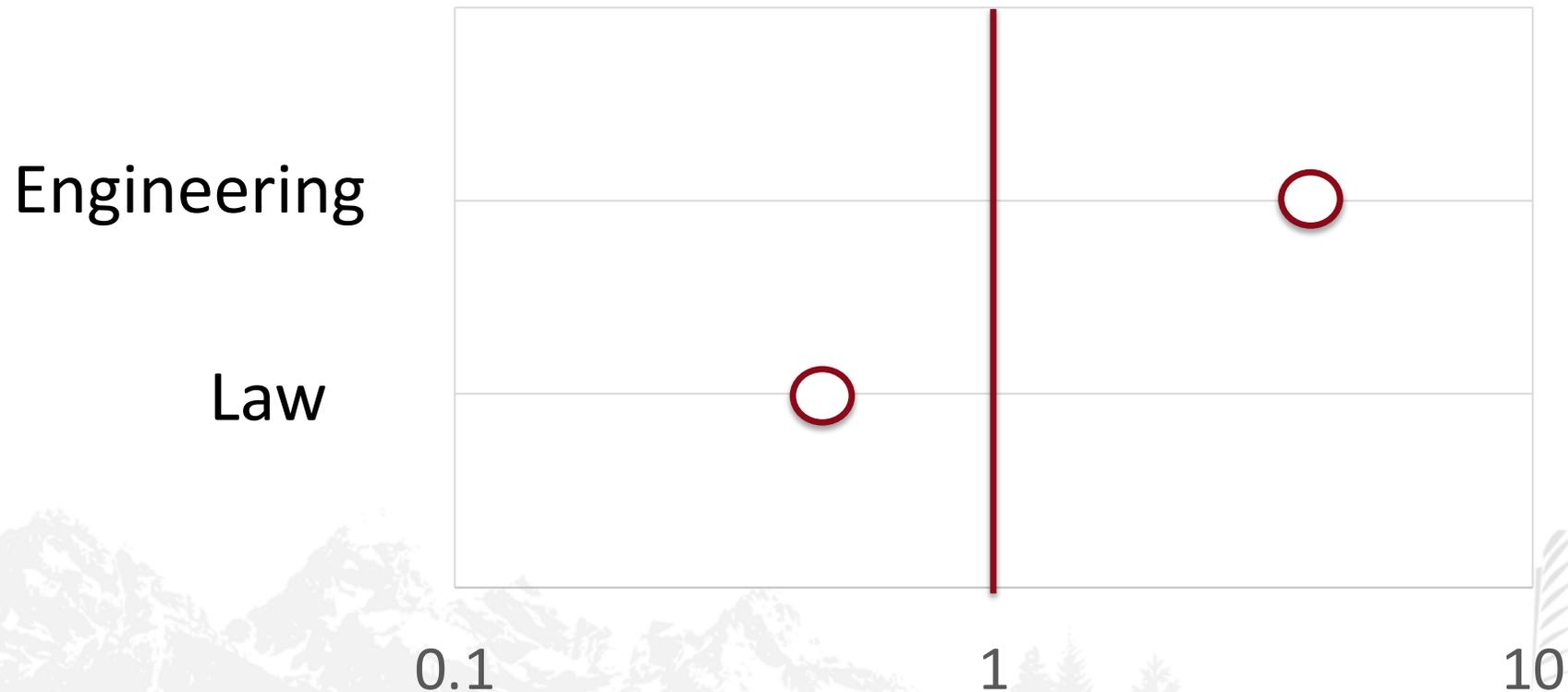
3- Bias in fellowship program?

Male : Female ratio in enrolment vs internships

Simulated data

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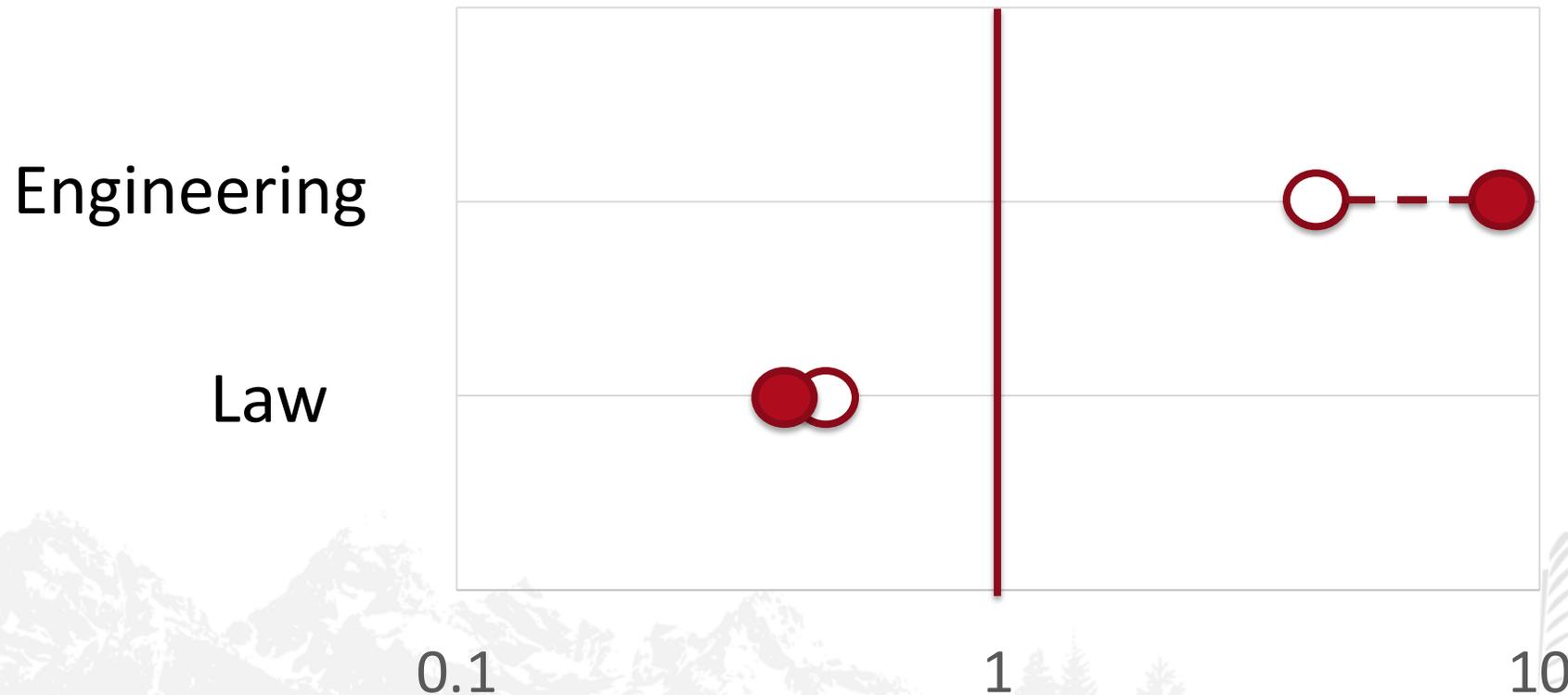
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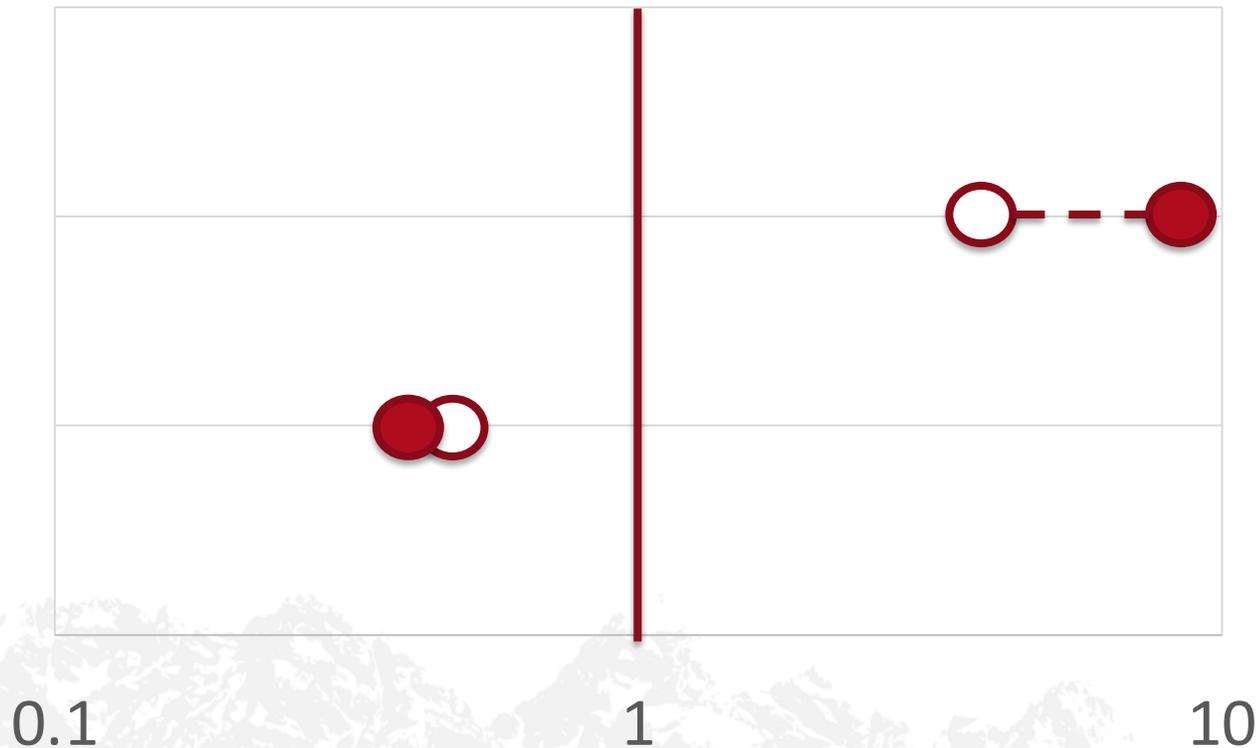
Required data from:
- Fellowship agency
- Research services
- 'Creative' sources
- Graduate studies

Simulated data

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4- Research metrics for applications
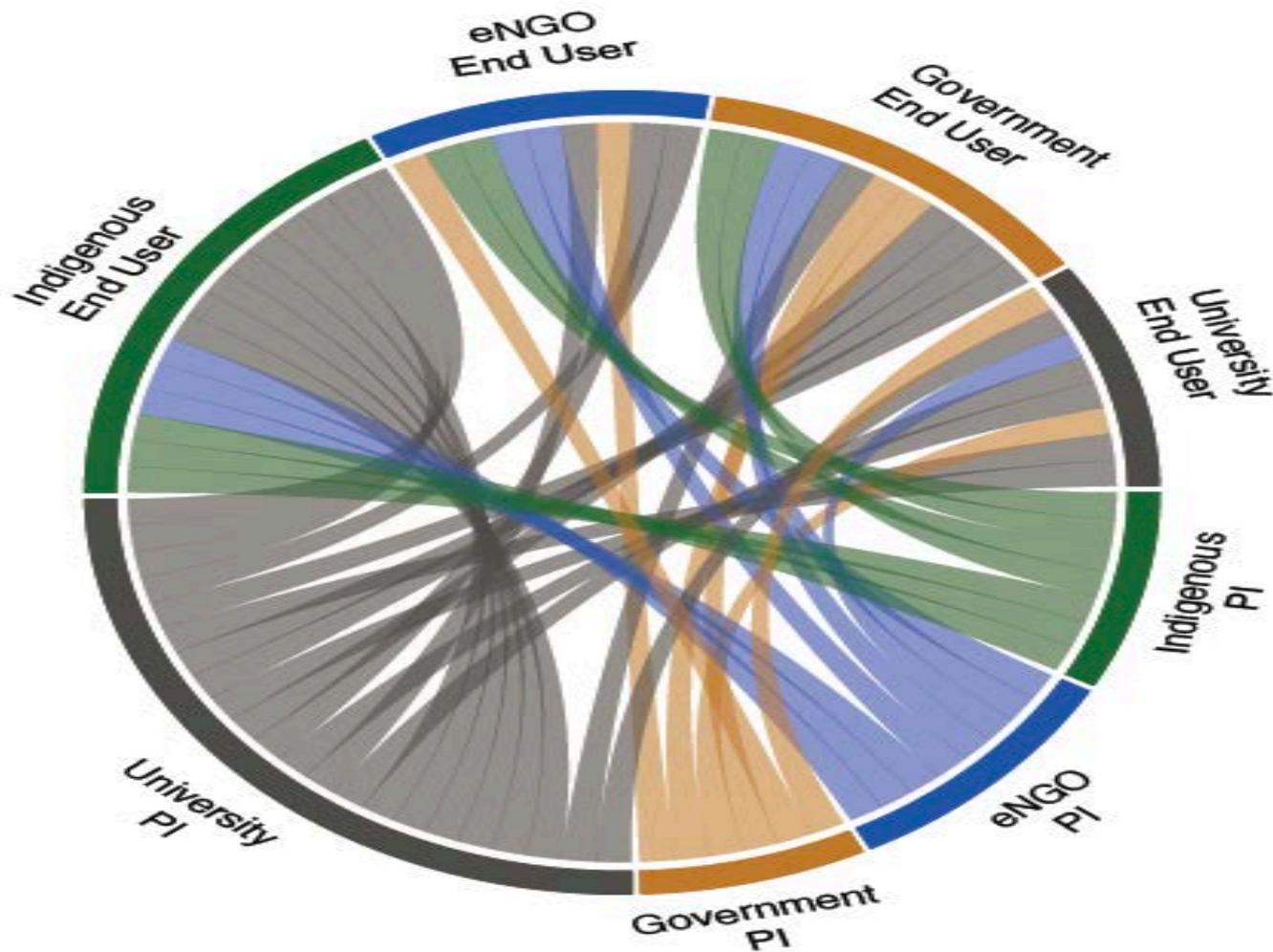

'Team-i-ness'

- co-publications
- team grants
- co-taught classes
- co-supervision

4- Research metrics for applications

Outcomes by Years Out from Graduation
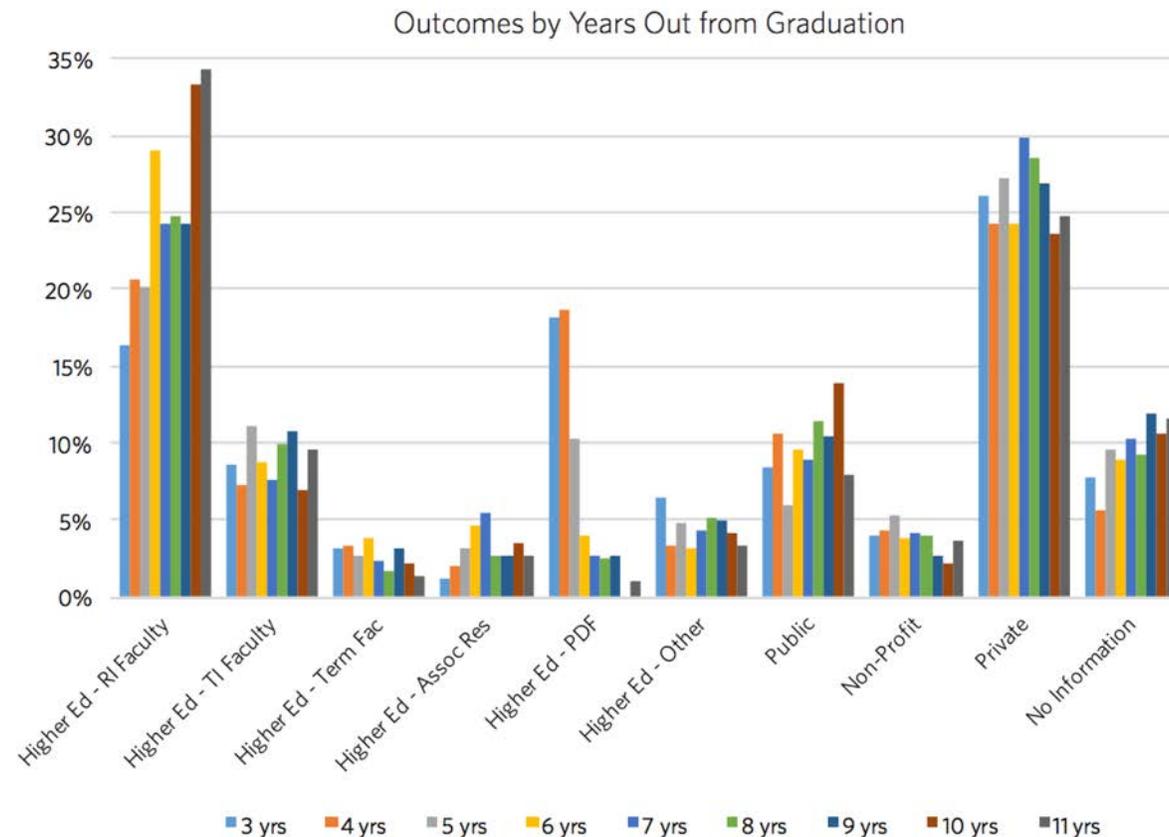
'excellence in training'

- # students
- time to completion
- career outcomes

4- Research metrics for applications

- 'best in the world'
- 'most innovative'
- 'committed to community and public engagement'
- etc.

Big Data Big Challenges

- Advantages of data integration:
  - Attract competitive funding
  - Aid researcher recruitment
  - Improve internal services & administration
  - Enhance University reputation

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Big Data Big Challenges

- Data integration not without challenges:
  - Community resistance to change
    - Technical & cultural
  - Suspicion regarding (irresponsible) use of data
  - Concerns over privacy

Community Resistance

Technical:
requires innovative approaches to business operations + (re-)training

Cultural:
requires communication, demonstration of advantages, institutional support + champions

Data abuse

- Irresponsible use of metrics
  - Disregarding disciplinary diversity
  - Superficial analysis

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Research metrics: use & abuse

Canada Research Chairs with keywords including *Social Innovation* or *Social Change*
Publications range: 2013-2018 (Source: Scopus/SciVal)
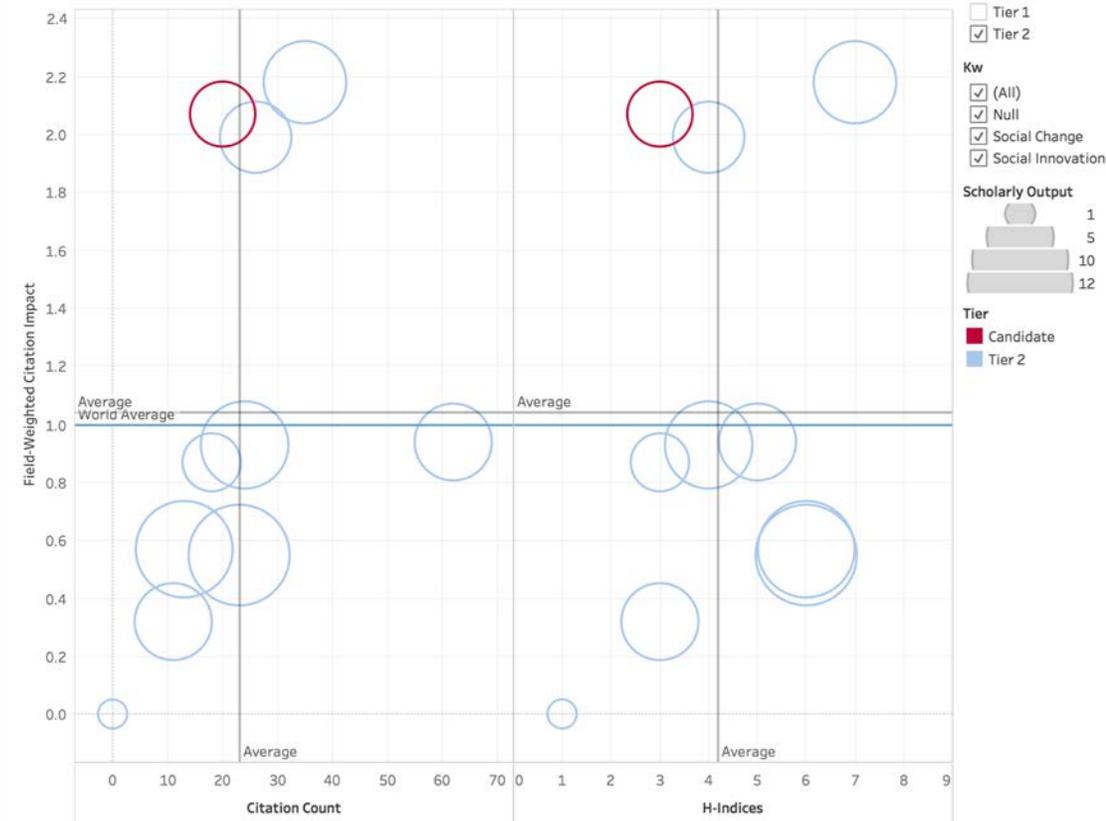
Blinkered approach? impact factors are being used too often to evaluate research

At least one in three research-intensive universities in North America examined by a study leaned on the journal impact factor of periodicals that academics had published in when making decisions on promotion and tenure, but the true proportion may be much higher.

The study, believed to be the first to examine the use of the journal impact factor in academic performance reviews, warns that there is an "undue reliance" on the controversial metric, which represents the number of times articles in particular publications have been cited in recent years.

Universities 'must read applicants' work to defeat impact factor'

READ MORE

Journal impact factors are being used too often "to evaluate the quality and significance of research, despite the numerous warnings against such use", says the study, published on *PeerJ Preprints*.

For the study, researchers from four countries collected and analysed review, promotion and tenure policies from 129 universities in the US and Canada.

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Privacy 🔒

- ## Collection notice
  - *"I have the data but can I use it for this purpose?"*

- ## Personal information (perceived vs real)
  - *"Is this data personal? Is it current? Might out-of-date data reveal personal history?"*

- ## Data access
  - *Data governance models, managing access*

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Where to go from here

- Data in action roadshows

- AI at the executive board
  - Data-informed decisions: good!
  - Robotic/formulaic decisions: bad!

- Accountability, reliability, transparency

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Thank you

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