Parallel Session (A.051)

Methods & Tools
for Assessment

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AESIS

#IOS22

Bottlenecks for evaluating societal value of science

1. Heterogeneity of 'impacts'

2. Time lag between knowledge production and visible 'impacts'

3. Attribution of causality

Method	Level of analysis	Original context
Payback Framework	Program	UK medical research
Science and Technology Human Capital	Research group or program	US STEM research
Public Value Mapping	Program or organization	US science policy
Monetisation	Program or system	UK medical research
Flows of Knowledge	Program	UK research council funding
SIAMPI	Project, program or organization	Research institutes (ICT, health, SSH, nano) for European Commission
Contribution Mapping	Project or program	Global health sector
Impact Narratives	Research group	UK assessment of university research (REF)
ASIRPA	Program or organization	French public agricultural research institute
Evaluative Inquiry	Research group or organization	Dutch assessment of university research (SEP)

Method	Actor roles	Interaction mechanisms
Payback Framework	Policymakers and professionals as contractors, agenda-setters and users	Cyclical: 7 stages with interfaces and feedback
Science and Technology Human Capital	Scientists and engineers as producers and carriers of knowledge	Linear: People mobility
Public Value Mapping	Institutional, social and economic 'end-users'; 'knowledge value collectives' as translators of research to new uses	Cyclical: Knowledge value collectives
Monetisation	Clinicians as users, patients as beneficiaries	Linear: Linear chain
Flows of Knowledge	Practitioners and policymakers as specific users; organizations and individuals as intermediaries	Cyclical: Dynamic process of iterative dialogue and reciprocal benefits
SIAMPI	Actors from science, industry, government and non-profits as stakeholders in knowledge use	Cyclical: Productive interactions
Contribution Mapping	Scientific and societal actors (including organizations, objects) engaged in priority-setting, proposal selection; producing, combining and using knowledge	Co-production: Alignment
Impact Narratives (REF)	Non-academic actors from society, economy, culture and public policy as (potential) beneficiaries	Linear: Linear exchange
ASIRPA	Academic, economic, knowledge transfer and governmental actors as part of research production and, as intermediaries and beneficiaries. Also objects as intermediaries	Cyclical: Translation networks and iterative learning processes
Evaluative Inquiry	Networks of people, technologies and resources connected to research units enable achievement of academic and societal value	Co-production: Translations within and between networks

Method	Concept of societal value	Relationship societal-scientific value
Payback Framework	Mixed: Successively as products for, use by or benefits to research, policy, (health) practice and economy	Distinctive, successive categories
Science and Technology Human Capital	Product: Increase in human capital	Embodied
Public Value Mapping	Mixed: Tracked backwards from public benefits to societal use and research outcome	Integrated
Monetisation	Benefit: Improvements to healthcare	Implicitly connected
Flows of Knowledge	Benefit: 5 types of impact (Instrumental, conceptual, capacity, cultural and connectivity)	Distinctive categories
SIAMPI	Use: (productive interactions)	Not clearly distinguishable
Contribution Mapping	Use: Contribution to actor-scenarios	Integrated
Impact Narratives (REF)	Benefit: Effect, change or benefit beyond academia	Causally related
ASIRPA	Mixed: Effects on economy, environment, health etc.	Integrated
Evaluative Inquiry	(Not predefined)	Integrated

Smit and Hessels (2021).
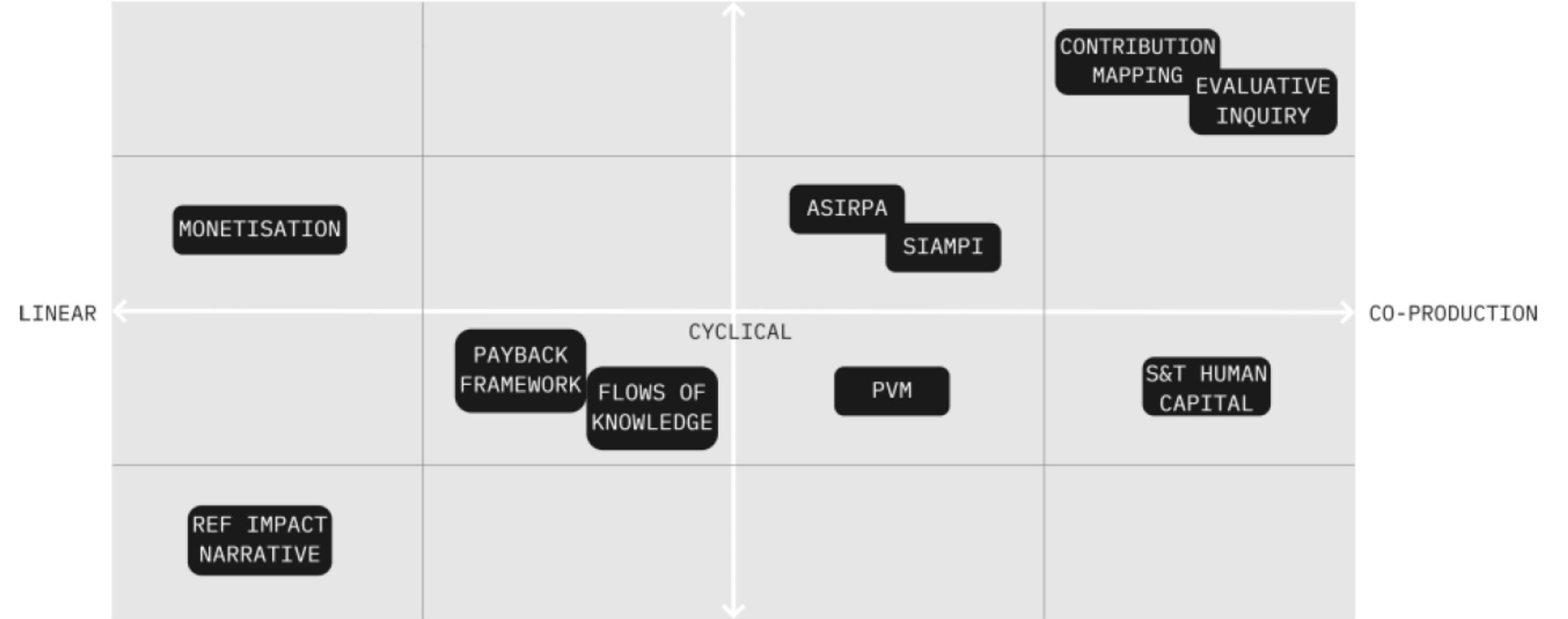
The performative nature of evaluations
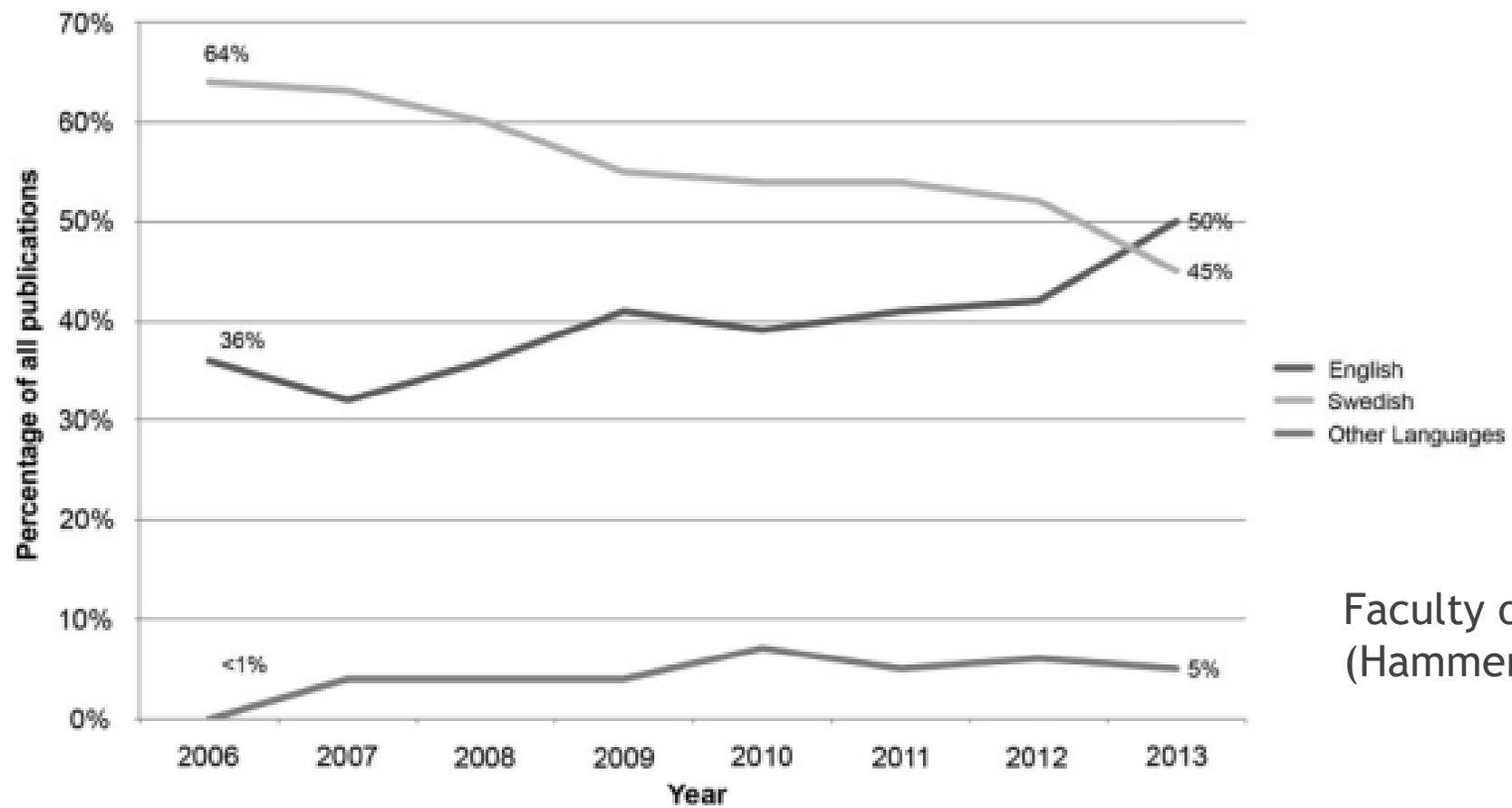
Faculty of Arts, Uppsala University
(Hammerfelt & de Rijcke, 2015)

The Leiden Manifesto for research metrics

Hicks et al. 2015

1) Quantitative evaluation should support qualitative, expert assessment.

2) Measure performance against the research missions of the institution, group or researcher.

3) Protect excellence in locally relevant research.

4) Keep data collection and analytical processes open, transparent and simple.

5) Allow those evaluated to verify data and analysis.

6) Account for variation by field in publication and citation practices.

7) Base assessment of individual researchers on a qualitative judgement of their portfolio.

8) Avoid misplaced concreteness and false precision.

9) Recognize the systemic effects of assessment and indicators.

10) Scrutinize indicators regularly and update them.

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Senior project manager

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Researcher

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Senior Researcher

Responsible metrics for societal value of scientific research

March 10, 2022 · Science & Society and · Long read · 5 min read

Main principles

- choose methods that match the purpose of evaluation

- choose methods that fit the research context

- combine qualitative and quantitative data

- consider the theoretical assumptions of your evaluation method

Conclusions

- Indicating societal value is attractive but methodologically complex
- Evaluation methods vary in purpose, data requirements <u>and</u> theoretical assumptions
- Research evaluation is a performative act
- Use metrics of societal impact responsibly

Key references

- Smit, J. P., & Hessels, L. K. (2021). The production of scientific and societal value in research evaluation: a review of societal impact assessment methods. *Research Evaluation, https://doi.org/10.1093/reseval/rvab002.*

- Hicks, D., et al. (2015). The Leiden Manifesto for research metrics. *Nature,* 520, 429-431

- Costas, R., de Rijcke, S., & Marres, N. (2021). "Heterogeneous couplings": Operationalizing network perspectives to study science-society interactions through social media metrics. *Journal of the Association for Information Science and Technology, 72*(5), 595-610.

- Hessels, L.K., van Drooge, L., Holtrop, T., Costas, R. (2022). Responsible metrics for societal value of scientific research. Blogpost at www.Leidenmatrics.nl

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Rathenau Instituut

Eiríkur Smári Sigurðarson

Research Specialist at University of Iceland

AESIS

#IOS22

What is it good for?

Eiríkur Smári Sigurðarson, School of Humanities, University of Iceland

AESIS 2022, Leiden 22-24 June

Impact and value

- Some simplistic ideas:

  - Value is difficult.

  - Impact is also difficult - but easier.

  - Indicators and metrics often the easy way out.

- Too little debate about value and valuable impact in general.

Value, impact and metrics

- "There is a danger that the concept of impact might narrow and become too specifically defined by the ready availability of indicators for some types of impact and not for others." *The Metric Tide* (p. x).

- "There are things that can be measured. There are things that are worth measuring. But what can be measured is not always what is worth measuring; what gets measured may have no relationship with what we really want to know."Jerry Z. Muller, *The Tyranny of Metrics*, 2018 (p. 3).

Putting value into evaluations

- How do we include value in evaluations? Or: What is a good society?

  - Not all impacts are good!

  - Multiple theories of good societies and of well-being.

- Some recognised principles:

  - UN Declaration on Human Rights.

  - **Sustainable Development Goals (SDG).**

  - Capabilities (Sen/Nussbaum).

Australian university tops fourth edition of global ranking measuring institutions' social and economic impact

April 27, 2022

Rosa Ellis

Twitter: @RosaEllis

Issues with THE (Hazelkorn 2022)

- Opacity of the process.

- Reliance on self reporting.

- Limited participation.

- Making money of data.

"This data set contains 700.000+ publications from all Aurora Universities in the period from the early1700's till mid 2022."

**10.63K** RESEARCH PAPERS CONTRIBUTING TO THE **SUSTAINABLE DEVELOPMENT GOALS**

Publications per Sustainable development goal

Publications per Sustainable development goal and targets

SDG-13 Climate Action	SDG-14 Life Below Water	SDG-15 Life on La...
2.26K	2.24K	1.34K

SDG-12 Responsible Consumption...	SDG-06 Clean Wat...	SDG-16 Peace...	SDG-17 Pa...
1.19K	0.88K	0.67K	0.57K

SDG-11 Sustainable Cities and Co...			
1.16K	SDG-01 No Pov...	SDG-07 Affordabl... 0.37K	SDG... 0.27K	SD... 0.23K
	0.52K	SDG-02 Zero Hu...		
SDG-03 Good Health and Well-bei...	SDG-04 Quality... 0.34K	SDG-08 Decent ... 0.34K	SDG-09 In... 0.23K
1.01K	0.43K		

To enable drill-down to targets and publications: hover on top-bar of the chart &lick on down-arrow.
Why do I see targets of other SDG's in a selected Goal?
Because some publications are identified to be relevant for more than one SDG.

619 RESEARCH PAPERS CONTRIBUTING TO THE **SUSTAINABLE DEVELOPMENT GOALS**

Publications per Sustainable development goal

Publications per Sustainable development goal and targets

SDG-14 Life Below Water	SDG-13 Climate Action	SDG-12 Resp...
216	120	74

SDG-03 Good Health and Well...	SDG-04 Quality Educat...	SDG-01 No P...	SDG-17 Pa...
59	44	32	27

| SDG-11 Sustainable Cities and ... | SDG-16 Peace, Justice ... | SDG-08 Dece... | SDG... | SD... |
| 49 | 42 | 25 | 14 | |

SDG-15 Life on Land	SDG-05 Gender Equality	SDG-06 Clea...	SDG-02 Zer...
49	36	21	
			SDG-07 Aff...

To enable drill-down to targets and publications: hover on top-bar of the chart &lick on down-arrow.
Why do I see targets of other SDG's in a selected Goal?
Because some publications are identified to be relevant for more than one SDG.

SDG: Themes					
13 Climate Action	308%	462%	42%	20%	129%
15 Life on Land	193%	1194%	56%	19%	38%
17 Partnerships for the goals	235%	223%	42%	12%	0%
Averages	192%	424%	43%	16%	62%

EXAMPLE: INSTITUTIONAL PROFILE OF THE VU ON 7 SDG'S;
POLICY IMPACT OF SDG13 (MORE IN ARBI 2)

VU VRIJE UNIVERSITEIT AMSTERDAM — Institutional SDG profile — 2017-10-06

SDG: Themes	SEP: Research Quality		SEP: Relevance to society		
	Production: thematic skew of publications	Usage: skew in top 1% most cited	Production: of publications in OA (2016)	Usage: of publications in (N)GO Policy	Usage: of most cited in (N)GO Policy
2 Zero Hunger	179%	480%	44%	17%	56%
3 Good Health and Well Being	110%	81%	41%	12%	50%
11 Sustainable cities and communities	169%	292%	50%	17%	29%
12 Responsible consumption and production	147%	233%	26%	14%	133%
13 Climate Action	308%	462%	42%	20%	129%
15 Life on Land	193%	1194%	56%	19%	38%
17 Partnerships for the goals	235%	223%	42%	12%	0%

Policy sources	Policy papers refering to all VU climate research (n=2006)
Intergovernmental Panel on Climate Change	61
The Publications Office of the European Union	34
Food and Agriculture Organization of the United Nations	41
Australian Policy Online	40
National Academies Press	33
World Bank	28
rijksoverheid.nl	21
overheid.nl	11
World Health Organization	10
National Bureau of Economic Research	8
The Inter-American Development Bank	6
UK Government (GOV.UK)	6
UNESCO	3
Brookings Institute	2
The International Fund for Agricultural Development	2
UK Parliament Briefing notes	2
International Monetary Fund	1
Oxfam GB Policy & Practice	1
The International Institute for Sustainable Development	1
Totaal	331

EXAMPLE: INSTITUTIONAL PROFILES OF THE AURORA INSTITUTIONS ON 4 SC'S;

EU Societal Challenges – Research profile of Aurora institutions
last update: 2017-10-10

GROSS ACADEMIC VALUE AT VU | USING PURE IN MAKING ACADEMIC VALUE VISIBLE

https://youtu.be/AksSQE9rfE4

AURORA CATALOGUE OF SOCIETAL IMPACT – SHOW CASES ON SOCIETAL RELEVANT THEMES

Target	Description	Query
		(

5. 1	End all forms of discrimination against all women and girls everywhere
	
	5.1.1 Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex
		`TITLE-ABS-KEY (("discrimination") W/3 ( "sexual" OR "gender*" OR "women" OR "female" OR "girl*" ) ) OR`
		
		`TITLE-ABS-KEY (( "law*" OR "legislation*" OR "legal*" ) AND (( "equality" ) W/3 ( "sexual" OR "gender*" OR "women" OR "female" OR "girl*" ) ) )`

5. 2	Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation
	
	5.2.1 Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age
	
	5.2.2 Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than an intimate partner in the previous 12 months, by age and place of occurrence
		`OR`
		`TITLE-ABS-KEY (( ( "violence" ) W/3 ( "sexual" OR "physical" OR "psychological" ) ) AND ( "gender*" OR "women" OR "female" OR "girl*" ) ) OR`
		
		`TITLE-ABS-KEY ("human trafficking" )`

The data

- Bibliometric databases: Scopus

- Additional masures: Top 10% (SciVal), OA status (Impact Story), references in policy documents (Altmetrics).

- Known serious limitations: Scope!

- Problems: Gives a false view of SDG related research and reinforces a view that some research fields are less relevant than other.

- Gaming?
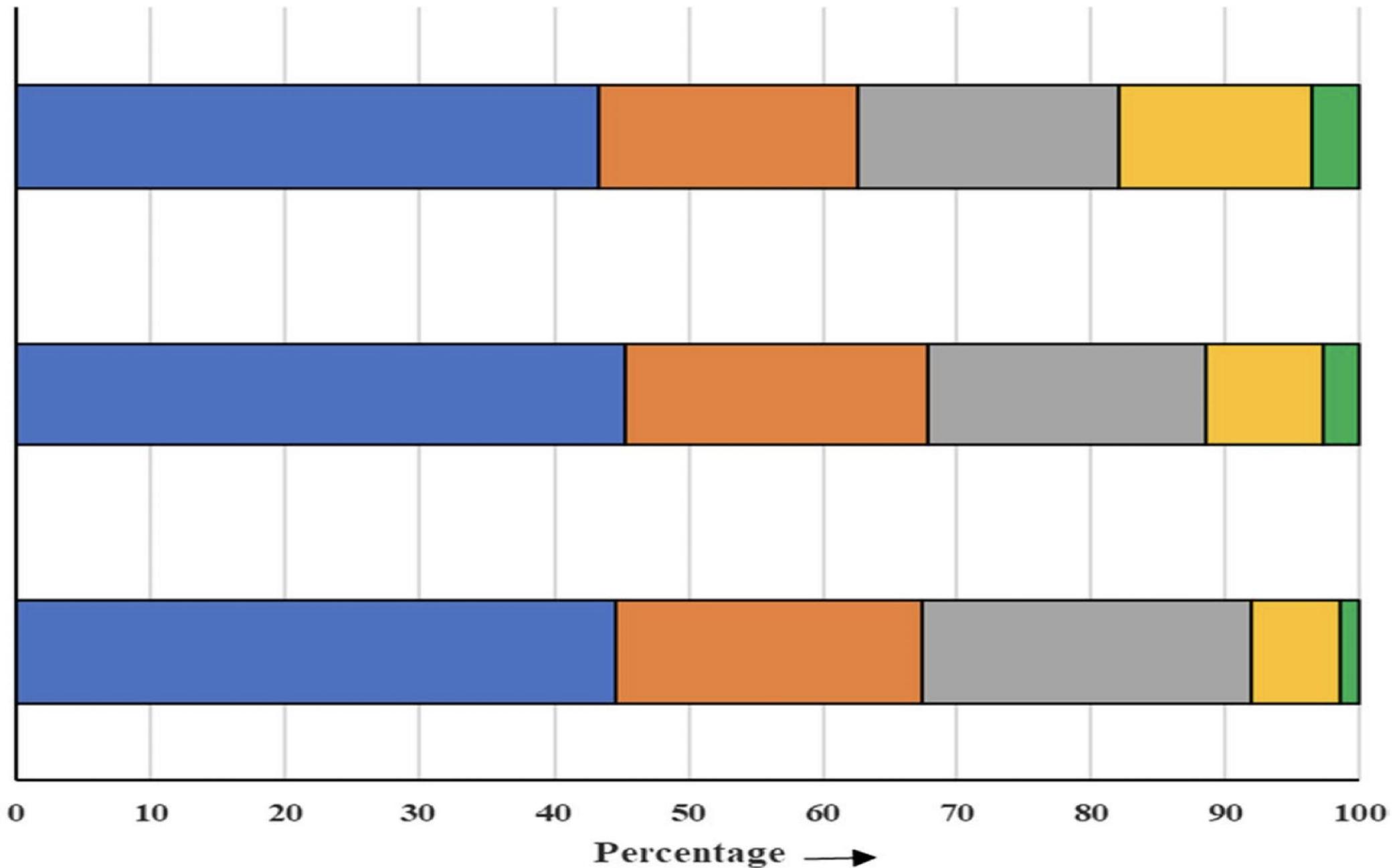
Value, impact, and the tyranny of metrics

Ismael Ràfols, comment in Research Europe (2017):

In summary, for the assessment of societal impact, given that the effects of research are uncertain and disputed, bespoke Indicators have to be developed and used in collaboration with research users. <u>At present indicators are tools to close down debate.</u> They should instead become part of a pluralistic exploration of impacts - and in the process foster wider participation in research assessment.

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ismael ràfols — **view from the top**

There's no silver bullet for measuring societal impact

Across Europe, policymakers are placing more emphasis on the contributions of research to society. These contributions are diverse—taking in improvements to well-being, spurring innovation or creating meanings—and their assessment is complex and subjective. This creates a pressure to develop indicators that can justify policy choices while saving time and resources.

But using general indicators as a silver bullet to measure societal impact is analytically wrong, unfair to some types of research and harmful to science as a whole. The contributions of science to society are so varied, and mediated by so many different actors, that indicators used in impact assessment cannot be universal metrics. Instead, they need to be developed for given contexts and used alongside qualitative assessment.

First, remember that science, technology and innovation do not necessarily improve social well-being. They have also caused much harm—sometimes purposefully, as with nuclear weapons, sometimes accidentally, as with asbestos or thalidomide. Often, there is uncertainty and disagreement regarding what is desirable—some may think, for example, that developing renewable energy is more important than improving the combustion engine.

Therefore, we cannot assume that more impact is necessarily better. It is crucial to assess the type of contribution made. Improving weapons is not the same as developing therapies. Impact is a vector, not a scalar—its direction matters. Unidimensional indicators, such as numbers of jobs created, cannot capture directions—the value of the impact depends on the type of jobs.

Second, policy analysts such as Roger Pielke Jr have argued that, for uncertain and disputed questions, analysis cannot be separated from decision-making. This applies to societal impact: what is valued is tightly entangled with what is measured and how. Therefore, impact indicators must be developed as part of the decision-making process, and include diverse views and interests.

Developing indicators in this way would be a major departure from current practices. Conventional science indicators are mainly based on information from a few data sources, for example publications, tweets or patents.

These indicators come with assumptions about the data, such as the meaning of a citation, and the effect of measurement, for example that assessment will foster 'quality'. This type of research assessment analysis takes place in seclusion, away from the contexts and decisions about research and policy.

To shift the way indicators are developed, I would adopt two suggestions for pluralising science policy advice, made by Andy Stirling and his colleagues in the Science Policy Research Unit at the University of Sussex.

The first involves a broadening of inputs, from publication and patent databases to a wider set of data and expertise. This could include information from social media, as well as databases of news, healthcare, consumption, social welfare and so on.

More data alone is not enough. Disparate forms of expertise will be needed to bring in qualitative insights to frame, interpret and contextualise these data. Such interpretation is crucial because indicators mean different things in different contexts.

The second move concerns how the outputs of analysis are presented and used in decision-making. Conventionally, indicators are presented to decision-makers as tables, providing what seems to be a unique and prescriptive ranking of the options or performers.

In cases such as societal impact, where there is uncertainty and disagreement, evidence should instead be presented in formats such as spider graphs, maps or drawings, which allow different interpretations depending on priorities, thus providing plural and conditional advice.

A science map, for example, can show the differences between research that contributes to therapies or to prevention. Different parties, each with their own values and interests, can then argue about the strategy that will have a more desirable form of impact.

This way of presenting evidence acknowledges that societal impact assessment is inevitably value-laden. Rather than using indicators that hide these values—and their politics—the aim should be to reveal the assumptions behind quantitative evidence for impact.

In summary, for the assessment of societal impact, given that the effects of research are uncertain and disputed, bespoke indicators have to be developed and used in collaboration with research users. At present, indicators are tools to close down debate. They should instead become part of a pluralistic exploration of impacts—and in the process, foster wider participation in research assessment. More to say? Email comment@ResearchResearch.com

Ismael Ràfols is a science policy analyst at the Universitat Politècnica de València, Spain. This article is based on his keynote to the Science, Technology and Innovation Indicators conference held in Paris between 6 and 8 September. For slides and references, see goo.gl/eLYhny

'Societal impact assessment is inevitably value-laden.'

Closing the debate

- Value is never settled. Needs continuous debate, negotiation, renegotiation, …

- Are the SDGs closing the debate?

- Does it represent closed more than open science?

- Based on products more than processes.

Challenges, changes and capacities

- UNESCO on Social Transformations

- "The world is undergoing important <u>social transformations</u> driven by the impact of globalization, global environmental change and economic and financial crises, resulting in <u>growing inequalities</u>, <u>extreme poverty</u>, <u>exclusion</u> and the <u>denial of basic human rights</u>. These transformations demonstrate the urge for innovative solutions conducive to universal values of peace, human dignity, gender equality and non-violence and non-discrimination. Young women and men, who are the most affected by these changes, are hence the principal key-actors of social transformations."

# Challenges, changes and capacities (Benneworth, Gulbrandsen & Hazelkorn 2017)

Process scale	Knowledge process	Conceptual framework for understanding "value"	Value determination process
Individual	Co-creation of new knowledge	The societal analogue for scientific excellence, directly related to individual research projects—measures of "goodness"	Are researchers making their findings as accessible as possible?
Micro	Knowledge exploitation/transfer	Users taking knowledge and research from researchers and embedding it in their own products, processes and techniques	Is there evidence that users are engaging/exploiting findings?
Meso	Embodiment in network behaviour	Maximising incentives for creating public benefits from private activities, via autonomy and accountability	Are the findings disseminating and exploited via networks?
Macro	Becomes knowledge commons	Creating and empowering societal capacities to live a "good life", particularly outside direct economic sphere	Are networks changing in ways that promote a "better" society?

Challenges, changes and capacities

- Benneworth et al.:

- "Our research has traced through a concrete series of examples the ways in which humanities research becomes codified and embedded in intermediate artefacts that create new forms of <u>societal capacity</u>—that is, social innovation."

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Potential and actual impact of research

Figure 2.1 A stylised visualisation of the core concepts of capability theories
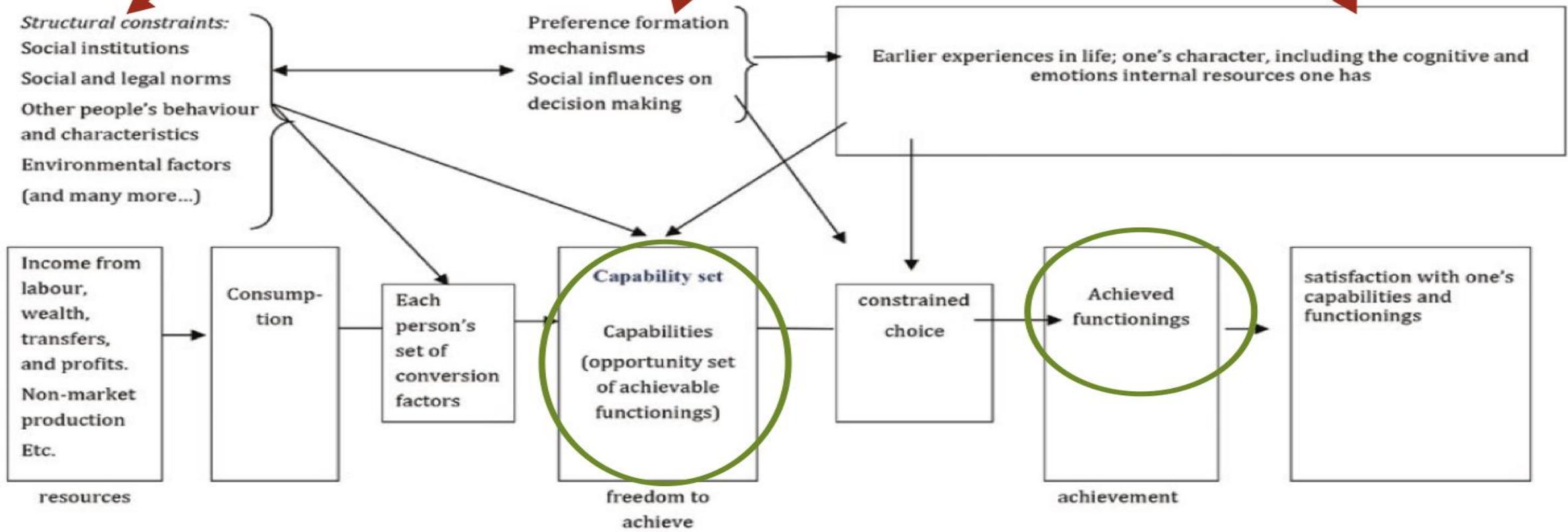
Source: Based on Robeyns (2005b), updated and expanded.

Conclusions, discussions?

- The SDGs are positive, agreed-upon global societal goals! Evaluations of societal impact based on the SDGs are heavily metrics based.

- This is already having an effect on evaluation and incentive systems.

- The bibliometric indicators are known to have issues of coverage affecting language of publication and research field.

- Are we still being dictated by the availability of indicators?

# How do we benefit from measuring impact?

Sean Newell
The Impact of Science, Leiden, June 2022

Why do we do research?

A huge driver for doing research is that we benefit as a society
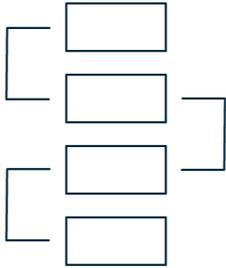
Impact: Improved health for the community
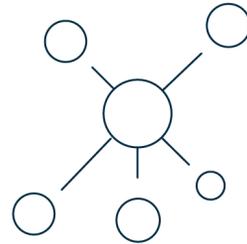
Impact: Better standard of living

Impact: Better protection for the environment

Wouldn't it be good if we could achieve these impacts more quickly?

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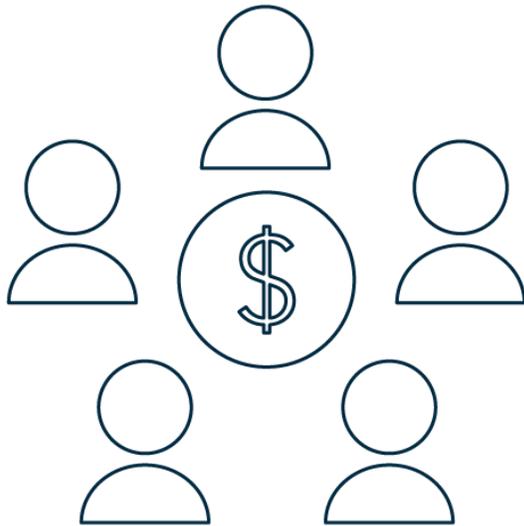
Research Spend

Globally it's in the trillions of dollars.

In the USA in 2019, over $600 billion was spent on Research and Development, 90% from business and the federal government.

The EU - €120 billion

But do we understand it, and could we do it better?

Challenging landscape

How important is your project?

Political landscape	Covid impact on research funding	Economic downturn
Funders must justify every dollar spent on research.	Redirected $ to vaccines and other virus related activities, plus inability to fundraise during the pandemic.	Stakeholders (including public) are being more careful with where dollars go and there are simply fewer dollars available.

Your project is still very important! How are you going to ensure its validity and success?

Visibility - How is the impact of that expenditure reported today?

Many funders use mainly bibliometrics, an important, but outdated approach

Limited

Publications only looks within academia. Knowledge exchange impact requires we look beyond that, to the impact on society.

Unread

Vast amounts of published papers remain unread or doesn't translate to the wider world.

Isolated

How would you know from a publication if your research is having any societal, economic or environmental impact?

Joining the Impact Dots

Research Projects

Publications

Engagement Activity

Collaboration

IP developed/ Patent Granted

Company Spinout

Economic Impact

New Research Database

New Medical Device

Clinical Trials

Improved Health

Technical Product

Influence on Policy

Improved Social policy

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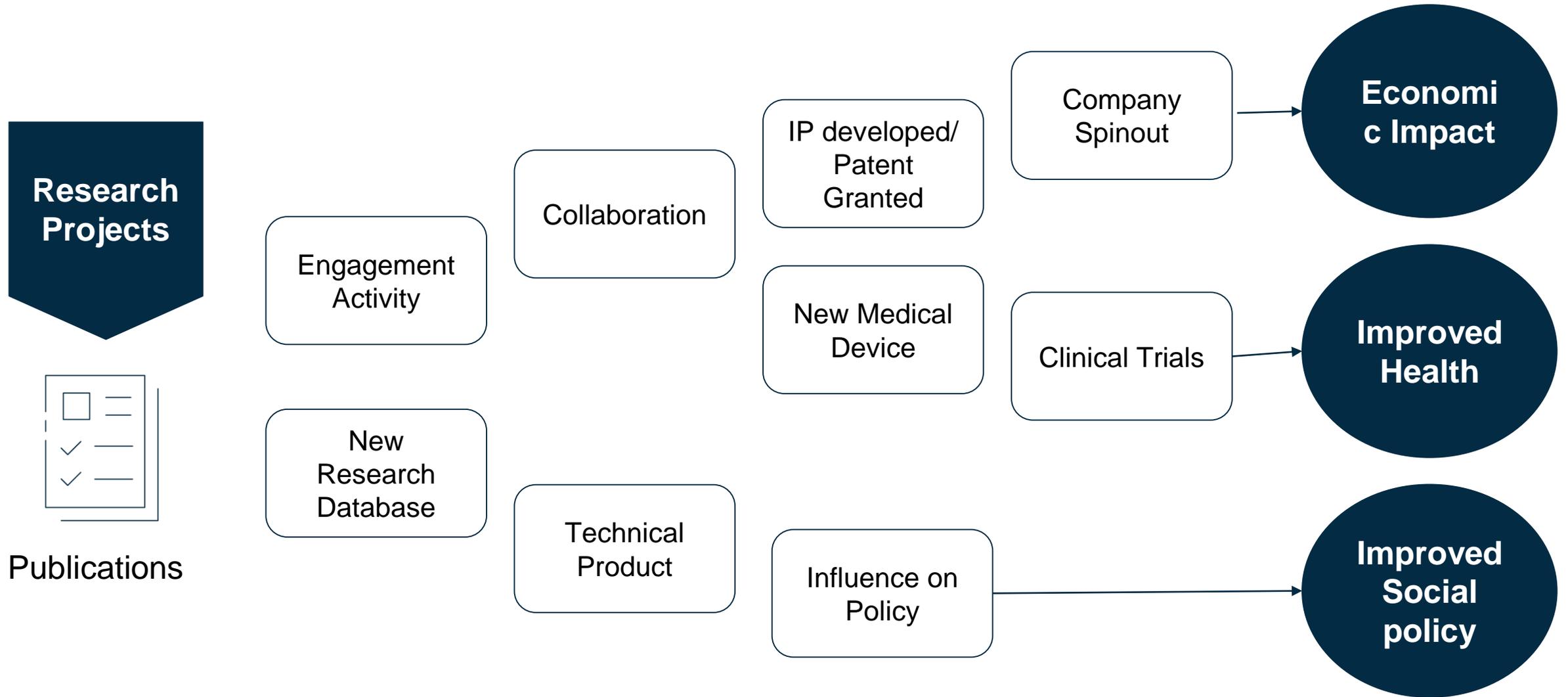
Here's what we have learned in the past decade

With increasing focus on transparency and value for money, institutions globally are adapting to better understand, evaluate and explain their research:

- Simply stating the amount that is funded is no longer an acceptable measure of success

- Describing academic outputs as a measure of impact is not sufficient and bears little relation to the real world

- Understanding impact takes time, as some impact might occur many years after the original research

- Just because something is hard to measure doesn't mean we shouldn't measure it

The current approach is too narrow in focus - there is no long term view

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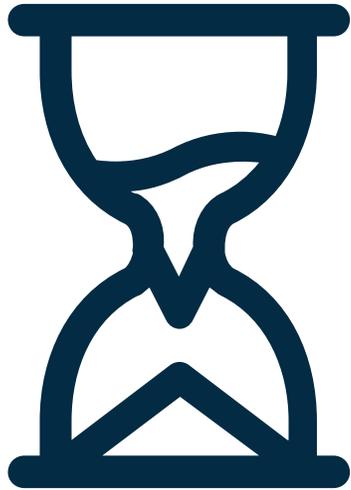
Time & Resources

- Data everywhere - struggle to map it (RIMs, Libraries, Departments)

- Paper based, siloed or complicated

- Door knocking exercises

- Moving staff (academic and administrative)

Costs of Not Tracking and Evaluating your Impact

Huge Annual Resources Consumed Under Conventional Practices

Slower progress to impact
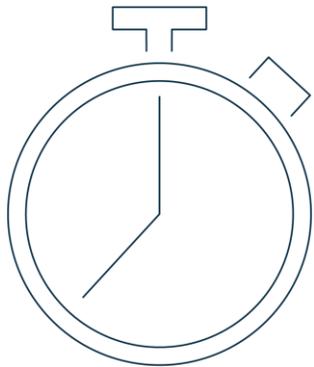
Time and energy of researchers
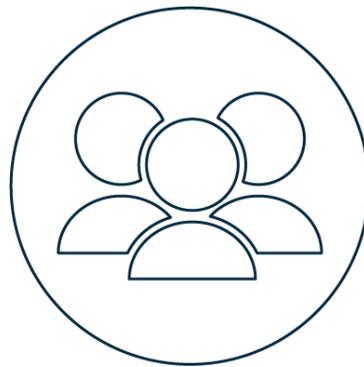
Missed opportunities

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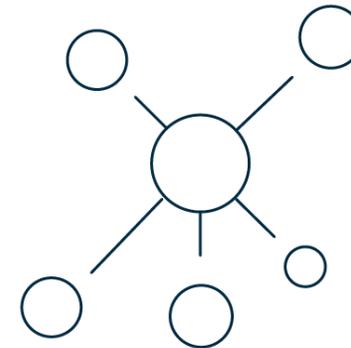
A longitudinal view is needed which captures all outputs and outcomes

Years 1-2

Year 3

Years 4-5

Year 6

✓ Published in journal
✓ Collaboration with overseas colleagues

✓ Additional funding received

✓ Spin out company formed
✓ Patent granted

✓ Cited in clinical guidelines
✓ Influenced a government policy
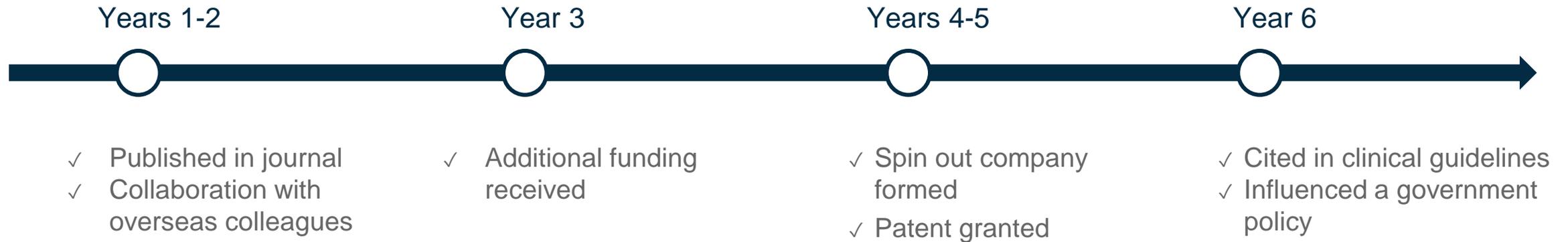
In order to understand the research it is essential to have a longitudinal view of outputs and outcomes, that lead to impact from that research

It is essential to use tools that shine a light on this longitudinal view of data outside pure bibliometrics

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THANK YOU!

sean.newell@interfolio.com

Recommendation

Methods & Tools for Societal Impact

"Develop a fit purpose toolbox for researchers and practitioners to assess and measure the progress to societal impact over time."