Peer review history for:

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HOW TO CITE:
Challenges with measures used for assessing research impact in higher education institutions [peer review history]. S Afr J Sci. 2024;120(7/8), Art. #14934. https://doi.org/10.17159/sajs.2024/14934/peerreview

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Reviewer D: Round 1
Date completed: 16 March 2023
Recommendation: Accept / Revisions required / **Resubmit for review** / Decline
Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?
Yes/No
Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?
Yes/**No**
Does the manuscript contain sufficient novel and significant information to justify publication?
Yes/No
Do the Title and Abstract clearly and accurately reflect the content of the manuscript?
Yes/No
Is the research problem significant and concisely stated?
Yes/**No**
Are the methods described comprehensively?
Yes/**No**
Is the statistical treatment appropriate?
Yes/No/Not applicable/**Not qualified to judge**
Are the interpretations and conclusions justified by the research results?
Yes/**Partly**/No
Please rate the manuscript on overall contribution to the field
Excellent/**Good**/Average/Below average/Poor
Please rate the manuscript on language, grammar and tone
Excellent/Good/**Average**/Below average/Poor
Is the manuscript succinct and free of repetition and redundancies?
Yes/**No**
Are the results and discussion confined to relevance to the objective(s)?
Yes/No
The number of tables in the manuscript is
Too few/Adequate/**Too many**/Not applicable
The number of figures in the manuscript is
Too few/**Adequate**/Too many/Not applicable
Is the supplementary material relevant and separated appropriately from the main document?
Yes/No/Not applicable
Please rate the manuscript on overall quality

Excellent/Good/Average/**Below average**/Poor

Is appropriate and adequate reference made to other work in the field?

Yes/No

Is it stated that ethical approval was granted by an institutional ethics committee for studies involving human subjects and non-human vertebrates?

Yes/No/Not applicable

If accepted, would you recommend that the article receives priority publication?

Yes/**No**

Are you willing to review a revision of this manuscript?

Yes/No

Select a recommendation:

Accept / Revisions required / **Resubmit for review** / Decline

With regard to our policy on 'Publishing peer review reports', do you give us permission to publish your anonymised peer review report alongside the authors' response, as a supplementary file to the published article? Publication is voluntary and only with permission from both yourself and the author.

Yes/No

Comments to the Author:

This was a challenging article to review because it has much to offer, but I believe substantial edits are needed for it to reach its potential. I have put extensive comments in the attached article and urge the researcher to engage with these. I hope the number of comments is helpful rather than overwhelming.

While the in-text comments raise several issues, I will discuss just three in this section.

1) There was reference to two theoretical frames, but very little was said about the one (Payback Theory) and none about the other (New Institutional Theory). The researcher seemed to assume a familiarity with these theories, which is problematic given the wide readership of SAJS. (I would also recommend deleting reference to New Institutional Theory in this title entirely - it may have been used in the larger study from which this article emerges but it is not used here).

2) The section on "Challenges with current metrics" was by far the most powerful section, and I wonder if this article wouldn't be stronger if it just presented this data and unpacked it in conversation with the literature.

3) A number of findings were presented without any discussion. The percentage of people who stated that they agreed or disagreed with an issue is not interesting in itself. We'd like to read what the implications are or what these responses indicate.

I think extensive revision is needed prior to publication, but I am of the view that there is much in this article that will be of interest to SAJS readers.

[See Appendix 1 for Reviewer D's comments made directly on the manuscript]

General Response to Reviewers Round 1

1. The authors did not revise the paper but opted to revamp the initial paper that focused on a "holistic framework for assessing research impact in higher education institutions" to focus on one aspect of the paper which is the challenges with current metric indicators.
2. Therefore the paper neither highlights the changes in the revision paper nor does it respond to the individual suggestions as these have been incorporated in the 'new paper'.
3. The general issue like strengthening the problem has been attended to in the 'new paper' as well as writing the paper for a non-specialist audience.
4. Moreover efforts have been made to clearly discuss implications of the results in the discussion section of the paper.

Reviewer D: Round 2
Date completed: 17 August 2023
Recommendation: Accept / **Revisions required** / Resubmit for review / Decline
Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?
Yes/No
Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?
Yes/No
Does the manuscript contain sufficient novel and significant information to justify publication?
Yes/No
Do the Title and Abstract clearly and accurately reflect the content of the manuscript?
Yes/**No**
Is the research problem significant and concisely stated?
Yes/No
Are the methods described comprehensively?
Yes/No
Is the statistical treatment appropriate?
Yes/No/**Not applicable**/Not qualified to judge
Are the interpretations and conclusions justified by the research results?
Yes/**Partly**/No
Please rate the manuscript on overall contribution to the field
Excellent/**Good**/Average/Below average/Poor
Please rate the manuscript on language, grammar and tone
Excellent/**Good/**Average/Below average/Poor
Is the manuscript succinct and free of repetition and redundancies?
Yes/**No**
Are the results and discussion confined to relevance to the objective(s)?
Yes/No
The number of tables in the manuscript is
Too few/**Adequate**/Too many/Not applicable
The number of figures in the manuscript is
Too few/**Adequate**/Too many/Not applicable
Is the supplementary material relevant and separated appropriately from the main document?
Yes/No/**Not applicable**
Please rate the manuscript on overall quality
Excellent/**Good**/Average/Below average/Poor
Is appropriate and adequate reference made to other work in the field?
Yes/No
Is it stated that ethical approval was granted by an institutional ethics committee for studies involving human subjects and non-human vertebrates?
Yes/No/Not applicable
If accepted, would you recommend that the article receives priority publication?
Yes/No
Are you willing to review a revision of this manuscript?
Yes/No
Select a recommendation:
Accept / **Revisions required** / Resubmit for review / Decline
With regard to our policy on 'Publishing peer review reports', do you give us permission to publish your anonymised peer review report alongside the authors' response, as a supplementary file to the published article? Publication is voluntary and only with permission from both yourself and the author.
Yes/No

Comments to the Author:
I really enjoyed reading this article which tackles a topical and important issue in the South African higher education system and beyond. I recommend several relatively minor changes, some of which are typographical, before publication.

The article does not specify the ways in which research impact assessments are used within the South African system broadly and specifically within the University of Cape Town. This needs attention because such metrics are used very variably across the sector. The article notes that subsidy is accrued by South African universities for publications on approved lists. However, there is no distinction between these journals, such as the impact factor or what quintile they fall within, and the subsidy allocated per journal article is identical regardless of the journal in which it is published. This is crucial information for the article. There is indeed an argument to be made that the lack of focus on the impact factor means that all publications are treated as equally useful, relevant, or important if they are on any of the tens of thousands of journals on such lists.

This is not to say that research impact is unimportant in this sector. Increasingly, some universities, though not all, are indeed looking to h-indices and impact factors to make decisions around appointments and promotions, and this article raises important warnings in this regard. In many universities, however, such considerations do not enter the conversation, and would certainly not form part of any formal policy. These variations within the sector need to be noted.

Clarity is also needed as to the extent to which such research impact assessments are formally part of UCT processes and policies. Are they mentioned in appointment, promotion, or performance management, for example? It should also be noted for context purposes that the NRF calls for indices on Google Scholar, Web of Science, and Scopus as part of the individual rating process.

Besides this call for a more nuanced and detailed discussion about how research impact assessments are used in the South Africa context, I also offer the following minor corrections for the author's consideration.

"This is because in the South African context research impact assessment is still predominately focused on bibliometrics and government subsidy pushes researchers to publish more and quickly" - clarity is needed here that subsidy is based on bibliometrics only insofar as funded articles need to be within the many journals on the approved lists.

"Most academic reward systems rely on proxy measures of quality (such as citations, journal impact factors, h-index, etc.) to assess researchers" - clarity is needed here as to which academic reward systems are being referred to because many universities in South Africa only consider number of publications and do not engage with issues such as citations, journal impact factor, or h-index.

DORA is mentioned on page 4 but the term is only unpacked in full on page 5. This needs to happen where it is first referred to.

"This is also evidenced by the number of HEIs in Africa who are DORA signatories, by 31 May 2023, no single research-intensive higher education institution has signed DORA, a 10-year-old declaration." - I would advise splitting this sentence to make it less ambiguous; I suggest placing a full stop after 2023.

"Mitchell28 adds that countries like South Africa where there is no national assessment or reform efforts tend to fail when there is a lack of support in terms of funding and legislation from the national government" This sentence needs some rewording to avoid ambiguity.

1. What are the common challenges experienced with metric indicators used in research impact assessment?

The above question will make more sense to the reader once the context in which research impact

assessments are used has been clarified.

“Bias and discipline coverage” - this item is only unpacked in the next paragraph and I would suggest the readers need to understand it where they are first introduced to it.

“Biases in metric indicators tend to drive researchers’ behaviour in a particular direction and make researchers focus more on ‘what counts’ rather than what is important, this drives scholarship away from its intended purpose which is to address community and societal needs.” I am sure that the authors understand community and societal needs in a very broad way but to avoid criticism, I would suggest expanding the idea of research’s intended purpose to include, for example, building our understanding of the world and the universe and expanding disciplinary knowledge. It might be possible to read the original wording as suggesting that all research needs to be socially engaged.

“that the most used bibliographic databases used to retrieve metrics” – reword to avoid repeat of the word ‘used’

“and which have language and geographic biases toward the global south;” - ‘toward’ should be ‘against’

“these databases use Western standards to measure the local and global impact of research, and the databases do not recognise local context and differences between the global south and the rest of the world in terms of research impact” It is unclear what is meant by ‘Western standards’. If this phrase is kept significant building of this argument is needed.

“another study also found this” What study? Reference needed. If this is the study discussed in the next sentence, the word ‘a’ in “In a study” should be replaced with “this”

“but important example of how this metric may be distorting academic incentives and behaviour29, which is the case in South Africa and the University of Cape Town (the focus of this study), where institutions get a state publication subsidy or grant for publications in such journals.” This is again an example where a more nuanced discussion of how metrics are used in the context is needed.

“surveyed academics and researchers” It’s not clear how the author distinguishes between academics and researchers?

“The underlying principles were cross tabulated with academics and researchers’ faculty to see if there were any differences across the eight faculty structures at UCT.” But then nothing is said about such differences and the article moves on to some other study. This statement about faculty differences needs to come immediately before the discussion on this some sentences later.

“Conversely, a study32 that explored the importance of academic activities for research careers reported that only 34% of the researchers found open science and open access to be important.” I’m not sure why this is ‘conversely’, firstly it is unrelated to the previous sentence about disciplinary differences and secondly, as far as I can understand, the data from this study showed an even lower number of 19%.

“As responsible research practices advocate for an open, inclusive, and impactful research culture that recognises the plural characteristics of high-quality research” – not a full sentence.

“include creating works” – perhaps include creative works?

“A study participant discussed that” – It doesn’t seem like they discussed it. They stated it.

“de Rijcke and others2 who alluded that metrics measures” – It doesn’t seem like they alluded to it. They stated it.

"The NRF evaluation and rating (UCT template) included a warning on predatory journals which at times is regarded as being synonymous with open access publishing while the Health Sciences faculty ad-hominem guidelines encouraged publication in open access journals as well as high impact journals." The blurring of open access and predatory journals is a dangerous issue and so this statement needs much more nuance and clarity.

"The study argued, and quite correctly, that simply encouraging…" Avoid editorialising, delete 'and quite correctly'.

"are not equitable or inclusive." – are neither equitable nor inclusive

"metric indicators researchers…" – need a comma after 'indicators'

"tend to be greatly affected by the biases" – 'greatly' should be 'especially' or 'particularly'

"Therefore, exerting more pressure on researchers from Africa to change their behaviour and research agendas to conform to these norms at the expense of locally relevant scholarship." – Not a full sentence.

Author response to Reviewer D: Round 2

The article does not specify the ways in which research impact assessments are used within the South African system broadly and specifically within the University of Cape Town. This needs attention because such metrics are used very variably across the sector

AUTHOR: A statement to this effect has been added on page 2 – at the end of the third paragraph: In the context of this study, the University of Cape Town (UCT), research impact (academic and societal impact) assessments are used for ad-hominem promotion and academic excellence awards, while National Research Foundation (NRF) researcher rating (internal review) and academic appointment focuses more on academic impact.

The study also provided a clarity on what on the concepts used in the introduction and background in page 1-2, last paragraph – Research impact refers to the benefits that result from research. Academic or scientific impact is the intellectual contribution to one's field of study while societal impact is the impact of research on various levels and areas of society (social, cultural, environmental, and more). Societal impact is seen as the impact beyond academia or intended audience.

The article notes that subsidy is accrued by South African universities for publications on approved lists. However, there is no distinction between these journals, such as the impact factor or what quintile they fall within, and the subsidy allocated per journal article is identical regardless of the journal in which it is published. This is crucial information for the article. There is indeed an argument to be made that the lack of focus on the impact factor means that all publications are treated as equally useful, relevant, or important if they are on any of the tens of thousands of journals on such lists.

AUTHOR: This being a journal article and with limited space, and while this is mentioned it is not the focus of this paper, a statement is added on page 2 to clarify which papers get subsidy – government subsidy (on publications in the Department of Higher Education and Training list of accredited journals)

This is not to say that research impact is unimportant in this sector. Increasingly, some universities, though not all, are indeed looking to h-indices and impact factors to make decisions around appointments and promotions, and this article raises important warnings in this regard. In many universities, however, such considerations do not enter the conversation, and would certainly not form part of any formal policy. These variations within the sector need to be noted.

Clarity is also needed as to the extent to which such research impact assessments are formally part of UCT processes and policies. Are they mentioned in appointment, promotion, or performance management, for example? It should also be noted for context purposes that the NRF calls for indices on Google Scholar, Web of Science, and Scopus as part of the individual rating process.

AUTHOR: A statement to this effect has been added on page 3 paragraph 2 - "Reward systems, in higher education institutions like UCT, to some extent rely on proxy measures of quality (such as citations, journal impact factors, etc.) to assess researchers in academic performance reviews, promotion and excellence awards; these proxy measures are also utilised in NRF rating applications. Therefore, research impact assessment is part of formal processes used for academic advancement at UCT and outside.

A statement has been added on page 7 paragraph 2, first critical question which addresses this from the document analysis undertaken in the study – "UCT faculties' ad-hominem promotion and academic excellence and merit awards guidelines and the NRF evaluation and rating (UCT) template tend to require metrics (publication counts, h-indices, JIF, etc.)."

The use of metrics vary from discipline to discipline and this is acknowledged in the paper. A statement has been added on page 3 paragraph 2 to this effect – "While the use may vary from discipline to discipline, most disciplines utilise bibliometrics to ascertain quantity (publication count) and 'quality' of research outputs, especially in the natural sciences."

Research impact assessment at UCT and at NRF are part of processes utilised for academic advancements – see statement above.

DORA is mentioned on page 4 but the term is only unpacked in full on page 5. This needs to happen where it is first referred to.

AUTHOR: Explanation on DORA has been moved to page 4 at the end of paragraph 2 - Metrics have evoked mixed emotions from the research community which has resulted in various declarations such as the 2012 San Francisco Declaration on Research Assessment (DORA), the Metric Tide and the Leiden Manifesto for research metrics.

What are the common challenges experienced with metric indicators used in research impact assessment? The above question will make more sense to the reader once the context in which research impact assessments are used has been clarified.

AUTHOR: To contextualise the challenges experienced with metrics – a new critical question has been added on page 7 and findings to this effect have been added also in page 7:

1. How are metrics used in research impact assessment?

Findings are added in page 7 under the heading - Use of metrics in research impact assessment - "… Respondents utilise metrics for different career milestones; metrics are mostly used for research funding applications (29.2%) and ad-hominem promotion applications (26.2%). …"

"Bias and discipline coverage" - this item is only unpacked in the next paragraph and I would suggest the readers need to understand it where they are first introduced to it.

AUTHOR: Bias and discipline coverage is explained in the literature review on page 4, last paragraph hence not much explanation is provided at this stage – "Steele, Butler and Kingsley[6] explain that policymakers are often unaware of the problems in the use of the data - such as inherent bias with language and country, the differences in citation patterns between disciplines, lack of coverage of certain disciplines and bias in journal indexing thus under-representing some areas of the world in their coverage."

"Biases in metric indicators tend to drive researchers' behaviour in a particular direction and make researchers focus more on 'what counts' rather than what is important, this drives scholarship away from its intended purpose which is to address community and societal needs." I am sure that the authors understand community and societal needs in a very broad way but to avoid criticism, I would suggest expanding the idea of research's intended purpose to include, for example, building our understanding of the world and the universe and expanding disciplinary knowledge. It might be possible to read the original wording as suggesting that all research needs to be socially engaged.

AUTHOR: The suggestion has been effected on page 8, at the end of the third paragraph 1, to expand the idea – "… which is to address community and societal needs, and to advance fundamental knowledge."

"these databases use Western standards to measure the local and global impact of research, and the databases do not recognise local context and differences between the global south and the rest of the world in terms of research impact" It is unclear what is meant by 'Western standards'.

AUTHOR: A statement to this effect has been added on page 8 – at the end of paragraph 2 – 'Western standards' (a generally accepted standard originating from the global north which is assumed as the world standard)

"surveyed academics and researchers" It's not clear how the author distinguishes between academics and researchers?

AUTHOR: A statement to this effect has been added on page 6 as a footnote where the concept is first introduced in methodology - [1]Researchers at UCT refers to individuals whose job involves a higher research component as opposed to academics who have relatively high teaching and research component in their role. Hence researchers in this context also includes postdoctoral fellows.

"The NRF evaluation and rating (UCT template) included a warning on predatory journals which at times is regarded as being synonymous with open access publishing while the Health Sciences faculty ad-hominem guidelines encouraged publication in open access journals as well as high impact journals." The blurring of open access and predatory journals is a dangerous issue and so this statement needs much more nuance and clarity.

AUTHOR: As suggested the statement has been removed to avoid causing confusion.

Reviewer D: Round 3
Date completed: 29 February 2024
Recommendation: Accept / Revisions required / Resubmit for review / Decline
Conflicts of interest: None

Does the manuscript fall within the scope of SAJS?

Yes/No

Is the manuscript written in a style suitable for a non-specialist and is it of wider interest than to specialists alone?

Yes/No

Does the manuscript contain sufficient novel and significant information to justify publication?

Yes/No

Do the Title and Abstract clearly and accurately reflect the content of the manuscript?

Yes/No

Is the research problem significant and concisely stated?

Yes/No

Are the methods described comprehensively?

Yes/No

Is the statistical treatment appropriate?

Yes/No/Not applicable/Not qualified to judge

Are the interpretations and conclusions justified by the research results?

Yes/Partly/No

Please rate the manuscript on overall contribution to the field

Excellent/**Good**/Average/Below average/Poor

Please rate the manuscript on language, grammar and tone

Excellen**t**/Good/**Average**/Below average/Poor

Is the manuscript succinct and free of repetition and redundancies?

Yes/No

Are the results and discussion confined to relevance to the objective(s)?

Yes/No

The number of tables in the manuscript is

Too few/**Adequate**/Too many/Not applicable

The number of figures in the manuscript is

Too few/Adequate/Too many/**Not applicable**

Is the supplementary material relevant and separated appropriately from the main document?

Yes/No/**Not applicable**

Please rate the manuscript on overall quality
Excellent/**Good**/Average/Below average/Poor
Is appropriate and adequate reference made to other work in the field?
Yes/No
Is it stated that ethical approval was granted by an institutional ethics committee for studies involving human subjects and non-human vertebrates?
Yes/No/Not applicable
If accepted, would you recommend that the article receives priority publication?
Yes/**No**
Are you willing to review a revision of this manuscript?
Yes/No
Select a recommendation:
Accept / Revisions required / Resubmit for review / Decline
With regard to our policy on 'Publishing peer review reports', do you give us permission to publish your anonymised peer review report alongside the authors' response, as a supplementary file to the published article? Publication is voluntary and only with permission from both yourself and the author.
Yes/No
Comments to the Author: I think you have attended to all concerns and that this article makes a useful contribution to the conversation in the field. A minor but significant amendment is where you state "(on publications in the Department of Higher Education and Training list of accredited journals)"; you need to edit this to state "(on publications in the Department of Higher Education and Training list of accredited journals and five other approved journal databases)". Many novice researchers are under the misunderstanding that the list put together by DHET is the list of funded articles and are unaware of Scopus, WoS, Norwegian II, DOAJ, IBSS.

Author response to Reviewer D: Round 3

I think you have attended to all concerns and that this article makes a useful contribution to the conversation in the field. A minor but significant amendment is where you state "(on publications in the Department of Higher Education and Training list of accredited journals)"; you need to edit this to state "(on publications in the Department of Higher Education and Training list of accredited journals and five other approved journal databases)". Many novice researchers are under the misunderstanding that the list put together by DHET is the list of funded articles and are unaware of Scopus, WoS, Norwegian II, DOAJ, IBSS.
AUTHOR: The statement has been revised to include the reviewer's suggestion on page 2, however there are six and this has been adjusted from suggested five to six including SCIELO SA: This is because in the South African context research impact assessment is still predominately focused on bibliometrics and government subsidy (for publications in the Department of Higher Education and Training list of accredited journals and six other DHET-approved international journal lists[1]) which pushes researchers to publish more and quickly, creating perverse and unintended consequences, as noted by de Rijcke and others. A footnote has added to list the six other DHET approved journal lists – see footnote: [1]DOAJ (Directory of Open Access Journals), IBSS (International Bibliography of the Social Sciences), Norwegian, SciELO SA, Scopus and Web of Science.

Reviewer A: Rounds 1–3

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A holistic framework for assessing research impact in higher education institutions

Abstract

Traditionally research impact assessments have focused on academic impact and quantitative measures at the expense of researchers whose impact cannot be quantified. Internationally there has been a push for the prioritisation of research impact beyond scholarly contribution. However, research impact assessments have emphasised quantity rather than quality of research and have created widespread dissatisfaction and hence there is a search for alternative methods that can holistically measure the broader impact from research. The purpose of this paper is to report from a PhD study which focused on developing a holistic framework for assessing research impact in higher education institutions. The inquiry adopted a mixed methods approach within a pragmatist paradigm, and a case study of the University of Cape Town. The Payback Framework and New Institutional Theory were used as theoretical grounding to explore the role of metrics, and the extent of satisfaction with metrics; the challenges experienced with metrics as well best practices for assessing research impact in higher education institutions. A questionnaire survey was used to collect data from academics and researchers as well as semi-structured interviews with a sample of these academic and research staff. The findings highlight that there is a need for a holistic framework for assessing research impact in higher education and that which embraces broader measures of impact that are contextually sensitive and uses both quantitative and qualitative approaches. The study proposes a holistic framework for assessing research impact across disciplinary spaces in higher education.

Significance:

- The importance of embracing impact beyond metrics and academia in higher education institutions.
- The need to complement quantitative methods with qualitative methods for assessing research impact.
- Holistic framework for research impact assessment in higher education institutions.

Introduction and background to the study

Universities are increasingly called on to "maximise public benefits arising from publicly funded research" [1] and thus focus has turned towards methods for assessing and incentivising public benefits of research. The pre-eminence of research impact beyond scholarly contribution is shaping how research is supported financially, undertaken and eventually assessed.[2]

Research impact is a convoluted, multifaceted and rapidly growing field of inquiry and by highlighting how research funding and time are being used, impact assessment can inform strategy and decision making by both funding bodies and research institutions.[3] Research impact assessment is critical in higher education as globally there is an increasing scarcity of resources and greater need for productivity. Thus, researchers are under much pressure to distinguish themselves from their peers with quantifiable evidence because research impact is tightly tied to funding, promotion and tenure. As the national project becomes the university project, the university has to ensure its own success by imposing practices, expectations and standards by which scholars are judged; which are fashioned around countable items such as number of peer reviewed publications.[4]

Research problem

Current mechanisms used across higher education to evaluate scholars and their work are unsustainable and are increasingly destructive. Research evaluation tends to "reduce a limited set of proxy measures" and evaluation systems fall short in recognizing and reward the many aspects that which a healthy scholarly ecosystem depend on.[5] In the search for accountability and research excellence, easily available research metrics from scientific citation indexes such as Clarivate Analytics' Web of Science, Elsevier's Scopus and Google Scholar have been used as they provide a quick, easy solution to evaluate research.[6] A growing number of research leaders believe that the current system of higher education incentives (promotion, grants, researcher evaluation and ratings, etc.) and rewards (salary, bonuses, service and excellence awards, etc.) are misaligned with the needs of society.[7] Bibliometrics have traditionally provided a useful complement to the peer review process yet these metrics are used inappropriately and without any consideration for context.[8] Similarly, concerns have been raised about the validity and reliability of bibliometric measurement and linked to this is the growing interest from funders to show return on money invested in research in terms of societal impacts.[9] On the other hand, altmetrics have been criticised for lack of theory, ease of gaming and bias. Cronin[10] argues that scholarly communication today is less linear, less opaque and less rigid than before as both the end process and the end product are being transformed inexorably. Hence the full value produced by higher education institutions (HEIs) can never be quantified by simple metrics.[11] Consequently this study sought to explore local realities at the University of Cape Town as well as best practices globally to find a contextually suitable intervention and thus develop a holistic framework for assessing research impact in HEIs.

Theoretical framing

The study being reported was informed by the Payback Framework[12] and New Institutional Theory[13-15]. The Payback Framework[12] examines the 'impact' or 'payback' from research using a "multi-dimensional categorisation of benefits" and a model to organise the assessment of impacts. New Institutional Theory[13-15] focuses on developing a sociological view of institutions through studying the organisational behaviour – how institutional structures, rules, norms, and cultures influence the choices and actions of individuals when they are part of an institution.[16] The Payback Framework assesses the impacts from research using five categories: Advancing knowledge; Impacts on future research; Impacts on policy; Impacts on practice; Broad economic and social impacts. Using the benefit categories from the Payback Framework, the study explored the culture, norms and rules within the selected institution and higher education in South Africa generally.

Literature

Universities have two primary activities: teaching and research, recently there has been a focus on the application and use of the knowledge beyond academia which is sometimes seen as 'third mission'.[17] Even though societal impact is regarded as being separate from research and teaching, one may argue that it is rather the application and utilisation of research by society, thus making it part of universities' core business[18] rather than a third mission. Academic impact is viewed as "the demonstrable contribution that excellent research makes to academic advances"[19]. Societal impact, also regarded as broader impact, is the impact of science on different aspects and at various levels in society.[20]

Research impact assessment

Assessing the wider benefits arising from university-based research has been a growing area of interest internationally, especially in the United Kingdom, Australia and Canada, even though HEIs have been primarily focused on research impact benefits arising from academia and scientific knowledge.[21-22] The purpose of research evaluation in South Africa is no different, however, fund-driven research evaluation in order to distribute state funds has been more dominant.[22] The South African National Research Foundation (NRF) evaluation and rating system supports high quality outputs and publications in high impact journals[23] thus leaning more towards quantitative research impact indicators. These national evaluations are equally important, but their purpose is not to assess impact for an individual researcher as they focus on specific goals and need to account for the tax-payer's money. While research impact assessments, whether for individual or institution, provides a richer picture by looking holistically at research process. Similarly, the NRF in its role to increase impact and contribute to the country's developmental goals has adopted, as a critical element of the impact agenda,

a national framework - Framework to Advance the Societal and Knowledge Impact of Research.[24] The framework's purpose is to identify and communicate the impact of research rather than an evaluation or comparison tool.

Impact assessment practices are beginning to transform but more work still needs to be done as impact does not work in a linear process. The linear thinking about impact misses the multi-directional impacts and the collective nature of impact and further silences alternative narratives which are not straight-forward to measure.[25] The over-emphasis of monetary measures of impact overlooks current real-world impact of social sciences and humanities research.[26] Thus, there is a need to "support atypical, experimental, non-linear, fragmented forms of impact" and therefore assessments like the Research Excellence Framework may run the risk of incentivising HEIs to go down the 'safest' and 'easiest' route; hence the need for a broader conceptualisation and extensive engagement with how impact is framed and assessed.[25] Though, assessing non-academic impact faces substantial methodological challenges, but a careful policy design can potentially improve performance of universities and societal relevance of HEIs research.[27]

Scholarly communication seeks to make research publicly available, yet scholarly processes tend to be directed toward promotion and refer, primarily, to academic publishing.[28] Research impact is a complex and research is diverse and different disciplines will demonstrate it differently.[21] Thus, different approaches to assessing research impact are designed for disparate objectives, that is, one size does not fit all. Popular approaches for assessing research impact merge a logic model (input-activities-output impact pathway) with a case study approach to capture the intricate processes and interactions involved in scholarly communication.[3]

Equity, diversity and inclusion in research impact assessment

Equity, diversity and inclusion, also known as a transformation agenda, in research and research assessment are critical as they speak to universities' transformation strategies which support participation of under-represented or under-served individuals in the knowledge economy. A shift in current research assessment practices towards responsible research assessment processes has the potential to create equal opportunities for diverse individuals. While many universities and research institutions have diversity and equity statements to ensure equitable access for all staff and researchers, these statements at times do not translate to research assessment practices. A study exploring the goals and objectives of transformation strategies and the lived experiences of marginalisation communities noted a disconnect and that black women still face inequalities due to the dominant institutional culture

and norms.[29] Similarly, Kraemer-Mbula[30] admits that the gender scientific gap persists, and women endure several difficulties in their academic careers.

Increasing equity in hiring and ongoing support for womxn and under-represented minoritised groups and increasing support for diversity within research teams would be a positive step towards addressing inequalities that exist in academia. Declaration on Research Assessment (DORA) principles advocate for equity and transparency in research assessment processes.[31] Still, the rate of change towards race and gender equality in research assessment remains below par and proliferation of "proxy measures continue to safeguard biases against scholars" who are historically and geographically excluded from the research community.[32] Equally, the COVID-19 pandemic has further affected womxn researchers and there has been a call for research assessments to factor this. The University of Cape Town has published guidelines on broadening assessment of research impact which it hopes will nurture a sense of personal accountability and prioritise equity, diversity and transformation.[33]

Methodology

This paper reports aspects of a study that was conducted in 2020/2021 among academics and researchers at the University of Cape Town (UCT), South Africa. The study used a pragmatist paradigm and the mixed methods approach to explore the phenomenon of research impact. The study utilised a questionnaire survey using *SurveyMonkey* in the first quantitative phase and then followed this with semi-structured interviews, via *Zoom* and *Microsoft Teams*, in the second qualitative phase which allowed for greater insight into research impact assessment practices at the University of Cape Town. In the first phase the survey was completed by 255 UCT academics, researchers and postdoctoral fellows and 30 academics and researchers were interviewed in the follow-up phase. The study was ethically cleared by [anonymised by journal administrator]. Among the critical questions interrogated by the study, were the following:

1. What metrics are used across disciplines for assessing research impact, and extent of satisfaction with these metrics?
2. What are the challenges experienced with research impact assessment methods?
3. What are the best practices that may be utilised in research impact assessment?

Findings and discussion

This section outlines study participants' biographical data as well as findings in response to the critical questions from the questionnaire survey and interviews. The questionnaire had an actual survey response of 255 (14%) valid responses, where respondents completed most items. This might have been due to survey fatigue in a time of much COVID-19 survey work

taking place or low interest in participating as research impact assessment is an 'emerging area'. While a 14% response rate may not be ideal, it nevertheless provides data for significant reporting and, furthermore, the questionnaire was only one of two data collection methods used in this mixed methods study. The total number of participants (n values) may vary due to some participants not responding to certain questions; n values may also vary for multiple response questions.

The study targeted data collection from all academic and research staff from UCT's eight faculties: Commerce, Engineering and Built Environment (EBE), Health Sciences, Humanities, Law, Science, Graduate School of Business (GSB) and the Centre for Higher Education Development (CHED). The Health Sciences faculty had the highest number of academics and researchers and thus more participants in both the questionnaire (22.4%) and interviews (23.3%). The faculties of Humanities (21.2%) and Science (18.4%) were also part of the top three faculties in terms of participants in the questionnaire survey. The science related faculties (EBE, Health Sciences, Science) totalled 56.6% of participants for the interviews, and there were no participants from the GSB for this second qualitative phase of the study. More than 50% of the questionnaire respondents were early career researchers (ECRs) (mostly Postdoctoral fellows, Junior lecturers, Lecturers and Research fellows) while other ranks overlapped between mid-career researchers and established researchers. Usefully for the study, in the case of the interview participants a total of 58% were either mid-career or established researchers, somewhat higher than observed for the questionnaire survey were ECRs were the majority (53.7%).

Use and extent of satisfaction with metrics

Metrics used and other indicators utilised for different career milestones are depicted in Figure 1, with metrics being mostly used for research funding applications and ad-hominem promotion (a Latin phrase used to refer to the person; in this context it refers to the promotion of an individual in terms of academic rank) applications (55.4% in total). Other uses of metrics and other indicators of research impact included: job and fellowship applications, performance review, international peer review, when deciding which papers to cite, curriculum vitae development, for professional society award, and during submission of a manuscript for publication. Table 1 reflects surveyed academics and researcher's level of satisfaction with metric indicators of research impact in their disciplines or interdisciplinary spaces. Generally researchers were satisfied and partially satisfied with 'Bibliometrics' (for total citations and for h-index). With regard to extent of satisfaction with 'Altmetrics', though academics and researchers' responses were almost fairly distributed across all four options they, still, seemed not satisfied with social media or found it not applicable. This is on par with the study on

European universities[34], where 54% of respondents found altmetrics to be 'unimportant' or 'of little importance' for evaluation practices.

Table 2 presents academics and researchers' use of metrics according to the Payback Framework (the study's supporting theory) categories. The Table shows a positive association (>70%) between use of bibliometric indicators and the 'Advancing knowledge' benefit category except for the outreach sub-category. This is in alignment with the question that explored extent of satisfaction with metrics. However, authors[35] have cautioned against citations because they do not provide a complete picture, also citations ignore many other audiences of scholarly literature who may read and use but not cite the work. Hence, there is a need for indicators that can embrace the complexity of research and the resulting impact resulting. Qualitative indicators tend to be used for 'Impacts on policy', 'Impacts on practice' and 'Broad economic and social impacts' benefit categories (see Table 2). A significant number of researchers reported that some of the benefit sub-categories were not applicable to them, such as commercialisation and research policy. This is in line with study's survey respondents as 45% of the respondents were from human sciences disciplines (Humanities, Law, Commerce, GSB and CHED) where such impacts might be secondary. Table 3 shows that more than 55% (combined) of the researchers were either partially satisfied or satisfied in the 'Advancing knowledge' benefit category. The mean scores indicate that on average survey respondents were partially satisfied with other benefit categories, and not satisfied with 'Broad economic and social impacts – commercialisation'. Approximately 20% of the respondents found other impacts listed (Table 3) to be 'not applicable' to them.

The study also explored academics and researchers' level of importance of the specific research impacts. The 'Advancing knowledge-research quality' sub-category was regarded most important (57.1%). The 'Broad economic and social impacts-commercialisation' sub-category was rated as least important (35.3%). This was in alignment to what was observed in Table 3 in relation to extent of satisfaction with metrics. In other benefit categories there was no clear importance as the mean scores leaned towards neutral with a standard deviation of one and more, and a Cronbach's Alpha coefficient of 0.854 which is an indication of strong reliability of the scores for academic and researchers' importance of specific research impacts. Table 4 presents a significant difference for academics and researchers' importance of research impacts among number of years engaged in research generally ($p < 0.05$), hence academics and researchers' importance of research impacts differs among number of years engaged in research generally. Researchers who had 31 years and above years of experience had a mean rank of 41.63 compared to those with 'less than 5 years' experience in research with a mean rank of 82.98. This may suggest that academics and researchers with more years of experience attach less importance to research impacts. The study found no significant

difference between faculty or rank and academics and researchers' importance of research impacts.

Challenges encountered with current metrics for assessing research impact

Table 5 presents common challenges with current metrics for assessing research impact as shared by academics and researchers. Academics and researchers agree on common metric challenges which include (see Table 5): Bias and discipline coverage (73.1%); Behavioural impact (72.3%); and, Interpretation (65.5%) - an indication that most researchers concur on these top three common challenges. The challenges related to metric indicators were also explored via semi-structured interviews and one academic/researcher commented that '*These metrics tend to be very biased and push academics to behave like a corporation with a big divide between established researchers and ECRs'.* A majority of the academics and researchers interviewed reacted to challenges to do with bibliometrics such as systemic bias against individuals in or from the global south, biases against younger researchers or those who have not been researching for long. Academics and researchers also noted the biases which are embedded in current assessment systems which tend to privilege certain groupings and, related to this, an academic/researcher commented:

> '*Metrics and evaluation systems privilege researchers that have no responsibility outside of themselves and their institution… it privileges researchers and not people (who are also researchers) trying to change unjust systems.*'

An earlier study which agrees with this notion, pointed out that current incentives often discourage researchers and academics from engaging in 'other' work such as mentorship, social responsiveness as these kinds of work do not lend themselves towards the incentive structures.[8] A common critique from the interviewed academics and researchers was that the limitations of quantitative indicators tend to fuel the 'publish or perish' principles where researchers tend to aim for quantity instead of quality research. An interviewed researcher in the study shared: '*The one cardinal rule that [I] was told, quite unequivocally, when I came to UCT is that the university, institution and government only care about publications.*' Similarly, another academic/researcher, '*Research assessment practice privileges dominant views, not paradigm-shifting thinking; polemic or controversial pieces e.g. Nattrass 2020 article published in South African Journal of Science will be hugely cited but is awful scholarship*'.

On a related point, an academic/researcher reflected on the importance of context with current systems for assessing research impact:

> *'Metrics may be misinterpreted as an absolute measure of value, without taking contextual factors into account. The problem with this kind of approach is that it drives undesirable behaviour which should not be underestimated.'*

This view was also argued by Agate and others, when they observed that bibliometrics and altmetrics quantify impact, thus resulting in a flattening and alienating effect because the assigning of scores as proxies of quality does not effectively account for nuances of context, depth of engagement and integrity of the process.[5]

The study also enquired from surveyed academics and researchers about metric underlying principles regarded as important for assessing research impact. Table 6 indicates that for the Humanities faculty 'Diversity of types of research is valued' as an important principle and the Science faculty rated 'Transparent reporting' high. A few academics and researchers commented on 'other' important principles important for assessing research impact but which were not captured by the question, and these included: Contribution to equity and transformation; Reproducibility of research through supporting and recognising replication studies which relates to open science; and, Software and data as research outputs.

Best practices for assessment of research impact

Academics and researchers interviewed shared alternative indicators and methods that could be used for assessing research impact, for example, impact narratives, story-telling, and other qualitative methods, and argued for the need to allow flexibility in research impact assessment across disciplines. Traditional bibliometric techniques tend to give only a partial picture of research impact with no link to causality and thus metrics have shortcomings when used to measure broader impacts. Academics and researchers interviewed commented on the use of mixed methods such as case study approach as a meaningful method and best practice for assessing research impact and societal impact. The participants' in the study shared their discontent with institutional culture and structures which at times tend to influence researchers in a negative way. An indication that there might some misalignment between institutional values and research impact assessment practices.

Quite a few of the academics and researchers interviewed shared views about recognition and rewards as being the drivers of kinds of research and ultimately impact. At least a third of the interviewed academics/researchers expressed that they are engaged scholars, however, there is little to no recognition from their institutions for this and so they would rather focus on journal articles to achieve career advancement. Social responsiveness is one of the four portfolios in UCT's ad-hominem promotion process, but this tends to be rated lower compared to research and teaching in assessment for promotion. Studies have shown that metrics cannot account for the more ephemeral, yet essential, interactions that happen in classrooms,

conferences, and neither can they capture the full range of activities performed by academics and researchers.[8] Several of the academics/researchers interviewed noted the need for a range of methods for assessing the diverse benefits from research rather than restricting impacts to what can be measured. Moreover, meaningful methods for assessing research impact would be those that recognise disciplinary differences and do not prejudice any academics/researchers, a point also mentioned by Agate and others[5]. Hence, a case study technique would be a meaningful method, as it combines multiple sources of data to provide a holistic view of the impact from research, and it has the ability to contextualise research impact. Case studies are able to go deeper than metric indicators and thus more suited for assessing academic and broader impacts from research. Related to this study, Australian institutions are advocating for a greater use of quantitative and qualitative evaluation methods as they are considered to be "more accurate, transparent and responsible"[34].

Proposed holistic framework for assessing research impact

The various data collection methods allowed the researcher to explain the occurrence of the phenomenon through integrating collected data to develop a holistic framework for assessing research impact. Hatch and Curry[32] rightfully state that "any systemic change requires a fundamental shift in policies, processes, power structures and deeply held norms and values". The proposed research impact assessment framework (Figure 2) aims to capture how research is conceptualised, funded and eventually assessed and reported to assist institutions and funders to manage research impacts, allocate resources and to learn from the process. Despite the proposed framework resembling a logical approach it does not assume that the research process is linear but adopts a process-view approach. The framework can be used for both individuals and research groups. The proposed framework acknowledges that impacts can occur at any point in the framework, nevertheless, this does not mean that impact categories do not commonly link to stages. The Payback Framework[12] involves six stages (Stage 0 to 5) and this study, having been conceptually framed by the Payback Framework, adopts a similar process which follows the pathway to impact processes (inputs, outputs, activities, outcomes and impacts) taking into consideration institutional aspects and indicators at each stage, as per the New Institutional Theory[13-15] which also informed this research. The proposed framework for assessing research impact in HEIs such as UCT (see Figure 2) is presented in five stages that outline how impact can be assessed throughout the research process taking into consideration the processes happening at each stage. The Framework also concedes that the research process begins before the inputs stage, that is, in the preparation stage (Stage 0) where the topic or issue identification happens before the research itself begins. Researchers and institutions have control from Stage 1 to Stage 3 as they are

leading the research process and how the outputs are disseminated, but neither the researcher nor the institution have control of what secondary outputs get adopted and lead to a beneficial outcome (Stages 4 and 5) - this is dependent on the beneficiaries.

In the inputs stage the indicators of impact can be used to indicate resource investment using metric indicators and narratives. The environment and research culture are key to the framework and the inputs stage which speaks to the organisational aspect and the broader environment which researchers are part of. Similar to Stage 1, in Stage 2 indicators of research impact such as metrics and narratives would be appropriate for evidencing research outputs. Attribution for impacts on policy (Stage 3) may be hard to evidence, hence more dynamic and context-sensitive approaches would be most suitable in this stage, for example, narratives and complementing metrics with other relevant qualitative indicators. Secondary outputs (Stage 4) may go on to become outcomes if they get adopted by the public and practitioners in a specific discipline. Metrics and other quantitative indicators are not able to tell the full story of these kinds of impacts, and therefore for this stage a mixed methods case study approach and impact narratives would be appropriate. The final outcomes, also referred to as the broader economic and social impacts, contribute to positive change in some part of society. Final outcomes (commercialisation and social benefits), similar to Stage 4, the final outcomes (Stage 5) are also hard to attribute and may take years to show, and therefore here too a mixed methods case study approach and impact narratives would be more appropriate. Similar frameworks such as the NRF's[24] agree that impact from research is better demonstrated through case studies, other relevant indicators and through narratives, however, these serve a different purpose as they do not evaluate impact.

Conclusion and recommendations

Research impact assessments and indicators used should be context-sensitive and move away from over-dependence on proxy measures of impact which may enforce the biases that are embedded in these quantitative metrics. In addition, metrics should support decision-making but not be the basis of decisions in research impact assessments. Similarly, there is a need to adopt and adapt, where necessary, other approaches that can better evidence the impact of research in academia and beyond. To narrow this gap and to allow for meaningful assessment of research impact, both the institution and funders need to develop standards (and templates) and structures to support researchers in their use of impact case studies to showcase the impact of their research. Moreover research support services would need to raise awareness and assist researchers and academics in the use of these impact case studies.

Multi-disciplinarity and interdisciplinarity of research necessitates that all faculties broaden the scope of what is being valued as relevant research output, activity or outcome, and appropriately incentivise and recognise this broader range of academic activities in future. This study recommends that research impact assessment both in practice and in policy needs to be adjusted and revised to ensure that research impact assessment practices are fit for purpose. Additionally, all contributions to research or scholarly activities need to be recognised. Institutions and funders need to adequately incentivise responsible research assessment practices such as open access and open science to encourage quality research and impactful research. Open science and open access are not adequately incentivised in promotion, hiring and funding guidelines; alignment of open access and open science related policy and research impact assessment practices may move the institution a step closer to achieving equitable and responsible research impact assessment. As research becomes more dynamic and the outputs and benefits from research become increasingly complex, we can no longer depend on old approaches to new challenges but need to creatively and collaboratively find solutions to these problems to equitably assess the impact from research.

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Tables and figures

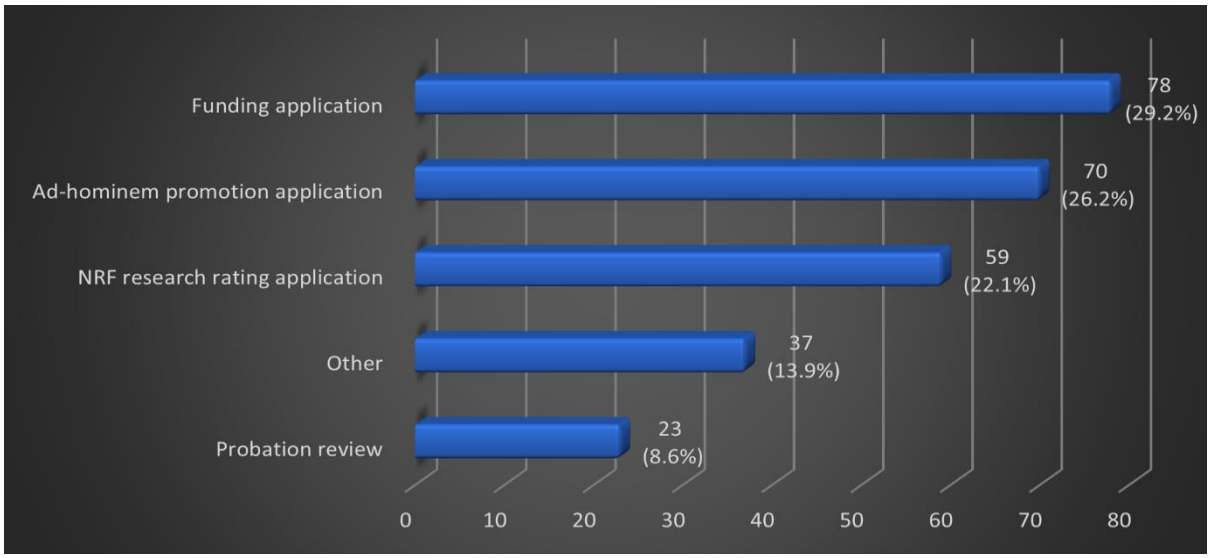

Figure 1: Surveyed academics and researchers' utilisation of metrics and other indicators of research impact

Table 1: Level of satisfaction with metric indicators for assessing research impact in disciplines or in interdisciplinary spaces

Metric type	Metric indicator	Level of satisfaction with metric indicators (n = 141)				Cronbach's Alpha coefficient 0.873	
		Not applicable (0)	Not satisfied (1)	Partially satisfied (2)	Satisfied (3)	Mean	SD
Bibliometrics	h-index	8.5%	14.2%	36.2%	41.1%	2.43	0.83
	Total number of publications	6.4%	15.6%	41.1%	36.9%	2.34	0.81
	Total citations	5.8%	10.9%	37.7%	45.7%	2.46	0.77
	Journal impact factor (JIF)	6.4%	24.1%	34.8%	34.6%	2.23	0.89
	Collaboration or co-authorship analysis	20.6%	13.5%	41.1%	24.8%	2.52	0.96
Altmetrics	Usage (e.g. views, downloads, clicks)	15.0%	24.3%	28.6%	32.1%	2.38	1.01
	Mentions (e.g. blogs, news media, etc.)	21.4%	27.1%	31.4%	20.0%	2.35	1.09
	Social media coverage (e.g. tweets, likes, etc.)	22.0%	35.5%	26.2%	16.3%	2.24	1.15
	Captures (e.g. bookmarks, followers, etc.)	28.6%	26.4%	29.3%	15.7%	2.46	1.16
Impact narratives	Qualitative indicators	22.1%	14.3%	27.9%	35.7%	2.66	0.98

Table 2: Academics and researchers' use of metrics for assessing research impact in disciplines or in interdisciplinary spaces for research outputs and broader benefits of research

Benefit category from the Payback Framework	Sub-categories and indicators of research impact	Use of metrics to assess research impact (n = 141)			
		Bibliometrics	Altmetrics	Qualitative indicators	Not applicable
Advancing knowledge	Research quality	78.0%	18.4%	46.1%	7.8%
	Research activity	76.6%	24.1%	31.2%	12.8%
	Research outreach	48.9%	29.1%	32.6%	22.7%
Impacts on future research	Personnel development	49.6%	23.4%	46.1%	20.6%
	Funding	59.6%	19.9%	41.1%	18.4%
	Infrastructure grants	48.2%	20.6%	34.0%	29.8%
Impacts on policy	Research policy	34.0%	25.5%	41.8%	31.2%
	Research use of research in curricula	34.8%	22.7%	46.1%	29.8%
	General benefits to the public	29.8%	42.6%	52.5%	25.5%
Impacts on practice	Effects on individual behaviour	28.4%	33.3%	44.0%	30.5%
Broad economic and social impacts	Commercialisation	27.7%	27.7%	34.0%	46.1%
	Socioeconomic status of beneficiaries	29.8%	37.6%	52.5%	26.2%

Table 3: Extent of satisfaction with metrics in the benefit categories from the Payback Framework

Benefit category from the Payback Framework	Sub-categories and indicators of research impact	Extent of satisfaction with metrics in the benefit categories (n = 141)				Cronbach's Alpha coefficient 0.929	
		Not applicable (0)	Not satisfied (1)	Partially satisfied (2)	Satisfied (3)	Mean	SD
Advancing knowledge	*Research quality*	7.8%	35.5%	44.0%	13.5%	2.11	0.88
	Research activity	6.4%	37.6%	41.8%	14.2%	2.11	0.88
	Research outreach	9.2%	34.0%	41.8%	14.9%	2.01	0.93
Impacts on future research	*Personnel development*	30.5%	9.9%	17.7%	41.8%	1.93	0.94
	Funding	27.0%	11.3%	21.3%	40.4%	1.83	0.96
	Infrastructure grants	24.1%	20.6%	20.6%	34.0%	1.62	1.07
Impacts on policy	*Research* policy	20.6%	27.0%	16.3%	35.5%	1.50	1.10
	Research use of research in curricula	23.4%	24.1%	17.0%	35.5%	1.58	1.10
	General benefits to the public	25.5%	22.7%	19.9%	31.9%	1.60	1.10
Impacts on practice	*Effects on individual behaviour*	21.3%	24.1%	22.0%	32.6%	1.51	1.08
Broad economic and social impacts	*Commercialisation*	17.0%	41.8%	14.9%	26.2%	1.18	1.16
	Socioeconomic status of beneficiaries	22.0%	22.0%	22.0%	34.0%	1.56	1.06

Table 4: Testing the difference between number of years engaged in research generally and academics and researchers' importance of research impacts

Number of years engaged in research generally	n	Mean rank	M	SD	Other tests
5 years and below	20	82.98	3.89	0.56	Median = 3.41 IQR = 0.92 χ2(df) = 17.367 p value = 0.002
6-10 years	31	64.23	3.52	0.83	
11-20 years	29	60.38	3.46	0.54	
21-30 years	23	46.63	3.07	0.88	
31 years and above	16	41.63	3.05	0.61	

Table 5: Academics and researchers' challenges with current metrics for assessing research impact

Challenges with current metrics for assessing research impact	(n = 119)			Cronbach's Alpha coefficient 0.850	
	Disagree (1)	Neutral (2)	Agree (3)	Mean	SD
Behavioural impact – metric drives behaviour in a particular direction	5.0%	22.7%	72.3%	2.67	0.57
Bias and discipline coverage – metric is biased by country, language, and coverage of certain disciplines	5.9%	21.0%	73.1%	2.67	0.58
Interpretation - data is open to misinterpretation and misuse (e.g. JIF)	7.6%	26.9%	65.5%	2.58	0.63
Relevance - the metric does not relate directly to a critical aspect of the research produced	12.6%	28.6%	58.8%	2.46	0.71
Prone to gaming - metric provides scope for special interest groups or individuals to intentionally exploit the system	8.4%	38.7%	52.9%	2.45	0.65
Limited coverage of output from research	16.0%	39.5%	44.5%	2.29	0.73
Validity - the metric does not reasonably reflect the underlying concept that it is intended to measure	23.5%	37.0%	39.5%	2.16	0.78
Lack of clear and unambiguous definition for consistency	11.8%	48.7%	39.5%	2.28	0.66
Attribution – metric data cannot be discretely ascribed to the unit being assessed	14.3%	51.3%	34.5%	2.20	0.67
Data availability - limited access to metric data for evaluators and researchers	22.7%	47.9%	29.4%	2.07	0.72
Cost of data – challenge of purchasing metric data outright or obtaining a license	26.9%	45.4%	27.7%	2.01	0.74
Methodological soundness - that is, the calculation of the metric lacks sound and robust methodology	27.7%	46.2%	26.1%	1.98	0.74
Replicability and comparability – metric is not easily reproduced or compared	36.1%	37.0%	26.9%	1.91	0.79

Table 6: Cross-tabulation between metric underlying principles that academics and researchers regard as being important for assessing research impact and Faculties

Metrics underlying principles	CHED	Commerce	EBE	GSB	Health Sciences	Humanities	Law	Science	Total
Responsible research practices	7	12	12	1	19	19	4	23	97 (23.5%)
Open science (open research)	4	11	11	1	17	16	6	14	80 (19.4%)
Transparent reporting	4	9	9	1	14	15	5	18	75 (18.1%)
Diversity of types of research is valued	5	7	14	1	12	19	4	15	77 (18.6%)
All contributions to research and scholarly activity are recognised	3	6	14	1	15	17	6	15	77 (18.6%)
Other	n/a	n/a	n/a	n/a	1	1	n/a	5	7 (1.7%)
Total	**16**	**33**	**48**	**4**	**59**	**68**	**21**	**67**	**413 (100%)**

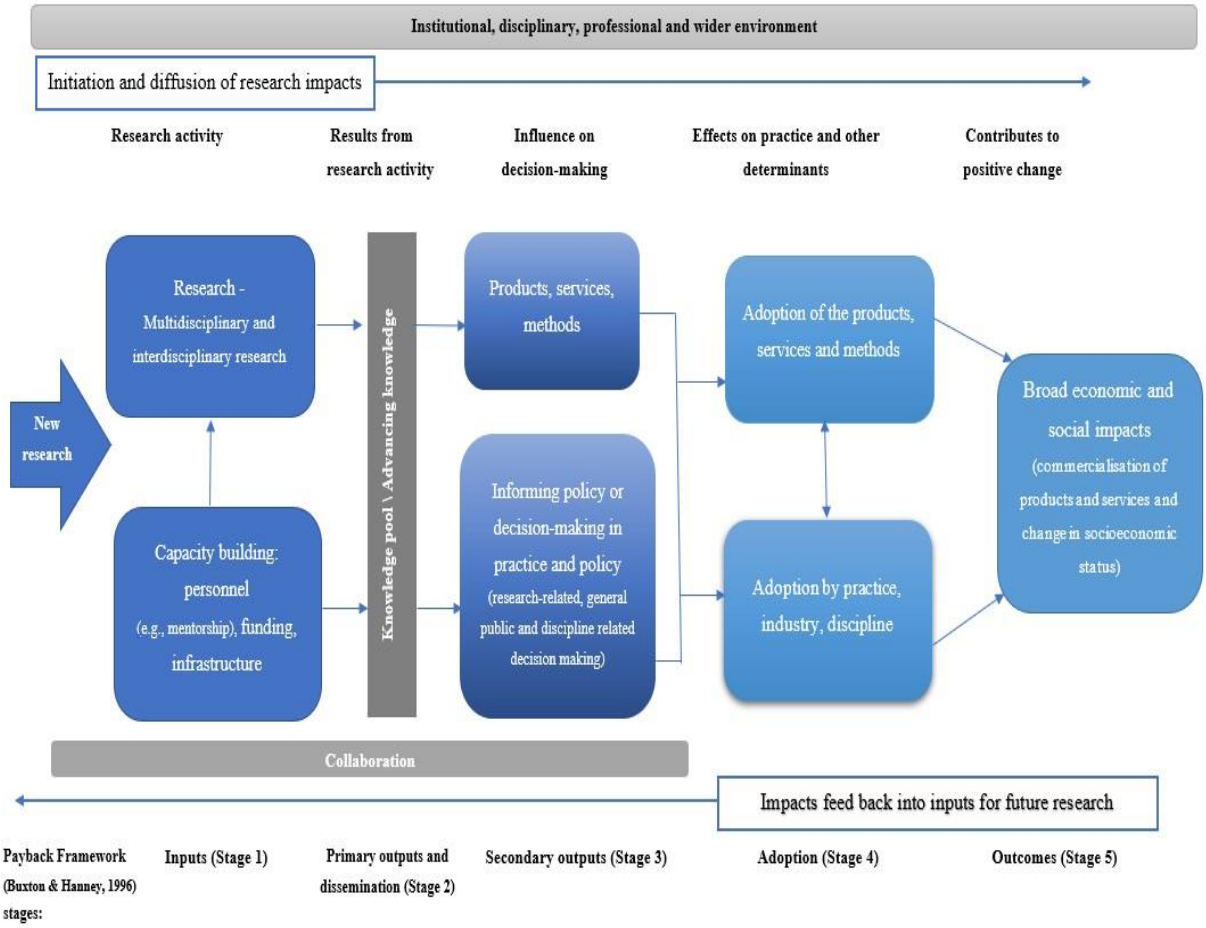

Figure 2: Proposed holistic framework for assessing research impact in higher education institutions