

BENCHMARKING UNIVERSITY RESEARCH QUALITY USING A RESEARCH QUALITY INDEX

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ABSTRACT

In this paper, a metric for assessing research quality is proposed. This metric, the research quality index (RQI), is a composite index that encompasses the three main areas of research activity traditionally engaged in by Australian academic units and measured almost endlessly by government funding agencies, namely publications, research grants and higher degree by research activity. The public availability of such an index will facilitate benchmarking (internally, competitively and generically) by academic units in universities, an activity that has become an important one in Australia with the foreshadowed introduction of the Research Quality Framework (RQF) as the future research funding mechanism for Australian universities.

INTRODUCTION

This paper suggests a research quality index (RQI) that is readily usable by Australian universities (as well as universities elsewhere in the world) to facilitate annual research quality benchmarking. The data and measures used in this paper are those that are appropriate to Australia. For use of the RQI in other countries, the data and measures would need to be altered to suit. In summary, the RQI has the following attributes:

- (i) focuses on the quality associated with the three main forms of research output namely: publications, research grants and higher degree completions;
- (ii) facilitates *annual* benchmarking and is a generic benchmark *per se*;
- (iii) facilitates an academic unit's evaluation of their position relative to themselves in the past, other academic units within their university, other universities academic units and international universities' academic units for a majority of the research output categories (for academic units of the same discipline or not);
- (iv) takes into account, where appropriate, the quantity aspects that still remain important (for example the overall productivity with respect to publications).

The RQI suggested in this paper will not encompass any of the direct peer assessment that is a characteristic of the RAE and RQF, however, it does include indirect peer review in multiple forms. The RQI will, when linked together with expert change management tools, provide a powerful and valuable mechanism for affecting a transition from quantity based research funding to quality based research funding in Australia.

A SUGGESTED ANNUAL RESEARCH QUALITY BENCHMARKING METHODOLOGY

The components used in the evaluation of the quality index are aligned with the three main areas of research activity encompassing publications, research grants and HDR (high degree by research) activity.

Research Publications Quality

Publication quality is based on the *per capita* quality publications. For the purposes of this paper and the relative ease of quality assessment, Tier 1 journal articles will be used as the surrogate for publication quality. It is a moot point whether one ought to include Tier 2 and 3 publications here. It could be argued that they also may be of quality (but less so than Tier 1 publications). It is easy to make provision for their inclusion as can be seen in (1). The determination of which journals are Tier 1, 2 or 3 is relatively easily undertaken, with many lists available for this purpose (see for example [3]). In (1) it is assumed that the base weight for publications is Tier 1 =1 with Tier 2 and 3 having weights less than 1.

$$P_{i,t} = \sum_{k=1}^K J_{i,k,t} w_{k,t} \quad (t = 1, \dots, T) \quad (1)$$

$$(i \in I(s))$$

$$w_{k,t} \begin{cases} = 1; \text{ if } k = 1 \\ < 1; \forall k \neq 1 \end{cases} \quad (t = 1, \dots, T) \quad (2)$$

where:

$P_{i,t}$ = is the total weighted journal numbers in the i^{th} academic unit of a specific discipline base ($I(s)$) in year t

$w_{k,t}$ = is the weight assigned to the Tier k journal article in year t for all academic units

$J_{i,k,t}$ = is the number of journal articles in Tier k journals in academic unit i in year t .

$I(s)$ = the subgroup of academic units that are of similar disciplines and thus comparable without any standardization.

The benchmark for publication quality is the *per capita* weighted publications (for academic unit i):

$$p_{i,t} = P_{i,t} / S_{i,t} \quad (t = 1, \dots, T) \quad (3)$$

$$(i \in I(s))$$

where ;

$p_{i,t}$ = the *per capita* weighted publication rate for the i^{th} academic unit in year t where ($i \in I(s)$).

$S_{i,t}$ = the number of equivalent full time academic staff in academic unit i in year t

The publication quality index is:

$$PP_{i,t} = (p_{i,t} / CPN) \cdot 100 \quad (4)$$

where PP_t = is the percentage of the industry ideal (II) or industry 'best practice' (IB) (expressed as a critical publication number (CPN)) that an academic unit has achieved in academic year t by its *per capita* publication rate, i.e., the *publication quality index*. Note that $0 \leq PP_{i,t} \leq 100$ since if $PP_{i,t} \geq CPN$ then the $PP_{i,t}$ would become the CPN and $PP_{i,t} \equiv 100\%$. As publication numbers increase, the PP_t in (4) also better reflects participation, i.e., the $PP_{i,t}$ is more representative (see [4]).

Research Grants Quality

Research income (grants) is a contentious issue with respect to its representing ‘quality’ of research. It certainly represents past quality (as it is based on academics’ reputations and, in part, past publication records) and it will potentially produce quality in the future (i.e., as in output via future journal publications). But how does it represent current quality? It could be argued that to obtain an Australian Competitive Grant (ACG) the grant application would need to be very meritorious and of a high quality since these are awarded on peer review and the competition is fierce. Awards of industry based funds will normally have been decided on expected returns (see [1]). Williams [6] has argued that receipt of research income does not guarantee a successful completion or ensuing articles. This is a caution that should be well heeded.

Given that research income is in most of the world’s research (quality) assessment models helping to determine university funding *per se*, potentially it will also be included in the RQF. In any event, many individual universities value research income as much (if not more) than publications and therefore it is included as a part of the benchmarking process for research quality. Research income will be limited for the purposes of this paper to ACG income (including National Health and Medical Research Council grants) only, i.e., government based peer reviewed funding. The reasoning behind this decision is in part due to some industry funding often being seen to be (rightly or wrongly) as no more than ‘clever consulting’. As in the case of the publications *per capita* measure, it is more meaningful to express this figure in terms of achievement against some industry ideal (II) or industry best practice (IB) standard. The percentage of the II/IB *per capita* research income amount that the ‘faculty’ has achieved in year t is then given as follows:

$$PR_{i,t} = r_{i,t} / Ir_t \cdot 100 \quad (i \notin I(s)) \quad (5)$$

$$r_{i,t} = R_{i,t} / S_{i,t} \quad (i \notin I(s)) \quad (6)$$

where;

PR_{i,t} = the percentage of the II/IB *per capita* research income amount that academic unit i has achieved in year t (i.e., *the research grant quality index*). Note that again $0 \leq PR_{i,t} \leq 100$

Ir_t = the Industry Ideal (II) or Industry Best Practice (IB) *per capita* level of ARC research income in year t

r_t = the *per capita* ARC research income in year t for academic unit i.

R_{i,t} = the ACG research income for academic unit i in year t for academic unit i.

Higher Degrees by Research Completions Quality

It may be that there are two sides to quality here, one based on the candidate (completion rate) and one based on the university (completion time). Bourke *et al* [2] summarises this dichotomy concisely as “Attrition [*the compliment of the completion rate*] would seem to be of greater concern for both the candidate personally and the university, whereas extended candidature leading to completion may be seen as a problem only for the university” ([2] p2). It is suggested therefore, that the average completion rate (ACR) might be used as a quality indicator. It would certainly be correct to assume that if the academic unit has a consistently high ACR than there *must* be some quality supervision, support and quality assurance going on within it. The higher degrees activity quality is determined thus:

$$PCR_{i,t} = (ACR_{i,t} / ICP_t) \cdot 100 \quad (i \notin I(s)) \quad (7)$$

where;

$PCR_{i,t}$ = the percent achievement of the II/IB that a faculty has managed in year t (i.e., *the higher degree quality index*). Note that $0 \leq PCR_t \leq 100$.

ICP_t = the Industry Ideal/ Industry Best practice (II/IB) average completion rates for PhD candidate as at year t which is compatible with the discipline of a faculty (see [5] for discussion relating to the determination of this figure).

The Research Quality Index

It is quite possible to benchmark each of the individual quality indexes already developed in this paper, however, it is also possible to combine each of the percentage indexes to form an average composite one that summarises the quality in the three areas which, at times, may be more desirable. The individual indexes as well as the aggregated RQI represent generic benchmarking *per se*, making them immediately useful. The RQI is effectively a weighted average, with weights being assigned to each of its constituent indexes. The overall research quality index is:

$$RQI_{i,t} = a_1 \cdot PP_{i,t} + a_2 \cdot PR_{i,t} + a_3 \cdot PCT_{i,t} \quad (8)$$

(t=1, . . ., T); (i ∈ I(s))

$$a_1 + a_2 + a_3 = 1.0 \quad (9)$$

$$0.0 \leq a_1, a_2, a_3 \leq 1.0 \quad (10)$$

where;

$RQI_{i,t}$ = the research quality index for an academic unit i at the end of academic year t and can take on values from 0 to 100 (by definition).

a_1, a_2, a_3 = weights (significance) assigned to each of the research component parts of the composite quality index by senior management and/or senior research staff of an academic unit and used for all academic units involved in benchmarking.

References

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