Adding up the Flipped Subscription Model

Scott Nicholls
University of Western Australia, Australia, scott.nicholls@uwa.edu.au

Simon Hart
University of Otago, New Zealand, simon.hart@otago.ac.nz

Howard Amos
University of Otago, howard.amos@otago.ac.nz

Jill Benn
University of Western Australia, Australia, jill.benn@uwa.edu.au

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Jill Benn
University of Western Australia, Australia, jill.benn@uwa.edu.au

ABSTRACT

One of the common pathways proposed to achieving a global open access scholarly publishing model is the "flipped" approach. In this scenario, journal publishers "flip" their pricing model from subscription to gold open access (gold OA) and library budgets are redirected from supporting subscriptions to Article Publishing Costs (APCs) associated with gold OA. Initiatives such as OA2020, and more recently Plan S, have to varying degrees advocated for this approach.

Underlying the flipped model is the assumption there is enough money in the global academic library subscription system to cover the costs of a scholarly publishing model based on APCs. A number of studies have tested this assumption including the Mellon Foundation Pay It Forward report which focused on large, research intensive universities in North America and the Max Planck Digital Library Open Access Policy white paper which used global market reports and publishing figures to derive their calculations. However, is this assumption valid for other sized universities or using different analytical approaches?

In 2018, the Matariki Network of Universities (an international collaborative venture of seven medium sized universities) used its unique partnership to test this assumption for medium-sized universities using shared subscription and publishing data. The project had two specific objectives. Firstly, to determine if the amount of money paid by Matariki institutions for journal subscriptions both individually and collectively is enough to cover APC costs of a flipped model. Secondly, to determine what the average APC cost would need to be if each Matariki institution only had their subscription budget to cover gold OA publishing.

This paper describes the approach taken in the study and outlines the findings in comparison to other studies. It will also discuss the implications of the results in the context of current initiatives supporting a flipped model.

INTRODUCTION

For many years the predominant business model underpinning scholarly journal publication has been the subscription model or pay to read. While this model has been highly successful, it has two major underlying issues. It has locked research behind pay walls, restricting access beyond the academy and limiting the potential impact of the research. Secondly, subscriptions are expensive and increasingly take up a greater share of University budgets. Large oligopolies of publishers have come to dominate the market and an academic ranking system which preferences publishing in particular journals, has meant journal prices have proven to be relatively inelastic. As a result annual prices have increased well above inflation (Lariviere, Haustein, & Mongeon, 2015).

Responses to these challenges have come under the broad banner of the open access (OA) movement, which began with a series of declarations in Budapest in 2002, and Bethesda and Berlin in 2003. One of the key models that emerged was gold open access (gold OA). In this approach, authors typically pay an Article Processing Charge (APC) and the article is made openly available on

publication. Gold OA has been moderately successful to date in opening up research. There have been a number of publications such as Public Library of Science and BioMedCentral that have established themselves as high impact factor journals. However, they still only represent a small amount of the total research output. In one of the most recent studies on the state of OA it was reported that gold only represents between 3.2% to 14.6% of published outputs depending on what sample source is used (Piwowar et al., 2018). Further to this, total OA publishing only represents 27.6% – 47.3% of all publishing. This means there is still a considerable amount of content locked behind pay walls.

To accelerate the transition to OA a number of initiatives like OA2020 and more recently, Plan S, have been advocating to "flip" the subscription model. That is, universities redirecting the money currently spent on journal subscriptions to supporting sustainable OA business models. Underlying this is the belief that there is enough money in the global academic library journal subscription system to do this. This is based on the findings of two major studies. The first is the Max Planck Digital Library Open Access Policy white paper (Schimmer, Geschuhn, & Vogler, 2015) that used global market reports and publishing figures to derive their calculation. The second is the Pay It Forward report (Mellon Foundation, 2016) that focused on large, research intensive universities in North America. However, is this assumption valid for other sized universities or using different analytical approaches?

In 2018, the Matariki Network of Universities (MNU), an international collaborative venture of seven medium sized universities, used its unique partnership to test this assumption using shared subscription and publishing data. The project had two specific objectives. Firstly, to determine if the amount of money paid by MNU institutions for journal subscriptions both individually and collectively is enough to cover APC costs of a flipped model. Secondly, to determine what the average APC cost would need to be if each MNU partner only had their subscription budget to cover gold OA publishing. For each of these objectives, calculations were made based on either the lead author paying all of the APC (lead author payment option) or the APC costs being shared proportionately between authors (equal author payment option).

The results of the study confirm some of the findings from the other studies and raise some interesting implications for gold OA versus transformative agreements.

METHODOLOGY

The approach agreed by the MNU was to compare potential APC spend against actual subscription spend, with a particular publisher and between the years 2015 to 2017. This approach had four major components.
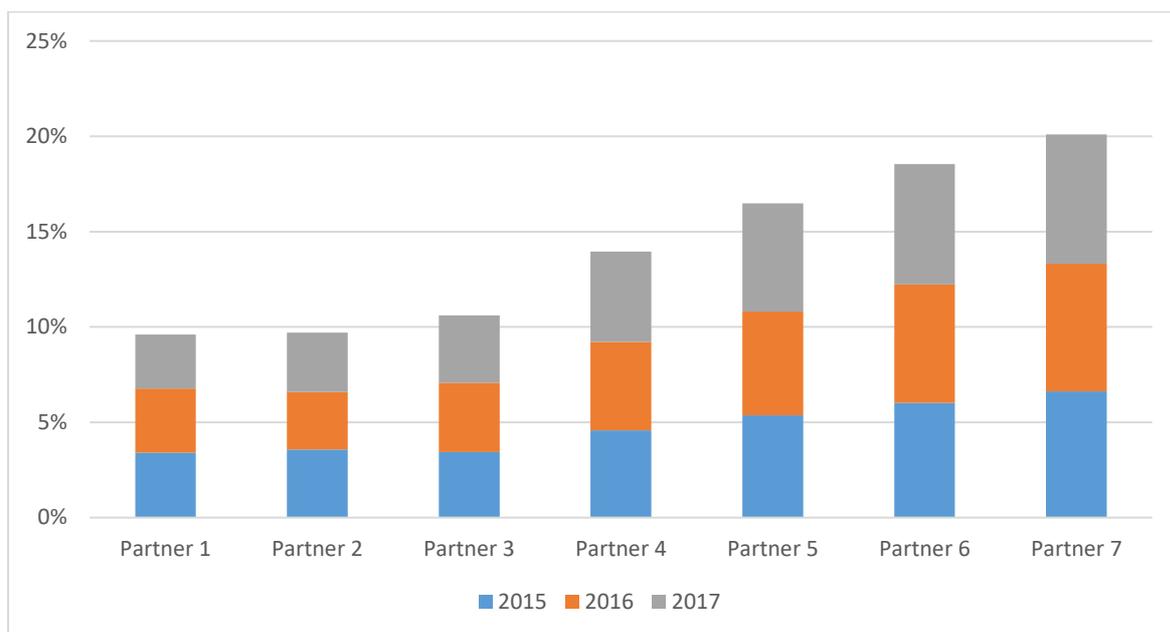
1. Identifying subscription package
Firstly, a common publisher subscription package shared across all partners was identified. This was done by extracting publication data for each of the partners over the specified time period and analysing the data. The publisher selected had a package in excess of 1000 journal titles that was subscribed to by all the partners; a large enough quantity of publications from all partners to make the data comparison valid; and availability of historical and current APC data. (The publisher selected is referred to subsequently in this paper as the Publisher).

2. Obtaining subscription package cost data
Permission was sought from the Publisher to share subscription data across the MNU for the purposes of this study. This was agreed to on the basis that the subscription costs of the individual members of the network not be part of any published findings. For this reason the selected publisher is not named in this paper and only the total costs are included.

Details of the subscription costs were obtained from each of the MNU partner libraries. For comparison the subscription cost was converted into a common currency, US dollars, by using the exchange rate on the day the payment was made. This provided the 'Total of Subscription Package Costs' (TSPC) across all of the MNU'. Graph 1 below shows the subscription spend by each partner as a percentage of total subscription spend across the MNU and illustrates the variability of the package costs in the different geographical regions of the partners.

3. Determining the APC costs

Details of the APCs for the Publisher journals were obtained from the publisher for each year (see table 1).

Date	# titles with APCs	Range in US$	Average APC in US$
7/1/2015	52	3500-4000	3,760
22/9/2016	1,381	1530-5200	3,073
6/6/2017	1,375	1500-5200	3,072

TABLE 1. DETAILS OF ARTICLE PROCESSING FEES FROM 2015-2017

For those journals that did not have an APC, a reference table was developed that estimated what the APC price would likely to have been. The impact factor was used as a proxy measure of value. Using the known APC data from the publisher, batches of 100 journals within a 2014 impact factor range were mapped against an average APC cost for those journals. As can be seen from graph 2, there was a strong correlation between the impact factor and the cost of the APC. In short, the higher the impact factor for the journal the higher the APC.

Where a journal had no APC data, the impact factor for the journal was sourced from either the publisher or the International Scientific Institute list of impact factors (https://www.scijournal.org/). The average APC was then calculated based on the impact factor using the reference table.
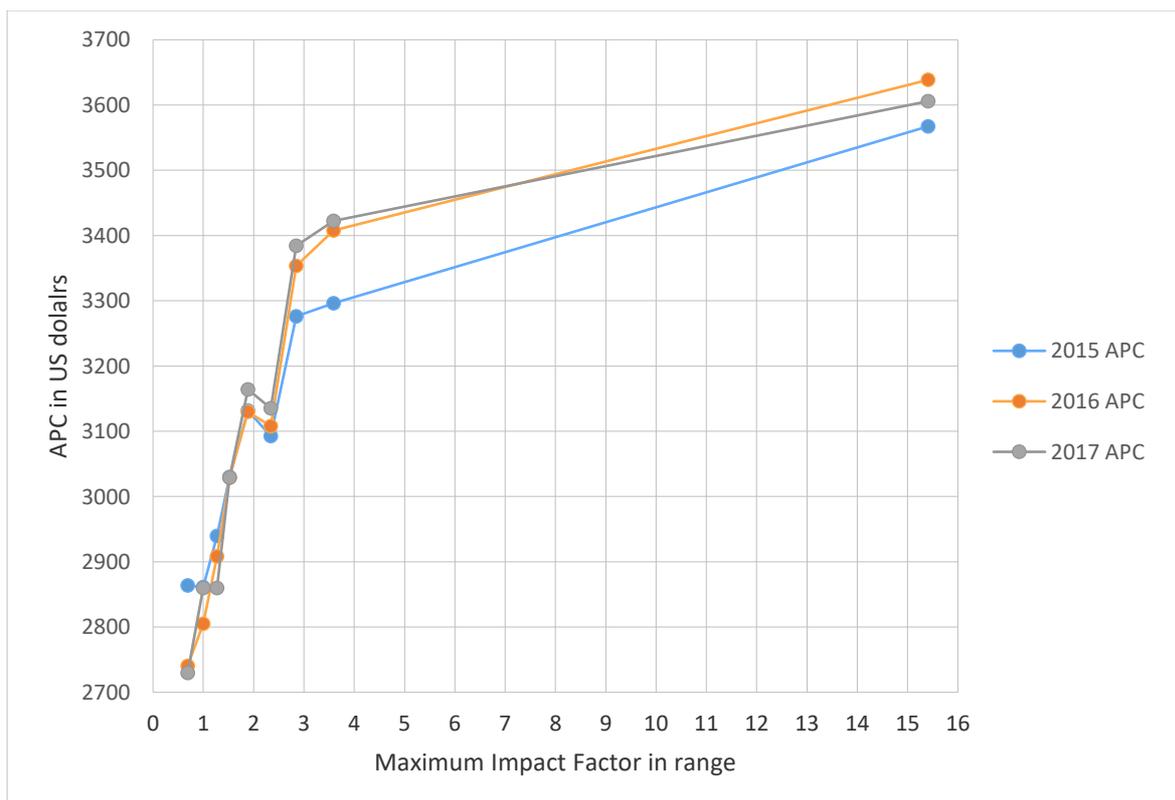
GRAPH 2. THE AVERAGE APC FOR THE MAXIMUM IMPACT FACTOR IN A RANGE OF 100 JOURNALS

4. Gathering publications data

Details of MNU articles within the date range were downloaded from Scopus into an MS Excel spreadsheet using the variant affiliation by-lines used by each partner. This list was refined to articles published with the Publisher by matching ISSN data with the Publisher's online list of journals. Formulae were then applied within MS Excel to determine for each MNU:

- the number of authors for each article
  ["=LEN(C3)-LEN(SUBSTITUTE(C3,",",""))+1"] C= list of Authors
  (This formula essentially counts the commas separating the author's lists in Cell C)
- whether a MNU researcher was the lead author (NLLA)
  ["=IF(ISNUMBER(SEARCH(B2,J2))=FALSE,"","Lead Author")"] B= each MNU ; J= the first affiliation by-lines
  (This formula essentially searches the first affiliation (in Cell J) to identify if a MNU institution (from cell B) is listed – if they are then they are the lead author)
- the number of contributing MNU authors for each article.
  ["=(LEN(K3)-LEN(SUBSTITUTE(K3, B3, "")))/LEN(B3)" B= each MNU]; K= Scopus affiliation list. See table 2.
  (This formula essentially counts how many times the MNU institution (from cell B) appears in the affiliation list extracted from Scopus)

University	Number of articles (NA)	Number of authors	Number of articles where MNU is the lead author (NLLA)	Number of MNU authors
Partner 1	657	3,069	320	1,135
Partner 2	1,058	10,009	455	3,278
Partner 3	1,632	11,046	765	4,061
Partner 4	1,786	13,222	668	4,561

Partner 5	661	3,870	358	1,399
Partner 6	476	3,165	200	973
Partner 7	1,098	7,178	581	2,754
Total	**7,368**	**51,559**	**3,347**	**18,161**

TABLE 2. MATARIKI PUBLICATION DATA FOR 2015-2017 FOR THE PUBLISHER

Once these had been calculated the spreadsheet contained a list of:
- All articles published by each MNU partner with the Publisher
- APC cost for each article
- Identification of articles that had an MNU lead-author (which allowed calculation of the lead author pays APC option)
- A count of how many of the total authors for each article were from MNU institutions (which allowed calculation of the proportional share of APC costs for the equal author payment for APC option).

FINDINGS

Objective 1(a): Is there enough money to cover lead author payment?

Calculations were undertaken within MS Excel to determine if what each of the MNU pays for the subscription package was enough money to cover the APC if lead authors paid the APC. The articles with lead authors from each of the MNU were matched with the APC for the publication year. Comparing the Lead author APC (LAPC) with the TSPC shows the cost differential as to whether or not there is enough money in the current subscription model (see table 3).

Total Subscription Package Cost (TSPC)	Lead Article Processing Cost (LAPC)	LAPC cost differential (TSPC-LAPC)
$13,362,064	$10,852,440	$2,509,624

TABLE 3. LEAD ARTICLE PROCESSING COSTS AND COST DIFFERENTIAL

Objective 1(b): Is there enough money to cover the equal author payment?

Calculations to determine if there was enough money to cover the APC if all authors pay an equal share of the APC required a different approach. This involved calculating the ratio of MNU authors to all authors in each article and then using this ratio to calculate the proportion of APC costs that would be incurred for each. Comparing the Equal author APC (EAPC) with the TSPC shows the cost differential as to whether or not there is enough money in the current subscription model (see table 4).

Total Subscription Package Cost (TSPC)	Equal Article Processing Cost (EAPC)	EAPC cost differential (TSPC-EAPC)
$13,362,064	$12,733,988	$628,076

TABLE 4. EQUAL ARTICLE PROCESSING COSTS AND COST DIFFERENTIAL

The calculations confirmed the assumption that collectively across the MNU there is enough money based on subscription costs of $13,362,064 to cover a flip to paying APCs under both a lead author scenario ($10,852,440) and equal author share scenario ($12,733,988). However, at the individual institution level the assumption only held up for four of the seven MNU. The three that did not have enough money to cover APCs from their subscriptions alone at the current publication rate. were in the top four of the MNU in terms of the highest publication output. However, the partner which had the third highest rate of publication across the MNU also had the highest subscription costs. It is this variance in subscription costs across the MNU, and the fact that these costs in no way correlate with publishing output with the Publisher, that underlie these results. This raises an interesting challenge for the flipped model. How do individual institutions flip from a package subscription model that has been based on either historical print spend or usage, to one based on publication output? The two do not necessarily correlate.

Objective 2 (a) Collective MNU Average APCs

Calculations were undertaken to determine what the maximum average APC could be under each scenario if collectively the MNU only had their subscription budget to pay for publication outputs. Under the lead author payment scenario this involved dividing the TSPC by the Total number of Local Lead Authors (TLLA) (see table 6).

Under the equal share payment scenario a different approach was required. The first thing to determine was the average cost of all APCs. This required dividing the Total cost of all Unique APCs (TUAPC) by the Number of Unique Articles with at least one MNU author (NUA). Here the Total cost of the APCs (TAPC) was deduped so that APC costs for articles that shared authors across the MNU were only counted once. Similarly duplicate articles that included collaborations across the MNU were removed to avoid double counting the Number of Articles with at least one MNU author (NA) (see table 5). The result of this was then multiplied by the result of dividing the TSPC by the Total Equal Article Processing Cost (TEAPC). Essentially what this formula was calculating was a ratio. If the average cost of an APC (TPSC/NLLA) resulted in a TEAPC then what would the average cost be if the TEAPC was equal to the TSPC (see table 6).

Total cost of all Unique APCs (TUAPC)	Number of Unique Articles (NUA)	Number articles where local lead author (NLLA)	Equal Article Processing Cost (EAPC)	Lead Article Processing Cost (LAPC)	Total Subscription Package Costs (TPSC)
$23,985,232	7309	3347	$12,733,988	$10,852,440	$13,362,064

TABLE 5. DATA REQUIRED FOR AVERAGE APC CALCULATIONS

Measure	Equation	Cost
Maximum average APC could be in Lead Author scenario	TPSC/NLLA	$3992
Average APC cost	TUAPC/NUA	$3282
Maximum average APC could be in Equal Share scenario	(TUAPC/NUA)*(TPSC/TEAPC)	$3443

TABLE 6. COLLECTIVE AVERAGE APC COSTS FOR LEAD AND EQUAL SCENARIOS

Objective 2 (b) Institutional MNU Average APCs

Calculations were undertaken to determine what the maximum average APC could be under each scenario if each of the MNU only had their subscription budget to pay for the articles their authors publish. When calculations were applied to each of the MNU using the formula the duplicates were not removed.

The maximum average APC that the MNU could pay collectively within the subscription budget, ranged from $3992 under a lead author scenario, to $3443 under an equal share scenario, both of which were above the average APC cost for MNU as a whole. However, when broken down to each MNU, the maximum average APC under each scenario for three of the partners fell below the collective averages at their current rate of publication under both scenarios. This meant they would need the current average APC to be lower in order to flip within their subscription costs. On the other hand, the remaining partners had a maximum average APC above the collective averages and could pay more for the APC if they only had their subscription budget to pay for articles that their authors publish at the current rate of publication.

COMPARISON TO OTHER STUDIES

This study correlates with a number of the findings of the Pay It Forward report and the Max Planck study. The Max Planck study used market reports to identify the global spend in subscriptions. It then identified an average cost per article (equivalent to an average APC) by dividing the global subscriptions spend by the estimated number of articles produced (using Web of Science data). This

figure was then compared to average APC costs from various sources at a global, national, and institutional level. Across all levels the Max Planck study found there was enough money in the journal subscription system. However, the study only included the Max Planck Digital Library for institutional data. Similarly, the MNU study found that there is enough money collectively across the institutional partners, but found a different result than the Max Planck study at the institutional level. For some institutions that have high publication output and a comparative lower subscription cost, there will not be enough money in library subscription budgets alone to flip to an APC model.

The Pay it Forward study was much broader and covered a longer period (2009 – 2013); focussed on large research-intensive universities in North America; looked at publication outputs from multiple publishers; and looked at current spend not only in terms of Library subscriptions but also in terms of grant data spent on APCs. Their finding was that high output North American research-intensive universities who flipped to gold would exceed their current Library budgets. The MNU study also found this. However, the Pay it Forward study went on to find that if those libraries only had to fund outputs that were not part of a project with grant funding, then there was enough money.

IMPLICATIONS

The MNU study found overall there is enough money in the MNU library subscription budgets collectively to flip the model. However, at an institutional level this is not the case. Institutions that had a high publication output are likely to face additional costs, and in some cases this is substantial. In the MNU study the most affected University would pay an additional US$1.4 million over 3 years in a flipped scenario. As a result, generally high publishing universities would require the average APC cost to be lower in order to use their subscription budgets alone to cover the costs of APCs.

In response to this, the Pay it Forward study suggests a flipped model should be funded by a combination of subscription budgets and grants or researcher discretionary funds. In this model, universities provide support for APC costs up to a certain amount (funded from a repurposed subscription budget) and then additional costs would be covered by the author (from their grant or discretionary research funds). This has two main advantages. It allows the model to be flipped to open for high output universities by using a combination of subscription funds and other sources, such as grants. It also, importantly, introduces a market mechanism into the publishing model by making publishing costs visible to the author.

As has been argued (Poynder, 2018) (Schonfeld, 2018), one of the original objectives of OA was to help address the unsustainable high cost of subscriptions. Primarily it was thought this would happen by increasing the transparency of APC payments. In this scenario, APCs become part of the determining factors informing authors where to publish, and as a result publishers would be more likely to keep their APC costs competitive to attract authors. This transparency does not exist in the current subscription model. However, a recent study examining price sensitivity of APCs (Khoo, 2019) found "no evidence that authors avoid journals that introduce or increase APCs" (p. 14). This study concluded that while APC cost increases have been lower than subscription increases, they were still three times above inflation and were still susceptible to the same price inelasticity seen in the subscription model.

Based on this, the flip to gold OA could see the current flaws in the subscription model remain. This is especially the case given commercial publishers are already sending signals that in any future market where subscription revenues diminish, APC costs are likely to rise. Indications from Elsevier (Hersh, 2017) are that future APC costs are likely to rise as it is claimed that subscription costs are subsidising the cost point for APCs, and as these revenues decrease the APC cost will need to rise. In addition, Hersh points out that approximately 25% of publisher subscription revenue comes from non-academic sources (like industry). If these subscriptions are cancelled due to an increasingly open environment, then increased APC costs are likely to be used to compensate for the loss in revenue.

This raises an interesting question for the implications of the MNU study, in the context of the transformative agreements that are currently emerging. These deals are typically being entered into by consortiums (in a similar way to subscription package deals) and comprise costs to cover potential OA publication in hybrid and gold journals, and a fee to read legacy content that remains behind a paywall. The important consideration here is how consortiums distribute the costs of these contracts amongst their members. There is likely to be a transition phase where costs are distributed based on

the previous subscription model (which are linked to either historical print spend or to factors like student FTE or usage). This approach would likely benefit high publishing institutions (though not always as was the example for one partner in this study indicates) as publishing costs would be distributed across the consortium. On the other hand, universities with lower numbers of research outputs would likely be disadvantaged. However, as these models move to publish only, it is likely the distribution models will be based solely on publication output and the reverse will apply.

As with gold OA, transformative models do not necessarily address the issue of affordability. They replicate existing expenditure patterns with major publishers and obscure price transparency from authors. They are also likely to cost more in the short term, from a library perspective, in that they will include costs for publishing (not typically covered out of library budgets) as well as read access. However, they do end the "double dipping" inherent in the hybrid model and are more likely to lead to greater OA.

Both the flipped gold and transformative OA models are attempting to deliver greater OA, but are doing so within the framework of an existing commercial scholarly publishing environment. As such, they are unlikely to address issues of affordability. However, these models do potentially disrupt the way costs are distributed between institutions. What the MNU study reveals is that as these cost distribution models evolve, institutions will need to look very carefully at the their volume of publishing and the impact this might have on their costs.

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