

## CDL Journal Weighted Value Algorithm Assessment & Revisions

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### Summary

For the last four years the California Digital Library (CDL) has been researching ways to provide improved benchmarks for UC's journal and publisher package evaluations by modifying the CDL Journal Weighted Value Algorithm. Staff interviewed a variety of academic experts in the fields of statistics, economics, and library and information science and conducted a written survey of librarians from the U.S. and Canada known for their expertise and experience with journal value assessment. Advice was also collected from UC librarians across a variety of subject specialties. As a result of our review some changes to the Algorithm were implemented in 2015 which the research showed would improve the accuracy and reliability of our value rankings. Updated journal title and journal publisher rankings will be distributed soon and posted on the CDL website. The new rankings will better facilitate the UC Libraries journal title adjustment process.

### Overview

During the last a few years, CDL developed and continued to improve the Journal Weighted Value Algorithm, which has been widely recognized within national and international library communities. It has been used at both CDL and UC campuses to explore and to develop a holistic process for evaluating journal packages, including developing negotiation targets and objectives for specific publishers, evaluating journals for potential cancellations, developing a better value-based pricing for publisher packages and undertaking title substitution projects. The original algorithm<sup>2</sup> takes into account three vectors of value encompassing six data metrics: utility (Usage and Citations), quality (Impact Factor and SNIP) and cost effectiveness (Cost per Use and Cost per SNIP<sup>3</sup>). Median values, as the baseline for comparison, are calculated for each metric within 160 different Library of Congress subject categories. Depending on whether a journal's values are above or below the median for that subject, a numerical score and an overall value category are assigned to each title.

While the value methodology developed by CDL proved very useful for many collection evaluation projects and attracted wide interest among colleague institutions, the validity of the methodology had not been subjected to an objective review. In order to validate the accuracy and reliability of the Journal Weighted Value Algorithm, CDL conducted various assessment and research projects:

- From 2011 to 2012, 32 UC bibliographers reviewed the values of 7,800+ academic journals calculated by the Algorithm, indicated whether they agreed or disagreed with the value rankings for each title and provided comments.

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<sup>1</sup> Updated document to reflect projected task status.

<sup>2</sup> See more description about the CDL Journal Weighted Value Algorithm:  
<http://www.cdlib.org/cdlibinfo/2012/02/13/calculating-scholarly-journal-value-through-objective-metrics/>

<sup>3</sup> Cost per SNIP is replaced by Cost per Citation in the revised version of the algorithm. The reason is explained in the later part of the document.

- In the spring of 2014, CDL interviewed fourteen faculty experts, including bibliometric scientists, economists, statisticians, and library and information scientists, from seven universities, to solicit feedback on the Algorithm design, metric selections and applications.
- In the summer of 2014, CDL surveyed a group of librarians from non-UC universities to gather feedback on their view of the Algorithm
- CDL conducted a research project from 2014 to 2015 with two graduate student interns to study the various factors that might impact usage data, particularly focusing on how the publisher interfaces inflated the full text downloads. This research was necessary because usage is a key metric in the algorithm

Based on this feedback and research, some changes to the Algorithm were implemented in 2015. The changes in the revised Algorithm improved the accuracy and reliability of the weighted value algorithm. As a result, some journal publisher rankings and title rankings have changed.

### **Assessment Feedback**

Overall, CDL received very positive feedback from both UC and non-UC communities. The original value rankings for 98% of the journal titles were approved by the majority of UC bibliographers. Only 130 titles changed their value rankings based on UC bibliographers' comments.

Faculty members and librarians interviewed and surveyed highly acknowledged our work. Below is a sample of their quotes:

- *"Very impressed and it serves its goal very well."*
- *"Fitness for purpose."*
- *"It is so wonderful to see the work you have done, which is based on quantitative data with UC context."*
- *"It is a thorough approach."*
- *"It is a very good idea to develop some sort of algorithm along these lines and I think using the one you have developed is far better than not having one."*
- *"I regard the CDL weighted value algorithm as the most thoughtful, responsive discipline-sensitive approach available to determining return on investment in licensed resource content."*

The value of having a composite metric design was recognized, because it added diversity to the Algorithm and it balanced all value perspectives so that none of the individual metrics would dominate overall value. Selected metric categories including Utility, Quality and Cost Effectiveness were considered to cover the majority of relevant perspectives. Most metric selections were valued as key metrics.

Faculty experts also praised the fact that UC bibliographers reviewed the value rankings and provided input. Quantitative ranking alone was not meaningful enough particularly in niche subject areas. Also qualitative reviews by librarians can sometimes catch data anomalies.

### **Issues & Recommendations**

Faculty experts and librarians also identified a list of issues and provided recommendations.

UC bibliographers indicated that:

- Usage should be weighted more heavily in the Algorithm since it is a key metric
- Cost per SNIP is confusing and hard to understand.
- Titles from niche subject areas with local campus interest are usually grouped with broader subject groups and are not evaluated correctly.
- Journal titles with missing data and insufficient data are not appropriately evaluated because they are treated as the same as the titles with the lowest values.
- Some journal content types don't share the same usage and citation behavior as peer reviewed titles, e.g. conference proceedings, review articles, newsletters, magazines, non-English literature. They should be evaluated separately.

Faculty experts indicated that:

- Under the original CDL Value Weighted Algorithm, median values were the only baseline values, so journal titles with just above median values and titles with many multiples of the median values had the same scores. This added too much randomness to title scores. The Algorithm needed a more detailed scoring system, e.g. decile rank, so that titles would have different scores with different values.
- Cost per SNIP was considered by some faculty as an invalid metric because cost was scaled to the size of the journal, SNIP measures impact at article level and is not related to the size of the journal. Cost per Citation was recommended as a good alternative, because both of the metrics are related to the size of journals.
- Unsubscribed journal titles that were added to UC journal packages at no cost by their publishers were calculated by using list price with a UC contract multiplier. Faculty reviewers thought this was arbitrary and didn't correctly reflect the value of the unsubscribed titles.
- Titles with missing metrics were assigned the lowest possible scores. It put titles especially in the arts, humanities and social sciences at a disadvantage because they usually had fewer citation metrics available. Titles with missing metrics should be evaluated based solely on available metrics.
- The \$50 benchmark value for the Cost per Use metric was estimated as the average interlibrary loan cost including staff salaries and copyright royalty. It was considered too high by some reviewers because they pay on average \$35 per article from commercial publishers.
- Usage weight in the CDL Weighted Value Algorithm is twice as much as other individual metrics. The weight assignment appeared arbitrary and other options need to be explored, particularly usage weight since it is most valued by librarians.
- According to some of the economists interviewed, Cost per Value should be the deciding metric that libraries consider. Other faculty members argued that Cost per Value should not be the only metric to decide the value of journals, since a journal's content cannot be replaced by another journal's content just because it is less expensive.

- Some library and information scientists had strong reservations about using the Impact Factor metric because it only measures the number of citations per article and it is not related to the size of a journal. Impact Factor doesn't reflect actual citation patterns because some of the citation activities might have happened before the article was published, e.g. pre-print.

Another issue CDL researched was the potential inflation of full text downloads due to the interface effect where users are automatically presented with an HTML version and then access the PDF from the HTML view. Based on our research and findings, many search tool linking and publisher websites have inflated HTML usage to some degree. Therefore, total usage counts that combine HTML and PDF are not recommended. However, search tool linking and publisher websites were not consistent across all platforms and all publications. This is a changing landscape and usage adjustment factors need to be continuously customized.

### **Changes in the Revised CDL Journal Weighted Value Algorithm**

In 2015, all research and analysis was evaluated by CDL and some changes to the Algorithm were implemented. The changes in the revised Algorithm improved the accuracy and reliability of the Journal Weighted Value Algorithm.

- **Detailed Scoring System:** applied decile rank to differentiate title values.
- **Cost per Citation:** replaced Cost per SNIP so both cost and citation is scaled to the size of a journal.
- **Unsubscribed titles added to journal packages at no cost:** adjusted the overall value by only using Utility and Quality metrics and accordingly increased the available metrics' weight. Cost was not factored in.
- **Titles with no citations data:** adjusted the overall value by only using Utility and Cost Effectiveness metrics and accordingly increased their weight. Citations were not factored in.
- **Cost per Use:** removed \$50 benchmark, because ILL cost data is not well documented. Also, only 0.5% of titles had over a \$50 cost per use, and didn't work well as the baseline value for comparison.
- **Value rank:** changed from value categories (lowest, low, medium and high) to quintile rank (Q1 to Q5, Q5 being the highest), because quintile rankings are more objective.

Other recommendations were explored and tested, but not implemented.

- **Increased usage weight:** Increased usage weight had a smaller impact on the already highly used titles because those titles typically had higher values for other metrics as well and were already in the higher value rank before the changes. However, increasing usage weight had larger negative impact on the less used titles with higher citation values. Citation values would not be appropriately recognized in the Algorithm which would result in a lower ranking for those titles.
- **Cost per Value:** Title rankings based on Cost per Value are very different from the rankings based on composite value. Titles ranked highest based on Cost per Value

are usually titles with very low cost. For example, many of the low priced Elsevier Freedom Collection titles are ranked at the top of the journal ranking list. On the other hand, some core titles, because of their higher cost, were ranked at the bottom of the journal ranking list. As some reviewers indicated, a journal cannot simply be replaced with another just because it is less expensive.

Other recommendations, such as adding book citation data, authorship data, rewarding OA journals, analyzing turnaway data, and mapping the subject with the size of academic programs and others, may be explored in the future.

**Revised CDL Journal Weighted Value Algorithm**

Changes are highlighted in red:

- Revised CDL Weighted Journal Value score= Usage score (29%) + UC Citation score (14%) + SNIP Score (14%) + Impact Factor Score (14%) + Cost per Use score (14%) + **Cost per Citation score (14%)**
  - Weights are indicated as percentages in the formula above.
  - **Special cases**
    - **Unsubscribed titles:**  
= [Usage score (40%) + UC citation score (20%) + SNIP Score (20%) + Impact Factor Score (20%)] \*1.4
    - **Titles with no citation metrics available:**  
= [Usage score (67%) + Cost per use score (33%)] \*2.3

○ Detailed Score Assignments

Score Category		Min Score: 0 Max Score: 7					
		Utility		Quality		Cost Effectiveness	
		Usage	UC Citation	SNIP	Impact Factor	Cost Per Use	<b>Cost Per Citation</b>
<b>Min</b>		<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Max</b>		<b>2.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
Decile Rank	10 <sup>th</sup>	2.0	1.0	1.0	1.0	1.0	1.0
	9 <sup>th</sup>	1.8	0.9	0.9	0.9	0.9	0.9
	8 <sup>th</sup>	1.6	0.8	0.8	0.8	0.8	0.8
	7 <sup>th</sup>	1.4	0.7	0.7	0.7	0.7	0.7
	6 <sup>th</sup>	1.2	0.6	0.6	0.6	0.6	0.6
	5 <sup>th</sup>	1.0	0.5	0.5	0.5	0.5	0.5
	4 <sup>th</sup>	0.8	0.4	0.4	0.4	0.4	0.4
	3 <sup>rd</sup>	0.6	0.3	0.3	0.3	0.3	0.3
	2 <sup>nd</sup>	0.4	0.2	0.2	0.2	0.2	0.2
	1 <sup>st</sup>	0.2	0.1	0.1	0.1	0.1	0.1
No Data		0.0	0.0	0.0	0.0	0.0	0.0

- All baseline values (**decile rank values**) are calculated for each metric and each subject category.
- There are currently 160 subject categories
- Overall value rankings are based on titles scores. They are divided into 5 categories: **5<sup>th</sup> quintile (Q5), 4<sup>th</sup> Quintile (Q4), 3<sup>rd</sup> Quintile (Q3), 2<sup>nd</sup> Quintile (Q2), and 1<sup>st</sup> Quintile (Q1).**