PNNL–27193

Implementing Snowball Metrics in the Battelle-Affiliated DOE National Laboratories

Battelle Snowball Metrics Working Group

December 2017

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

DISCLAIMER

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

PNNL–27193

Implementing Snowball Metrics in the Battelle-Affiliated DOE National Laboratories

Battelle Snowball Metrics Working Group

December 2017

Prepared for
the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Pacific Northwest National Laboratory
Richland, Washington 99352

Preamble

Although all of the Battelle-affiliated National Laboratories use performance metrics, such as patents, publications, and invited talks to measure impact, each one does it differently. Snowball Metrics is a framework developed by research-intensive universities in the United Kingdom that provides clearly defined methodologies for metrics that are data source- and system-agnostic. “The aspiration is for these metrics to become global standards that enable institutional benchmarking, and to cover the entire spectrum of research activities.”[1] The concept of a Battelle Snowball Metrics Working Group originated at a meeting of the Battelle chief research officers (CROs) in Q3 of fiscal year 2017. The CROs convened this working group to utilize the Snowball Metrics framework to build and employ a method to calculate metrics that will enable the Laboratories to better understand their strengths and weaknesses. This information allows these Laboratories to build and monitor effective strategies for evaluating science and technology as individual Laboratories, and as a Battelle institution. Initial efforts of Pacific Northwest National Laboratory’s adoption of Snowball Metrics were used as a seed for the working group. This document describes the elements needed for building a foundation for the framework to work across these Laboratories, and delivers “recipes” for four recommended Snowball Metrics to use as a starting set.

Summary

The purpose of the Battelle Snowball Metric Working Group is to use the Snowball Metrics framework to build and employ a method to calculate metrics that will enable Battelle-affiliated National Laboratories to better understand their strengths and weaknesses in a few representative areas. This effort supports the overall aim of these Laboratories to use data-driven and evidence-based metrics to build and monitor effective strategies for evaluating science and technology (S&T) as individual laboratories, and as a Battelle institution. Battelle-affiliated National Laboratories include Brookhaven National Laboratory, Idaho National Laboratory, National Renewable Energy Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory.

Representatives from each Laboratory met regularly by teleconference to select a set of metrics to evaluate research impact, discuss the use of Snowball Metrics, recommend a subset of the pilot, agree upon methodologies (“recipes”) for their use, and deliver a strategy for their implementation.

The working group, as a consensus, recommends the following subset of Snowball Metrics:

- Scholarly Output
- Collaboration
- Intellectual Property Volume
- Citations per Output

There is an advantageous alignment of the recommended Snowball Metrics with the U.S. Department of Energy (DOE) Performance Evaluation and Measurement Plan (PEMP) framework. Using the PEMP as a foundation, an integrated set of metrics, which include Snowball Metrics, can help inform Battelle on the progress of delivering S&T results that contribute to and enhance DOE’s mission by providing world-

[1] https://www.snowballmetrics.com/

class scientific research capacity and advancing scientific knowledge through peer-reviewed scientific results.

The performance questions in PEMP that can be informed in-part by Snowball Metrics have a wide scope and encompass many factors. No assumption should be made that any metric individually will provide a complete answer to any of the PEMP questions. A comprehensive evaluation of performance must use several pieces of information, and the working group's recommendations only partially address factors that may be considered. A sampling of factors considered in PEMP Goal 1.0 (see the following list) illustrates the scopes in which the values of the working group's recommended metrics could rest:

Is the system of Battelle-managed Laboratories:

- Producing high-quality, original results that advance S&T through community impact/peer review?
  - Impact of publications on the field, measured primarily by peer review
  - Impact of S&T results on the field, measured primarily by peer review
  - Impact of S&T results outside the field indicating broader interest
  - Uniqueness and challenge of science pursued, recognition for doing best work in the field
  - Developing intellectual property that is impactful within the scientific community (license agreements, patents, etc.)
- Providing Laboratory staff that take on substantive or formal roles in their scientific community and in DOE activities?
  - Invited talks, citations, making high-quality data available to the scientific community
  - Staff members visible in leadership positions in scientific community
  - Extent and quality of collaborative efforts
  - Involvement in professional organizations, National Academies panels and workshops
  - Appointment to technical and standards steering committees. Contribution to the authorship of national consensus standards and reports
  - Significant awards (Nobel Prizes, R&D 100, FLC, etc.)
- Demonstrating sustained scientific progress and impact to DOE mission needs?
  - Impact of S&T results on DOE or other customer mission(s)
  - Successful stewardship of mission-relevant research areas
  - Delivery of proposed S&T plans
  - Success in competition for resources
  - Effectiveness in driving the direction and setting priorities of the community in a research field
  - Willingness to pursue novel approaches and demonstration of innovative solutions to problems

The working group prepared recipes that describe each metric and provide parameters for their use. These recipes were written to be used in the context of each Laboratory as the frequency of data retrieval, tools used for data retrieval, and output types that apply to the metrics vary among Laboratories. The format and portions of text for these recipes mirror the published recipes found in the Snowball Metrics Recipe

Book.[2] The working group adapted these published recipes to fit the business needs of the Battelle-affiliated National Laboratories.

The working group also recommends that each Laboratory report this set of metrics to Battelle stakeholders through three channels: the chief research officers (CROs), internal Laboratory committees deemed appropriate by the applicable CRO, and two communities of practice (COP): Integrated Performance Management Community of Practice and the Strategic Planning and Policy Community of Practice. The COPs are chartered to look at and share Laboratory performance across Battelle-affiliated National Laboratories.

[2] https://www.snowballmetrics.com/wp-content/uploads/snowball-recipe-book_HR.pdf

Acknowledgments

Battelle Snowball Metrics Working Group Members:

Justin Day, Research Librarian, Pacific Northwest National Laboratory (lead)
Moody Altamimi, Strategic Initiatives Alliance Manager, Oak Ridge National Laboratory
Kathi Barkigia, Special Assistant to the Director, Brookhaven National Laboratory
Patricia Garvey, Manager, Research Library and Publications, Brookhaven National Laboratory
Timothy Gawne, Business Intelligence, Oak Ridge National Laboratory
Gavin Hawkley, Conduct of Research Office, Idaho National Laboratory
Katie Knight, Metadata Librarian, Oak Ridge National Laboratory
Marlene Mirabile, Manager, Performance Analysis and Reporting, Brookhaven National Laboratory
Tami Sandberg, Librarian, National Renewable Energy Laboratory
Linda Wierenga, Manager, Laboratory Performance Systems, Pacific Northwest National Laboratory

Contents

Figures

Tables

Overview of Snowball Metrics

The Snowball Metrics (www.snowballmetrics.com) originated out of a consortium of universities in the United Kingdom following a 2010 report on research information management.[3] The approach of Snowball Metrics is to present metrics in a way that is independent of any specific data provider(s), define them so data comparisons are considered valid, support ownership between like organizations, and influence funders and agencies. It is an aspiration for the Snowball Metrics to become an international standard that enables academic institutions and research organizations to understand their strengths and weaknesses so they can build and monitor effective strategies.

Metrics display value when they are defensible, transparent, and flexible. A defensible metric addresses the question, "Where does the data come from?" Snowball Metrics are source agnostic, meaning that any source can be used. However, the quality of the source should be evaluated beforehand. The working group has written into its recipes the sources agreed to be appropriate to calculate each metric. A transparent metric informs how the values were retrieved. Values calculated using the metrics should be reproducible under identical conditions to those used initially. This transparency implies that the metrics are not proprietary to any source. Lastly, a flexible metric means that the metric can maintain its integrity in various situations. For instance, a flexible metric can be used across various sizes of institutions, output types, and sets of research fields.

The qualities of being defensible, transparent, and flexible that Snowball Metrics exhibit is in contrast to using proprietary metrics dependent on resources that may require a subscription or have questionable data quality. For the Battelle-affiliated National Laboratories to work together for mutual benefit, each participating Laboratory has to embrace the "apples-to-apples" approach to metrics touted in the Snowball Metric framework. The working group strongly recommends that this document inform Laboratory leadership of practices and resources to adopt in their organizations.

The optimum application of Snowball Metrics is throughout the landscape of research activities. The ensemble of metrics is divided into three categories to represent the landscape: research inputs, research process, and research outputs and outcomes. Overwhelmingly, *output and outcome metrics* are the easiest to calculate because the tools used to derive most of them already calculate them, and most of them do not include business-sensitive information in their calculation. *Input and process metrics* require funding, grant volume, or business intelligence information not normally shared outside of the home Laboratory. As such, these metrics are more difficult to obtain for an enterprise impact assessment.

Data Sources

The Snowball Metrics recipes are designed to state which data sources are suitable for use by the user community. The reason to have this element in the recipes is two-fold: 1) to list suitable sources and 2) to inform the user of the metrics about the credibility of the data and provide transparency about the origin of the metrics' values.

Intellectual Property Volume data is supplied by the Technology Transfer Working Group point-of-contact for each Laboratory.

[3] https://www.snowballmetrics.com/wp-content/uploads/research-information-management1.pdf

A challenge for the working group was identifying sources to use to retrieve Scholarly Output, Collaboration, and Citations per Output because there is not a common set of resources among the Laboratories for these metrics. Clarivate Analytics' *InCites*[4] and Elsevier's *SciVal*[5] were selected as the research performance and benchmarking tools; they use their bibliographic databases—*Web of Science*[6] and *Scopus*[7], respectively—as their raw data sources. The following table indicates which laboratories have access to which tools:

Table 1. Data Source Availability Among Working Group Participants

Laboratory	Web of Science/InCites (Clarivate Analytics)	Scopus/SciVal (Elsevier)
Brookhaven	Y	N
Idaho	Y	N
National Renewable	N	Y
Oak Ridge	Y	Y
Pacific Northwest	Y	Y

Due to time constraints for producing these recommendations, data source availability was not discussed exhaustively by the working group or even within each Laboratory. Until more discussion happens, the working group recommends that these tools be included in the appropriate recipes, and the values of the Snowball Metric carry a data flag that provides the source of the data and a date for when the data was last updated in the source. This recommendation provides flexibility to each Laboratory, depending on their available sources.

Not having uniformity of data sources among the Labs will influence the ability to compare data values. The lists of journals, conference proceedings, and other document types that are indexed by Scopus and Web of Science vary;[8]—there is considerable overlap, but also some disparity. This means that two values for a metric, one using Web of Science and the other from Scopus, may not be the same. An exhaustive quantitative estimation of the variance for each metric is outside the scope of this deliverable. However, the working group retrieved the values for the recommended Snowball Metrics based on calendar year 2016 outputs among the five Laboratories and listed those values in Appendix 1.

Normalizing Metrics

Two of the Snowball Metrics (i.e., Scholarly Output and Collaboration) can be calculated with full-time equivalent (FTE) or headcount as a denominator. Having this denominator normalizes the metrics across the Laboratories when comparing Laboratories with similar research portfolios. The working group recommends using the Lab-At-A-Glance scheme in the Annual Laboratory Plan as the denominator for these metrics because the number of FTEs has a standard definition across all Laboratories.

[4] https://clarivate.com/products/incites/
[5] https://www.elsevier.com/solutions/scival
[6] https://clarivate.com/products/web-of-science/
[7] https://www.elsevier.com/solutions/scopus
[8] Mongeon P and A Paul-Hus. 2016. "The Journal Coverage of Web of Science and Scopus: a Comparative Analysis." *Scientometrics* 106(1):213-228. DOI: 10.1007/s11192-015-1765-5.

In order to arrive at the optimal normalization scheme for the Snowball Metrics, the working group reviewed several of the methodologies for data submitted to DOE in various reports (see Table 2).

Table 2. Normalization Methodologies within DOE Reporting

<table>
<tr><th>Source</th><th>Method</th><th>Challenge(s)</th></tr>
<tr><td>Lab-At-A-Glance[a]</td><td>FTE</td><td>Counts everyone in the organization, not just researchers.</td></tr>
<tr><td>Direct FTEs</td><td>FTE</td><td>All of the labor that is charged to a program is counted here, which can be more than just scientists and engineers.</td></tr>
<tr><td rowspan="2">Annual Lab Plan starting in FY 2017</td><td>Headcount</td><td>The working group would need to understand the definitions of the Functional Areas further.

As excerpted from the final FY 2017 guidance: “Describe the recent trends in the Laboratory workforce including a three-year profile of headcount paid staffing levels. Definitions will be created by the NLDC HR Working Group and shared with Laboratory points of contact, this will be included in the FY 2018 guidance.”</td></tr>
<tr><td colspan="2">Summary of Workforce Trends
<table>
<tr><th>Functional Area*</th><th>FY 2014</th><th>FY 2015</th><th>FY 2016</th></tr>
<tr><td>Senior Leadership (LD, DLD, ALD)</td><td></td><td></td><td></td></tr>
<tr><td>Research/Technical Management (first-line and mid-level)</td><td></td><td></td><td>x</td></tr>
<tr><td>Operations (or research support) Management</td><td></td><td></td><td></td></tr>
<tr><td>Technical Research Staff</td><td></td><td></td><td>x</td></tr>
<tr><td>Operations Support Staff</td><td></td><td></td><td></td></tr>
<tr><td>Postdocs</td><td></td><td></td><td>x</td></tr>
<tr><td>Paid Graduate Students</td><td></td><td></td><td></td></tr>
<tr><td>Paid Undergraduates</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="2">Annual Lab Plan prior to FY 2017</td><td colspan="2">Headcount</td></tr>
<tr><td colspan="2">
<table>
<tr><th>Functional Area</th><th>FY 2013</th><th>FY 2014</th><th>FY 2015</th></tr>
<tr><td>Scientists</td><td></td><td></td><td>x</td></tr>
<tr><td>Engineers</td><td></td><td></td><td>x</td></tr>
<tr><td>Postdocs</td><td></td><td></td><td>x</td></tr>
<tr><td>Research Support</td><td></td><td></td><td></td></tr>
<tr><td>Graduate Students</td><td></td><td></td><td></td></tr>
<tr><td>Undergraduate Students</td><td></td><td></td><td></td></tr>
<tr><td>Operations/Administrative Support</td><td></td><td></td><td></td></tr>
</table>
Definitions are as follows:
1. Scientists: usually PhDs leading and conducting scientific research and development projects (e.g., physicists and biologists)
2. Engineers: staff with engineering titles supporting scientific research (e.g., computer programmers, mechanical engineers, and waste management engineers)
3. Postdocs: recent PhDs conducting scientific research under the guidance of a scientist or faculty member – typically considered a trainee position
4. Research Support: exempt and non-exempt technical staff supporting scientific research (e.g., lab technician, accelerator operator, research associate, radiation technician, and safety coordinator)
5. Graduate Students: post-baccalaureate students enrolled in an accredited graduate degree program
6. Undergraduate Students: post-high school students enrolled in an accredited baccalaureate degree program
7. Operations/Administrative Support: everyone else (e.g., clerical staff, exempt HR staff, accountants, skilled crafts, business managers)
</td></tr>
<tr><td>Budget Officers’ Metrics</td><td>FTE</td><td>It does not discriminate among the categories of research staff. The information is not granular enough.</td></tr>
<tr><td>Institutional Cost Report (ICR)</td><td>Cost</td><td>It provides only cost information, not FTEs.</td></tr>
<tr><td colspan="3">(a) Used in the 2016 PNNL Publications Report</td></tr>
</table>

Sharing Snowball Metrics Values

The primary purposes of metric sharing are to:

- Better understand and describe the collective impact of the Battelle-affiliated National Laboratories
- Present a more compelling picture of performance
- Help gain support and funding
- Understand and act upon strengths and weaknesses, collectively and individually

The working group is potentially interested in sharing this information with the CROs who commissioned the working group; the governance committees and boards for each Laboratory, specifically those who monitor S&T performance and risk; and the Battelle COPs responsible for sharing and documenting best practices, among them the Integrated Performance Management and the Strategic Planning and Policy COPs. As each Laboratory's construct is different, CROs would provide guidance for internal dissemination appropriate to their Laboratory.

The working group recommends that each Laboratory collect Snowball Metrics annually (in the February/March timeframe) and report to their respective stakeholders. With additional effort, this information could also be useful for DOE's Annual Laboratory Plan process and deliverables.

Appendix 2 provides a recommended reporting template to be used by each Laboratory for reporting purposes. This can be adjusted for each Laboratory's internal needs, but a minimum set of data to be reported is included in the template.

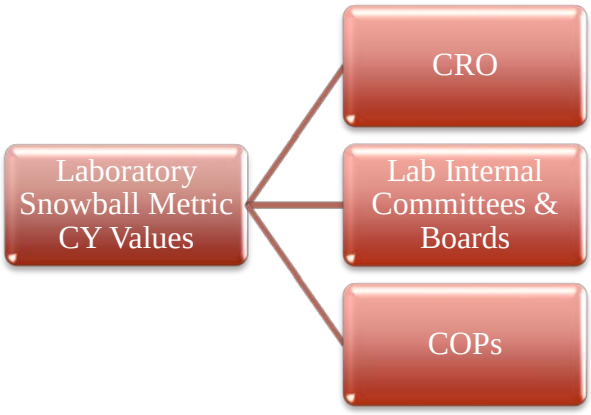


Figure 1. Sharing Structure for Snowball Metric Values

In addition, the Snowball Metrics framework includes a concept related to sharing metric values called a *benchmarking club*. A club operates on the premise that values for metrics are open for all members to see using a free "broker service" for the exchange of data. It removes concerns about nominating one Laboratory to facilitate data transmission. Only the final values for each adopted metric would be uploaded to the exchange. The data underlying the metric would never be exchanged and would remain within the member institutions systems. The working group recommends considering the use of this club to share data between Laboratories after some run-time to be sure reporting is accurate and consistent.

Workflow

Understanding the roles of staff involved in the workflow to measure research impact is important in understanding the relationships and how teaming can occur. The extent of these relationships will be different between the Laboratories because organizational constructs and group priorities vary, but the capability to team exists regardless of construct. This graphical representation illustrates generalized groupings of Laboratory personnel who have roles in the workflow and a concept of the relationships.

Figure 2. Concept of Workflow Relationships

Strategy Planning

These staff are senior-level Laboratory Leadership Team members who develop and use research impact questions to make, suggest, and/or defend decisions affecting the organization.

Laboratory Performance

Laboratory Performance staff support internal performance and benchmarking activities, and respond to requests for analysis from Strategy Planning members. These staff include experts in data analysis and statistics. In general, Laboratory Performance staff work with the library to capture publication data and understand how to interpret bibliometrics.

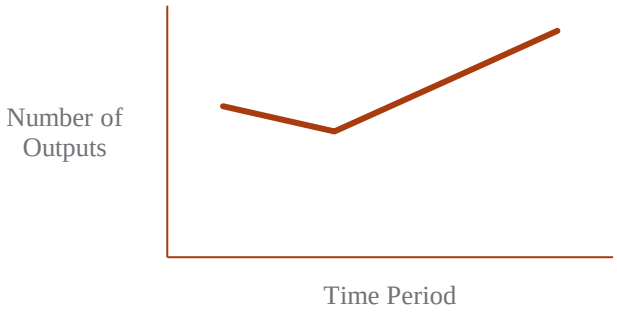
Library

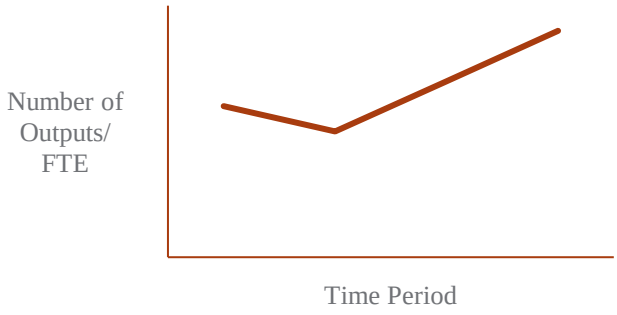
The library is often the steward of the commercial bibliographic databases and publication performance tools available to the Laboratory because those tools are usually are purchased and managed by the institution's library. One or more library staff should be subject-matter experts (SMEs) in the field of bibliometrics or scientometrics. These librarians should be called upon by Laboratory Performance staff for data collection and interpretation of metrics. They should have strong relationships with vendor SMEs who they can consult with in support of research impact questions from Strategy Planning.

Scholarly Output

Metric Definition

Scholarly Output counts the number of institutional outputs of types defined below.





Details

Outputs of the following types are included in Scholarly Output:

- Peer-reviewed journal publications
- Conference papers
- Book chapters

Outputs of the following types are excluded from Scholarly Output:

- Internal technical reports
- Abstracts
- Poster presentations

The Lab-At-A-Glance scheme is recommended for use as the denominator for normalizing this metric.

Primary Data Sources

The source's name of the metric that represents this Snowball Metric follows each source.

- Web of Science/InCites (Web of Science Documents)
- Scopus/SciVal (Scholarly Output)

Battelle Application

Time period: Annually, based on the calendar year. Recommend collecting during the second quarter for most complete indexing of the previous calendar year.

Considerations

The scope of journal and conferences indexed in sources can vary from source to source. There will be some overlap, but also uniqueness between databases. This means that Scholarly Output values are not likely to be exactly the same when compared between resources.

It is likely that the coverage of an institution's total productivity will be less than 100 percent in the primary data sources due to their limited scope of indexing. However, a partial reflection of an institution's activity is still valuable in providing evidence-based support for decision-making through benchmarking, because this limitation is likely to affect all comparators equally.

Future Opportunities

Commercial abstracting and indexing databases will continue to extend their degree of coverage of an institution's output to give a more comprehensive picture of an institution's activity.

Collaboration

Metric Definition

Collaboration calculates the number and/or percentage of outputs that have national or international co-authorship:

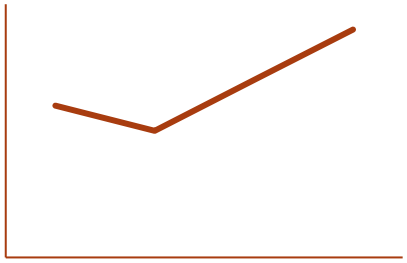
- An output has national co-authorship if it has an affiliation that does not belong to the parent institution but is within the parent institution's country.
- An output has international co-authorship if it has an affiliation that does not belong to the parent institution and is outside the parent institution's country.
- An output is classified as either national or international. An output that has both national and international co-authorships will be classified as international, to avoid double counting.
- An output that has only internal co-authorships or single authorship will be classified as national, to adjust for the lack of this information from the InCites data source.
- Countries are defined as in the ISO classification.

(a) Number of internationally collaborative outputs.

(b) Internationally collaborative outputs as a percentage of total outputs in the denominator.

(c) Nationally collaborative outputs.

(d) Nationally collaborative outputs as a percentage of total outputs in the denominator.



Time Period

(a) Number of internationally collaborative outputs per FTE.
(b) Number of nationally collaborative outputs per FTE.

Time Period

Details

The value for international collaboration is provided by InCites as a percentage value and SciVal as an option of a percentage or absolute value. The preference of the working group is to report Collaboration

as percentage values. The percentage value for national collaboration is derived from subtracting the international collaboration percentage value from 100. National collaboration will include outputs with collaborations from outside the parent institution but within the parent institution's country, outputs with collaborations only within the parent institution, and outputs with single authorship from the parent institution.

The Lab-At-A-Glance scheme is recommended for use as the denominator for normalizing this metric, only if the absolute values rather than a percentage values are used.

Institutions may have research groups or facilities affiliated to them and permanently based overseas (e.g., researchers in local universities, hospitals, or governmental research centers). Collaboration considers the physical location of the affiliation's researchers to be irrelevant.

The country information actually provided in the outputs is used. If an author did not include his/her country in his/her affiliation information, then his/her affiliation is not taken into account in the metric.

It is likely that affiliation data will not be available for all elements that constitute an institution's Scholarly Output. For example, if a commercial abstracting and indexing database is used as the data source for the collaboration information, its coverage will be less than 100% of the institution's total productivity. An institutional system may only partially capture this information for the outputs it holds. A partial reflection of an institution's activity is still valuable in providing an evidence-based support for decision-making through benchmarking, because this limitation is likely to affect all comparators equally.

Primary Data Sources

The source's name of the metric that represents this Snowball Metric follows each source.

- Web of Science/InCites (% International Collaborations)
- Scopus/SciVal (Collaboration)

Battelle Application

Time period: Annually, based on the calendar year. Recommend collecting during the second quarter for most complete indexing of the previous calendar year.

Values for this metric will be reported as percentages (i.e., the percentage of the Scholarly Output) and not the absolute value (i.e., the number of documents exhibiting said collaboration).

Considerations

The Laboratories represented in this working group have niche research areas where outputs are often generated by large group collaborations. As such, the sheer number of authors may affect the Collaboration values and introduce an element of bias. A best practice for this metric is to consider the makeup of a Laboratory's entire research portfolio when comparing values. It is not sensible to exclude papers from large collaborations because these outputs can represent large core capabilities for a Laboratory.

For example, collaborations in high-energy physics (e.g., Belle or ATLAS) can be comprised of tens to thousands of members and can bias this metric. Laboratories that have outputs published in these groupings may have higher values for collaboration compared with peers that do not. The percentage of

these outputs as part of the total Scholarly Output can help evaluate the amount of bias (i.e., the percentage of total Scholarly Output is indicative of the level of bias). A high percentage of group collaborative outputs within the total Scholarly Output will indicate more bias in the metric.

Future Opportunities

Commercial abstracting and indexing databases extend their degree of coverage of an institution's output to give a more comprehensive picture of an institution's activity.

A denominator reflecting the themes and subject focus of outputs would be highly valued, especially if the same thematic denominator could be applied not only to Output and Outcome, but also to Input and Process metrics, if that approach was taken in the future. Most likely, an automated way of assigning subject fields based on abstracts of the items in question (e.g., submissions or publications) would be needed to enable this.

Intellectual Property Volume

Metric Definition

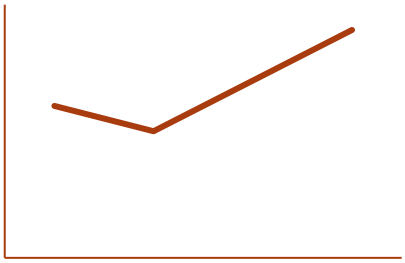
Intellectual Property Volume calculates the number of U.S. patent applications filed as a non-provisional application, U.S. patents granted, and the number of license agreements. It may be an indicator of:

- How many innovations are engaged in technology transfer at an institution each year.
- The size of an institution's exploitable portfolio for commercialization.
- What an institution has exploited commercially that is now being used by industry.

(a) Number of U.S. patent applications filed

(b) Number of U.S. patents granted

(c) Number of license agreements active



Details

Intellectual Property for purposes of the Intellectual Property Volume metric includes:

- Filed U.S. non-provisional patent applications
- Granted patents in the United States
  - Patents granted in other (foreign) countries do not count in this definition.
- Active license agreements defined as Patent License Agreements, Options, Software Site Licenses, Software Marketer Licenses, Exploratory Licenses & Research Licenses.
  - Excludes trial installation/Evaluation agreements or in-licenses and material transfer agreements or "other" agreement types.

Primary Data Sources

The annual data call of the Technology Transfer Working Group/Office of Technology Transitions/NIST. This information could be supplied to the Laboratory Performance staff by the Technology Transfer Working Group point-of-contact for each Laboratory.

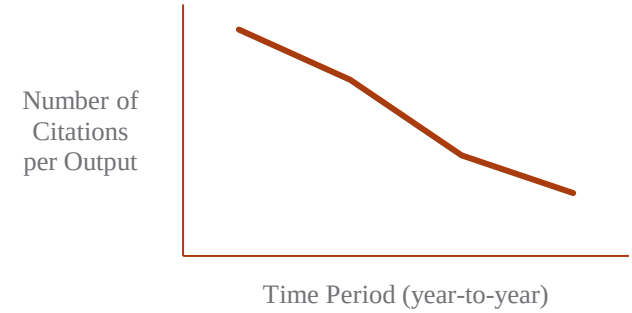
Battelle Application

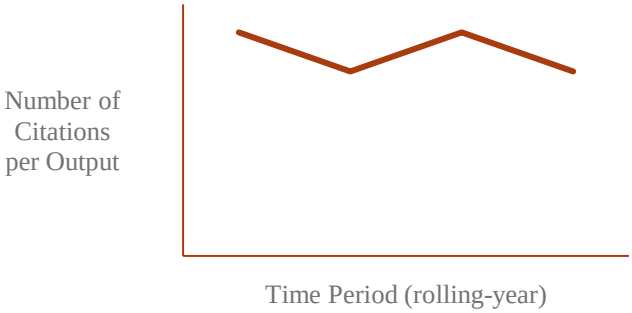
Time period: Annually, based on the fiscal year and in tandem with the annual DOE Office of Technology Transfer data call. This application supports process efficiency and removes duplication of effort.

Citations per Output

Metric Definition

Citations per Output calculates the average citations received to date by each output that is part of a particular set.





Details

It is likely that citation data will not be available for all elements that constitute an institution's Scholarly Output. For example, if a commercial abstracting and indexing database is used as the data source for Citations per Output, its coverage will be less than 100% of the institution's total productivity. A partial reflection of an institution's activity is still valuable in providing an evidence-based support for decision-making through benchmarking, because this limitation is likely to affect all comparators equally.

Primary Data Sources

The source's name of the metric that represents this Snowball Metric follows each source.

- Web of Science/InCites *(Citation Impact)*
- Scopus/SciVal (*Citations per Publication*)

Battelle Application

Time period: Annually, based on the calendar year. Recommend collecting during the second quarter for most complete indexing of the previous calendar year.

The time period does not pertain to the year in which citations were received, but to the year the outputs were produced.

Considerations

Special consideration should be given to what is defined as *output*. There may be the case that this metric is reported alongside others. To avoid confusion, it is important that metrics that are compared all represent the same set of outputs.

Individual publications that are highly cited compared with their peers can positively bias Citations per Output.

A rolling-year calculation might be considered to reduce the natural decline of this metric because it is a citation-based metric. A three- or five-year rolling period would be suitable for most scientific research portfolios.

Some scientific fields are cited more than others, which can create the effect of highly varied Citations per Output values between Laboratories. For example, it is unfair to compare a research portfolio dominant in computer science with a portfolio that is dominant in chemistry. The citation rates of each field are different and do not alone reflect a performance issue between fields or the participating organizations. A best practice is to consider the research portfolios of the Laboratories to get the most relevant analysis. The core capabilities for each Laboratory are a valuable resource for learning about their research portfolios and can be found at https://science.energy.gov/~/media/lp/pdf/Laboratory-planning-process/SC_Consolidated_Laboratory_Plans.pdf.

Further Considerations

Based on the working group's initial examination of the Snowball Metrics and the recommendations outlined in this report, the working group believes the potential exists for adding value by expanding the set of metrics. After an adequate run time, considerations for metrics not selected in this initial set of recommendations should be reviewed to possibly provide additional insight into Battelle's impact. This should include a review of additional Snowball Metrics beyond the Output and Outcome metrics, such as Input Metrics (i.e., Awards Volume) and Process Metrics (i.e., Income Volume).

A record of past performance can be built as data is collected year-to-year. The working group expects that past performance, in addition to current performance on the Snowball Metric Report Template (Appendix 2), will become a point of discussion. Currently, the template is designed to provide a single year of data.

Appendix A

Data Source Comparison of Metrics, Calendar Year 2016

Appendix A

Data Source Comparison of Metrics, Calendar Year 2016

InCites dataset updated Nov 18, 2017. Includes Web of Science content indexed through Sep 29, 2017.

SciVal dataset updated Nov 6, 2017. Includes Scopus content indexed through Nov 6, 2017.

Scholarly Output

Laboratory	Web of Science/InCites (Clarivate Analytics)	Scopus/SciVal (Elsevier)
Brookhaven	1,442	1,545
Idaho	293	456
National Renewable	740	838
Oak Ridge	2,581	2,764
Pacific Northwest	1,522	1,660

Collaboration

Laboratory	Web of Science/InCites (Clarivate Analytics)		Scopus/SciVal (Elsevier)	
	International	National	International	National
Brookhaven	60.89 %	39.11 %	59.0 %	41.0 %
Idaho	23.21 %	76.79 %	19.7 %	80.3 %
National Renewable	33.78 %	66.22 %	32.3 %	67.7 %
Oak Ridge	44.05 %	55.95 %	42.1 %	57.9 %
Pacific Northwest	36.73 %	63.27 %	36.5 %	63.5 %

Citations per Output

Laboratory	Web of Science/InCites (Clarivate Analytics)	Scopus/SciVal (Elsevier)
Brookhaven	5.61	6.2
Idaho	1.68	1.7
National Renewable	5.44	5.9
Oak Ridge	3.66	4.2
Pacific Northwest	4.54	4.8

Appendix B

Snowball Metric Report Template

Appendix B

Snowball Metric Report Template

Metric	Definition	2017 Metric Values				
		BNL	INL	NREL	ORNL	PNNL
Scholarly Output	The number of institutional outputs including peer-reviewed journal publications, conference papers, book chapters, and national consensus standards and reports.					
Citations per Output	The average citations received to date by each output that is part of a particular set.					
Intellectual Property Volume	The number of patents that are filed and granted, and the number of license agreements.					
Collaboration	The number and percentage of outputs that have national or international co-authorship.					

Source Information

Laboratory	Date of Metric Values Retrieval	Source Used	Source's Date of Last Dataset Update
BNL			
INL			
NREL			
ORNL			
PNNL			

Pacific Northwest
NATIONAL LABORATORY

www.pnnl.gov

902 Battelle Boulevard
P.O. Box 999
Richland, WA 99352
1-888-375-PNNL (7665)

U.S. DEPARTMENT OF
ENERGY