



ANSI/NISO Z39.104-2022

ISSN: 1041-5653

CRedit, Contributor Roles Taxonomy

Abstract: The Contributor Roles Taxonomy's 14 roles and best practices represent a simple but comprehensive system that enables the range and nature of contributions to scholarly published output to be captured in a transparent, consistent, and structured format.

An American National Standard
Developed by
the National Information Standards Organization

Approved January 14, 2022 by
the American National Standards Institute

Published by the National Information Standards Organization
Baltimore, Maryland, U.S.A.

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Published by
NISO
3600 Clipper Mill Road
Suite 302
Baltimore, MD 21211
www.niso.org

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ISSN: 1041-5653 National Information Standards series

ISBN: 978-1-950980-18-5

DOI: <https://doi.org/10.3789/ansi.niso.z39.104-2022>

Contents

Foreword	4
1 Scope and Purpose	7
1.1 Scope	7
1.2 Purpose	7
2 CRediT Taxonomy	8
2.1 Contributor Roles	8
2.2 Contributor Roles Defined	8
3 CRediT Implementation	9
3.1 Academics	9
3.2 Publishers	9
3.2.1 Taxonomy Application	9
3.2.2 Optional Specification	9
Appendix A : (informative) Adopters	10
Appendix B: (informative) Role URIs and IDs	11
Bibliography	12

Foreword

(This foreword is not part of the CRediT, Contributor Roles Taxonomy, ANSI/NISO Z39.104-2022. It is included for information only.)

About This Standard

CRediT grew from a practical realization that bibliographic conventions for describing and listing authors on scholarly outputs are increasingly outdated and fail to represent the range of contributions that researchers make to published output. Furthermore, there is growing interest among researchers, funding agencies, academic institutions, editors, and publishers in increasing both the transparency and accessibility of research contributions.

Most publishers require author and contribution disclosure statements upon article submission – some in structured form, some in free-text form – at the same time that funders are developing more scientifically rigorous ways to track the outputs and impact of their research investments.

In mid-2012 the Wellcome Trust and Harvard University co-hosted a workshop to bring together members of the academic, publishing, and funder communities interested in exploring alternative contributorship and attribution models. Following the workshop (see workshop report¹) and working initially with a group of mainly biomedical journal editors (members of the International Committee of Medical Journal Editors (ICMJE)), a pilot project was established to develop a controlled vocabulary of contributor roles (taxonomy) that could be used to describe the typical range of ‘contributions’ to scholarly published output for biomedical and science more broadly. The aim was to develop a taxonomy that was both practical and easy to understand while minimizing the potential for misuse.

A draft taxonomy was tested with a sample of recent corresponding authors publishing across science and was relatively well received. The outcomes of the pilot test are described in a Nature commentary (April 2014)².

Since 2014, the contributor taxonomy – otherwise known as CRediT (Contributor Roles Taxonomy) has been widely adopted across a range of publishers to improve accessibility and visibility of the range of contribution to published research outputs, bringing a number of important and practical benefits to the research ecosystem more broadly, including:

- Helping to reduce the potential for author disputes
- Supporting adherence to authorship/contributorship processes and policies
- Enabling visibility and recognition of the different contributions of researchers, particularly in multi-authored works – across all aspects of the research being reported (including data curation, statistical analysis, etc.)
- Supporting identification of peer reviewers and specific expertise
- Supporting grant making by enabling funders to more easily identify those responsible for specific research products, developments or breakthroughs
- Improving the ability to track the outputs and contributions of individual research specialists and grant recipients
- Easy identification of potential collaborators and opportunities for research networking
- Furthering developments in data management and nano-publication

¹ IWCSA Report (2012). Report on the International Workshop on Contributorship and Scholarly Attribution, May 16, 2012. Harvard University and the Wellcome Trust. http://projects.iq.harvard.edu/attribution_workshop

² Allen, L.; Brand, A.; Scott, J.; Altman, M.; Hlava, M., Credit where credit is due. *Nature* 2014, 508 (7496), 312-313. <https://doi.org/10.1038/508312a>

- Informing ‘science of science’ (‘meta-research’) to help enhance scientific efficacy and effectiveness
- Enabling new indicators of research value, use and re-use, credit and attribution

This standard represents a stage of formalization for CRediT, which is hoped will better support existing users and implementors in scholarly workflows. Under the aegis of a NISO Standing Committee, future work is planned to foster discussion and community feedback for potential expansion of CRediT. As described above, CRediT was originally developed in the health and life sciences and has since been taken up in additional STM areas; this potential expansion could include support for other scholarly areas, which will require more examination of requirements.

The overall aim is to make the Contributor Roles Taxonomy practical and useful, avoid its misuse, and most importantly, ensure rigor in the process for how the standard is evolved to support the research community at large.

Suggestions for improving this standard are welcome. They should be sent to the National Information Standards Organization, 3600 Clipper Mill Road, Suite 302, Baltimore, MD 21211 or via email at nisohq@niso.org.

NISO Information Creation & Curation Topic Committee

This standard is part of the portfolio of the NISO Information Creation & Curation Topic Committee. At the time the Topic Committee approved this standard for ballot to the consensus voting pool, the following individuals were committee members:

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NISO CRediT, Contributor Roles Taxonomy Voting Pool

At the time this standard was balloted, the following organizations were members of the CRediT, Contributor Roles Taxonomy Voting Pool that approved this standard. NISO approval of this standard does not necessarily imply that all Voting Pool members voted for its approval.

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Acknowledgements

The Z39.104 Working Group wishes to acknowledge the following organizations and individuals outside the formal working group who contributed to this effort: Amy Brand (MIT Press) and CASRAI (Consortia Advancing Standards in Research Administration Information).

CRedit, Contributor Roles Taxonomy

1 Scope and Purpose

1.1 Scope

In a world where research is increasingly international, and where teamwork, collaboration and multidisciplinary are required, it is important to understand how and where different individual contributions make a difference; being able to capture and describe those contributions easily and effectively is a key first step.

Specifically, the Contributor Roles Taxonomy's 14 roles and best practices represent a simple but comprehensive system that enables the the range and nature of contributions to scholarly published output to be captured in a transparent, consistent and structured format.

1.2 Purpose

Calls for a contributor roles taxonomy emerged following increasing dissatisfaction with established bibliographic conventions for describing and listing authors on scholarly outputs, which had become outdated, and increasingly, did not convey the diversity of contributions that researchers make to published output. The emergence of the 'impact agenda' for research, and the view that the published research article is perhaps the most important currency on which to judge the impact of an academic career, makes it fundamentally important not to rely on spurious indicators of a researcher's contributions – and using author position has been shown to be one such spurious and unreliable indicator.

Providing accessible contribution information about each specific contribution and contributor was seen as a way to address a range of well-described problems with author lists, among the most important, perhaps, to provide more accountability to prevent questionable, guest and 'ghost' authorship on research articles. Also, secondary drivers include providing a way to make sense of the increasing number of authors listed in research articles in many areas of science and providing visibility to early career researcher contributions where a 'first author' paper has proven to be elusive.

Furthermore, in fact, there are no consistent name ordering conventions from one field to the next. Alongside calls for a more responsible use of research-related metrics, and more holistic and tailored approaches to research and researcher assessment, as advocated by DORA³, it is also simply a good time to bring greater transparency to research. In a world where collaborative and open science is becoming the norm, the ability to provide visibility to a multitude of contributions is an important incentive for researchers contemplating a move into large team science. In addition, for the readers and users of research, being able to decipher the contributions, origins and context to what they are reading in a piece of scholarly published work are important determinants of how much – or how little – they might want to use, or even trust, the research being described.

There are many practical benefits of including more granularity about contributions to published scholarly output as a core component of metadata associated with a specific research output which enables computational research uses such as text and data mining and machine learning.

³ San Francisco Declaration on Research Assessment, <https://sfdora.org/read/>

2 CRediT Taxonomy

2.1 Contributor Roles

Conceptualization

Data curation

Formal analysis

Funding acquisition

Investigation

Methodology

Project administration

Resources

Software

Supervision

Validation

Visualization

Writing – original draft

Writing – review & editing

2.2 Contributor Roles Defined

Conceptualization – Ideas; formulation or evolution of overarching research goals and aims.

Data curation – Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use.

Formal analysis – Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.

Funding acquisition - Acquisition of the financial support for the project leading to this publication.

Investigation – Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.

Methodology – Development or design of methodology; creation of models.

Project administration – Management and coordination responsibility for the research activity planning and execution.

Resources – Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.

Software – Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.

Supervision – Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.

Validation – Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.

Visualization – Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.

Writing – original draft – Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).

Writing – review & editing – Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.

3 CRediT Implementation

3.1 Academics

Allocate the terms appropriately to your contributors within research outputs. Advocate that your institution and any publications you're submitting to acknowledge and adopt the taxonomy.

3.2 Publishers

Allocate the terms appropriately to your contributors within research outputs. Advocate that your institution and any publications you're submitting to acknowledge and adopt the taxonomy.

CRediT adoption can be achieved via a manual workflow outside of Submission and Peer Review systems, or through using a system with an existing CRediT integration.

A link to current CRediT adopters can be found in Appendix A.

The roles given in the taxonomy include, but are not limited to, traditional authorship roles. The roles are not intended to define what constitutes authorship, but instead to capture all the work that allows scholarly publications to be produced. For clarity, CRediT roles define contributorship, not authorship. A person can have contributed to a research output in terms of CRediT role(s) without meeting the requirements for authorship. Further information is available on the Committee on Publication Ethics (COPE) website at <https://publicationethics.org/authorship>.

3.2.1 Taxonomy Application

List all Contributions – The 14 CRediT roles should be used to present specific author contributions to the scholarly work.

Multiple Roles Possible Per Contributor – A given contributor may have multiple roles.

Multiple Contributors Possible Per Role – A given role may have multiple contributors.

Make CRediT Machine Readable – Contributions must be captured in structured, machine-readable XML, and for journal articles, should be compatible with, or comparable to, JATS [ANSI/NISO Z39.96-2019, JATS: Journal Article Tag Suite, version 1.2](#), described in the JATS4R (JATS For Reuse) recommendation at: <https://jats4r.org/credit-taxonomy>.

3.2.2 Optional Specification

Degree of Contribution – Where multiple individuals serve in the same role, the degree of contribution may be specified as 'lead', 'equal', or 'supporting'.

**Appendix A:
(informative)
Adopters**

(This appendix is not part of ANSI/NISO Z39.104-2022, Contributor Roles Taxonomy (CRediT). It is included for information only.)

A regularly-updated list of CRediT adopters is available on the CRediT website at <https://credit.niso.org>.

Appendix B: (informative) Role URIs and IDs

(This appendix is not part of ANSI/NISO Z39.104-2022, Contributor Roles Taxonomy (CRediT). It is included for information only.)

Each Contributor Role is linked at <http://credit.niso.org/>. Each individual Contributor Role page has a permanent URI and an ID. NISO is committed to keeping these stable.

The table below includes simple-character versions of the role names used in their URIs.

Role Name	Simplified Name
Conceptualization	conceptualization
Data curation	data-curation
Formal analysis	formal-analysis
Funding acquisition	funding-acquisition
Investigation	investigation
Methodology	methodology
Project administration	project-administration
Resources	resources
Software	software
Supervision	supervision
Validation	validation
Visualization	visualization
Writing – original draft	writing-original-draft
Writing – review & editing	writing-review-editing

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(This appendix is not part of ANSI/NISO Z39.104-2022, *Contributor Roles Taxonomy (CRediT)*. It is included for information only.)

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