

## **Lecture 2: Channels of Science Communication**

### **Science Communication: Research Productivity and Data Analytics using Open Source Software**

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**Week: 01**

**Lecture: 02**

Dear learners, welcome to the second lecture of this first part on Introduction to Science Communication. So, in this lecture I will be discussing the different channels used for science communication and the different attributes associated with them. So, I hope you have shared your motivation for communicating science in the discussion forum. If you haven't shared your motivation, please do that. We will be happy to see what exactly your motivation is, what you feel, why science is communicated with the others. Okay, let's start this second lecture.

So, publishing and knowledge have a long history with knowledge sharing through ancient manuscripts. But the major breakthrough came when a German inventor Johannes Gutenberg invented the printing press in the late 1430s. And this was the time which gave the rise to the explosion of production of knowledge in the print form. However, the earliest channel of communicating science is considered as the journal publishing, which was started in 1665 when a European journal, the *Journal des Sçavans* was published. Shortly after this, in the same year, another journal *Philosophical Transactions of the Royal Society* of London was published.

So, much of the development in science publishing took place in the 20th century. Not many commercial publishers have emerged and started publishing various models of publications like open access. And inside open access, different open access models have emerged, different repositories, different preprint repositories have also emerged. So, we will see each of these like different models of open access and the kind of publishing in the upcoming lectures. So, let us first see what a journal is and what are the key attributes associated with a journal. So, a journal is the most preferred source of communicating science by the scientific community.

It is a kind of publication that publishes a number of documents. Okay, let us first see what are the attributes of a journal and then we will see what are the different kinds of

documents a journal publishes. So, the first attribute of a journal is a Title which signifies the name of the journal. Then a second attribute of a journal is the Publisher who publishes this journal. Is it a journal by society, or by an organization? And the third key attribute of a journal is an ISSN number. So, this is a unique set of eight digits that identifies the journal. So, the fourth key attribute of the journal is the Scope and the Subject. So, each journal publishes the research of a specific field and discipline, like some are medical sciences journals, some are social science journals, some are humanities journals. So, inside social science journals, many journals are publishing related to library and information science, some journals are publishing related to psychology, sociology, anthropology.

So, this is how each journal has their own Scope of publishing the research. Then the fifth key attribute of a journal is the Language. So, each journal allows contents only in a specific language. Then the sixth attribute of a journal is the document type. So, each journal allows some specific types of documents. Like, some journals publish only articles, review papers, editorials, while some journals publish data papers also, which is another document type which got popular in recent times. I will be discussing each of the document types in detail.

So, the seventh key attribute of a journal is the Frequency. So, it defines the publication schedule of a journal whether the journal is monthly, or annually, or quarterly. So, it depends. So, each journal has their own publication schedule. And the eighth key attribute is the Editorial Board. So, the editorial board of a journal is a group of subject experts and professionals that manages the publication of a journal. Generally, it comprises an editor-in-chief with associate editors.

Then the ninth attribute of a journal is the Review Process. So, it is one of the important attributes of a journal where research work is evaluated by subject experts to assess the quality of the publication. So, again it depends from journal to journal. Some journals use a double-blind peer review. Some follow triple-blind peer review. So, it depends, it varies from journal to journal what review process that journal is following. Then the tenth attribute of a journal is metrics. So, journals have their own metrics like Web of Science indexed journals have Journal Impact Factor, while journals indexed in Scopus have Citescore.

Then the eleventh attribute of a journal is Volume and Issue. So, the journal organizes the contents by publishing volumes and subsequent issues of each of the volume. Then this whole structure of volume and issue also varies from journal to journal, like some journals have four issues in a volume. Some have two. So, it depends on how they publish the research. Then the twelfth attribute of a journal is a Publication Mode. So, this attribute describes whether the journal is published in an online mode or a print mode or both.

If a journal publishes in both modes, it will have two separate ISSN numbers, one for the online one, and another is for the print one. Then the next attribute of a journal is the reference style. So, the journals have their own reference style. It also again varies from journal to journal. Some journals follow APA style, some follow MLA style, and some follow Chicago style. Even journals of the same subject have their different reference style of publishing. So, the reference style also varies from journal to journal. Then the next attribute of a journal is APC.

So, APC is an article processing charge. It is a fee charged by the journal for publication. So, again this also varies from journal to journal what amount of APC they charge for publication of the article in the journal. The only thing is what is the purpose of taking that APC. So, whether that APC charges for publishing an article in an open access, or like some journals charge APC for the publication itself. Whether it is open access or closed access, they take the APC for the publication. So, this is another attribute.

Then the next attribute is the license. So, license refers to as a legal permission of the contents, who has the copyright on the contents published in the journal. So, whether the author has the copyright on this particular research or the journal has the copyright on this particular research. So, again this also varies from journal to journal. So, open access journals mainly have a Creative Commons license for the articles published in their journals.

Then the attribute is the Access Mode. So, access mode describes how the journal can be accessed. Whether the content of the journal can be accessed freely, or is there any subscription amount that is there for accessing the contents of the journal. Then the 17th attribute of a journal is indexing and this exactly refers to the databases where this journal is indexed, like, Scopus, Web of Science, PubMed. So, there are different databases, and all the indexing of a journal in a particular database is considered as the reputation and credibility of a journal. It also enhances the visibility of the research. Some of the agencies prefer publishing in Scopus indexed journals, some agencies prefer publishing in Web of Science indexed journals. So, again this is one of the key attributes of a journal where that particular journal is indexed.

So, the next attribute is Year. So, a year is basically an attribute that gives the idea when the journal is started also. It is important. Some of the journals which, for example, started in 2000 but they are indexed in Scopus from the year 2005. So, the journal started its journey with publication from the year 2000 but indexing started in the year 2005. This is a critical point for every researcher to know when exactly a journal has been started indexing in different databases.

So, some of the journals were earlier indexed with some databases. But now they may not be indexed with such databases. So, if you go to a database and search those journals, it

will display that this was the year when this particular journal was started indexing and now whether it is continuing or it has been stopped. So, the last attribute of a journal is the publishing time. This is again a very popular attribute. So, this is again a very important attribute of a journal which has been popularized in recent times.

So, journals publish the publishing timeline they take for an article from submission to publication. So, this is again another key attribute of a journal. So, these are some of the 19 key attributes of a journal which are important to know what exactly a journal is. So, we will see all of these attributes with the examples. So, this is an example of a journal titled as Government Information Quarterly.

So, if you see on the left-hand side of my screen this is a title of the journal, and if you see on the topmost on the left-hand side. So, this is the publisher logo. So, this particular journal is published by Elsevier, and if you see on the topmost side of the left-hand side. So, these are the key attributes of the journals mentioned like volume number. So, this particular screenshot that I have taken up is of volume 40 and issue 4, and it is published in October 2023 and this is the eight digit ISSN number.

If you notice here, only one ISSN number is there. So, we are not able to understand whether this ISSN number is for the online publication, or the print publication. We will see where that detail is mentioned in the next slide. So, and if you see on the left-hand side, the details of the editors are given. If you see on the right-hand side, the Editorial Board's details are given. So, this is the Editorial Board. So, here there are two co-Editors-in-Chief for this journal, and then followed by the associate editors. This list is long but, here in this screenshot, it is only showing one associate editor but there are many associate editors for this journal. And if you see, there is an interesting thing shown for this particular journal: the gender diversity of editors in this particular journal. Generally, this kind of details all journals do not provide. But this particular journal has provided that for this journal the editorial board comprises 80% men and 20% women. So, this is again it varies from journal to journal which journal wants to display this information or not.

Then if you see on the left-hand side of this screen this is the reference style is given. Each publication in this journal follows this reference style. So, the author has to follow this reference style for publishing in this journal. So, if you see on the right-hand side the Aims and Scopes of this particular journal are given. Below that, it is showing the types of submission that this particular journal accepts.

So, in this slide if you see on the left-hand side this is the copyright part of this particular journal and if you see that for Gold Open Access articles upon acceptance of an article, the author will be asked to complete the license agreement. So, these are the complete details of the copyright of the contents published in this journal. On the right-hand side,

again the Aims and Scope of this journal have been listed with a short summary. Also, you can expand it further. Then the ISSN number is given. So, here you see there are two ISSN numbers given.

So, one is for the print one and this is for the online one. So, now we are like this journal is available in two publication modes, one is print form and another is the online form. Then if you see the next part is the subject areas. So, this particular journal accepts the research. This particular journal publishes research on sociology, political science, law, management, library and information science, business management, and accounting.

And the next is the journal metrics. So, this journal has two metrics, one is Citescore which is by Scopus. So, for this particular journal the Citescore is 17.3. Another is Impact Factor which is by Web of Science. So, the Impact Factor of this journal as per Web of Science is 7.8.

So, we will see in detail in the upcoming lecture what Citescore is and what Impact Factor is and what is the difference between them. But the key difference between both the metrics is that Citescore is given by Scopus. So, the impact factor is given by the Web of Science. Also, in Scopus three-year data is considered. But for the Impact Factor only two-year data is considered. We will discuss in detail how these metrics are calculated in the upcoming weeks. Then if you see here, it is mentioned about the article publishing charges.

So, if you read this whole paragraph, this particular journal is asking for article processing charges. So, the journal is asking for article publishing charges of dollar 3530 for publishing as an open access. So, you have to be very clear about this APC. Some call it an article publishing charge, some call it an article processing charge. So, again it varies from journal to journal why they are asking this APC. Whether they are asking for publishing or they are asking for it as a processing one. So, here the journal is asking the fee for publishing this particular research under open access.

Read this detail about article publishing charges. It is written that this journal offers authors the option to publish their research via subscription without article publishing charges or open access. To publish an open access, a publication fee needs to be met by the author or research funder. So, this is the fee for publishing the article as an open access. So, now if you see on the left-hand side, these are the like volumes and issues are given. So, if you see like for volume 40 there are the four issues and it depends because this journal is quarterly there are four issues each in the three months. So, the first is in January, second is in April, third is in June and the fourth is in October.

Then if you see on the right-hand side this is the attribute of a journal which shows that this particular journal takes the time of 346 days from submission to acceptance. So, this is again an important attribute of a journal which is considered before publication. For

example, you want to publish research but you don't want to take that much time. So, that is why publishing time is a key attribute to know how much time this journal takes from submission to publication. Then if you see another attribute of a journal is an abstracting and indexing service. Below are the details of indexing where the journal is indexed. So, this journal is indexed in a number of databases, such as, INSPEC, Library and Information Science Abstracts, Social Science Citation Index, Scopus, etc.

So, this is what a journal looks like. So, let us now discuss what all document types are published by the journal. These are some of the key document types generally published by a journal. So, it includes articles, review papers, letters, conference papers, research notes, editorials, erratum, short papers, data papers, articles in press, and retraction notes. We will be taking the examples of each of the document types. So, first we will see the layout of an article as the structure of the other document type has a similar kind of attribute with some extra or less information.

So, an article is a document type that presents the original research. So, the attributes of the articles are shown in this screen. So, we will go one by one to each of the attributes. So, the first attribute of the article is the Title which signifies the name of the research article.

Then the second is the Source. So, source exactly where this article is published, whether this particular article is published in that journal, or it is published in some other source. Then the key attribute of an article is Abstract. So, an abstract is a concise summary that provides an overview of the research methods, results and conclusion presented in the full article. Then another attribute of the article is IMRaD. So, basically this is a layout generally scientific article follows.

It means introduction, methodology, results and discussion. So, each article has these components. Then each article has references which generally are at the end of the article. Then another attribute of an article is Author. So, who exactly created this research? Who is the creator of this research article?

The seventh attribute of an article is DOI. DOI stands for Digital Object Identifier. It is a persistent identifier like ISSN. DOI uniquely identifies an article. So, this is the ID for the article.

Then another attribute of an article is keywords. So, keywords are the specific word or phrases that represent the main topics, themes, or concepts covered in the study. So, these are the keywords supplied by the authors during the submission of the article in the source.

Then another attribute of an article is Volume, Issue and the Page numbers. So, it represents the location of the article in the source where that article is published, which is

the volume number, what exactly the issue number is and inside that issue what are the page numbers where this article is published. Then the attribute is the Year, in which year this article is published.

So, another attribute of an article is the Citations. So, what citation is and what are like, why it is important, we will be discussing in the upcoming lecture but citations are the important criteria for evaluation of scientific productivity. So, each article has citations, like how many times these articles have been cited in different research papers or different sources. Then we have some auxiliary contents. Some journals require additional details in the article, like data availability statements, supplementary materials, annexures, funding, conflicts of interest, and so on. This you will not find in all the journals but nowadays many of the journals are providing this auxiliary information like data availability statement, if data is available, where that data is available, or if that data is published somewhere as data paper or not.

Then another attribute of an article is Dates. Dates are the important attribute that helps in knowing the possible time required in publishing the article in that particular source. So, again this also varies from source to source. Some journals provide all the dates but some journals may not provide. So, it again varies from journal to journal.

Then another point is the Publication Stage. So, the publication stage describes the status of the publication stage of an article. So, whether the article is in the printing or it is published. Then another key attribute of an article is License. So, license is another attribute which refers to legal permission which defines who has the legal right on this content. This also, again, varies from source to source like some articles have. The open access article generally follows the Creative Commons License. So, again this varies from source to source.

Then another attribute is the Publication Mode. So, the publication mode describes whether the article is published in an online mode or the print mode. So, this depends on the source where that article is published.

And the last attribute of an article is the access mode. So, how this article can be accessed whether it is free to access, or any subscription amount is required for accessing that particular article. So, this is the last key attribute of an article.

So, let us now understand all these attributes of the articles and other document types with an example. This is an example of an article document type published in a journal. Let us now see each attribute one by one. If you see in the header of this article some key information is given. So, first is Scientometrics. So, this displays that this particular article is published in the journal *Scientometrics*. So, this is the year. So, the year is 2010 and this is the volume number. So, volume number is 84 and these are the page numbers. So, pages are from 523 to 528. Now if you see below that there is information about DOI.

So, DOI of this particular article is given. After that header if you see, this is the title of the article. So, it is the Software survey: VOSViewer, a computer program for bibliometric mapping. So, this is the title of this particular article. Then it has the authors. So, these are the two authors who are there for this particular article. And if you see in this green box, these are the dates which are given that this particular article is received on 31<sup>st</sup> July 2009, and published on 31<sup>st</sup> December 2009. Again, like some in the box, journals also provide more comprehensive dates like received on this date then revised on this date then accepted on this date and then published on this date. So, many of the journals are providing the dates in the article itself.

Now, if you see here this is the abstract of the study. So, if you see here these are the keywords. So, the keywords bibliometric mapping, science mapping, visualization, and VOSviewer, show that this article is related to a software that can be used for bibliometric analysis and visualization. So, these are the keywords. Now if you see it starts with an introduction. So, I am not showing the full article but it has that layout. Then if you see in the bottom, the details of authors are given with the email-IDs and the corresponding details. And if you see this logo of this Springer that means this particular journal is published by the Springer. If you see on the right-hand side in the end of this article there is the acknowledgement, this acknowledgement and then this what I discussed earlier like data availability statement, conflict of interest, these are generally not provided in all the journals. So, that is why I listed them in the auxiliary content.

Then if you see below that there is open access. So, this describes the license of this particular article. So, this article is distributed under the terms of Creative Commons Attribution Non-Commercial License. So, which permits any non-commercial use, distribution and reproduction in any medium, provided the original authors and source are credited. So, this is how licenses are displayed in the article and in the end if you see a list of references of the article is given.

Now let us move to another document type which is like a book chapter and published in a book. So, there is not much difference in the article and the book chapter. The only difference is that the article is published in some journal whereas the book chapter is published in a book, which generally has an ISBN. So, journals have ISSN numbers, but books have ISBN numbers, and the other details are almost the same. Between the other details are other attributes of articles and book chapters are closely the same.

So, if you see on the left-hand side, it is an example of an edited book, which has the title as Mathematics and Computer Science which has volume 2. It is edited by the 5 editors and it is published by Wiley. And on the right-hand side all those details about this particular book are provided: what is the ISBN number, where it is printed, and what is the copyright year, and all those things.

Now and if you see on the left-hand side there are some of the book chapters published in this book and on the right-hand side this is an example of an article which is published as a book chapter in this book. So, this is the one example of the book chapter published in this book. So, now take the example of publication source as a type of book. So, the key difference between the earlier book and what we have discussed here is that all the chapters are written by these three authors only. If you see the chapter of this particular book, you do not find any author details. If you see here, these are the author names that are therefore associated with each of the chapters. So, in an example of an edited book it is edited by a group of authors and the chapters in the books are published by many other authors. But in the example of the book, all the chapters are written by only these three authors.

Next, we have the example of a conference paper. So, a conference paper is a kind of an article that is presented in a conference, symposium, or seminar. So, on the left-hand side this is an example of a conference proceedings with the key details like conference name. So, this is the conference name then the editors, dates, place. So, these are the details. Whereas on the right-hand side if you see, it is an example of a conference paper presented in the E3S Web of Conferences and later on this is published and a DOI is also associated with it, and the other things are the same as that article.

So, the next document type is a review paper. So, a review paper generally represents the comprehensive overview of the original published research. So, the review paper includes an extensive bibliography on a topic or a theme. This is an example of a review paper on deep learning. So, it is published in the *Nature* journal, and this is the other details like what is the source. So, the year is 2015 and the DOI is there. So, the key difference between the article and the review paper is the content in each of the document types. Other than that, the attributes are more or less similar in both review and article papers.

So, on the right-hand side if you see this is an example of an editorial. So, editorial is a kind of opinion or news about a topic or the event. Generally, it is listed at the beginning of the other documents, and it is in the short form generally around one to two pages. This is an example of an editorial published in the *Annals of Surgical Oncology*, which has the title Best Practices for Handling Missing Data. It discusses how to handle the missing data. So, generally these editorials are kind of short studies ranging from one to two pages with words ranging from 500 to 1000. Again, this layout of and the number of words and the pages varies from journal to journal.

Now if you see on the left-hand side, this is an example of a Note. So, a Note is another document type which is published by the journal. It is a kind of a commentary or a discussion. It also, like the editorial, provides the content related to any of the events or the concepts. So, if you see the examples on the left-hand side this is a note, a type of

viewpoint and which is titled Response to COVID-19 in Taiwan: Big Data Analytics, New Technology, And Proactive Testing.

So, this is the example of a Note on the left-hand side, and it has all the other attributes like journal name, when this note is published and details of correspondence and all. If you see on the right-hand side, this is another document type which is basically a correspondence with the editor on some topic. This is also a short text document published as a single item. It also has details like author, journal, volume, year, DOI, etc.

So, a short survey is another document type which is published by the journal. It is like a mini review of the original research articles. So, generally the short surveys are in the few pages only.

This is an example of a short survey on computational social science which is published in the *Science*. Let us now discuss this data paper which is the latest document type adopted by researchers that facilitates the sharing and reusability of data. The publication process of the data paper is similar to other documents in the journal. So, a data paper consists of a complete description that includes the scope, source, data collection methods, and preprocessing of the dataset. So, if you see this is an example of one of the data papers published in the journal *Data in Brief*. So, this is the journal name *Data in Brief*. It is published by Elsevier. So, this is the title of the data paper. Then if you see below that the author details are given. If you see below, different dates are given. So, these were the dates I was discussing that also vary from journal to journal. So, for this particular data paper the whole history is given like this. So, this particular data paper will be received in September 2023. Then it was revised in November 2023. Then it was accepted in November 2023. And then finally it was available online on 22nd November 2023. So, these kinds of dates and the type of dates which generally describe the history of the article vary from journal to journal.

Then the keywords are given. So, these are the keywords. So, the keywords like soyabean, quality detection, image qualification. So, this is a dataset related to soyabean. Copyright details are given that this particular data paper is in the open access under a CC-BY license. And below that if you see, corresponding details, DOI and license of this article is given.

So, in terms of attribute the data papers and the articles are quite similar. But inside the data paper there are some different things available which discuss the dataset. If you see here first it is given the subject of a dataset, that is agricultural engineering, computer vision, pattern recognition, and artificial intelligence. It has also provided what is the specific subject area under this subject. After this the details, about the data format that this data format as a row and column it is available in JPG. Then conversion to JPG and PNG is available. Then the annotation is in the text format, TXT format. Then types of

data. So, the types of data are images and how this data is collected and all those details are provided here. Then the data source location. So, data source means the source of the data. So, this is the source of data that is located in China, provided with all the latitude and longitude. And where this data can be accessed. So, this data is available at the Mendeley repository, and both the URLs are given. One is the data identification number and another is the direct URL of the data. These are the details which you will not find in an article. So, this is the key difference between the data paper and the article.

Now if you see on the right-hand side, these are the auxiliary content details, data availability, then acknowledgement, declaration of computing interest, and in the end references are given. If you see, the general layout of the article and data paper is quite similar except that the article has a structure of introduction, methodology, results and discussion. But the data paper has specifications about the dataset.

Let us now see another document type called as erratum which is used by the scientific community to report the error or any correction to be made in the published research. So, many times a research paper is published and after publication either the researcher or from the community have identified that something is missing. So, the scientific community uses this document type to inform that this is the correction in the published research. So, Erratum is a short document type that displays the errors in the published research.

Now for example on the left-hand side if you see this is an erratum of an article titled the development and evaluation of the earth gravitational model 2008 published in the journal of geophysical research solid earth. If you see on the right-hand side this is the original research paper which was published in 2012 and this was the erratum published in 2013. Of course, we can say erratum will only be published after the publication of the research article. That is why the date of publication of the erratum is one year after the publication of the original article.

So, if you see this Erratum, there is a correction in the paragraphs 73, 74, 90 and 118. So, it is showing that this is the one correction in para 73. So, there is another correction in 74, then there is another correction in 74, then in the 90, and then in the 118. So, this is another kind of document type that is published in the journals.

Now take the example of this document type known as retracted article. So, a retracted article is published when some irregularities are found in the original published research. Say, for example, some research has been published and after the publication of that research either the community or the publisher or the author himself found some issues with the article. These irregularities are reported in the form of publication as retracted documents. So, the retraction note is added in the article that displays the reason for retracting the paper. So, in this screen if you see there are four kinds of retraction notes.

So, we will see each of the retraction examples. Let us first see this retraction note. This was the document it was published, and later it was found that the peer review process was compromised. So, that is why this particular paper has been retracted. Then the second example of this retraction is due to data fabrication. So, here the research paper was published and later on it was found that data was fabricated and manipulated that is why this particular research paper has been retracted after the publication.

So, this is the third example about after the publication it was found that there is a high overlap with the already published content. And if you see the fourth example, So, this is an example of retraction with questionable results and there is also a partial plagiarism in this article. Out of these many document types, generally articles, review articles, conference papers, books, and book chapters are considered as the scientific contribution to the literature. Because many organizations and the ranking agencies considered these kinds of documents for the evaluation of scientific productivity.

So, this is the end of the first part of this week. I hope through this lecture you have got the understanding of different channels like journals, conference proceedings, books and the different document types that are published in the journals. As a practice I request that you identify each of the document types in your area of interest. Also, let us know if you found any erratum or retraction related to your research area. Please share all these details in the discussion forums. In the next lecture I will be taking up the second part of this week which is on open science. Thank you.