The Changing Nature of Academic Impact in a Digital World
The impact of digital transformation across industries has led to fundamental changes in the way the world searches, interacts, and perceives news and information. This paper attempts to explore the impact of digital (technologies, trends, behaviors) on academic research, especially the way academicians, scholars, researchers, publishers and societies are using new age media to be seen, heard, and acknowledged. It also presents possible strategies on the way ahead for them.

Traditionally, the establishment of knowledge and scientific communication has been through peer-reviewed journal article publication. While such a process has been important in ensuring scientific robustness, subscription-based publishing models and peer review processes can possibly take a considerable amount of time and can possibly hinder the dissemination of research outputs to wider audiences. Moving towards digitalization has increasingly benefitted academic cohorts at large.

Over the last two decades, the onset of social media and digitalization, has disrupted academic publishing and the way scientific knowledge is produced, evaluated, and disseminated. Pre-print servers like Social Science Research Network (SSRN) and arXiv; content sharing platforms like Google Scholar, ResearchGate, Academia.edu, and Mendeley; along with evolving Open Access business models are only the visible tips of the iceberg of new players, services, and modes of publishing. The academic world continues to evolve and adapt to digital communication tools and techniques for its research. This paper will explore some of these tools that can help researchers present their work to relevant audiences. For example, digital summaries for text, videos, infographics, and social sharing are impactful tools for promoting research, driving digital campaigns, and embracing the digital world.

EXECUTIVE SUMMARY

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A wheel wagon of what happens on the internet in a minute. Adapted to include data from the academic world.

GLOBAL INTERNET POPULATION GROWTH 2014-2020
(IN BILLIONS)

Over the last half decade, the number of internet users has grown 1.5 times.
According to Trend MD, over 2.5 million scholarly articles are published each year, which amounts to more than 8,000 each day. During the COVID-19 global pandemic, the volume of papers being written and produced saw tremendous growth. There is a record of over 200,000 papers being published during the 4-month lockdown period (from across the world) on Google Scholar. But this proliferation of content brought about fresher challenges: cutting through the clutter, establishing relevance, and finding ways to present research in accessible formats for non-academic audiences such as policymakers, funders, and the general public.

Until recently, the impact of published research was measured by just two metrics: citations and readership (downloads). Digital and social transformation have revolutionized academic publishing by expanding its reach through social media conversations, media mentions, and effecting virality of a research paper. Publishers are now looking at newer formats in the digital age to increase academic impact and engagement of published research.

**VISUALS SPEAK LOUDER THAN WORDS:**

The onset of the pandemic has forced people to stay indoors. During these periods of lockdowns, people are now consuming vast amounts of media. COVID-19 content currently dominates consumers’ time online across markets, income groups, gender, and most generations – except for Gen Z. Gen Z is likely to be listening to music (71%) than searching for coronavirus updates (67%). The COVID-19 Global Cases dashboard hosted by Johns Hopkins CSSE is an excellent example of how pandemic updates are conveyed globally through the use of an interactive infographic.
EVOLVING DIGITAL PREFERENCES

EVOLUTION OF COMMUNICATION MEDIUMS

In recent years, an increasing number of journals and academic institutions have been providing free online access to peer-reviewed scholarly journal articles. Alongside this shift to digital platforms is the boom of social media use in promoting research. Social media provides researchers with opportunities to increase the impact of their findings by reaching a broader set of audiences like other researchers, policymakers, journalists, and the general public, and potentially increasing the number of citations of their work and application of their ideas.

Roughly 2 million research papers are published every year (see Figure 1). Activity in science communication—also known as the public understanding of science, public engagement, or science and society—has grown significantly over the past few decades. Researchers in the field now have their own journals, conferences, and of course, specialized vocabulary. Universities, funding bodies, and medical charities employ a large number of press officers and outreach staff. Although newspapers and magazines employ fewer science reporters, science-focused podcasts, blogs, and social media have thrived. There is also a growing number of science exhibitions, festivals, and events in non-academic venues like pubs and cafes.

Although digital and social channels may seem casual with audiences having little visible scientific inclinations, they have tremendous reach and impact. A challenge that is pervasive but not insurmountable in the digital space is copyright violation with lack of responsible sharing. These challenges and regulatory dilemmas force traditional academia to refrain from venturing into new avenues of promotions.

Social media provides researchers with opportunities to increase the impact of their findings by reaching a broader set of audiences like other researchers, policymakers, journalists, and the general public, and potentially increasing the number of citations of their work and application of their ideas.
Down to the Bone: A Potential Therapeutic Target for Osteoporosis

Excessive osteoclast activity is a factor in bone and joint diseases like osteoporosis and rheumatoid arthritis. Macrophages (immune cells) differentiate to form osteoclasts (bone-dissolving cells). How is this process regulated at the translational level?

Mouse macrophage culture

RANKL protein stimulation to induce osteoclast differentiation

Cpeb4 mRNA and protein expression upregulated

Cpeb4 protein depletion prevents osteoclast differentiation

Translocation of Cpeb4 protein to nucleus

Intracellular signaling pathways for Cpeb4 translocation identified

Differential

RANKL

mRNA

Differential

Excessive activity

Cpeb4 protein plays a major role in osteoclast generation and could be a novel therapeutic target for bone and joint diseases like osteoporosis and rheumatoid arthritis.

Biochemical and Biophysical Research Communications

Hayata et al. (2020)

Tokyo University of Science (TUS), a science-specialized private research university in Asia took a leap of faith and has reaped the benefits of investing in a digital campaign. They produce a large volume of cutting-edge research which is published in journals with high impact factors. Impact Science helped TUS craft a end-to-end digital strategy for increasing social visibility of papers and creating perceptible impact.

A TARGETED DIGITAL CAMPAIGN INCREASED SOCIAL VISIBILITY FOR TUS’ RESEARCH PAPERS

For papers **with promotion**:

- 81% of the papers that we have promoted for TUS have been cited in the **first 18 months**

For papers **without promotion**:

- 50% of papers have no citations at all
- 20% papers have < 4 citations

The last two decades have seen a shift from desktop computers to mobile devices. With mobile data traffic rising 4.7 times on average in 2008, the importance of mobile-friendly content has increased. As of 2019, 55.9% of the time spent on websites is by desktop users, compared to 40.1% for mobile users. While more people are accessing the web from mobile devices than desktops, people tend to spend more time on websites when they access them from non-mobile devices. This presents a challenge for academic researchers who need to present large amounts of information in a clear, concise, and scientifically accurate manner.
EVOLUTION OF COMMUNICATION FORMATS

The emerging forms are text, visuals, videos, and social conversations.

(a) Blogs and Text-based Content

Blogs are an effective medium for conveying research content. Increasing numbers of universities are creating blogging homepages for staff to communicate with their academic peers and students. Blogs are also a quick reference point for the researcher to assess recent literature that may be of some use. Thirdly, blogs promote continual reading. On the History Blogging Project website, Anthony Ridge-Newman, a conservative British academic and politician, describes how he gave a presentation on blogging to Oxford’s history faculty where he debated the role of blogging in academia. “The use of blogs and social media is, generally, a fairly new phenomenon and is certainly viewed with some suspicion in academic circles,” Ridge-Newman said. But he concludes, “blogging is a tool for interactive discourse. A discourse that need not adhere to the conventions and rules of any other medium—whether academic in focus or not.”

Short-form summaries of long research papers too have gained popularity in the fast-paced digital age. The last few years have witnessed rapid growth in this approach with specialized agencies and support teams that help adapt scientific papers into simplified, reader-friendly content as well as press releases for the media fraternity.

(b) Visualization of Data

Visual communication is the way forward; articles with strong visuals get 94% more views than ones with no visuals at all. Compared to text and tables, graphs and other visuals are a more advanced form of communication and widespread use of graphs in the sciences contributes to the authority of scientific discourse. Graphs and other visuals, referred to as “inscriptions,” employ established conventions and symbols, which underlies their effectiveness in showing the direction and magnitude of data trends and patterns.

The two most effective kinds of visuals for research communication are infographics and graphical abstracts.

Articles with strong visuals get 94% more views than ones with no visuals at all.
(b.1) Infographics

An infographic is a collection of imagery, charts, and minimal text that gives an easy-to-understand overview of a topic. It is a creative form of visual communication that effectively showcases survey data and findings, summarizes a report, or explains a very complex process. Infographics get read 30 times more than published articles and are shared three times more on social media.

CASE STUDY

The American Society of Plastic Surgeons experimented with infographics for disseminating 30 research papers. 15 of them had infographics and the remaining did not.

On average, articles with infographics are cited almost three times more than those without infographics. Similarly, articles with infographics receive eight times higher views than those without.

Impact of the use of infographics on key metrics for American Society of Plastic Surgeons’ papers.

With infographics  | Without infographics
--- | ---
Citation (average) | 5.06 | 9.20
Altmetric (average) | 15.93 | 15.40
Views (average) | 17.60 | 2.93

**FIGURE 1: INFOGRAPHICS & IMPACT**

Infographic created, to make articles by American Society of Plastic Surgeon’s papers more engaging, by Impact Science.
(b.2) Graphical Abstracts

A graphical abstract is a visual representation of the abstract of a paper. Usually, journals have their guidelines for a graphical representation, but there are no strict rules for the same. It gives readers a quick overview of how the results fit together into a conceptual or empirical framework and how that framework impacts their scientific field. Ideally, a graphical abstract provides some background on the research question and gaps in literature. To date, more than 50 journals, organizations, and institutions have adopted the visual abstract into their social media dissemination strategy, including the New England Journal of Medicine, JAMA Surgery, and Heart BMJ.

(c) Videos

There has been a 43% rise in consumer demand for video content. The art of capturing the essence of a long, jargon-heavy research paper into a meaningful 2-minute video has proved to be extremely helpful. Videos are impactful and appeal to visual and auditory senses alike. They also drive an organic search 50 times more than text. Online videos, for instance, may be useful for scholarly communication within the arts and humanities since human motion is fundamental in some visual and performing arts (e.g., dance, theatre, and film). Online videos may also be useful in areas of science where records of complex laboratory demonstrations, science documentaries, or academic lectures might more effectively communicate scientific experiences than prose would. There are proven advantages to using video for communicating scientific methods, protocols and results and, for spreading the word on educational programs.
The Journal of the American Society for Information Science and Technology published a paper on the role of online videos in research communication. It involved an analysis of YouTube videos cited in academic publications. There has been a steady upward growth in citation of online videos within scholarly publications from 2006 to 2011.

A total of 1,808 Scopus publications cited at least one YouTube video. YouTube video citations are common within arts and humanities (0.3%) and the social sciences (0.2%).

A content analysis of 551 YouTube videos cited by research articles indicated that in science (78%) and in medicine and health sciences (77%), over three fourths of the cited videos had either direct scientific (e.g., laboratory experiments) or scientific related contents (e.g., academic lectures or education) whereas in the arts and humanities, about 80% of the YouTube videos had art, culture, or history themes, and in the social sciences.
CASE STUDY

The Journal of Bone & Joint Surgery decided to opt for new-age formats to enrich the articles that it published in 2020. Articles with both (infographics and video summaries) received three times higher Altmetric scores than articles with just infographics and six times higher than those without any of the innovative content formats.

Similarly, articles with infographics and video summaries garnered higher citations than those with infographics and five times more than those articles that adopted the non-visual route.

Journal of Bone & Joint Surgery saw visible impact across three parameters by including new-age formats within articles.

<table>
<thead>
<tr>
<th>Without infographics</th>
<th>With infographics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citation (average)</td>
<td>1.3</td>
</tr>
<tr>
<td>Altmetric (average)</td>
<td>2.6</td>
</tr>
<tr>
<td>Views (average)</td>
<td>4.93</td>
</tr>
</tbody>
</table>

**Risk Factors Associated with Implant Migration and Loosening Following Total Knee Arthroplasty**

Radiostereometric analysis (RSA) is an accurate tool for detection of implant migration and prediction of loosening following total knee arthroplasty (TKA). However, risk factors that contribute to implant migration and loosening of the tibial component are unclear.

**Meta-analysis of 11 long-term follow-up RSA studies**

Patients who underwent TKA (N = 830)

Radiological examination for RSA

Factors assessed

Age

Sex

Body mass index

Postoperative and preoperative alignment

Implant characteristics

Migration patterns

- High initial migration
- Septic loosening

Early stabilization

Late loosening

Increased migration seen with

- Female sex
- Rheumatoid arthritis
- Posterior-stabilized implants
- Cemented components
- Uncemented components

Patterns of implant migration and loosening reflect different causes of TKA failure and thus may require distinct radiological screening regimens.
(d) Social conversations

‘Digital 2020 July Global Snapshot’, a report published by DataReportal in July 2020, reveals that more than half of the world now uses social media. 4.57 billion people use the internet, with an addition of 346 million new internet users. Social platforms like ResearchGate, Facebook, and LinkedIn, to name a few, have made scholars accessible to the rest of the world. Authors are increasingly communicating their opinions, talking about their subject matter, and becoming thought leaders in their domains. They not only talk about their research but also appreciate their peers, colleagues, and discuss developments in their field, in general. They are open to venturing and exploring more platforms to reach a wider audience. The audience too is spending more time online through social networking and messaging apps.

A 2018 study showed that some science-related pages and Facebook profiles have a follower base in tens of millions. Studies have found that researchers are active users of social media platforms. Evidence from other disciplines suggests that promoting Green Open Access papers through Twitter and blogging can increase their impact, as demonstrated by higher downloads and higher early citations.

Impact Science provides a guideline for researchers to build and engage with a relevant personal audience for amplifying visibility of their research papers through social media.

According to the Global Web Index, between January - March 2020, a digital consumer has spent an average **2 HOURS 22 MINUTES** on social media apps like Facebook, Instagram, LinkedIn and Pinterest.

An increase in social media consumption is seen by **Gen Z and millennials**.
ACADEMIC IMPACT IN A DIGITAL WORLD

HOW IS ACADEMIC IMPACT DEFINED?

Research impact is traditionally defined as ‘the demonstrable contribution that excellent research makes to society and the economy’. This can involve academic impact, or economic and societal impact, or both.

**Academic impact** is considered to be the impact that scientific research has within the academic sphere. Academic impact is traditionally measured by author metrics such as per-author and per-journal citation counts. Slightly more complex impact factors include the Journal Impact Factor (JIF), devised by Garfield in 1955, and the author H-Index devised by Hirsch in 2005. These remain de facto success metrics for academic prevalence across the scientific community at the time of writing.

**Economic and societal impact** is the demonstrable contribution that excellent social and economic research makes to society and the economy, and its benefits to individuals, organizations, and/or nations.

Articles with a video have:

- **140%** higher Altmetric scores
- **80%** more article views
- **33%** higher rankings than articles published in the same journal
NEW FORMATS REDEFINING ACCESSIBILITY, UNDERSTANDING, AND IMPACT

Open Access, or providing free and reusable rights (through a Creative Commons [CC-BY] license) to research findings, is a hotly debated topic in the scholarly publishing industry. The proponents of Open Access state that it is in the interest of democratizing access to science. But even the elimination of all paywalls might not solve the problem of discoverability of research completely.

On average, researchers spend just over four hours searching for research articles a week and more than five hours reading them. More intriguingly, between 2011 and 2019, researchers have read 10% fewer articles but spent 11% more time finding articles. This is both a challenge and an opportunity in the digital world—one of abundance (as mentioned earlier in this paper) and that of accessibility of content and understanding by the non-scientific community.

The consumption of research has been largely limited to the traditional long-form journal article with the one-off article in media. Emerging formats such as infographics and videos can supplement, not replace, the ‘research manuscript’. These formats could also potentially help researchers to zero in on specific aspects of the work that need to be highlighted. In a crowded digital media landscape, a good infographic can summarize an entire research paper and get consumed much faster than a 6000-word manuscript.

While scientific outreach is crucial to make a paper more accessible to the general public, it may also be directly beneficial to researchers trying to bring other scientists’ attention to their research. Various universities are now expected to present evidence on the social impact that their research has. For example, the Research Excellence Framework (REF) in the UK.

P. Sage Anderson, the lead author of a study that examined a large dataset consisting of more than 800 peer-reviewed research papers explains,

“Our findings do not indicate that scientists, or their associated institutions, will experience greater scientific impact by enlarging their media relations staff or expanding their social media outreach. But, given the strong association, they should carefully consider the impact of popular and social media when striving to expand their influence or evaluate the influence of individual scientists.”
Brill Publishing is one of the world's oldest publishing houses. Today, it publishes close to 1,400 books and reference works per year in both print and electronic formats. They don’t need any introduction or marketing to increase web traffic or popularity with those even remotely connected with the world of academia in the US and European markets. However, they wanted to find an enterprising way to connect with new audiences and geographies in the most relevant and contextual way possible. An integrated communication campaign was devised to be able to suitably showcase their flagship publication.

The integrated communication campaign crafted for Brill Publishing included collaterals in a variety of visual formats:

- a 3-minute video that introduced Brill
- a 30-sec video teaser
- a video summary with subtitles in five languages (Arabic, Chinese, Japanese, Korean, and French)
- standees to be displayed at key events and
- a web-story (hosted on Brill’s homepage)

The audiences found an instant and contemporary connect with the brand due to the communication. It created an image of Brill as a 300-year young brand with a visionary future for researchers across the world. For their flagship product, they received traction in the form of new traffic to the site, lead generation, and enquiries for other products.
ACCESS AND CONSUMPTION PATTERNS ARE REDEFINING SCIENTIFIC CONTENT

Given the information overload of the 21st century, the ease with which a reader can consume, understand, and remember content cannot be taken for granted. The American Society of Clinical Oncology (ASCO), the world’s leading professional organization for physicians and oncology professionals and a platform for keeping up to speed with the latest updates and conversations in the field, wanted to synthesize its complex data. The challenge was to find creative solutions to distill complex data from multiple research studies. It was also important to crystalize these significant volumes of research findings into easily digestible information for busy oncology practitioners. The impact was clearly visible as ASCO’s digital footprint increased multifold.

ASCO’s digital footprint was enhanced by creating visual and easily consumable collaterals from text-heavy content. They include a 60-page annual report and a combination of research papers and articles.

60-page annual report > short 3-minute video for various stakeholders and the general public

10 research papers & 15 articles > Easy-to-navigate infographics

When one looks for the latest developments in science or medicine or even management, the first source would be an academic journal. However, the gap arises when a reader can’t digest or understand the information due to the use of highly technical language. Researchers usually write with their target audience in mind, namely, other researchers, societies, and journals. This audience does not necessarily include the general public or non-technical individuals. Hence, an additional step of breaking down complex information into readable formats for everyone is necessary to make scientific research easily accessible to all.

John Pescatore, MD, Academy of Management (AOM) talks about their impact when he says, “Before, we had one single piece of content, a journal article that got promoted through social media once. Now, we have a journal article that gets promoted to social media and an infographic that is aligned with that article or research brief that’s aligned with that article. There’s 300% more content from one single article that we can then use to disseminate not only to our members, but now to our wider audiences.” “A lot of our authors, whether junior or older scholars, those that are adept at social media,” he continues, “take those pieces that we create and push them out through their own channels as well.”
Since the pandemic, there has been a monumental increase in online and digital activities. The need for accessible data on open portals is being seen as a valuable metric to measure impact.

**FIGURE 3: INCREASE IN ONLINE AND DIGITAL ACTIVITIES BETWEEN 2019 AND 2020**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching more shows on streaming services</td>
<td>54%</td>
</tr>
<tr>
<td>Spending more time on mobile applications</td>
<td>36%</td>
</tr>
<tr>
<td>Spending more time on social media</td>
<td>43%</td>
</tr>
<tr>
<td>Spending more time on messenger services</td>
<td>42%</td>
</tr>
<tr>
<td>Listening to more music streaming services</td>
<td>37%</td>
</tr>
<tr>
<td>Spending more time playing online video games</td>
<td>35%</td>
</tr>
<tr>
<td>Creating and uploading video content</td>
<td>15%</td>
</tr>
<tr>
<td>Listening to more podcasts</td>
<td>16%</td>
</tr>
</tbody>
</table>

From Hootsuite, We are Social report

“In a world where COVID-19 has caused chaos and complexity, access to reliable and verified information is more important than ever. The right to information is key to enabling broader access to data, information and knowledge – and empowering citizens in their efforts to build brighter futures.”

- Audrey Azoulay, Director-General of UNESCO, on the occasion of the International Day for Universal Access to Information.
Various disciplines in the research community that include science technology, engineering and math, and other disciplines are embracing the change in measuring impact in their publishing methodology and marketing strategies. Dominique de Roo, Brill Publishing says, “A lot of universities are acquiring e-books or have developed their own platform to make their literature/research more accessible to everyone. Historic researchers are moving towards 3D animation to showcase historical archives, e.g.: 3D re-creation of a 17th century household.”

**Media Outreach Strategies Drive Visibility & Coverage**

Chung-Ang University’s research on robotic suits gets record media coverage and score.

**What did they do:** Distributed a news story and infographic on a ‘Portable Robotic Suit’.

**Results:** Media mentions in major press publications around the world including NPR, Daily Mail, Asian Age, China.org, Tech Crunch, Scientific American, etc.

**Impact:** The paper achieved a score of over 1000+.

**Win-Win for All Cohorts**

According to a 2018 STM report, academics and researchers are adding to the existing wealth of research by producing a staggering 3 million academic papers annually (this has seen a manifold increase since the pandemic).

For publishers and journals, sharing the latest information about their work and extending reach is vital to remain top of mind, follow the latest research from other journals, and attract new generations of researchers into the fold of authors.

For societies, it is vital to propagate their mission to large audiences, begin conversations around topics of research, attract a new generation that is passionate about research, and add to the growing global pool of knowledge.

The first rule of science communication is that jargon needs to be minimal in the information conveyed to a non-technical audience. In fact, studies show that the use of jargon undermines efforts to inform and persuade the public on scientific findings through the cognitive mechanism of metacognition. The reader simply loses interest. But using jargon is, many-a-time, essential. In such cases, secondary assets can be used to help strike a balance and digitally disseminate the research.
THE USE OF SECONDARY ASSETS HELPS BOOST VISIBILITY AND READABILITY

Scholars and researchers are finding value in creating ‘secondary assets’ such as plain text summaries, short videos, videos with subtitles, infographics and even social media posts complement their dissemination strategy. Concise summaries are proving to be effective alternatives to voluminous papers that subject matter experts refer to for research. Busy practitioners also find them helpful and time-saving in staying updated with trends in their respective fields. Ideas and infographics are also generating interest online and aiding in improving digital footprints. Harini Calamur of Impact Science summarized the digital revolution that academia is witnessing, “One can see the increase in ‘Impact Value’ of using alternate promotional assets. There has also been a democratization of the process of dissemination. It no longer follows a rule-book but is adapting rapidly to newer avenues of sharing research.” Curiosity among new audiences is on a rise.

The real impact for any research is garnered by finding its right audience. People's behaviors are evolving and it's important for researchers to understand how these changes will impact demand for content consumption. There is a need to adapt marketing activities to achieve maximum efficiency and effectiveness. A ‘balanced diet’ approach in all things digital is the need of the hour. Publishing houses and societies should take advantage of every opportunity to learn about what audiences really care about. In the case of the academic world, the influx of information is immense. Traditional journal articles are dense, complex, and consist of sizable chunks of text. Reading and understanding them requires a significant amount of time and energy. Short but simple text and visual summaries enable readers to obtain accurate and comprehensive information without the effort of decoding complex and lengthy text. The emergence of these tools has led to increased involvement by universities or societies to legitimize supplementary asset creation in the form of infographics, press releases, establishing and maintaining social presence as well as creating a digital strategy for wider dissemination. The digital strategy also involves self-promotions by authors on social media channels. This has led to considerable traction on their personal profiles as well.
MEASURING THE IMPACT OF DIGITAL COMMUNICATIONS

RETURN ON OBJECTIVE (ROO) VERSUS RETURN ON INVESTMENT (ROI)

One may argue that a valid measurement of impact is measuring the ROI, a financial metric that is widely used to measure the probability of gaining a return from an investment. However, in the context of research communication, ROI cannot sufficiently measure impact. The intangible benefits outweigh the usual tangible benefits. Research papers are published with an intent to meet objectives that bring about a change. While ROI measures direct sales, ROO allows you to measure a desired action or behavior. ROO is objective rather than sales based. Where ROI allows you to measure financial return, ROO allows you to improve marketing methods. This is especially true for measuring the impact of research dissemination. When evaluating ROO, it’s vital that your findings are followed up by a conclusion and a recommendation.

SCIENTIFIC VERSUS ORGANIC APPROACH

With the rise of multiple social platforms and apps, dissemination tools and impact measurement tools, authors, researchers, and scholars now feel the need to marry opportunities that bridge the gap between the practitioner and theoretician. There are typically two ways of promoting research: scientific and organic.

The scientific approach entails citations and downloads, which are widely accepted metrics for measuring impact of a research paper. The empirical evidence, in this approach, is strong and understood by the academic world. However, it comes with its limitations. The organic approach involves creation of and increasing the visibility and accessibility of digital assets linked to the research that can be shared, commented on, or referenced. It is still at a nascent stage but aids in increasing academic impact.

Academic communication is difficult to understand. It is technical, organized, and very structured. Research papers are also written in various languages. The need to make it accessible to all is where the organic approach helps.
Researchers can now be divided into two camps: those who see publication of their research as the final step in the process and those who see it as the first step in sharing their findings with the wider world. Both camps still strongly feel the need to measure the discoverability, readership, and impact of their scientific research.

“Researchers can now be divided into two camps: those who see publication of their research as the final step in the process and those who see it as the first step in sharing their findings with the wider world.” Both camps still strongly feel the need to measure the discoverability, readership, and impact of their scientific research.
TOOLS FOR MEASURING IMPACT

Citation analysis and H-index have been the most sought-after measurement tools for scholars and researchers. The H-index quantifies an individual’s scientific research output, whereas citation analysis is the process whereby the impact or ‘quality’ of an article is assessed by counting the number of times other authors mention it in their work. Recently, article-level metrics (ALMs) have come to be used to quantify the reach and impact of published research. They incorporate data from new emerging sources like social media mentions, along with traditional measures (such as citations) to present a richer picture of how an individual article is being discussed, shared, and used. Measuring and reporting societal impact is becoming increasingly more important. ‘Impact factor’ is another measure of the frequency with which the average article in a journal is cited in a particular year. Impact factors measure the impact of a journal, not the impact of individual articles.

The most popular and trusted tool for obtaining both quality and quantity of attention received by a scholarly work is Altmetrics. The tool analyzes data through social media mentions, citations and article downloads. They can include (but are not limited to) peer reviews on faculty of 1000, citations on Wikipedia and in public policy documents, discussions on research blogs, mainstream media coverage, bookmarks on reference managers like Mendeley, and mentions on social networks such as Twitter. As measures, altmetrics offer evidence about how and where research is being shared and discussed, and by whom. Increasingly, researchers, funders, and universities are using this data to understand and tell richer and more detailed stories about their scientific impact and investments. In addition to being involved in these efforts, libraries and librarians are using altmetric data and research to find out about online tools and spaces that researchers and the general public are using to engage with science and scholarship. Altmetrics primarily records attention, dissemination, and influence.
Plum Analytics is a company dedicated to measuring the influence of scientific research. PlumX, their flagship product, is a widely used online tool that provides altmetrics for peer-reviewed journal articles and other scholarly works by aggregating information from different sources. The current version of the tool, PlumX Suite, consists of 5 offerings: metrics, dashboards, +grants, benchmarks, and funding opportunities.

Here’s a brief overview:

**A record of attention:**
This class of metrics can indicate how many people have been exposed to and engaged with a scholarly output. Examples of this include mentions in the news, blogs, and on Twitter; article page views and downloads; GitHub repository watchers

**A measure of dissemination:**
These metrics (and the underlying mentions) can help you understand where and why a piece of research is being discussed and shared, both among other scholars and in the public sphere. Examples of this would include coverage in the news, social sharing and, blog features

**An indicator of influence and impact:**
Some of the data gathered via Altmetrics can signal that research is changing a field of study, the public's health, or if it is having any other number of tangible effects upon society at large. Examples of this include references in public policy documents or commentary from experts and practitioners

Plum Analytics is a company dedicated to measuring the influence of scientific research. PlumX, their flagship product, is a widely used online tool that provides altmetrics for peer-reviewed journal articles and other scholarly works by aggregating information from different sources. The current version of the tool, PlumX Suite, consists of 5 offerings: metrics, dashboards, +grants, benchmarks, and funding opportunities.

**FEATURES OF PLUMX, A ONLINE TOOL FOR GAUGING ALTMETRIC SCORES OF ACADEMIC WORK**

- how a subscriber can add and organize its research products for metric tracking,
- the metrics and data sources that it supplies and mines, and
- the options and visualizations that it provides for data outputs and analysis.
Researchers are now finding value in measuring organic attention and impact along with traditional metrics. Altmetric scores and Plumx are becoming significant components in measuring success. In the case of the Tokyo University of Science (TUS), their Altmetric score showed significant improvement within a short span of time from 200 to 264 when TUS issued a visual press release. The visual press release was created for Medusavirus, a large DNA virus discovered by TUS researchers, including a text note, infographics, and a video.
IN CONCLUSION

Social media, digital transformation across industries, and the COVID-19 pandemic have altered the digital behavior of humans forever. New measurement approaches, content tools, and emerging platforms are also transforming the way research papers are written, produced, and disseminated. These changes present their fair share of challenges as well as opportunities for academicians, scholars, researchers and publishing societies to reach a wider audience base, build credibility, and get acknowledged for their work. There already exists a strong ecosystem that can support them in making the right investments to achieve their objectives, with a sharp focus on outcomes.

Impact Science has been working towards driving impact and providing creative solutions to universities, researchers, publishers, journals, and societies. Our work revolves around digitally enabling the research matter, the researcher, as well as the publisher to enhance impact throughout the print cycle with a nuanced understanding of digital communication tools and mediums. We find merit in creating high-engagement videos, infographics, and research stories, along with training and strategic communication solutions. It is imperative for a researcher to reach multiple stakeholders and present their work effectively. We have a team of highly skilled communicators, visualizers, graphics designers, animators, web developers, and impact catalysts. Impact Science is an author-centric service that is all for increasing author experiences in this changing world.

To know more about our services, write to us:
https://www.impact.science/contact-us/
REFERENCES:


Other references:
