THE CHANGING NATURE OF RESEARCH IMPACT IN A DIGITAL WORLD
EXECUTIVE SUMMARY

Digitization has revolutionized how people search for, interact with, and perceive information. As the digital revolution drives shifts in worldwide media access and consumption, the academic world continues to evolve and adopt new digital communication tools to collaborate and to share research more efficiently. This paper explores the impact of digital technologies, trends, and behaviors on academic research, especially how researchers, publishers, and societies are using digital media to be seen, heard, and recognized in a crowded media landscape.

In the evolving and increasingly “Open” digital knowledge economy, non-academic audiences – such as policymakers, the media, industry, and the public – are increasingly accessing highly specialized published research. To help these audiences better interpret and understand research, academic institutions, publishers, and societies are leveraging new digital formats to communicate research.

This unprecedented public demand for, and access to, trustworthy research is contributing to a growing expansion in the definition of research ‘impact’ to include non-academic outreach and engagement. This paper also explores the evolving definition of “impact” in the research community, and the role that digital communication tools can play in expanding audiences and enhancing the real-world impact of published research.
Research has traditionally been communicated through publication in peer-reviewed journals. While the journal publishing model remains the cornerstone of accurate and rigorous research publishing, social media and digitization have disrupted the way research is produced, evaluated, and disseminated. In addition to subscription journals researchers today access information via pre-print servers like SSRN and arXiv; use content-sharing platforms like Google Scholar, ResearchGate, Academia.edu, and Mendeley; and publish in an ever-growing list of open access journals.

Fig 1: The internet in a minute: A wheel wagon of what happened on the internet in a minute in the year 2020. Adapted to include data from the academic world. Source: Statista

1. Adapted to include data from the academic world.
2. Source: Statista

New Pathways and Platforms
Every year, more than 2.5 million research papers are published: more than 8,000 daily. This number has spiked during the COVID-19 global pandemic, with submissions to health and medicine journals increasing by more than 90% between February and May 2020. For the research community, this content boom comes with the challenges of “clutter” obscuring relevant work. Researchers on average spend just over four hours a week searching for articles, and more than five hours reading the found articles. Between 2011 and 2019, researchers read 10% fewer articles but spent 11% more time finding articles.

The boom in digital publishing and access has expanded the reach of academic papers via both mainstream and social media, with some papers even going “viral.” Ever-growing numbers of non-specialist audiences are accessing and reading published journal articles. Journal content is complex, specialized, and time-consuming to read, however, which restricts wider audiences from reading and understanding research findings.

**COVID-19: 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 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 on mobile applications</td>
<td>36%</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>16%</td>
</tr>
<tr>
<td>Listening to more podcasts</td>
<td>15%</td>
</tr>
</tbody>
</table>

Percentages are based on internet users aged 16 to 64, in select countries who report spending more time on each activity due to COVID-19.

Fig 2: Increase in online and digital activities. Source: We are Social and Hootsuite
In a world where COVID-19 has caused chaos and complexity, access to reliable and verified information is more important than ever before. Information is essential for encouraging healthy behaviours and saving lives – rumours and inaccurate information can be as lethal as viruses.

- Audrey Azoulay, Director-General of UNESCO

Source: Azoulay¹⁰

The COVID-19 global pandemic has driven a sharp spike in media consumption across all categories, with people spending more time reading and watching content online and searching for trustworthy information. In 2020, 68% of consumers across all markets, income groups, gender, and generation used the internet daily to search for COVID-19 updates.¹¹ Trust was a key concern, with “scientific articles” ranked as a trustworthy source of information by 31% of respondents, after the World Health Organization, government(s), health bodies, and news media.

In response to this surge in demand for credible information, many peak bodies and governments have deployed simple, highly visual formats to communicate up-to-date research and data for public consumption. The COVID-19 Global Cases dashboard hosted by Johns Hopkins CSSE is an excellent example of how an interactive infographic can convey pandemic updates globally.¹²
The past few decades have witnessed significant growth in science communication, that is, activities aimed at improving public understanding of science, increasing public engagement, or bridging science and society. Traditionally, science communication was limited to public science centers in major cities, science festivals, science pages in mainstream newspapers and magazines, and educational radio and television programs. Such communication was generally managed by people not engaged in research (e.g., science reporters), though they might have had a science degree. Researchers made brief “guest” appearances (public lectures, interviews on mainstream media, etc.) but mostly did not actively promote their own work.

Now, the face of science communication has changed. Researchers themselves are beginning to actively publicize their research output. Universities, funding bodies, and non-profits increasingly employ press officers and outreach staff. Science-focused podcasts, blogs, and social media pages or accounts are flourishing. For example, Neil deGrasse Tyson, head of New York City’s Hayden Planetarium, has over 5,000,000 followers on his Facebook page, where he posts updates in astronomy, astrophysics, and various other fields. Science events are increasingly held in non-academic venues like pubs and cafes (e.g., the Pint of Science festival held every May in 400 cities).

While outreach is crucial to make a paper more accessible to the public, it may also draw the attention of other academics to the paper. Research papers with mainstream news and social media attention are more likely to be cited. However, social media usage for professional activities is lower among researchers than the general public, possibly because of the misconception that social media is for trivialities. While the need to rapidly and frequently generate catchy material makes social media challenging for researchers, social media is a valuable tool they can use to build their credibility and networks.
Social and Mobile: Shareable Research, On-the-Go

The growth of Open Access has allowed greater use of social media to promote published research. Social media enables researchers to reach and influence broader audiences like researchers from other disciplines, policy makers, journalists, and the general public.

As of January 2021, around 4.2 billion people use social media worldwide. Facebook is a regular source of news (including medical and scientific news) for around 1/3rd of US adults. Open Access papers are promoted on Twitter and blogs, which boosts their downloads and citations.

The importance of mobile-friendly content has also increased. In 2020, around half of the traffic to websites across the world was from mobile devices, including tablets. Although leading journals and publishers do have mobile-friendly websites and even apps, the content itself may be more difficult to read via a mobile device, because of how users navigate (with their fingers) and more distractions (e.g., notifications from other apps).
Tokyo University of Science, a top-tier science-specialized private research university, produces a large volume of cutting-edge research, which is published in journals with high impact factors. The university conducted a digital campaign, involving press releases, videos, and infographics.

Average Altmetric score of published papers increased from 4 to 61 after press releases were distributed.

81% of the promoted papers were cited in the first 18 months.

Of the papers not promoted, about 50% have fewer than four citations while 25% have no citations at all.

**Case Study 1: Japanese University Boosts Citations and Altmetrics of Its Research**

As readers search, share, and read online, researchers are increasingly using simple, highly visual formats to quickly and accurately communicate their work. These new formats lend themselves to mobile and social media consumption and stand out in newsfeeds.

Articles promoted on social media with visuals have higher altmetric scores and abstract views than articles promoted without visuals. Visuals also help readers understand and retain information better. The two most effective kinds of visuals for research communication are infographics and graphical abstracts.

John Pescatore, Managing Director, Academy of Management, describes the impact of the new content formats as follows: “Before, we had a 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 or research brief that is aligned with that article. There is 300% more content from one single article that we can then use to disseminate not only to our members, but to our wider audiences now.”
“A lot of our authors, whether junior or older scholars, are adept at social media,” he continues, “and they take the pieces that we create and push them out through their own channels as well.”

**Blogs**

Increasingly, universities are creating blogs to improve communication between staff and students as well as other academics. Blogs can notify researchers of recent publications they may be interested in, driving engagement. They also allow universities to present research in language and formats accessible to the public. Science blogs can also improve knowledge exchange among researchers, especially those from underrepresented groups, as they allow ideas and opinions to be shared quickly and easily.

**Plain Language Summaries**

Plain language summaries of research papers—which explain the study’s rationale, methods, findings, and implications in non-technical language—have gained popularity. They can be easily shared on social media and modified into press releases. They enable research to reach non-expert audiences as well as time-poor researchers and practitioners from other fields. In particular, plain language summaries increase patient empowerment and streamline communication between patients and healthcare professionals.

**Infographics**

An infographic is a visual summary of the key highlights of a research paper, comprising images, charts, icons, and minimal text. Infographics have great potential for making complex information comprehensible to the public, even overcoming language barriers. They are also highly suitable for social media, since they are more visually appealing than plain text, and enable viewers to obtain maximum information despite limited attention spans. Consequently, some journals, like *Bone and Joint Research* and the *British Journal of Sports Medicine*, even publish stand-alone infographics (without an accompanying research article).

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**Case Study 2: Infographics Boost Visibility Within Academia Too**

A leading surgery journal disseminated 30 research papers: 15 with infographics and 15 without infographics. Articles with infographics had higher altmetric scores and were cited more frequently than those without.
Graphical Abstracts

A graphical abstract is a visual representation of the abstract of an article; it can be considered similar to the movie trailer to an article. Like infographics, visual abstracts can be a powerful tool for disseminating research on social media. Visual abstracts are shared much more frequently than text-only summaries on social media, particularly Twitter, and result in higher article views.

Videos

Many research papers are not read by the very people the researchers are trying to inform or influence (policymakers, practitioners, and the public). Summarizing research insights into a brief, meaningful video improves transfer of knowledge and can boost access to the research.

It’s not surprising that video abstracts are gradually gaining popularity, even though they cannot be published along with the print issue of a journal. Although a high-quality video may be more costly to produce than a blogpost or a plain language summary, it is effective in making research findings understandable to a variety of demographics, particularly children and those with limited education.

Take the case of the American Society of Clinical Oncology (ASCO). The journal wanted to simplify data from multiple studies to keep busy oncology practitioners updated. The steps they took included a 3-minute video that summarized a 60-page annual report, an infographic summarizing 10 papers on new technology, and an infographic summarizing over 15 articles on kidney cancer. Subsequently, ASCO’s digital footprint increased multifold.

YouTube Isn’t Just for Watching Performing Kittens

Did you know how frequently YouTube videos are cited in research papers?

In one study of Scopus articles...

Over 75% of the videos cited in STEM articles contained laboratory experiments, academic lectures, etc.

Over 551 YouTube videos were cited in total.

About 80% of the videos cited in arts and humanities articles covered arts, culture, and history.

Over 63% of the videos cited in social sciences articles covered news, politics, advertisements, and documentaries.

Source: Kousha et al.
Case Study 3: What Happens When You Use Both Infographics and Video Summaries?

Of all articles published by the *Journal of Bone & Joint Surgery* in 2020, those with both infographics and video summaries had Altmetric scores almost 22 times higher than articles with only an infographic, and 63 times higher than articles with neither.

Similarly, articles with infographics and video summaries garnered over twice as many citations than those with only infographics and more than seven times as many citations than articles with neither.

Open Business Models

In discussions about democratizing access to science, an often-mentioned topic is Open Access, or free and reusable rights to research findings (through a Creative Commons (CC-BY) license). Although seamless and free access to content is important, simply removing paywalls may not guarantee discoverability of research. Using language and formats that are accessible and appealing to the public is essential for discoverability.
REDEFINING RESEARCH IMPACT

Measuring Academic and Societal Impact

In the academic context, the term Impact is typically used to describe the utility of scientific research for other scientists, traditionally measured through number of citations per journal (the Impact Factor) or number of citations per author (the H-Index). These currently remain the de facto and preferred success metrics in academia.
Increasingly, however, there is a move to expand the definition of research impact to include “the demonstrable contribution that excellent research makes to society and the economy” and its benefits to individuals, organizations, and/or nations. Specifically, research is expected to facilitate achievement of the United Nations’ Sustainable Development Goals (SDGs). Contribution to the SDGs is a critical component of university quality indicators, especially the Times Higher Education World University Rankings. Universities are now expected to present evidence of the social impact of their research (e.g., the Research Excellence Framework in the UK) and to directly link their research activity and output to the SDGs.

Measuring Attention and Engagement

A popular measure of the quality and quantity of attention received by a research paper is altmetrics, which are obtained from data such as social media mentions, citations, article downloads, open peer reviews, citations in Wikipedia and public policy documents, mainstream media coverage, and bookmarks on reference managers like Mendeley. Researchers, funders, and universities are increasingly using altmetrics to understand how researchers and the public engage with research online. Altmetrics can be obtained through tools such as PlumX, a product of Plum Analytics, and Altmetric.com.

Secondary Assets: Boosting Research Visibility Even Within Academia

For any research to have impact, it must reach the right audience. “Secondary assets” (e.g., plain text summaries, short videos, videos with subtitles, infographics) are quicker for busy practitioners to process and easier for researchers from other disciplines to read, than lengthy papers. Harini Calamur, Head, Impact Science, remarked: “One can see the increase in the ‘impact value’ of using alternate promotional assets, and a democratization in the process of dissemination. It is no longer following a rule-book but adapting rapidly to newer avenues of research dissemination.”

Consequently, universities and societies are increasingly supporting the creation of supplementary assets like infographics and press releases, being active on social media, and creating a digital strategy to disseminate their research output. This strategy also involves self-promotion by authors on social media, which boosts their personal profiles as well.
COMMUNICATING RESEARCH

Return on Objective or Return on Investment?

Many argue that a valid measure of impact is return on investment (ROI), a financial metric that is calculated, in simple terms, by dividing the profits gained from something by the cost of that thing. However, ROI cannot sufficiently measure the impact of research communication as its intangible gains outweigh the usual tangible monetary gains.

Research papers are published to bring about a change. While ROI is financial by nature, return on objective (ROO) measures a desired action or behavior and thus enables one to improve dissemination strategy. To drive ROO, published research must provide clear context and present the implications and recommendations for policy and practice.

The Scientific versus Organic Approach

There are two main ways of promoting research: scientific and organic. The scientific approach involves the measurement of citations and downloads. This approach provides strong empirical evidence but is limited in that it focuses on and is understood mainly by academia. The organic approach involves creating and sharing digital assets linked to the research. This approach is still in its nascent stage but increases impact outside academia.
Components of Altmetrics

A record of attention:
Indicates how many people have been exposed to and engaged with a scholarly output. *E.g.: mentions in mainstream media, blogs, and Twitter; article page views and downloads; GitHub repository watchers*

A measure of dissemination:
Shows where and why a piece of research is being discussed and shared, both within and outside academia. *E.g.: mentions in mainstream media, social media, and blogs*

An indicator of influence and impact:
Indicates that the research is changing a field of study or has tangible effects on society, public health. *E.g.: references in policy documents or commentary from experts*

Source: Altmetric51

PUBLISHERS AND SOCIETIES DRIVING RESEARCH IMPACT

Publishers and Societies have traditionally owned, managed and promoted the trusted outlets (i.e., journals, monographs) that researchers need to publish and share findings with their academic peers. Journal publishing today remains a mainstay of academic impact and is central to the mission of Societies to advance science and knowledge. As definitions of impact broaden and shift, however, publishers and Societies have an important leadership role to play in enhancing journal publishing activity with research communication.
In a competitive journal publishing marketplace, publishers and journals seek to attract high-caliber, high-impact authors, editors, and reviewers. To do this, journals have to continually innovate and develop tools that allow researchers to share their work widely and extend their reach to global audiences.

Societies have a central mission to foster conversations around their discipline and profession, to promote knowledge and understanding and to add to the growing global pool of research. They have a mission-critical role to play in expanding the impact of research beyond academia, and driving meaningful change in policy, industry, and public awareness.

“A lot of universities are acquiring e-books or have developed their own platform to make their literature and research more accessible to everyone. Historic researchers are moving towards 3D animation to showcase historical archives, such as the 3D re-creation of a 17th century household.” Dominique de Roo, Global Marketing Director, Brill Publishing.

**Case Study 5: Putting It All Together: Impact of an Integrated Communication Campaign**

Brill Publishing wanted to
(1) connect with new audiences and geographies outside Europe and the US and
(2) showcase their flagship product: Linguistic Bibliography Online (LBO).

They launched an integrated communication campaign, including:

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

The campaign successfully positioned Brill as a future-facing “300-year-young” brand, for researchers worldwide. LBO received traction in the form of new traffic to the site, lead generation, and inquiries into their other products.
CONCLUSION

New measurement approaches, content tools, and platforms are transforming the way research papers are written, produced, and disseminated. Digitization presents numerous challenges as well as opportunities for researchers, publishers, and societies to reach a wider audience, build credibility, and get acknowledged for their work. There is already a strong ecosystem that can support them in making the right investments to achieve their objectives, with a sharp focus on both academic and societal outcomes.

Impact Science drives impact and provides creative solutions for universities, researchers, publishers, journals, and Societies. We communicate research clearly, quickly, and accurately through formats such as videos, infographics, and research stories.

We have a team of highly skilled communicators, visualizers, graphic designers, animators, web developers, and impact catalysts with deep experience working with researchers to share their work in innovative ways.

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


2. Ponte, D., Mierzejewska, B.L., and Klein, S. 2017 The transformation of the academic publishing market: multiple perspectives on innovation, Electronic Markets. doi: https://doi.org/10.1007/s11225-017-0250-9


