



## STM Tech Trends 2025

*With*

- **Anita de Waard, VP, Research Collaborations, Elsevier**
- **Prof Lynda Hardman, Director of Amsterdam Data Science**
  - **John Sack, co-founder HighWire Press**
- **Heather Staines, Director of Community Engagement & Sr. Consultant, Delta Think**

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KENNEALLY: It's my pleasure to join you for Innovations Day as part of the 2021 STM spring conference. I'm Christopher Keneally at Copyright Clearance Center. I host our podcast series, Velocity of Content, which is also the name of the CCC blog, both of which may be found at copyright.com. For several years now, I've enjoyed the opportunity to follow Eefke Smit's summary of STM's Future Lab committee annual brainstorming sessions with a roundtable discussion. Each time, I have marveled at the ingenuity that goes into creating the SDM trends graphic or infographic.

The latest example is especially creative. A voyage around a page takes us on an engrossing metaphorical journey from the Sea of Syndication to the Lake of Knowledge, passing Woods of Truth and Scholarly Fields forever, of course. Surely, a touchstone for this fully realized yet imaginary world of equally engrossing maps of Middle Earth created by J.R.R. Tolkien to lay out for readers the sometimes-mystifying topography of the setting for the *Lord of the Rings*. Thankfully, though, the place names are given in English and not in Sindarin or any other Elvish language. The Rings trilogy, the narrator explains, is largely concerned with hobbits. Our own story is equally an epic quest, seeking the source of trust and truth.

We're going to be joined first today from Amsterdam by Professor Lynda Hardman.

We are talking today, Professor Hardman, about going upstream. It seems to me that, from your perspective there in your lab at the university, you really are at the headwaters, right? You're concerned with data, and that is what will eventually flow into the rivers and tributaries and down into that delta that Eefke Smit described for us. So what does it feel like right now in 2021 to be at those headwaters? What are you most concerned about? What are the questions that you're asking right now?



HARDMAN: So yes, in terms of the downstream data, my own research is in human-computer interaction. I really loved the infographic that we were shown today. Some of the research I'm doing at the moment is on augmented reality, so I would really love to see this infographic go three-dimensional and allow us to be able to wander through this virtual world and interact with the different stories that we were informed about today. So that's a playful observation.

In terms of my own science, I work a lot with users, because we have prototype systems. Indeed, I'm working with a prototype system now on augmented reality where we use concepts to explore literature. So again, I think there's a really nice overlap with what we're talking about today. For me, output and input are the same thing – that I'm interested in using published works in allowing other researchers, in this case, neuroscientists, to explore these published works through interesting novel interfaces. We're looking at augmented reality. And we're looking to explore through the use of concepts, which is why, again, I love the infographic, because they're really little conceptual islands, and every conceptual island has a story behind it. In my own research, the concepts are at slightly different levels, so it's the hippocampus or Alzheimer's disease, the things we're looking at, and to allow the research to explore the stories behind these concepts.

KENNEALLY: Someone else has said that journal articles, journal publications, are really stories told with data. You have to persuade people that they should have confidence in science, right? That's the pursuit of trust and truth there. It's about confidence. Tell us more about that.

HARDMAN: Absolutely. So there was a case back 10 years ago in the Netherlands where we had a researcher at the University of Tilburg, and he created his own data. This is not a good thing, right? In science, we cannot have that. That's also what Eefke was mentioning. So we have to make sure that the data comes from a trusted source.

Again, in my own research, I think it's a nice example, where I have to use users, but I have this conundrum where my users have to remain anonymous. Otherwise, it's unfair to ask them to participate in my experiment. On the other hand, when I publish, somebody has to be able to make sure that I'm not making up my own data. So we have complicated things where my master's student will get signatures or digital signatures these days from the participants, and we store them somewhere where no one else can access them. But if something crops up, we can bring them out of the cupboard and find the transcripts. So we want open data, we want open science, but some things we can't reveal to the outside world. But there should be checks and balances there.



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KENNEALLY: Well, as you say, as a politician in the United States once said, you're entitled to your own opinions, but you're not entitled to your own facts. That researcher – I think his name was Diederik Stapel – he wanted to be entitled to his own data. So that's really not something that science allows.

Well, Professor Lynda Hardman at the University of Utrecht in Amsterdam, thank you for joining us, and it does sound indeed exciting. Now, I want to skip all the way over from Amsterdam to the West Coast of the United States to California and introduce John Sack. John, hello. Welcome.

SACK: Good morning.

KENNEALLY: Good morning. John Sack is co-founder of HighWire Press. John considers himself a futurist or a trend spotter. He says he looks for patterns emerging in consumer and scholarly services so that publishers and editors might prepare for change or take advantage of it. That is really our assignment today, John, is to prepare for change.

Again, I was imagining that Professor Hardman is positioned there at the headwaters because of her research and the data that she is working with. But in another way, where you are in California, you're at the headwaters there, because I would say that probably the original source of so much of the technology that's changing publishing, you can go back to the 1940s and a certain garage in Palo Alto with Hewlett and Packard. So you really do see things from that perspective up there at the headwaters. Talk about what life is like upstream and why you particularly feel that trust and truth are important questions.

SACK: I think the main thing that I'd like to think about is the overall metaphor, if you will, of the forest rather than the trees, and how difficult it's going to be to go upstream. Most of our languages have some kind of metaphor of how hard it is to, if you will, swim upstream. There's a reason for that. It's against the current. And I think we in STM and STM technology should be aware of what it would mean to go upstream.

So I think the metaphor of going upstream suggests that there are tributaries – smaller and smaller streams as you go upstream that are feeding the major flows that are downstream. And these are varied. They're coming in from different places and going to different places. And we need to recognize that there are many, many ways people are creating these flows. If we're going to go upstream to engage with those people and their data, then we're going to have to be able to work with a greater variety of tools – data sources, data file types, and so on.

I also got started in this business through human-computer interfaces. That was 25 years ago. And I remember one of the things that researchers were telling me as I was doing the



interviews was that the publishing process, to them, is one of fitting their round pegs into square holes – that is, the containers we call articles. Now, they have to throw stuff away to be able to create the formal article. So much of what we're going to be doing as we go upstream is allowing those things to stay attached to the scholarly article, and I'm not saying be put into it necessarily, but be connected to it. Rather than trying to attach it at the end of the publishing process – almost all of our platforms now have this concept of supplemental data, which might be supplemental figures. It might be supplemental datasets. It might be supplemental citations, references, and so on. The whole concept of supplemental suggests something that's tacked on at the end, when actually that stuff was there at the beginning of the research writing process, and somebody made the researcher take it out, because it wouldn't fit, if you will, in the PDF. So I think we're going to have to find ways to keep those things attached as we go upstream.

Preprints are, I think, really important. Not just for public health purposes, as we've seen in the last year, but preprints exemplify going one step upstream, if you will. They are a formal type of container, but it's a container that's more or less under the control of the researcher rather than the editor and the publisher. Just imagine if we had 1,000 different preprint servers instead of a few dozen in our fields of scholarly research how hard it would be to work with preprints. I think that, if you will, is again an example of what going upstream is going to be, because there are so many tools that we're going to have to connect to.

We will probably need to develop standards. There might be just a few key tools, and those tools might have standards in them. We'll have to get good at identifying the major standards so that we can communicate to authors about which types of things can be connected and how. We may have to define certain types of containers. A number of platforms are doing this now – containers, if you will, that let you put code into a research article, executable code even, which has to be done pretty carefully.

So I think that the challenge going upstream is going to be the varieties of things that we'll encounter, but it's important to do.

KENNEALLY: Well, as you say, going upstream is a challenge. Just ask any salmon, I suppose. John, when it comes to transparency and reproducibility, those are issues that are of tantamount concern within our profession. But they are now, because of the way that science has become much more of a public activity with COVID-19 – those issues of transparency, reproducibility, they're of concern to the public as well. So talk about that, how this trust, concern, and the need for confidence in science is important not just to scientists and to scholarly publishers, but to the public as well.



SACK: The challenge we were seeing during 2020 was that the public, and policymakers in particular, saw science as just another story that was being told, and they had – they, the policymakers and politicians, had other stories that they'd rather tell. And there was no effective way to counter that, in part because of the way social media grabs people and puts them in a bubble. That, I think, harmed the US response to the pandemic, for sure.

But the even bigger thing coming at us than the pandemic is climate change and how to deal with climate change. Now, that is going to truly be a political process, but it has to have science somewhere in it. I think that's why this is worth the hard work it's going to be to have trust in what the science is telling us about climate change and what to do about it and how soon certain effects are coming and where. That's worth doing because of the impact – even, if you will, bigger than the pandemic.

KENNEALLY: Well, John Sack, co-founder of HighWire Press, thank you for that. We'll come back to you in a few moments. I want to join us now for the discussion Heather Staines. Heather, welcome.

STAINES: Hello. Good morning. Good afternoon.

KENNEALLY: Heather Staines is director of community engagement and a senior consultant at Delta Think. Her prior roles include head of partnerships for Knowledge Futures Group and director of business development at Hypothesis. So we are talking about going upstream, and I want to ask you your perspective on that. What do you, in your work with Delta Think – makes going upstream interesting? It's a consultancy. You work with a variety of clients across the industry. Why would going upstream have benefit to them?

STAINES: Thanks, Chris. It's a great question. It's fantastic to be able to join everyone today. When I think about the critical nature of going upstream and really zooming out on the picture to literally get the big picture, I think about my background in publishing and those folks who were around in the early days of digitization and online content – a lot of stuff happened downstream. A lot of workflow models followed the print models that already existed. And at the end – and it's been referred to before – things were kind of retrofitted onto that final product. I remember in the early days of e-books, we had a wonderful colleague, but her job was to translate the e-book formats to, I think, 31 different standards out so that the e-books could get to where they wanted to go.

So we've learned some things from that, that there should be parallel workflows for digital, or even born digital and enabling conversion at a later point. But I think when we're talking about the greater research picture now – the underlying data, the code, different things around maybe institutional review, the funder mandates, conflict of interest, things that need to travel with the article, as John mentioned, backing up as far as we can to really



almost, as you say, the source of the fountain of youth, which is the researchers getting the spark of an idea in their mind even before they've applied and been able to dip into Funder Lake.

One of the things I think is really critical – we talk a lot about researcher needs these days, and it's good to see researchers participating in this meeting. I don't know that we always do a great job of listening to researchers, but we do a fantastic job of piling more things on them that they're expected to do. I recently ran a researcher panel, and in addition to trying to manage work/life and being cut off, in most instances, from their labs, they are expected to have good data management practices, as Lynda referred to. They're expected to be able to follow good transparency and privacy practices, all the while getting published, which certainly is necessary for them for career and promotion, but they want to be in the lab. They want to be doing the research in many cases. So it's still seen as kind of an extra thing to do.

KENNEALLY: You were describing the important point around the displacement that has taken place for all of us in the last year as a result of the pandemic. Everyone has been sent home from the office to work from home. So these researchers that you're concerned with, they're sort of floating on a raft or something like that. Even if we do finally return to some sense of normal later this year or next year, that sense of displacement is likely to linger and have an impact.

STAINES: Yeah. I'm an early participant in remote working, and it was really startling a year ago to see how quickly organizations had to change things up and get more employees online.

Talking about data, publishers remain so interested in the content that's being accessed, the relationship with the libraries who are utilizing that. With open access content, it may live in multiple places across the web. Right now, there's no easy way to put all of that usage back together and create that picture. I'm also on the COUNTER board of directors, so usage is one of those things that I wake up in the middle of the night thinking about. But COVID has shone a light on so many issues that maybe we were able to kind of brush off in the past. Now, we have to be more committed to solving those challenges.

KENNEALLY: Well, Heather Staines with Delta Think, thank you very much. My last panelist before we get to your questions and more of a roundtable is Anita de Waard. Anita, welcome.

DE WAARD: Thank you.

KENNEALLY: Anita is vice president, research collaboration, at Elsevier. She works on bridging the gap between science publishing and computational and information



technologies, collaborating with different academic groups in Europe and the US. So that challenge that you're engaged with on a daily basis, closing the gap between science publishing and technology, is one that clearly we've been discussing throughout the morning here. I understand, though, that as part of the Future Lab conversations, when it came to the end, you really were insisting on this point about trust and truth. For you, Anita de Waard, why are trust and truth so essential to the conversation around scholarly publishing?

DE WAARD: Yeah, thanks. I love this conversation, I have to say. It's just an incredible moment to notice that people are getting news on scientific facts. They're getting news about science and the process of science. But there are so many other channels that are providing them with information that, I believe, the publishing community should support scientists worldwide. This is a matter of tremendous urgency in explaining, first of all, the scientific facts regarding COVID. That is a specific thing. But also, I think there just needs to be so much done in terms of explaining how science works.

So I fully agree as well with the other speakers who were saying we should look even further upstream than preprints, even further upstream than data, really looking at what drives funding. Also, the enormous losses that occur when scientists propose projects to funding organizations – who makes those decisions on what does get funded and what does get reported?

In summary, I think there are two components. It would be great to really think how can we as publishers support greater transparency, greater clarity about the entire cycle, including even further upstream, the policies and the funding? And such simple things we can do, of course, are adding funding information to papers, or exposing perhaps a bit more about what research ended up being funded by which grants, that kind of thing. But also supporting the scientific community in explaining the entire process of doing science – both what gets funded, what gets reported, etc.

I think the final point is the issue of speed. I think one of the reasons that we saw this – I've been in publishing for over 30 years, as have many on the call, and I've never seen such a core shift in the speed in which science was communicated as the past year. I have friends who are microbiologists and who kept sending Twitter links, and the communication mechanism was there were Twitter comments on preprints, and then there were comments on those comments on preprints, etc. So there was an almost instant cycle. People would track the preprints instantly and then comment on them on Twitter. I think that the reason for that was that the speed was of the essence. Knowledge was developing so incredibly quickly. And again, I think as publishers, we could do a lot more to start thinking about how that type of instant system could be supported by publishing.



KENNEALLY: Well, Anita de Waard, this charge you're giving to publishers to support the scientific community, and I think beyond that, to really help the public audience with understanding science and improving their own literacy around all of this – these are missions that publishers haven't had before. Heather Staines was talking about the added burdens to researchers. It's fair to say that there are some new burdens on publishers today.

DE WAARD: Well, we should choose to take them on, of course, but I think it is imperative upon us if we wish to keep supporting science. Again, like John, I live in the US, and it was bone-chilling to hear higher-up government officials last year say that, for instance, the policies around the COVID vaccines could not be bothered by waiting for the scientific opinion, so they set policy without any further scientific input. So I think it's imperative upon all of us that we make sure that science does play the role that it should play in both policy and public activity. I think us as publishers, we are part of the scientific community. We support communication between scientists. And I think adding to that, between science and society, it's a very important effort to support. I think things like generating lay summaries so that papers can be read by a larger audience and other efforts like that – I think it would be a very valuable, but also important and essential role for us as science publishers to take on.

KENNEALLY: Well, we are coming up to the end of our session right now. And I guess I will give Heather Staines the last word on this, because you were the most empathetic, if you will, for the researchers.

STAINES: Yeah. I think we do see publishers looking closely at researcher workloads. We see publishers getting involved with preprint servers. We see publishers perhaps getting involved in the data space and the like. But the libraries are going to be key partners here, because institutional repositories, if you haven't been paying attention, are not what institutional repositories were 15 years ago, where there was a lot of junk.

KENNEALLY: Well, Heather Staines, director of community engagement and senior consultant at Delta Think, thank you so much. I also want to thank the other members of our panel today – Professor Lynda Hardman from the University of Utrecht at Amsterdam. Professor Hardman, thank you for joining us today. Your perspective has been very important. Thank you, indeed. John Sack, co-founder of HighWire Press – thank you. I also want to thank Anita de Waard, vice president, research collaborations, at Elsevier. Thank you, Anita.

As well, I want to thank Eefke Smit, STM's standards and technology director, for her work organizing the program this morning. My name is Chris Kenneally. Thank you.



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