



## Smart Users Demand Smart Information

*with*

- [Renny Guida](#) with IEEE
- [Liz Marchant](#) of Taylor & Francis
- [Sameer Shariff](#), CEO and founder, Impelsys,
- [Heather Ruland Staines](#) at Knowledge Futures Group

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KENNEALLY: Welcome, everybody online joining us for this virtual STM US Conference. I'm delighted to join you. My name is Chris Kenneally. I am a marketing director at Copyright Clearance Center and host of our podcast series, Beyond the Book. It's a real pleasure to join you once again this year.

STM Innovations Day is devoted, as we have heard, this year to the user, an abbreviation of end user, a term that originated in the early 1960s when a bright line divided the end user from developers and installers of the product. In those long-gone days of the mainframe computer, the people who came first worked in Armonk, New York, at the headquarters of Big Blue. The user, situated somewhere far off but very definitely way down at the end, came dead last.

In 2020, of course, we look at things from the very other end of the line. The user today is each one of us. We all expect personalized solutions delivered with exacting precision – nothing anonymized or dead-end about any of it. And as Eefke Smit has just explained, the STM Future Lab Group this year has a vision of an entire media and data universe in which the individual user stands at the center.

Now, you may wonder, how can everyone be at the center? This is a familiar paradox from astronomy, however. In a uniformly expanding universe which has no center, everywhere is the center. This fascinating cosmological principle is the great equalizer, and we should be very content to see it echoed here. It means that my information needs in Boston are the most important in the world, and so are yours in New York and yours in Oxford and in Amsterdam and in Bangalore.

Helping me today to connect all the dots on our chart are my panel. I'll introduce them all briefly and then chat with them individually. Renny Guida – Renny, welcome.



GUIDA: Hi, Chris. Hi, everyone.

KENNEALLY: Renny is director of product management for IEEE, the world's largest technical professional organization, with publications ranging from aerospace systems, computers, and telecommunications to biomedical engineering, electric power, and consumer electronics.

Also joining us is Liz Marchant. Liz, welcome. Liz is life and earth science director, journals, at Taylor & Francis, a division of Informa. She received a PhD in genetic manipulation of plants from the University of Nottingham.

Also on the line is Sameer Shariff. Sameer, welcome. Sameer is the founder and CEO of Impelsys, Inc. and has grown the company into a market leader in digital content and learning delivery solutions for global publishers, education providers, and enterprises.

And our fourth panelist is Heather Staines. Heather, welcome as well. Heather is head of partnerships for Knowledge Future Group, founded as a partnership between the MIT Press and MIT Media Lab, and it is building open-source infrastructure for publishers and libraries.

Heather Staines, I'd like to open the discussion with you. We have seen the infographic that IEEE helped put together after your Future Group discussion in December in London. It's important to you, you have told me, that it is in fact a knowledge graph as well. And as we look into the future in our information world, knowledge graphs are going to be increasingly more important. Tell us why.

STAINES: Yeah. Thanks, Chris. I'm really happy to be here today. I've missed this session for the past few years, so very excited. And I'm really thrilled that the infographic for this year is a knowledge graph. One of the reasons I was so excited to join the Knowledge Futures Group was an open knowledge graph project that's underway. It's actually called the Underlay.

Some of you may be kind of thinking, what the heck is an open knowledge graph, and why is it even relevant to me? Well, I think we're at a key juncture where open knowledge graphs move from the purview of experts and specialists and coders into an environment that we can all use. Now, most people are probably familiar – when you type something into Google, the little box that appears on the right and lets you know that the supermarket is open and whether it's busy and provides you a little map. But what we aren't able to see on that knowledge graph is where all



that information comes from – the transparency, the trust – which also appear on the larger chart. With this open knowledge graph we’re building, the Underlay, which is developed by Danny Hillis, the same gentleman who created one for Google, we’ll be able to actually deposit data and metadata and make assertions. And in this time of distributed information, where there’s repositories and preprint servers and aggregators in play, it’s going to be really crucial for publishers and librarians, as a locus of trust, to be able to make assertions to connect things together.

We’re starting this open knowledge graph project with all of the metadata for content from our PubPub platform, which already includes, as you said, MIT Press content but also Harvard, Stanford, American Psychological Association, American Astronomical Society. And anyone who does a query will actually be able to see who curated that information and actually follow that path of trust that is most useful for them.

**KENNEALLY:** Talk about the state of trust in our media universe today, our information universe today, Heather, and why it’s going to be important. Clearly, we live in a time of fake news, fake science. Particularly at this moment with the coronavirus crisis, we have to really be discerning about the information we consume. Expand a little bit on the importance of trust and how this knowledge graph model is going to improve that.

**STAINES:** Yeah, stepping back from the knowledge graph directly but looking at all the things that are represented on there, there’s such a higher bar that researchers need to meet in order to ensure reproducibility, replicability, and trust that’s going to be deposit of their data and subsequent peer review of data, peer review of code. It’s going to be connection of different researchers together, different lab environments, perhaps workflow tools like their electronic lab notebook and maybe even their AI assistant.

So when all of this comes together and we want to look under the hood, again, we want those trusted partners. We want to be able to see that a publisher asserted that this data is connected to this article and a researcher asserted this lab is responsible for this data. There’s a time now when that is just increasingly in the forefront. And whether it’s predatory journals or whether it’s scams around conferences or the like, that trust is really the underpinning upon which we’re all trying to move forward now.

**KENNEALLY:** Another area that you identify as important on the infographic is peer review – the development, the evolution of peer review and its increasing



transparency. Why is that important, and why would that be important? There's a term that's used on the infographic, digi-natives. I tend to think of us all, particularly at this moment, as kind of naturalized citizens of the digital world. We've all gotten our passports stamped. We're all members of that community right now. But I think there is a question of demographics, of generations here. So to the point about peer review, how is that evolving? How does that fold into these concerns around trust and transparency?

STAINES: Well, as a former military historian, I sort of feel like we've all been impressed into the armed forces for digital, with unending Zoom calls all day. Younger researchers and a lot of early-career researchers that we work with are putting emphasis on quickly sharing results on preprints. So there are a number of initiatives to review preprints. Particularly in light of the COVID-19 crisis, there is an effort to accelerate that – open peer review, collaborative community review, which is something that we do a lot on our PubPub platform, authors who want to make sure that they include different perspectives that they can roll up into a later version of the manuscript.

I think that whether it is publishing a peer review report, which is a nice step for some publishers who maybe their editorial boards aren't quite ready to go for a full-fledged open peer review, or whether it's post-publication community review – there's so many different models out there – I think that the younger researchers are more open to trying new things. They might look at traditional peer review as quite a black box. You send your article off, and you don't hear anything for weeks or maybe even months, and then reviewer number two sends you back to the drawing board. But I think we're going to see that this variety of different experiments that publishers, societies, and even independent groups like Peer Community in are trying to put together are going to move us forward, and we're going to be sort of changing our perceptions of what peer review is, but not on the importance of peer review.

KENNEALLY: Right. And we are at a moment finally, Heather Staines, of tremendous disruption – public health disruption, economic disruption – and the disruption that technology is bringing is going to make a big difference to publishers. Can you just let us know how you feel about that moment? Disruption has pushed publishers into new areas before, and they've thrived in that new world. How do you feel we're going to do on the other end of this crisis? Is this going to really mean some important and positive changes for publishers?

STAINES: Yeah, I mentioned the just seemingly unending stream of Zoom calls before. And I've been on a lot of sessions, both for STM and for other groups, where



groups who have ordinarily been in an office – some of us are fortunate. We’ve had a lot of flexibility for a long time, or maybe even we work remotely. But a lot of people who have moved from the office out of the office have been grieving for the loss of that contact with our colleagues, as we are now.

We’ve been through disruption when content moved online. We’ve been through, recently, challenges around funder mandates for open access. So I think as an industry, this is just another step that we need to consider. Some publishers have put a pause on their print publications. Others have found that it’s not been necessary. Content is in libraries and currently not accessible. I saw that some libraries are using drones to scan the stacks, which I think is interesting.

KENNEALLY: Really?

STAINES: People have the books then delivered by Amazon. That would be wonderful. So I think as an industry, we have had preparation in the past to deal with these types of things, and I think we’ll show resiliency in the future.

KENNEALLY: Well, Heather Staines with the Knowledge Futures Group, thanks very much.

Renny Guida, I’d like to turn to you right now. We’ll talk about your professional work, but I know you have told me that you’re something of an amateur data scientist, and I think this relates to what Heather was just talking about. This crisis we’re in – it’s a particularly personally important one to you. You have two daughters, I understand, who are nurses working in New York City, which of course is a real hot zone of COVID-19. And I understand you’re at your home sort of following what they are living through, because you are able to look at data online, see how the virus is spreading, see where the hotspots are. I guess that’s curiosity that’s a father’s curiosity, but it’s also professional curiosity. Why is that important, and how will that use of data really matter to publishing moving forward?

GUIDA: Chris, you know, I think that what Heather was talking about with this – the changes that are going on – data needs to be much more accessible. Over the last few days, we’ve heard about data reproducibility. In a way, I wouldn’t even consider myself an amateur data scientist, but the data is there. So if you know how to use Excel and you could go get a CSV file from the *New York Times*, you’re able to pull together data and make that connection to what’s going on. Maybe, Heather, that’s what you talk about (inaudible).



From a publishing standpoint, I think a lot of the changes that we're going to see coming up in the future are infrastructures and capabilities to give scientists, users – and even those who aren't even amateurs – the ability to start to interpret the data and then maybe create the mechanisms for them to ask questions to create that community around – if you look at a publisher environment, that community around sort of a trusted source. The *New York Times*, for me, was a trusted source. They're using Hopkins data. So making that connection is important and will facilitate use and interest.

**KENNEALLY:** Let's drill down a little bit on this notion of trust. In the infographic, there is an important callout to show me I can trust you. Trust and brand – there's an important relationship there. I like to think of brand as being about a commitment that a company, an organization, makes with the customer, whether it's an individual customer or another organization. So for the trust aspect of it, expand on that and the role that it has in the entire publishing ecosystem. It's not just the final product, but it's also the editorial process, the mission, which is important to you at IEEE. Give us an idea of why this trust really matters throughout publishing.

**GUIDA:** It really is a connection of a lot of dots, from sort of the beginning of ideas and a community and creating that community of people that care, right? So when you form these relationships, it creates a group of people who have that connection and that trust in each other. And then as they work together through conducting their research to publish articles, there needs to be a layer of trust that I'm using the right tools, that you have the right processes to ensure quality, and as, then, you move through that process, the trust to know that the final product is one that you could then integrate back in your own workflow.

I think the IEEE definitely – I don't think, I know that they put a lot of effort into this. And a lot of the other members of the publishing community do also – that it's important from not only peer review and the use of tools for peer review, but the tools that users use to discover the product and the assurance they put in is they reference content from a source that that content's been vetted in a way that they could know the results are trustworthy and usable within their work.

**KENNEALLY:** Another column on the infographic regarded open science and data reproducibility, which I understand is a focus at IEEE. You are working with your membership community around standards. So standards are a great way to be sort of the metric by which we measure our trust level, right?





GUIDA: Yeah, they are, Chris. I have colleagues that are really closely involved in the process of looking at data. I don't know if Gerry Grenier is online, but Gerry has done a huge amount of work with STM, NISO to impact not only the standards but to get the right people involved. So as a member and nonprofit organization, Gerry's been able to bring in some of the key volunteer leadership from the IEEE and get them involved in these processes. I think that it's not only about creating standards, but getting those people involved to start to implement the standards. (multiple conversations; inaudible).

KENNEALLY: Excuse me, Renny. Sorry. What I was going to ask you, finally, is regarding your membership again, because so much about the infographic was around community and trust and the roles we all play in supporting each other. You're a membership organization, so support for your members is really critical. You must be aware of demographic shifts. And as we move deeper into the digital territory, tell us about the important role that mentorship and advisory capacity plays. Because what we see today is a generation that's become accustomed to the handheld, to voice-activated devices, all the rest of it. Those personal influences – they'll be bringing them into the professional environment. There's going to be kind of a two-way communication there between one generation and another. Talk about that.

GUIDA: Yeah, I think it hits right at the heart of the graph, because the users – we meet the needs of so many different users. From an author community, you look at authors who are very senior and tenured as compared to some of the new postdocs that are coming out and starting their research community. So it becomes important to understand the needs of those users and work with them to not only reinforce the trust but then have them learn about the processes that the publishers have to have them sort of trust that process.

It's multiple users. It's the author community and then it's the user community. And as you start to look to a user community past the boomers, it becomes important to start to give them the information the way they want it. Maybe it's just not in article form. So create the features, create the information in ways that can be ingested, whether it's a mobile device, whether it's a traditional article, or whether it's through data that they could bring in and then share within their communities and create those conversations.

So from a publishing and product-development perspective, you need to be flexible to understand what the user wants. Eefke said this – it's all changing. We've got to understand that change, and then we've got to be able to deliver the solutions to



meet these needs, taking into consideration the hard work that's been done over the many past years to lay that foundation of trust and community.

KENNEALLY: Well, Renny Guida from IEEE, thank you for that.

Liz Marchant, that's a great way to transition to some of the points that are of particular interest to you. I see we have the infographic up there. There's a lot there, and we haven't got much time to cover everything. But one point that keeps coming through – it started with Heather Staines telling us this is a knowledge graph and these kind of multiple points of entry – I think that's important for you, Liz, because we are seeing a shift, a transition, from that notion of publishing and research as being about the article, which it has been about for probably 300 years. It's a conservative system that's kind of hung onto that. But its grip is weakening right now, and we're going to be seeing a good deal more than just the single flat article.

MARCHANT: Yeah, I think, actually, if we start with the technology, if you think – those of you who can remember – back to the days where technology equaled a computer on your desk, and if you didn't go to that computer, you wouldn't be engaging with technology. We know that over the years, technology's been integrating into our lives, and it's been fitting around us and what we need. And I think that's what we're starting to see in research and we're starting to see in publishing.

But you talk about hung on in there, the article, and it's a very, very valid piece of content, because it has a lot associated with it. It has trust. We know what's happened to it. We know we can trust it. It's within a vehicle such as a journal – a platform, these days, sometimes that itself has an element of trust. It has an element of signaling around it about the research field, the angle of the research. So in that way, the article is serving us really well. But of course, it's fixed. And in that sense, we've connected it very well, we've (inaudible) to link from one to the other, we've put great metadata around it.

But what I think we're seeing in parallel in content as well as technology is, OK, so how can I – there's a knowledge graph word – center me in the middle and what I need, whether I am at this point a teacher, a learner, about to embark on a new area of research and I want to kind of dig deep into what it's about, whether I'm in the middle of an experiment and my assay is not working – whatever it might be, there is so much useful stuff in an article that at the moment is quite rigid in the way it works.





And of course, then, when you look at the way we publish research, researchers themselves are quite conservative. They've also held on to the journal and article because of the similar reasons that I've just said. Even young researchers, who naturally might want to work in a different way in their daily lives, don't particularly change in this environment, because they are worried that they will get it wrong. I've had conversations with people just embarking on their research careers who are absolutely adamant that they need an article with page numbers on it. Just a DOI isn't enough. They have to have the page numbers to believe that they have published. So I think what we're seeing in the next few years is as technology develops, as more sophisticated AI and everything else develops, is we can start to do what we actually want to do without losing the trust, without losing the sense of where I am.

I think another piece is going beyond the article, whether it's a particular graph or type of result, I can bring back a little what we want, which is the serendipity of research. We can look through the lens of, perhaps, a method, a graph, a graphical piece, a piece of kit, a piece of software, or whatever it may be – keywords, related publications – and we can find more things that will help me.

It may be that you completely jump subject areas when you're looking at, say, an assay and the data associated with it or the results associated with it, and that really helps the research process in a way that perhaps the early days of digital didn't do. The early days of digital tend to narrow you. It tends to make you find things that you know you want, and it doesn't find the things that you didn't know you wanted. So I think this is really exciting from a purely scientific research perspective of doing that piece around, rather than me going to my computer to find out information from research and published research, it wrapping itself around me in whatever scenario I'm in at that time.

**KENNEALLY:** Well, it's the multiplicity – the multiple openings, the multiple rules, the multiple channels. This is a universe, if you will, where maybe there are theories about parallel universes, right? There's not a single universe here. We could be in a universe of universes, and that's very exciting. I appreciate the point around serendipity, because there's something that seems sort of overly determined in a lot of technology, and what you're saying is we get to go back to that sense of, well, it's my view. It's my research. It's not what's been kind of served up for me and served up to everyone else.

**MARCHANT:** Exactly. Even if you're in the same field, you're at that point – you're doing a different piece of work, you have had a different amount of existing reading and knowledge, you're wanting to do different things, you're at a different



stage of your career. So yeah, absolutely, the more a system knows about what I might want and what I might need when I have my different hats on – because if I’m at the moment trying to put together a journal club for a module that I’m teaching, I want completely different things to the moment when I am actually in the lab or wherever I may be – in the library, in the field – doing my research.

And of course, the devices you use and all the connectivity is different. Sometimes I’m in the institution. Sometimes I’m not. So I think you’re just starting to see – you talk about joining the dots. You’re just starting to see, if you look at this graph, lots of dots here that have perhaps been quite separate pieces, but you start to join them together, and you start to see quite exciting things happening.

**KENNEALLY:** And what’s been bringing all of these different points together – these points of light into that center is because of the shift to the focus on authors as customers. So we really do have the author today at the center of the publishing universe – not only a source of research, a source of the article itself, but a source of data, too.

**MARCHANT:** Yeah, and I’m not sure this was envisioned at the very beginning of the open-access movement. But actually, when you start to think about the author as customer, which is what they’ve become, the author’s always existed – I mean, we’ve haven’t had publishing research without having authors – but it makes you constantly think about how well you’re serving them when you have a lot of people trying to engage in a slightly different way. I think it’s been great, actually, and I think it’s led us to do things that we should have done, maybe, but hadn’t. It’s made us think about their needs in a different way.

Also, it’s made us think about, as technology’s developed and as capacity for storing information’s developed, all the other things that go into or that come out of research. Whether that’s the preliminary results, whether that’s the data, whether that’s information about the methods or the policy papers come out, there’s an awful lot of early research outcomes or almost gray literature that sits around research that’s really helpful. PhD theses, for instance – a lot of stuff never saw the light of day. Another piece would be, of course, non-results. Unless you had a strong element of novelty in your research, you couldn’t get it published. Of course, that then leads to a lack of efficiency in the system. So I think there’s a lot around technology that is underpinning our ability to serve the publishing of research in a much better way.

But with it, of course, comes issues. So as we publish preprints – not we, I mean everybody – as everybody publishes preprints, as we have perhaps open peer



review, where there's a community element and perhaps it hasn't had the full amount of peer review yet, you come right back down to that trust issue that, OK, there's lots of very, very similar pieces of content out there that looks like an article. How do I know, like I used to when I had a printout from a journal, that this has really been verified? I still think there's a lot, lot more we can do about that. I think we're very subtle about the way we deal with that sometimes. And I think if you're new to the research community, if you're new to publishing or reading research, we are not yet there in terms of signposting the relative levels of trust you can have in what you're looking at, and that's important.

**KENNEALLY:** And then, finally, Liz Marchant, these levels of trust get to the heart of this notion of the user – me. What really matters to me? What are my values? Values were something that came up on the infographic. I want you to sort of put a bow on all of this for us and talk about the importance of values in this new way of looking at things. You have a staff of researchers and editors that care about a lot of different things – they care about the environment. They care about sustainability. How does that play a role – the values they bring to their work, the values we all bring to this ecosystem of publishing?

**MARCHANT:** I think – of course, yes, I'm very much aware of this, because I have teams of people publishing research in environmental science and climate and climate policy and all sorts of things like that. I have noticed a difference. I think people really care about what they do these days. I think they come to work to make a difference. Thinking now as a business and as an employer, I think there's a lot more we can do and a lot more we are doing about considering that element of employees – the job satisfaction, the feeling that I'm doing is worth it. I think it's up to us – companies, nonprofits, everybody else – to really think about that element.

You know, we're seeing this at the moment. Everyone keeps talking about the COVID crisis. But we were already talking about how could we run journals publishing with less demand on air travel, for instance? We spend a lot of time and money getting people to travel from all over the world to talk about the journals, and we'd already started thinking about how to look at this. Could you do much, much more virtual engagement, not just within the company, but with the academic community you work with?

I think what's been fab about the COVID side – it's not great in 99% of ways, but what has happened is it's forced us to think about that. Even if it seems a second-best solution, people are trying it because there's no other solution, whether it's a virtual editorial board meeting, a virtual conference like this – which I have to say



is fantastic. I think it's been really well put together. And I think that will accelerate in a way that probably we didn't even think of in December of what can happen. I think, you know, let people use their imaginations. Let them think about doing things differently, but definitely centering around how can I make a difference? And I think the I here is the employee as well as the customers we serve.

KENNEALLY: Well, Liz Marchant with Taylor & Francis, thank you very much. Sameer Shariff, thank you for waiting. We are looking forward to speaking with you. Hello, CEO of Impelsys.

SHARIFF: I thought you were going to forget me, Chris, but thanks for (inaudible).

KENNEALLY: What's that?

SHARIFF: I thought you were going to forget me.

KENNEALLY: I couldn't do that at all, but I could see you right there, so looking forward to chatting with you at the end of this. I think this is an opportunity to kind of tie up some of the points together here as they are sort of connected – these dots connected on our infographic. You are now working from home – as are we all, in fact – and I know that you've had a revelation around working from home. Tell us about that.

SHARIFF: I think as we all are working from home, we have a little bit of extra time, since we're stuck within our confines, and that extra time gives us more time to consume more digital content, right? The companies that have actually excelled during this time is Netflix – so we're binge-watching a little bit more and all of that.

Going back to this graphic about the user at the center and making things easy for me, making AI work and letting it do my own way – I look at Netflix or YouTube, which we have been consuming more, or even Spotify or any of the music services – and I live with my wife and my three kids. And we open up Netflix, and I want to make sure that when I open up my Netflix, that I go to my profile page and start viewing through my profile page. I make it a point to tell my daughters that, you know what? When you're watching, you should make sure that you put your profile page. What we're trying to do is we're getting into consuming content. We're trying to consume – I know certain things that I want to watch. But because we have so much more time now, I'd like to find other things, and I want to teach Netflix what I like, and I don't want Netflix to get confused about what my



daughter wants. So log in as Sameer, and I'm watching. But it also recommends – be it Netflix or YouTube, it recommends, and I get to find things that I actually like. I've found many different content that I would never have thought about. So that – make it easy for me – this really hits home.

And I think from a publishing perspective, we have a long way to actually build all the fundamentals in terms of technology so that it can be as easy for that researcher, for that student, for that educational learner to actually deliver better value, where the platform – like how the Netflix or Spotify or YouTube – is really leveraging technology to personalize the experience for what I want. I think that publishers need to up the game in terms of doing a lot more to get the technology to where some of these technologies that we use all the time. It is treat me as a digi-native. The digi-native is now using all these tools that are so user-friendly, so personalized.

The challenge for us as publishers in the post-COVID era is can we compete at that level? I think we can. And I think we're seeing a lot of the publishers really investing in technology. You know, you asked a question with Heather about what is it going to be like post-COVID? I think what we're seeing and what I've seen across all of my publishing clients is that – going back to this transformation of digital, we've been on this road for the last 20 years, and there's always been this reluctance of some publishers to completely go digital, completely go technology. But I think what this has actually done is that reluctance has now been taken away. And I think what we see with our publishers is some of the traditional revenues are being hammered, but the digital revenues are growing in this era.

What it says is that we need to create more and more sophisticated and better digital products, so in the post-COVID era, we can actually deliver better to our customers. I mean, it's a great time, and I think the future is super-bright. I think sitting at home, we get more time to consume more content but also think more about how things are going to transpire post the time when we all can all get back together in a nice hotel in DC and meet each other in person.

**KENNEALLY:** It certainly is an opportunity to reflect, because as you say, we're now entirely in the deep end of the pool when it comes to digital and all these various ways that we've used digital, which isn't just text. Obviously, we read articles, whether they're scientific articles or news articles, but the user interface is changing. There's user interface around voice-activation. There's, of course, just the fact that as Liz was saying, we used to interact with technology when we sat down. Now we're on the move. Mobile is our choice or preference when it comes to technology uses.



But I want to ask you specifically about voice, which I think is fascinating. It does come into our discussion here. It's one of these points where, in addition to images and text, voice activation is going to be critical. You, I understand, are working on a solution for point of care, which means in the hospital, at the bedside, someone – perhaps one of Renny's daughters – is trying to treat a patient and needs to know about the very latest treatment – what's working today, because this is such a dynamic story. That kind of voice-activated point-of-care solution – it's going to become very common in the future.

SHARRIFF: Yeah, absolutely. I think it's an evolution of user interface, right? As mobile becomes more important and as more IoT devices – meaning devices like your Apple Watch or where you're consuming content and tools in so many different ways – I think the user interface also is evolving and changing drastically, and we need to be ready for it.

Traditionally, when we've been sitting at a desk and when our products were delivered onto desktops, the user interface was a one-dimensional, I type my engagement with the content, and it actually delivers what you want. But as our products become more mobile-friendly and as our products are inside watches and digital content products, we've got to get better user interfaces. I think the easiest – and we're doing it, again, consumer-based – we're using Siri more. We're using Alexa more. Even engaging with our content at the point – for example, this one particular publisher, they've got a lot of point-of-care products. The nurse is delivering care or looking at drug interactions. Why does that nurse have to actually get onto the phone, type in what he or she wants? Why can't she just actually talk to the mobile phone and actually get that information back?

So you're going to see more and more different types of user interfaces. We've seen the evolution of user interface in terms of just visual – making it easier for us to find the content on the screen and all that. But we need to look at another dimension of how we engage, and voice is going to be more and more prevalent as we get into devices that are not the traditional laptop or desktop but IoT devices where content is delivered, and voice is a way to go. We're building technologies around that now, and I think over the next four or five years, we're going to see more of that, so it's pretty exciting there.

KENNEALLY: Very exciting. One other question, very briefly, Sameer Shariff, regards what we might expect in the future. Unfortunately, the coronavirus crisis is teaching us that we may be going through something that we'll see again soon. So even though we all look forward to returning to the physical space, the live





conferences, I think you have a vision of the growing efficacy of virtual reality, that perhaps we're going to look back and think of our Zoom conference today as being pretty primitive. One of these days not too far from now, we're going to be putting on those glasses, and we'll see each other and sort of feel like we're all in the same room.

SHARIFF: Absolutely. The whole crisis – definitely it's been unprecedented, and I think it actually forces us to think, and it gives us a way to reset. It pushes us into new ways of actually creating new habits. We work with some of our publishers who do a lot of business – traditionally, trade shows is a big element of these publishers, but they're quickly trying to move digital. Because they have so many traditional assets around trade shows, how do you duplicate that physical engagement into a digital environment? I think we're going to see a lot of technologies.

If you think about what we're looking at, I think this is like an iPhone 1 or 2, right? And we are an iPhone 11 and 12. We're engaging with voice. We're doing so many things. This is so primitive that we have four screens on top and we've got the PowerPoint presentation at the bottom, and we really can't engage. There's about 120 people in the audience, and we really can't engage. It's primitive. What we're going to see over the next four or five years – like you said, Chris, virtual reality – all the virtual reality machines are connected, so that we can actually see each other, we can talk to each other, and we can actually feel like we're in that hotel in Washington, DC, and we can actually engage.

So I think the crisis is – on one side, it's unfortunate. But there is a silver lining for us in the publishing industry that we have a great asset, which is trusted content, trusted processes in getting research out – trusted methods, trusted key authors that we have relationships with. We take that, leverage the technology that's out there, and create new ways for our consumers to consume and better the world with their research, with their education and all that. So I think there's a massive silver lining that we should leverage here and really keep pushing on technology, because technology will create new opportunities for all of us.

KENNEALLY: Well, as primitive, as early-stage as the technology may be, I think it's worked pretty well for us in this discussion, and the conversation's been a terrific one. I want to thank my guests – Renny Guida, director of product management for IEEE, Liz Marchant, who is life and earth science director of journals at Taylor & Francis, Sameer Shariff, founder and CEO of Impelsys, and Heather Staines, head of partnerships for Knowledge Futures Group. Thank you all for joining me.



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