How digital innovation and collaboration is driving a global demand for effective reporting in research funding

The UK, Europe and the United States are world leaders in research and innovation, with their researchers making vast contributions to global knowledge. They have world-leading universities, research institutes and scientific enterprises, supported by a public and private sector that has continued to invest in technology and innovation, despite the global economic downturn. But in a modern world beset by austerity and a demand for value-for-money, these factors are pushing the research and innovation industry to undergo a massive change.

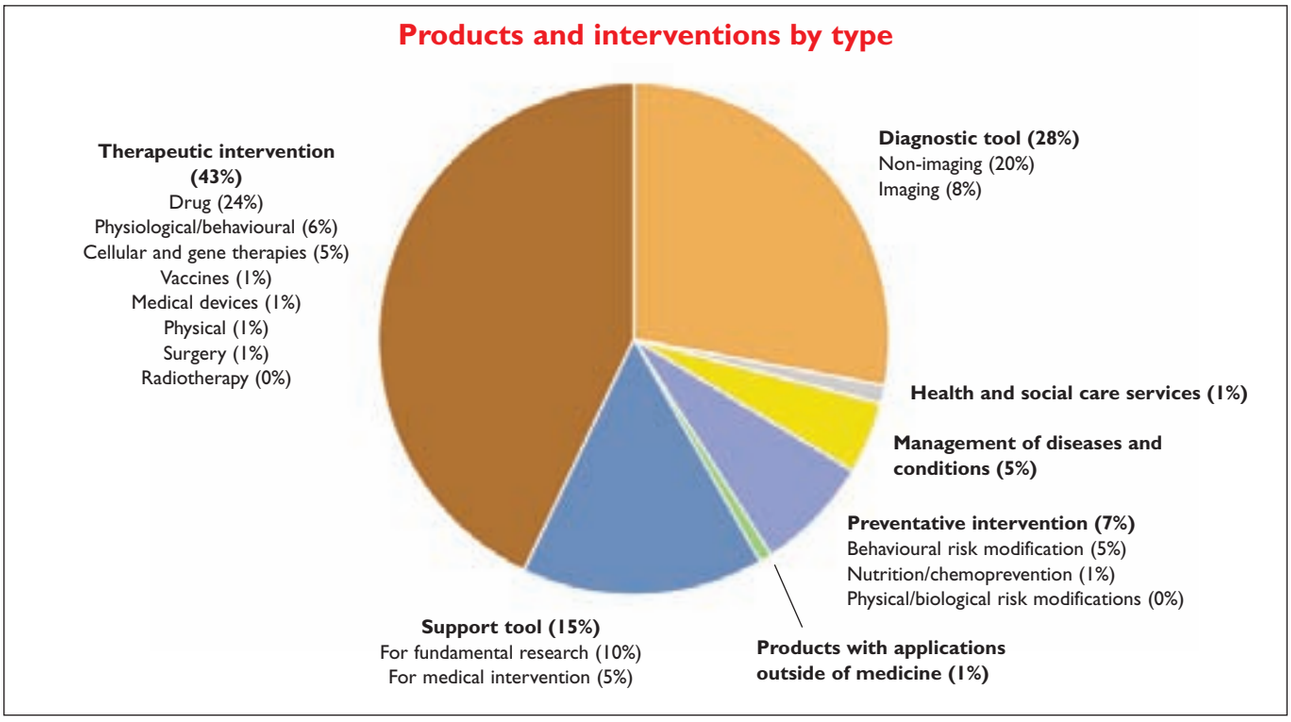
By Frances Buck

The UK Government recently made budget commitments to continue the support for scientific research. Together with similar pledges from other major economies such as Germany and the United States, they collectively demonstrate a desire for science and research to remain a strategic priority. These commitments ensure that those nations stay ahead in research at a global level, remaining at the cutting edge of new discoveries and collaboration across disciplines, while also supporting their national economies in the process.

Further to this British commitment, the UK Minister of State for Universities and Science David Willetts MP recently identified "eight great technologies" which he believes are crucial for securing the UK's hi-tech future, these being big data, space, robotics and autonomous systems, synthetic biology, regenerative medicine, agri-science, advanced materials and energy. Other countries too have decided that they need to focus their limited resources on where the impact can be felt the greatest.

However, with these disciplines set to receive focused slices of funding, there will also be an increased pressure for UK research bodies to justify to Government and the general public how the money is spent and the tangible impact that these, and other funded research projects, make. This means that clear cost-benefit analysis, impact assessments and transparency are needed for all research outcomes.

So we can see that in this era of increasing pressure on budgets – whether that is across the public sector, charitable sector or research institutions – science spending does not escape scrutiny. The need for clear, consistent and thorough reporting of how the money in research and innovation is spent is under the spotlight like never before. This growing demand for transparency across public and private sectors is fuelling a digital revolution in reporting and evaluation of that spending.



This does not necessarily signal a change of how effective funding now needs to be allocated, to be solely on research which produces direct and immediate economic and tangible benefits. On the contrary, this drive for impact assessments not only creates new opportunities for showcasing long-term achievements in research, but also for encouraging greater collaboration in research across borders and demonstrating that investment performance on a global scale.

But research reporting, and the tracking of their outcomes, has been done rather adequately with the current paper system, and collaborations still occur with great success; so why the need for change?

The need for a solution

It is widely agreed that the work of a researcher has long gone beyond simply research.

Indeed, effective reporting on the impacts in research funding and reporting research outcomes has been part and parcel of the academic process for many years. From lengthy end-of-year grant reports required by funding bodies, to the criteria set out by organisations such as the European Commission to qualify the funds it gives out, the need to ensure funding organisations and researchers are using their resources wisely and achieving value for money has long been a priority in the research world. Whether they are reporting to research councils, government organisations or research charities, this is accepted as a pre-requisite when seeking further funding and demonstrating the need for further academic investigation.

Unfortunately, this often means a frustrating and time-consuming process of creating multiple repeated reports for different organisations who are contributing to complementary research. Many scientists feel obstructed by the amount of time spent on paperwork, which takes away from what could be invested in pioneering lab work. In addition, these massive reports slow down the potential of disseminating the outputs of researchers' work to a wider audience.

But being able to report on these longer term impacts is more important than ever. Whether it is charities, higher education institutions or research funding agencies, in this age of austerity the pressure for thorough, effective reporting has grown and applies to all. Furthermore, even if the outcomes are rather more unexpected, it remains central to the development of our knowledge and understanding to capture all of those that emerge.

As a result of the economic constraints that the research community finds itself under, the search is on for an effective solution to make its case for greater and more consistent funding support. Funding bodies are simultaneously feeling the pressure to ensure that research outcomes from their

Research outcome measurement systems such as Researchfish can not only track research, but also show in real time where that research is leading

grants are consistently and comprehensively tracked and these outputs can demonstrate value-for-money.

Recent trends in academia have also seen more cross-collaboration between governments, industry, funding bodies and researchers, and a notable move towards greater data sharing across the sector.

For example, the European Union's next research and innovation funding programme, Horizon 2020, which will launch in 2014 and run until 2020 with a total budget of €79.4billion, has a distinct commitment and emphasis on the creation, development and nurturing of partnerships with businesses and across borders, and in doing so the European Union hopes that its research will continue to grow, maintaining member states as the leading countries for investment in science and research.

So with researchers and funding organisations now increasingly working together on projects across the globe, it is welcoming that many funders have started to collectively acknowledge that the manual method of reporting outcomes is potentially inhibiting further opportunities for collaboration, while also not providing the robust justification for their work that is needed.

There is a growing consensus that the future demands a robust online outcomes system; one which accurately tracks outputs, reduces administration and assesses the impact of research investment. Therefore, alongside the technology researchers already use which allows them to build their own libraries of articles that can be accessed and shared anywhere, and with the growing debate around open access, times are changing. This same digital revolution is now taking place in the way that grants and outcomes are reported on.

Spearheading the change

Collaborations in this field is exactly how systems such as Researchfish came about, whereby researchers, funders and universities can log the outcomes of their work in a uniform way. Here, a working group of seven research funders, including the Medical Research Council (MRC), Cancer Research UK (CRUK), Arthritis Research UK (ARUK), the British Heart Foundation (BHF), Great Ormond Street Hospital Children's Charity (GOSHCC), the Association of Medical Research Charities (AMRC) and the Chief Scientists Office worked together to examine the needs of funding bodies and researchers to develop a new system, building on the e-Val model used by MRC.

Membership now includes more than 80 funding organisations, including Marie Curie Cancer Care, Parkinson's UK and the Association for International Cancer Research. Twelve of the UK's leading research universities are also members, including the Universities of Oxford, Cambridge, Imperial College London and the University of Glasgow, as well as more than 15,000 researchers who use the system. In total, more than £4.5 billion of public and charitable funds are now tracked by funders through Researchfish tracking outputs on more than 30,000 awards.

Collaboration such as this could not be possible without the technological innovations which only five years ago were the subject of science fiction. Researchers, funding bodies and universities now connect by universal high speed internet, and the arrival of 'Web 2.0', whereby the internet has become not just a passive provider of information, but something which allows users to respond and react to the information provided by them. This means that systems and tools for supporting research need not be tied to the old methods which were effective then, but now appear outdated and unresponsive.

Another organisation that has benefitted from this innovation in digital collaboration is Europe PubMed Central (Europe PMC). Started in 2007, it grew from the American system PubMed Central and was developed by the European Bioinformatics Institute (EBI), the University of Manchester and the British Library, and is supported by a consortia of 24 funding bodies, led by the Wellcome Trust. From these collaborative beginnings, it has grown to become the largest open-access repository of biomedical literature in Europe – no mean feat.

In a sign of the times, these two products of collaborative endeavours, Researchfish and Europe PMC, have in turn collaborated together to better serve the needs of researchers. This innovation means that the two feed information to each other, allowing grant information to populate the articles found on Europe PMC, and allowing article citations to be seen in Researchfish – a measure of impact. This has so far seen more than 100,000 grants and articles being paired in this way.

Jo McEntyre, who leads the development of Europe PMC at the EMBL-European Bioinformatics Institute, said: "Connecting grants to publications has always been tricky. As several leading medical charities use Researchfish for reporting grant outcomes, we thought this was a company we should talk to. Now, for the first time, many of these charities can show the impact of specific grants though the articles in Europe PMC. This innovation will ultimately lead to increased

accountability and transparency for everyone. What's really great is that the data on grants and outcomes comes directly from the researcher, so we know it is the most accurate."

However, the benefits of the drive in digital innovation and collaboration are not just felt in academia, but by patients too. The National Institute for Health Research (NIHR), the research arm of England's NHS, which conducts clinical trials as well as ground-breaking translational research on treatments and diseases, also collaborated with us in August last year.

Head of Business Intelligence at the NIHR Dr David Kryl explains: "The previous system we had was working well, but only allowed yes or no questions to be answered. Some NIHR researchers had mentioned the benefits of the Researchfish system being used by other funders, so in an effort to reduce the burden on NIHR scientists, [it] seemed like a natural choice.

"The information we collect through this online system will definitely be used much more widely than it is now. We look forward to using it in communicating about our research to the public, feeding back into the planning of our own research strategy and making the case to government for continuing support of the research we do."

In other regions across the world, the push for utilising the technology around us and driving towards a different and better method of measuring research outputs is forging ahead. In the United States and Canada, as well as countries in Asia, their research organisations and bodies are already looking to streamline their systems. They are looking to the EU and in particular the UK to understand the successes and improvements that could be made to their own processes.

The real gains, however, will come not from each individual nation creating their own system for measuring scientific outputs, although this will obviously be welcome for the researchers, universities and funders in those countries. The flood gates will only open when those systems can speak to each other easily, or when there is only a single system for measuring research across continents, because then we will see the real benefits of comparing outputs and investment between countries accurately and allowing output measurement to become a real driver for international research and collaboration.

A future of unprecedented possibilities

As innovation and collaboration in the digital sphere continues to drive the global demand for the old systems to be swept away in favour of new, more effective measures that facilitate the work of academics and academia around the world, reporting and research outputs tracking – however unglamorous – will be lifted by the rising digital tide.

Out of the limelight, the future of the research and innovation industry continues on a path of closer and closer co-ordination and collaboration, as it seeks to utilise the new technologies to make the lives of its researchers easier and less of a burden. This is not simply a matter of making the lives of academics easier by burdening them with less red tape and less hoops through which to jump, but also provides greater value for the funding body's investment. They want to see researchers using their time mostly for research, whether this be in bench work in the lab, collaborating with colleagues inside and outside their institutions, presenting at conferences, or publishing in academic journals.

However, the pull on a leading principle investigator's time can be enormous – from PhD students, to submitting grant proposals, to logging the outcomes of work. So any development that can alleviate these pressures, is welcome not just by the researcher, but also by the funding body. The researcher then spends more time doing what they set out to do when they first embarked on their career – research.

So the future will inevitably see more developments, which use the technology available, and provide a means of changing the way a researcher's time is spent on the administrative side of science.

Beyond this, we can expect to see technology take on greater interconnectivity with all aspects of our lives and, in doing so, improving the way that researchers carry out their science. Video conferencing could become the standard means of attending a conference. Perhaps we could even see the heralding of academic conferences that are entirely digital.

These innovations could even find their way to the humble world of research outputs tracking. Future developments in digital technology could see the automatic acquisition of information directly from journals and academic articles, or from conferences and patents as soon as they are published online. But these innovations are for the moment still science fiction. However, what we have seen is the beginnings of the development of standardised and uniform ways of capturing the information from outputs that researchers produce.

Researchfish's experience has seen funding bodies, researchers and universities collaborate together through digital technology to agree on a way to

be able to analyse and examine the performance and outputs of funding investments in a clear way that is comparable between funders. The progression of this could see funders not just in the UK, but in other countries and continents using a standard system for recording and measuring the outcomes of their academic funding.

If this became a reality – and it is closer than many think – then the research outputs in relation to funding investment could be compared and seen across the globe. Countries could analyse how they are doing in comparison to their neighbours or their region and strive for further excellence. Scientific and academic prestige and the national desire to pip others to the post could herald a new age of increased investment as countries compete to be the best.

We are just a small part of this digital revolution – part of the clamour created by new technologies which is driving new ways of approaching age-old problems and in the end, benefitting academia and society. DDW

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