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Who will select and provide quality assurance of published knowledge in the future?

Between the paper mills and the World Wide Web

Information technology is transforming societies, cultures and power relationships. When sharing information becomes cheaper and easier, unexpected opportunities for development, democratisation and decentralisation appear. It becomes harder for a small elite to restrict (privileged) knowledge to themselves. Thereby, power relationships change. No, I am not referring to the Internet – the World Wide Web – or new social media, but to the revolution in information technology that was unleashed by the invention of the printing press in the mid-15th century (1).

The printing press made the written word cheaper and gradually available to most people. It also improved the quality of the written knowledge base. As long as reproduction of texts depended on manual transcription, there was a high possibility of errors being committed. Mass production of information caused a dramatic increase in the shared body of knowledge. It became easier to elaborate on findings made by others and collaborate on research projects – completely crucial elements of what we now regard as scientific thinking and methodology. It is easy to argue that the printing press helped usher in the scientific revolution of the 16th and 17th centuries (1). In its wake followed other innovations, such as cheaper production of paper. From 1850 onwards paper was manufactured industrially. This caused an explosion in the number of publications. Perhaps we can say that it was the paper mills – as much as the printing press itself – that caused a real democratisation of knowledge.

The Journal of the Norwegian Medical Association is part of this momentous development. It was established as the *Journal of Practical Medicine* in 1881 as a fairly radical alternative to the more academic and elitist *Norwegian Journal of Medical Science*. The first editors wanted to produce a journal that could be of benefit in clinical practice, with a basis in the doctors' practical experience. They wanted to help doctors all over the country share their experience. The new information technology prompted information outreach, but also caused knowledge to be produced in a new and decentralised way. The production of printed matter changed the production of knowledge.

There are clear parallels between the changes in communication that occurred when the printing press and the paper mills were developed and the changes that have been enabled by the Internet and not least the World Wide Web. Both technologies represent breakthroughs in the way we communicate and how we store, update and distribute knowledge.

The invention of the printing press and new paper-making technology brought with them a number of unforeseen consequences, because the technology was not the only thing that changed; cultural life and power relationships changed as well. We are now

beginning to recognise the main features of how the Internet will cause similarly fundamental changes in scientific publishing. We have obtained completely new opportunities for dissemination of science and research. We cannot imagine a life without online databases, clickable links, access to whatever is out there from our own computer and the ability to discuss and cooperate with colleagues at home and abroad virtually around the clock. The production of academic journals has been simplified, since the communication with authors and reviewers has become faster and cheaper. For those many journals that are published exclusively online, the distribution costs (paper and postage) have nearly disappeared.

This has also paved the way for completely new publication and funding models for the journals. The «open access» and «open science» movements not only use new technology, they also have a completely different approach to the issue of who owns and has the responsibility for quality assurance of the knowledge that is published. Why should peer reviews and editorial assessment be done in secret? Why should the journals own whatever they publish? Why should published texts and research data not be freely used by others? And why should we need to pay to read research results? Would it not be just as natural for the researchers themselves to cover the publication costs?

The fact that publication has become so simple and cheap has obviously also entailed some unforeseen consequences. There has been an explosive growth in the number of journals (2, 3) – as well as in the volume of published research. Competition for publication in the best journals is tougher than ever. This has created a market for services that help researchers to be accepted by these journals. Recently, a new type of «paper mill» has been established, offering services ranging from completely legitimate language editing to production of articles and provision of peer reviewers (!) – with a publication guarantee! *Where* depends on how much you are willing to pay (4, 5). This is all done in such a professional manner that we can hardly envisage how the traditional journals will be able to keep pace with this subterfuge through their control routines and quality assurance.

The question is whether publication of original research in journals will be possible at all in the future. Perhaps it will not be necessary either? Maybe it will be just as natural for the researchers themselves to take responsibility for quality assurance, publication and correction of their findings in their own and their institutions' archives? Then, the journals can perhaps devote their competence and resources to assessing, making accessible and facilitating discussion of the research that has already been self-published?

In the 19th century the paper mills rendered the establishment of journals – the Journal of the Norwegian Medical Association

included – possible. New information technology and new «paper mills» are now challenging the traditional academic journals. The consequences that this shift in power will bring are hard to predict. Who, if not the journals, should select and provide quality assurance, so that the knowledge can be applied in practice?

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