# Foreword

In 2001, the UK Government launched a 5-year, £250M "e-science" research initiative. The term e-science was introduced by the then Director-General of Research Councils, Sir John Taylor, to encapsulate the technologies needed to support the collaborative, multidisciplinary research that was emerging in many fields of science. Such e-science research covers a wide range of different types and scales of collaboration. Particle physics, the community that developed the World Wide Web, now wishes to go beyond mere information sharing using static web sites for their new experimental collaborations at the Large Hadron Collider, now under construction at the CERN laboratory in Geneva. These collaborations typically involve over 100 institutions and over 2,000 physicists and engineers and are truly global in reach. Moreover, the physicists will be dealing with petabytes of data—a far larger amount of scientific data than scientists have hitherto had to manage, mine and manipulate. To handle such data challenges, the physicists will require a much more sophisticated set of shared computing and data services than currently offered by the World Wide Web.

The astronomy and earth sciences communities have a similar global reach but are more focussed on developing standards for interoperable data repositories than on computing cycles. In contrast to these global collaborations, biologists, chemists and engineers typically want to establish collaborations involving a small number of research groups and data repositories. Their requirements are for easy-to-use middleware that will allow them to set up secure and reliable "virtual organizations." Such middleware must assist researchers to routinely

access resources and services at partner sites without having to memorize multiple passwords or manually negotiate complex firewalls.

In addition to the basic middleware to build such secure virtual organizations, these scientists require a powerful "Virtual Research Environment" that supports the needs of multidisciplinary research. Such an environment will consist of a set of sophisticated tools and technologies that will ease the extraction of information from data, and of knowledge from information. In the UK e-science program, for example, researchers in many projects are exploring the use of scientific workflows and knowledge management tools to support the scientists. Some projects are also evaluating the use of semantic web technologies in the context of these distributed collaborative organizations—the "Semantic Grid." It is also clear that these technologies will not only be useful to scientists and engineers but also to the social sciences and humanities. There are now an increasing number of projects exploring the way in which "e-science technologies" can be used to support social science and humanities research.

However, in addition to such work by practitioners of e-science, there is a complementary need to explore the sociological implications of these new collaborative technologies. I am therefore particularly pleased to see the publication of this collection of articles that begins an examination of these broader issues. I am convinced that such sociological issues will be as important as the technical ones in determining the uptake of e-science technologies and tools by the different research communities. I believe this collection will be an important contribution to our understanding of the potential of the new distributed knowledge infrastructure that is emerging.

*Tony Hey*
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