

Integrated Information Management in Physics

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Abstract: a report of activities in Germany is given and some arguments how the future development could be. In Germany the Physics, Information Science and Mathematics Societies are picking the thread jointly and hopefully in close collaboration with their international partners. It is argued, that since we do not know where the future will go, intensive discussions and innovative experiments of trying different ways have to be done. The past system has had some advantages: truly international, interdisciplinary standards for publication and refereeing. This should not get lost, thus the experiments we propose should be the same way: international and with different fields.

Introduction

The industrial revolution from **Printed Matters** to the **world wide web of electronic hypertexts** is a phase transition to a new-age-of-information, remoulding almost all aspects of life.

We here dwell mainly on the impact on the Physics Community. Many aspects, however, are not specific to Physics but apply basically to many other fields of human activities especially in science of course.

Physics means searching for the laws of Nature by experiments and by developing theoretical models casted in mathematical structures to predict the experimental results. The question here is, what can information technology help and how will this process be affected by the new age of information.

In the first part I give scenarios of some aspects of physicists work.

We then will present the action that the German Physical Society DPG, with its Arbeitsgruppe elektronische Fachinformation und Kommunikation Deutsche Physikalische Gesellschaft DPG, is planning in close cooperation with the APS, the American Physical Society.

Only specific action, world-wide coordinated and interlinked with other fields activities will be able to actively participate in the casting the future.

Organizing the e-print archiving

adjust the present organization or turn to a new one?

Should the present professional organizations take care of the new tasks or should there be new organizational structures?

In history the introduction of railways has led to the new organizational structures of the present railway companies and railway government structures, which once established have done their task in a sophisticated, professional and dedicated way. Thus even if nowadays one would come up with the opinion, that another way of organization might be better, due to the huge inertia of the present large system, the high dependence of the public on the continuous availability and the enormous political and economical power, – the barrier for a transition is unsurmountable high and can not be overcome.

The habits of travelling have adjusted over time, often unrealized.

Similarly for another industrial transition: the letter printing. Over the time a highly sophisticated intricate, professional system of libraries, distributors, book-shops, publishers, referees, has developed which serves the

public.

The reader's habits have adjusted accordingly, and so have the authors. Scientists think in terms of papers to be published as part of their career and scientific progress.

The organizational structures have grown from small individual enterprises, having had the right ideas and means at the right time, such as Mr. Elsevier for the international scientific journal.

The organizational structures from the times before the transition, –cloisters with monks copying by hand, horse–riding messengers, although they still exist, do not play an important role.

Should there be lobbying or public advertizing?

History tells that lobbying to get the money is certainly important. But in contrast to the task of introducing a similar product into an existing market, acting in the time of an industrial phase transition has advantages: The earlier an initiative the less competition. Although the public, thinking in the traditional way has often infinitely high objections against a change to the unknown for a solution to their known needs, there are two options: trying in vain to convince the future customer or just proceed with the experience that those who use the new tools see immediately the superiority and prospectives. Thus I propose to proceed. (The German Government, in spring 1994, – in the middle of the heated phase of the transition, had an at first sight brilliant idea: a full– fledged set of hearings was organized to get the opinions and views of all institutions and bodies, who would in the future be part of the new system. Since almost none of the attending persons had any extended experience in electronic printing or archiving the result was a bunch of precautions, hesitations, and warnings, which effected into a one–year stall.)

propositions

The following ideas are for discussion, not meant as an imperative.

The Ginsparg–initiative has given a fruitful answer to the preprint service and its archiving. It is at present run at a National Research Center.

The Physics Societies should take means to guarantee that this service is available on a long term basis, –even if the LANL were closed,– and extend it to other fields of physics. Thus the physicists worldwide should be urged to join using the server. The Physics Societies should either take over the service, or mirror it, or delegate it to companies with the respective boundary conditions.

Hoever we do have to analyze why the server is not accepted and used in specific fields of physics yet.

It should be accompanied by setting up servers at all physics laboratories and give access to all physicists to the web. This is more an educational task.

In addition, the Physics Societies should set up dedicated electronic services in specific fields, including the exchange of data, the coupling of computers and programmes. In some fields where in the past huge data bases (chemical physics, material science) have been set up and are widely used, it may have to be reexamined, which part could be replaced and what could be added by using distributed data bases, via world wide web called programs, or even distribute programs. The reason is, that in the past, for industrial data bases, when experimental numbers were missing yet, this has to be filled by numerical data, produced by numerical programs or simulations. With the new age of distributed powerful computer power and storage this has to be revisited.

Furthermore a huge task is the set–up and offering of information providers, filters, dedicated work–surfaces, retrieval assistance, etc. This is a whole new market and needs all kinds of professions, software writing, distributors, librarians, editors, etc.

The properties of such services being developed by the prospective users, the service and installation is best in the hands of the Societies or their cooperating industrial partners.

Whether some of the present industrial bodies such as publishers, libraries, distributors, are taking the pole or whether new structures will form, should peacefully be left to the industrial competition. The present large international publishers and the University Libraries do have the advantage of a large staff of professionals and an established set of referees. So, **if** they enter they will be transformed but survive. But probably other, even new companies with less inertia, may have a perfect chance. (A perfect example is the young Elsevier, who, with seeking and taking the advice of the then top physicists started the first *international* scientific journal,— with ELSEVIER Publ. Comp. now having some 15.000.) Since one cannot foresee the future development, and has no means to steer it, we here should not point a direction but offer to all willing to participate our collaboration.

Personally I think, we all should try hard to cooperate with all parties, Physics societies, publishers, librarians, willing to search for the best way to cast the future, to have enough expertise, strength and audacity on board.

Forming task forces addressing specific topics small enough to be flexible and fast enough, but containing enough breadth could be best: joint work–groups of the APS, EPS or some of their societies, a publisher, a software house, and a few University departments, groups or libraries.

The results of these experiments should be presented and discussed internationally. Setting and organizing the scene for a full fledged sensibilization and discussion of the world–wide physics community is at present the main task of the Physics societies instead of fixing new standards too early.

specific experiments to be addressed

refereeing and Peer system

In the past the refereeing had two aims:

The reader of a scientific published article wanted a guarantee, that the article has been screened by some referees. By picking the journal and knowing its past reputation, he had a feeling by his or other's experience what level of scrutiny to expect from the Publisher.

The author wanted to reach out to his readers and by getting his article into the suitable journal got this label, his aimed at readers use as a filter.

In addition the author needs the thus gained reputation for his applications for positions, etc. The hiring committees as well used the reputation of author's picked journals to help judging.

Thus the peer refereeing system was basically attached to the long standing and developed history and reputation of the scientific international journals. Without having a better and worldwide established system to cope with these job-related tasks as well, one has here to keep in parallel to new experimental ways the traditional way, added by a smooth extension of the journals being offered in parallel electronically and archived that way.

However, experimentally, and in parallel, the Physics Societies could think of setting up a Peer system by themselves, –as APS has anyway due to its journals–, which could be quite differently organized:

Hiring committees of a department, say, could ask the Society for a scientific referee report for the applicants. It would delegate this to its respective division (at present for APS its PR, PRL journal refereeing division), picking the actual referees by the well established patterns, who would then greatly ease their work by having full access to the work of the candidate by the internet accessed archive.

The innovative part is more subtle: authors could decide to live with their papers as ep-preprints, with no delay in distribution by refereeing.

But they could ask the referee system for screening specific articles, in order to eventually address a reader having turned on his filters to get only refereed articles. The screening and the distribution of science would thus be decoupled, and not more refereeing been done as necessary.

distribution of journals at Universities

For a smooth transition to a future with a yet unknown system of ep-archive it is absolutely necessary to keep the present system of journals running as is, but transferring it to use the electronic advantages.

The tasks here are :

- The publisher would have to put all journal's articles on its server,
- tools for the online retrieval of a desired subset of papers, their easy transmission, levels of access rights, screening of the use of the services, user's surfaces and local storing and handling means have to be developed, this needs testing, adapting and developing the respective software,
- financial agreements have to be set with the Universities individually or even with departments of Physics of the Publishers to open the access of its readers to all manuscripts of all journals of the Publisher, however only electronically.
- This has to be paralleled by an encouraging of user's orders for printing on demand of an article or a bunch or articles of specific use for that reader or a certain subset of readers (say 'Theory of atomic and molecular clusters', to name a field. These printed services are of course more expensive than the present journal volumes, but because of their high specificity the reader will pay a higher price.

Apparently, a task force of a publisher with some departments of Physics in different countries as embedded in the discussion boosted by the Societies, and in conjunction with a software house or group could do a very valuable experiment. For interested parties the author would like to act catalytically.

Reader's wishes

The physicist's dream as a daily user and producer of information can now with the new electronic possibilities be addressed:

Information to be accessed and distributed

- (almost) free of charge for him (not for the Government, University,...)
- instantaneous,
- fully world-wide from and to all physicists, interested,
- easy to use tools, even for the almost ep-archive illiterate,
- get and distribute full SGML manuscripts if necessary,
- serving and distributing is guaranteed even over 'historic' time-scales,
- a sensitive set of layers of authorization, access rights,
- a refereeing on demand and on different levels,

- tools, organization, standards, surfaces, – all worldwide the same so that the international and mobile web of physicists is not hampered by national or local, or for adjacent fields different working means in ep-archiving.

Especially the primary aim that the future system of ep-archiving has to be stable, worldwide, interdisciplinary sets a high level to the responsibility of organizing the experiments.

fields adjacent to ep-archiving

The phase transition from printed matter to electronic typing, storing, transmitting of text and the information network will equally revolutionize all fields of life, including not only the commerce but also the way, administrations internally operate. We have proposed to the German Science Ministry by means of a study in July 1994 how to approach this.

Actions of the German Physical Society DPG

The German Physical Society has set up a committee for Elektronische Fachinformation und Kommunikation ELFIKOM to advise the DPG in these matters.

ELFIKOM had had its first meeting in July. Members are delegates from Physics Departments, of Industry, of the commercial server FIZ Karlsruhe, the TIB Hannover (a large state Library), of publishers (Elsevier, Springer, CH), of computer centres. Permanent guests are the Societies of Chemistry, Information Science, Mathematics. For the APS R. A. Kelly was invited presenting the lines of the APS. It was decided that the tasks should be worked out and pursued in close cooperation with the APS and hopefully in the future other national Societies.

In the past, the German Science Ministry had had a national programme with about 45 Physics departments to implant and distribute the use of using commercial data servers such as STN and the FIZ-Karlsruhe.

Since then, each of the departments has a highly educated expert and a local system of education and training. on the 27th of September 1994 the Societies of Physics (DPG), of Information Science (GI-Informatik) and of Mathematics (DMV) in Germany have merged their efforts in striving for the future of information and communication electronically.

First actions are a joint e-mail server, a cooperative applying to the German Science Ministry for funding, a joint international workshop in spring 95, and a lot of future activities, such as harmonizing the University servers, a mutual representation in international bodies and conferences, a sharing of the professionalities, ..

We are aware, that although doing experiments in all directions, these have to be done with the international partners their interdisciplinary counterparts in neighbouring fields. – Prof. Dr. Dr. Eberhard R. Hilf Department of Physics Tel.: (+49)–441–798–2543 Carl von Ossietzky University Oldenburg FAX : (+49)–441–798–3201 D 26111 Oldenburg Germany
