

Information Technology as a Search Mechanism for Brain Gain

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Introduction

During decades the brain-drain of scientists from Croatia did not attract public attention nor governmental concern. There were a few empirical sociological studies trying to analyze the brain-drain and social profile of scientists-emigrants (Golub, 1988) the motives of scientific migrations (Prpi}, 1989) the potential exodus of Croatian scientists (Prpi} et al.,1990). From these studies we can ascertain that the Croatian scientific diaspora is big and spreads all over the world. The reasons for it are sometimes specifically for scientific motives (Adams, 1968) as primary factors, but economic and/or political factors should not be neglected. Whatever the reasons for scientific migrations, it is important to stress that the sporadic interaction of Croatian migrated scientists with domestic ones has always been present on an individual level for reasons inherent to the communication patterns of scientific activity, but also probably due to patriotic impulses.

Communication between diaspora and local scientists has become of utmost importance as Croatia is a recently established independent state contemplating recovery from the war devastations. In order to improve the interaction of domestic and diaspora scientists in a systematic fashion and as a way to promote the interaction itself, a database of scientists was established under the auspices of the Ministry of Science and Technology. The criteria for the establishment of the database and for the selection of the scientists to be put in it will be described in section 2. Section 2.2 will present the envisaged uses of the information stored in the database and will highlight the advantages of having this information available in machine readable form. The third section of the paper will explore the ways in which e-mail and INTERNET based services can be used as a systematic methodology for the location and updating of an international database of diaspora scientists, irrespective of their country of origin. The fourth section will detail the activities necessary for the establishment of a world-wide database of scholars in the diaspora. The conclusions are presented in the fifth section.

Database creation: Selection criteria and methodology

The original impetus for the database came from the need to improve the evaluation mechanisms for scientific projects financed by the Ministry of Science. It was therefore proposed to develop a broad international pool of referees from all scientific fields : natural, biomedical, technical, biotechnological and social sciences as well as humanities. The logistical organization of the referee's pool was located at the Ministry of Science and Technology.

It was necessary on the one hand to find experts (irrespective of their place of birth) who would be willing to use their knowledge and critical approach for the evaluation of projects submitted by Croatian scientists for domestic funding. It was felt that our depleted domestic population of scientists by itself would be unable to achieve a critical mass for optimum peer review processes to take place. It was necessary on the other hand to locate Croatian scientists working abroad because they would be more familiar with the limiting conditions characteristic of scientific activity within the scientific periphery.

Croatian scientists working abroad could help the Ministry to establish, promote and adhere to standards and criteria per scientific activities comparable to those of prevalent in more developed scientific communities. It was therefore decided that the pool of referees would be composed of domestic professional scientists, Croatian scientist working abroad, and internationally recognized scientific figures irrespective of their place of birth.

Different channels were explored in order to establish preliminary contacts : personal contacts, paper correspondence with different institutions and particularly e-mail interaction were used. E-mail was particularly useful to identify scientists of Croatian origin who are now living and working abroad. Letters were sent to the scientists explaining the purpose of the database and an invitation to submit their curriculum vitae in order to join the pool.

Database composition

The database is comprised of over 1500 records out of which 900 are international scientists. More than six hundred addresses of Croatian scientists working abroad have been collected. Table 1 presents the distribution per subject area of scientists that were approached and the number of these scientists that agreed to submit information for inclusion in the database.

More than fifty percent of scientists agreed to act as the referee candidates sending their full addresses, field of interest and the list of subdiscipline fields where they are experts. It was very optimistic that more than 350 scientists have shown the willingness to contribute to such an important step in scientific activity. It is interesting to observe from the Table I. that : a) 2

| Scientific Field | Approached | Agreed |
|-------------------------|-------------------|---------------|
| Natural sciences | 180 | 104 |
| Biomedical sciences | 163 | 90 |
| Technical sciences | 81 | 57 |
| Biotechnical sciences | 20 | 16 |
| Social sciences | 59 | 42 |
| Humanities | 74 | 46 |
| Interdisciplinary | 1 | 1 |
| Unknown fields | 55 | 7 |
| Total | 633 | 363 |

dominant scientific migrants are from the field of natural, biomedical and technical sciences. This, of course, is easily interpretable in the light of general scientific migrations, b) their response to our questionnaire was around 55 %, c) although the absolute number of scientists in the field of biotechnical and social sciences as well as humanities are smaller, their response to be included in the referee's pool is significantly higher (80 %).

The geographical distribution of our diaspora scientists shows (Table 2) that the USA is the scientifically most attractive immigrant country followed by Canada, Germany and Switzerland. In many countries in Europe, Asia and South America we have found only one scientist per country in the required status assistant professor, associated professor and full professor.

Potential uses of the database and future activities

There are many different ways to improve the interaction between domestic scientists and diaspora ones.

Establishment of a programme of visiting professorships

The teaching and research experience of diaspora scientists could be used by Croatian universities through the sponsorship of visiting professorship. Individually this involvement has taken place even earlier but we would like to install institutionally the visiting professorship particularly in the fields of social sciences and humanities to expose young students to undocinated approaches. Of course, this educational "refreshment" could be of benefit to all students in other fields as well. It is not necessary to mention that the advantage of our diaspora lecturers is no language barrier.

Predoctoral fellowships

A programme of predoctoral fellowships would enable our Ph.D. students to finish their Ph.D. thesis abroad (particularly in experimental areas) since economic problems hinder the access to materials, equipment, etc. The diaspora mentors will benevolently be included in Ph.D. exams at Croatian universities so that the students will get domestic diplomas.

Postdoctoral fellowships with diaspora mentors

In our opinion, Croatian postdoctoral fellows would benefit more from the mentorship with a diaspora scientists than from a non-Croatian scientists. Tradition we would hope that the brain-drain phenomena will be less frequent in the case of diaspora mentors.

Access to international funding

A very important step in the interaction of domestic and diaspora scientists is scientific cooperation through joint projects financed by different sources better known by diaspora scientists. The potential of domestic scientific communities in all scientific fields is illustrated in the book "Scientific Research in Croatia" (Pifat-Mrzljak, 1995) just published by the Ministry of science and technology.

Scientific exchange

Connected with the joint projects is scientific exchange not only with the scientific institutions, universities, but scientific societies, libraries, etc.

Meeting of domestic and diaspora Croatian scientists

Actual meetings of scientists would not be excluded. Namely, we are planning to bring together all our scientists to a meeting in Croatia where different possibilities of interaction will be discussed, particularly formalized institutional cooperation.

Future activities and methodological proposal

We believe that by means of new information technologies the brain-drain can be converted to brain-gain for the benefit of national science even without the process of migration. However, those technologies have not yet been exploited to their full potential. For example, in the case of the development of the Croatian database, it was particularly difficult to build the original list of scientists from personal contacts. We are therefore interested in exploring a methodological approach that exploits more fully the capabilities of electronic mail and INTERNET related services for the benefit of national scientific strategy and policy as well as for education process. Namely, we are proposing to explore a methodology for approaching scientists that by-passes personal contacts. We are interested in locating scientists from the diaspora via means of specialized electronic discussion lists managed through listservs and related INTERNET technologies.

Listservs and discussion lists

Discussion lists are useful and important sources for the exchange of information. Scientists and scholars throughout the world connect to those lists to put forward new ideas and debate items of research. Discussion lists are also used to disseminate announcements of conferences, debate the proposed agendas of the future conference or meeting, review recent publications, participate in calls for papers etc. In short, electronic discussion lists embody the essence of scholarly communication in a non-formal manner by allowing scholars to participate in the flow of ideas from their own offices. A “ listserv ” is the software that allows for the easy management of the flow of messages from the originator of the message to a central listserv address and the subsequent dissemination of the message from that central address to all the members of discussion group (Gilster, 1993). Usually, each discussion group is monitored by one individual who via the use of the listserv programme ensures the correct functioning of the discussion group both from its social and technological aspects. There are now several other programmes such as MAILBASE (for the UK), LISTPROC and MAJORDOMO who have roughly the same functions as a “ listserv ” but are housed on different machines. The name “ listserv ” is however, used generically to refer to the software that allows for the administration of the flow of messages of a discussion list.

There are presently over 3000 listservs in every subject imaginable (Whiney). Several directories of listservs are searchable on the WWW. For example the LISZT database (<http://www.liszt.com>) includes over 34000 discussion lists catalogued by subject area. It is therefore possible to search electronically for a number of discussion lists, determine there listserv addresses and explore the possibilities of systematically contacting diaspora scientists and scholars from any country of origin in order to create a world-wide database of diaspora scientists.

Objectives

Primary objective : To explore the feasibility of discussion lists and listservs as means of contacting diaspora scientists from any country of origin.

Secondary objectives : To develop a WWW homepage of the project ; to develop a self-administered questionnaire, (in several major international languages) accessible from the WWW ; to maintain and update a world-wide database of diaspora scientists using the information from the self-administered questionnaires.

Methodological activities

Determination of discussion lists

To identify through electronically searchable directories the lists that are most likely to attract scientific and scholarly discussion of high calibre. Ideally we should be able to contact at least two lists per scholarly discipline.

Questionnaire design

The questionnaire should include demographic data as well as academic trajectory data. Language competency and consultancy experience outside country of work/country of origin should be included. Optionally, some publication data (limited) could be included.

Design of database structure

To design relational database structure with boolean logic searching capabilities per field and in free text format.

Homepage design

Determine the design and structure of the WWW homepage for the project, with rational links to the questionnaire and to other areas of interest (funding organizations, project manager(s), etc.).

Conclusion

This paper has presented the steps taken to develop a database of Croatian scientists in the diaspora. The database will be used to strengthen the interaction between diaspora scientists and scientists in Croatia. It is expected that as a database becomes better known more scientists will be willing to join the project. However, the experience of building the database from the starting point of personal contact has led to the realization that the information technologies particularly those related to INTERNET services can be used to their full potential to develop a world-wide database of scholars in the diaspora. The technology is available for such an endeavour; all that is lacking is some form of material support and the willingness of interested individuals to collaborate.

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