

R&D and training activity need industry–academic institute interaction

To achieve development it is essential to implement latest technology, advanced knowledge and skill besides giving due consideration to basic policies and appropriate planning. Sustained multidisciplinary R&D work only can produce results which has been the plus point for industrially developed countries to have a lead over developing ones.

It is recognized all over the world that industrial and economical development of a country is closely related to the investment it has made in research work for industrial growth and the objectives of industrial research are distinct from those of academic research. Requirements of industrial research necessitate close linkage with industry for identification of needs and evaluation of results, proper facilities for scaling up and test marketing to assess consumer's acceptance of new products. Academic science is of uncertain utility whereas applied science has clear goals and targets. Success in the laboratory does not always translate to success in marketplace.

Training personnel to analyse, assess, and make economically sound decisions is a fundamental step for successful development. Another prerequisite is overcoming barriers created by the proprietary nature of technology found in the market economics. It is the moral responsibility of the research institutes to take up such R&D programme which would give a solution and assist industries with respect to constraints encountered. Industries need

to sponsor such development projects to scientific institutes for effective interaction.

It goes without saying that research programmes should be problem-oriented to attract industry to participate in the institute's activities. For many developing countries a serious gap often exists between research laboratories, institutes and industries, such as manufacturing, which need a new technology.

Close working relationship between technological institutes and university laboratories with industries is strongly recommended. A continuous dialogue between these two groups would be helpful to identify the problem and a concrete programme of work can be undertaken as a joint venture. Further, the work can be shared and divided depending on the nature of equipment and possibilities available with one or the other laboratory.

The guide must visit related industry repeatedly to understand industry functioning and the problems encountered by them. This will create better understanding between the industry and academic institutes. Academic institutes should invite industry to the institutes and demonstrate facilities available to create confidence in the industry persons. Institute/University should look for interface guides having required qualification and experience of both industry and academic institutes, for effective research work.

Such collaborative work will generate fund from the industry to support part fi-

ancing of the research work and through sponsored students, DST sponsored projects, consultancy activities and conducting training courses.

For all these, academic institutes have to approach industry telling them what they can do for the industry and what facilities institutes have, to solve their problem in a scheduled time period. Academic institutes should be very clear to choose from their strength while offering something to industry. Tangible benefits must be visible to industry very clearly. Only then will industry be interested in joint activity with academic institutes.

Industry should regularly keep in touch with the academic institutes in their vicinity to get practical advice for specific problems for guidance. It is always beneficial to attend training courses conducted by academic institutes and conferences organized by association of the concerned industry. Such courses and conferences bring new ideas and add to the knowledge which are often useful for regular work in the industry.

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Downloads and research productivity

Recently, Sharma¹ introduced the intriguing idea that, *In the Internet era, download counts or in broader term usage statistics of e-resources (i.e. number of research papers and book chapters downloaded per unit time from the institution) can be taken as an important indicator to measure the efficiency of S&T libraries*.

Indeed there is evidence from CSIR's experience with the consortia approach

for e-journals involving 11 publishers including Elsevier, that downloads are a good proxy of the amount of research activity in the organization.

Reliable data from Elsevier is available showing the download counts of articles labwise. Also, CSIR compiles annually the number of *SCI* papers that each of its laboratories publishes in a year. Figure 1 shows a plot of the correlation

between the number of *SCI* papers published and the number of Elsevier journal downloads for 2005. The laboratories have been grouped very roughly into two broad categories: sixteen Biological and Chemical labs (BioChem) and twenty-two Physics and Engineering labs (PhyEngg). Overall, for 38 Labs for which data is available, it is found that approximately 825 downloads of Elsevier articles 'led'

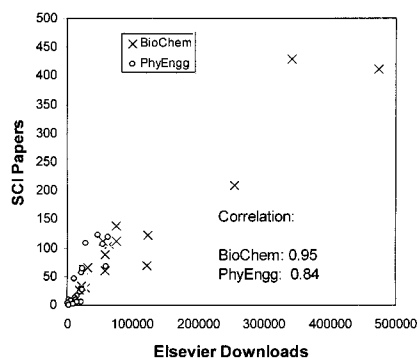


Figure 1. The correlation between *SCI* papers published in 2005 and the number of articles downloaded from Elsevier journals in 2005 for 38 CSIR Laboratories.

to one *SCI* publication. In some Labs, this figure approaches 1000. Figure 1 also shows that the correlation between downloads and papers is better for the BioChem Labs (0.95) than for the PhyEngg Labs (0.84). It is also seen from Figure 1 that the BioChem labs publish far more papers and download far more articles than the PhyEngg labs, showing that the research cultures are distinctly different.

This simple spreadsheet analysis was the subject of some discussion within the CSIR. One of the Directors pointed out that downloads and publications are directly proportional to the number of re-

search scholars in each lab. One word of caution is that correlations do not always mean causation.

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Training in biology and biotechnology teaching programmes

Of late, India is viewed as a destination for investment in biological sciences/biotechnology and the industry is witnessing investments in the form of foreign direct investments in biotechnology with a parallel growth in National Centers of Excellences. More venture capital companies are also surfacing that really need good, qualified trained manpower with hands-on-experiences in various state-of-the-art technologies. But, the question that still remains is whether we produce enough knowledgeable manpower to fill the gap. The Government policies have allowed liberal setting up of private colleges introducing new courses with fancy topics, new and renewed courses in existing educational institutions, etc. To vie with competition it has become a fashion for these institutes to claim placements offered by campus interviews and this goes to the extent of saying that there were 75–100% placements. But it is appalling to see the plight of those coming out of many institutes without jobs, who end up somewhere in some jobs other than biotechnology. Almost all institutions demand huge sums as tuition fees and other fees in various forms from the students. It is time to ponder whether the students are getting justice for the money they pay. The reality is that the educational system is influenced by various practices, viz. poor quality teaching, faculties who are underpaid, dilution in curriculum,

autonomy and deemed status which help institutions to offer better marks which transcribes into boasting transcripts. It should be the endeavour of such institutions to provide the best practical training to the students rather than spoon-feeding them. Most of the institutions follow the same pattern, viz. admit students, ask them to memorize and write the theory examinations, conduct a few practical classes and send the students for summer training programmes and project work outside the campus. Most of the institutes do not have good laboratories and if available, do not enjoy trained manpower to work in the laboratories. Almost all universities have the system of making the students compulsorily undergo a summer internship/project work during the tenure. Those institutions, running courses on microbiology, biochemistry, biotechnology, either science or engineering and lacking in-house laboratory facilities, prefer to send students out of the campus for exposure, ostensibly to minimize expenditure in their own laboratories. This, in one way, encourages the faculties of such colleges to act as pseudoguides. This is practised by most of the 'science and engineering colleges who send students for project work to other institutes', year after year. It is sad to see students running from institute to institute and industries with letters from their parent institutions to get some slots

for internship/project work. Most of the research institutes/industries running short of workforce, offer places and the students are guided by the scientists and sometimes a thesis/dissertation is written. This leaves a question as to whom the knowledge belongs to. In this exercise, the internal guide has nothing to do with the topic as the student is engaging himself/herself in the ongoing activities of the research institutes/industries where they are getting trained. While it is good that the student gets exposed to various areas of science, this process creates 'pseudoguides', who get certain rights. A comprehensive system needs to be worked out to change this, as India is moving towards intellectual property rights protection and vigorous patenting regime. For this, the concerned universities should (a) insist on the constituent colleges creating sufficient laboratory space allocated for conducting in-house research programmes or (b) scrap the project work from the curriculum or (c) practically insist that the credit be given to the research institutes/industries to which they are sent for such programmes. It is also wise to persuade these institutions to establish good laboratories and appoint qualified manpower to act as guides to conduct such scientific studies. The managements of those institutes should be encouraged to join hands with industries and research institutes for a larger understanding and