Intergenerational Knowledge Transfer

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# Abstract[

Institutions of higher education and universities have been at the forefront of intergenerational knowledge transfer. Their role has gone through evolution and several ideas of the university co-exist. Factors like the squeeze on public funding of higher education across nations, exhortation by governments to value work-based learning as a part of higher education and demand for graduates ready to start working immediately on joining a workplace, are making it necessary to further evolve the classical approach towards intergenerational knowledge transfer. The paper presents a framework that has been evolved in India to meet the requirements of intergenerational knowledge transfer. It essentially integrates a workplace and a university in a single entity similar to the practice in medical education.

# 1. Introduction

Human civilization has come to its present level of sophistication based on intergenerational knowledge transfer. Methods adopted for knowledge transfer vary, and determine the efficiency with which transfer takes place. Universities and other institutions of higher education have been the centres for intergenerational knowledge transfer for the past several centuries and have accomplished and continue to accomplish their task efficiently. While universities have been in existence for a long time, many workplaces including large corporations, research centres, other organizations, both national and international have come on the scene comparatively recently, and have emerged as users of knowledge as well as contributors to knowledge generation. In fact, many workplaces are store-houses of knowledge that needs to be preserved and transferred. As a result, knowledge now exists at multiple places and in diverse formats, a feature that shall ensure that knowledge will not be lost. One, of course, has to continue to look for any gaps and do all that is necessary to preserve knowledge.

Conventional wisdom tells us that for intergenerational knowledge transfer, coexistence of the young and the old is a necessary pre-condition. Whenever an activity is expanding, fresh talent is drawn towards that activity on a regular basis to meet requirements of growth and to replace aging workforce. Regular induction of fresh talent keeps the organization pursuing the activity vibrant, and knowledge from seniors to juniors is transferred by a variety of formal and informal processes. Details of formal processes are determined by the type of organization. In a university or an institute of higher education, such processes include attending lectures, study of text books, practice in a laboratory, and regular interactions between a research supervisor and students. In corporations, formal processes would take the form of structured training of an employee at the time of induction and periodic up-gradation, documentation of practices in the form of manuals and reports, and making them available for reading by employees, recording of exit interviews of employees at the time of superannuation or resignation etc. Trends during the past couple of decades point towards workplaces or corporate world encouraging academic credentials and one comes across close partnership between corporate and higher educational institutions [1]. A recent initiative launched in many organizations called as ‘oral history projects’ involves interviewing individuals who have made seminal contributions and recording such interviews. Informal processes would include information exchanged between the young and the old through word of mouth during personal interactions at workplaces, in cafeteria or outside of workplaces.

When an activity is at a steady state or near steady state, one needs young manpower to replace aging workforce, and for efficient knowledge transfer an overlap between the incoming and outgoing workforce has to be planned. While this can be done, there is a reluctance among the young to take up such an activity as it is difficult for newcomers to reach leadership position in an organization that is not growing. When an activity is declining, it is still more difficult to attract fresh talent to replace outgoing manpower and the conventional model of knowledge transfer which pre-supposes co-existence of the young and the old breaks down.

However, the conventional wisdom presupposing co-existence of the young and the old is under challenge due to a variety of reasons including explosion of knowledge. Self-study by students based on reading printed material as well as material available online requires that knowledge should be preserved so that it can be used by knowledge seekers as and when they need it. In certain cases such as management of emergency one needs information that can be retrieved fast and this has to be planned using technology to store information and development of appropriate taxonomy for retrieval. This is the issue which the International Atomic Energy Agency is trying to address through its nuclear knowledge management initiative [2].

This talk concentrates on what is being done in India for intergenerational transfer in the crucial area of nuclear knowledge. The Government of India is trying to expand the role of nuclear energy in India’s electricity generation mix and therefore, we have a situation where the young and the old co-exist in the nuclear establishment. All nuclear facilities are owned and operated either by the Central Government or by companies that are owned by the Central Government. While the higher education system in India is quite vibrant, the employment opportunities are only in the Government sector. Given this scenario, we have established a unique framework for intergenerational knowledge transfer as described in the following paragraphs.

# 2. The Framework

Before postulating a new framework, one has to examine the existing approach towards higher education. The classical approach separates workplaces (that is professional organizations) making use of knowledge in a given discipline from universities which transfer knowledge to students. This separation is, however, not universal. In the field of medicine, schools and hospitals are integrated into a single institution or are co-located. Medical professionals teach students as well as practice their profession. I always wonder as to why this model has not been extended to other disciplines.

Considering the squeeze on public funding of higher education across nations, exhortation by governments to value work-based learning as a part of higher education and demand for graduates ready to start working immediately on joining a workplace, it is necessary to rethink and tweak the classical approach towards imparting higher education. Extending the model of medical education to other disciplines will increase vocationalism, which has always been contested by academicians who subscribe to the belief that most important mission of higher education is the “pursuit of truth”. In spite of such contestation, vocationalism has taken place and to paraphrase Narisada Kaoru [3], throughout the long history of the higher education, to adapt to circumstances and to fulfil various functions, several ideas of the university co-exist.

The IAEA has been concerned with aging and retiring of the nuclear workforce, and consequent decline in the number of qualified and experienced staff and the loss of knowledge possessed by them [4]. This feature is not unique to the nuclear industry. The concern arises from the fact that as the program in many countries is not expanding and universities do not find it attractive to run academic programs in nuclear science and engineering. Therefore, it is no longer possible to attract young graduates to take up a career in nuclear science and engineering.

Indian scene has similarities as well differences: the nuclear program is thriving, young graduates have interest in taking up a career in nuclear science and engineering, but vibrant educational programs on the subject in institutions of higher education are at sub-critical level. Such academic programs are not in a position to support the needs of the nuclear establishment. This situation has persisted for a long time. However, to address the problem a Training School was established in late nineteen fifties in Bhabha Atomic Research Centre (BARC) to provide training in nuclear science and engineering to young graduates prior to their induction in the nuclear establishment. The program was not accredited to any university, though the training was fully academic. Faculty is drawn from among the practicing professionals working in the nuclear establishment. In this regard, one can see a similarity with medical profession. The program, first started as a part of BARC, was extended to other units of the Department of Atomic Energy to meet increasing requirements of manpower.

A young person always has attraction for a higher degree as it increases both social status and professional mobility. Around the turn of the century, it was realized that for continued success, it is necessary to get accreditation for the pre-induction training program. From the point of view of management, a pre-condition for any such accreditation by a university was that there should be no loss of autonomy in decision making, that is in the formulation of syllabi, selection of faculty, pattern of examination, and evaluation of student performance. The management realized that this level of autonomy would be possible only if the Department of Atomic Energy has full control of the university accrediting the program. As a result, a university level institution, having accreditation in accordance with the system of higher education in India, was set up in 2005. As described in the next section, it is an institution providing a unique framework for intergenerational knowledge transfer.

# 3. The Homi Bhabha National Institute

Concerns related to knowledge management can be easily addressed, if a framework for higher education that enables practicing professionals to teach is created. This is what has been done by setting up of the Homi Bhabha National Institute (HBNI) in India. Set up in the year 2005, it integrates academic programs being run in the following 11 institutions, all fully funded by the Department of Atomic Energy.

1. Bhabha Atomic Research Centre (BARC), Mumbai established in 1957[[1]](#footnote-1) and having campuses at other places in the country;
2. Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam set up in 1969;
3. Raja Ramanna Centre for Advanced Technology (RRCAT), Indore set up in 1984;
4. Variable Energy Cyclotron Centre (VECC), Kolkata, which became operational in 1977;
5. Institute for Plasma Research (IPR), Gandhinagar set up in 1986;
6. Saha Institute of Nuclear Physics (SINP), Kolkata set up in 1950;
7. Institute of Physics (IoP), Bhubaneswar, set up in 1972;
8. Harish-Chandra Research Institute (HRI), Allahabad set up in 1966;
9. Tata Memorial Centre (TMC), Mumbai set up in 1941; and
10. Institute of Mathematical Science (IMSc.), Chennai set up in 1962; and
11. National Institute for Science Education and Research (NISER)[[2]](#footnote-2), Bhubaneswar set up in 2006.

The Institute, thus, has a distributed structure. Its Constituent Institutions have been carrying out advanced research and development for several decades. HBNI is a leading[[3]](#footnote-3) research university and educates students at the doctoral and masters level. Distinctive characteristic of the Institute is to advance indigenous nuclear technological capability. The first five institutions listed above are engaged in technology development and are at the forefront of developing new nuclear knowledge, which is now being passed on to the next generation of students through the framework established by the setting up of HBNI.

HBNI has now completed eleven years. During this period, following an approach based on prudent gradualism, the HBNI has come a long way to establish itself as a leading research university. Prudent gradualism had to be followed on two fronts. In interaction with academics and officials from accrediting agencies outside of the HBNI, one had to explain the unique architecture of HBNI as a further evolution of the ‘idea of a university’ [3]. In dealing with stakeholders inside the HBNI, one had to work to superimpose a 'university culture' over the existing culture and this involved several facets: one was to explain the role and responsibilities of the faculty towards students to practicing professionals; the other was to explain the difference between doctoral research that has to be completed by a student in a certain time frame versus working on large research problems which may be done by individuals or teams of researchers over a longer time period.

Results of all these efforts are now visible. The program being run in the BARC Training Schools on a non-formal basis since 1957 has been converted into a formal program thereby giving the students an opportunity to get a post-graduate diploma or an M.Tech.[[4]](#footnote-4) (with the addition of a one-year project to one year of course work) from HBNI. While the Training Schools are functioning like Graduate Schools, the name Training School has so far been retained as it reflects history. Doctoral programs predominantly concentrate on problems related to nuclear science and engineering and intake to doctoral programs is being progressively increased. M.Tech. in fusion science and engineering has been started at the Institute for Plasma Research. Postgraduate and super-specialty medical programs in the area of oncology at Tata Memorial Centre have been significantly expanded. MD in nuclear medicine has been started in Bhabha Atomic Research Centre. Other important programs being offered are a post-M.Sc. Diploma in Radiation Protection and a post-B.Sc. Diploma in Medical Radio-Isotope Technology, both at BARC, and a post-B.Sc. Diploma in Fusion Imaging Technology at the Tata memorial Centre. Further details can be seen on HBNI website [5].

# 4. Closing Remarks

By establishing a university having unique architecture, it has been possible to achieve several objectives including nuclear knowledge management. The HBNI has also made vast research infrastructure in the institutions of the Department of Atomic Energy for human resource development. Every year more than 150 students complete M.Tech. or post-graduate diploma with specialization in nuclear science and engineering, and get employment in the nuclear establishment as they are selected by the nuclear establishment prior to their joining the academic program. Annual doctoral output is about 200 and is expected to cross 300 in near future. More than 100 students complete post-graduate or super-specialty programs in specializations related to oncology.

Squeeze in public funding for higher education has led to concepts like cooperation and partnership between universities and workplaces. The model of HBNI takes this forward by integrating a ‘workplace’ and a ‘university’ in a single entity. It is a step in the process of further evolution of the concept or ‘idea of a university’. While implementing the concept, it has been ensured that the academic rigour is not lost.

# References

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[2] International Atomic Energy Agency, Nuclear Accident Knowledge Taxonomy, IAEA Nuclear Energy Series No. NG-T-6.8, Vienna (2016).

[3] N. Kaoru, “The Co-existence of Several Ideas of a University”, in The Idea of a University in Historical Perspective: Germany, Britain and Japan, edited by K. Sneba, Y. Yasuhara and T. Hata, (Reviews in Higher Education 84), Research Institute for Higher Education, Hiroshima University, November 2005, pp79-84.

[4] International Atomic Energy Agency, Knowledge Management for Nuclear Research and Development Organizations, IAEA TECDOC 1675, Vienna (2012).

[5] Homi Bhabha National Institute: Ten Years of Excellence, 2005-2015, accessed on 13.08.2016 at <http://www.hbni.ac.in/about/hbni_ten_yr.html>.

1. Although it started in 1954, as the Atomic Energy Establishment, it was formally inaugurated on January 20, 1957. [↑](#footnote-ref-1)
2. The NISER was set up with education and research as its mission, while all other institutions were set up with research and development as their mission. [↑](#footnote-ref-2)
3. The HBNI has been accredited by the National Assessment and Accreditation Council (NAAC) with a CGPA of 3.53 on a four-point scale at ‘A’ Grade valid until 10 May 2020. NAAC is an autonomous agency set up by the Government of India and the grade ‘A’ is the highest grade. HBNI has been ranked at 17th position in the University category in India’s Rankings 2016, released on 4th April 2016 by the Ministry of Human Resource Development. [↑](#footnote-ref-3)
4. As per nomenclature of degrees followed in India, M.Tech. stands for Master of Technology and consists of one year of course work and one year of project work leading to a thesis. M.Sc. stands for Master of Science, B.Sc. for Bachelor of Science and MD for Doctor of Medicine. [↑](#footnote-ref-4)