Status of technology transfer in India – the much needed Magic Remedy

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Various strategies and models have been developed to implement successful technology transfer in Indian universities, many of which are inspired from existing approaches in developed countries such as the United States. This article provides an insight on the prevailing strategy and ways to streamline technology transfer in the Indian academic scenario.

Background

Technology transfer in India has transitioned towards a large-scale, globally interactive market and is bound to have tremendous impact on the economy through risk management, research income sponsored by the industry and exclusive licenses[1].

The different modes of transmission of technology across various domains include publications, conferences, consultancy services and workforce migration, and economic relationships between the academia and industry. Motivation for industrial investment and sponsoring, a research result that will make a difference and business opportunity that will allow market success are essential prerequisites for rapid acceptance and development of technology transfer. These prerequisites are often triggered by means of collaborations, patents and copyrights that help fill development pipelines for the industry while commercializing academic research[2,3].

Various strategies and models have been developed to implement successful technology transfer in research organizations and institutes. Some of these have been inspired from existing approaches in developed countries such as the United States. The question is whether these are suitable for Indian universities or not. This note aims at providing an insight into the technology transfer strategy prevailing in Indian universities and research institutes. We have attempted to suggest ways to streamline technology transfer in the Indian academic scenario.

Status of technology transfer in India

India is known for a rich history of technology transfer, both nationally as well as internationally, before and after independence. Inspired by the Morill Act and land grant system in the US (1862), India dedicated a specific set of land for agricultural education and training in the form of universities. The agricultural industry is amongst the major players in technology transfer in India along with the telecom, railroad, information technology, healthcare, defence and space technology sectors[4].

At present, India spends 1% of its GDP on research, which is 3.7% of global research and development expenditure. In 2010–2011, 88 patent applications were filed by academic institutions in India and abroad, of which 18 Indian patents were granted, 33 intellectual properties were commercialized and license money of Rs 65.32 lakhs was generated[5].

In 2008, the Indian legislation passed an act for encouraging technology transfer in the country. This was based on the Bayh–Dole model implemented in the US in 1980. While the Indian version of the Bayh–Dole Act mimics its US counterpart to a large extent, there is scope for scrutiny and improvization[6,7]. If the focus is on increasing the number of patents, the numbers are adequate in comparison to the US patents pre- and post-implementation of the Bayh–Dole Act[6]. According to the world intellectual property (IP) indicators report, the number of patent applications has increased from 11,000 in 2001 to 42,291 in 2011. In 2012, the Indian Patent Office (IPO) received 50,000 applications and granted 4741 patents[5]. However, as commented by Mansfield, and rightly so, increase in the number of patents does not essentially account for improved technology transfer[8]. Mansfield also reinforced the law of diffusion in the context of technology transfer and suggested that innovation would pick up pace provided it thrives in an industry which is less dense and optimally competitive.

Limitations of existing technology transfer scenario in India

While the Indian Government has invested special thought and efforts for improved commercialization of technology, it has failed to achieve the required momentum for sustainable and inclusive growth. The Indian R&D system is deficient in the following.

1. Minimal private sector involvement in R&D support programmes. 2. Lack of policy and decision-making ability of public institutions. 3. Rigid bureaucratic resource allocation procedures. 4. Conservative and safe approach that discourages high risk ventures. 5. Barely existing cooperative or professional education in the academic institutions or universities. 6. Lack of monitoring, accountability and utilization of fiscal incentives by the industry and private sector. 7. Lack of vision: for instance, research agenda in organizations with primary focus on fundamental or basic research often gets diluted due to unreasonable expectations of commercialization and vice versa.

Approaches to technology transfer in US and Germany

In countries such as the US, market forces, federal commitment, IP and intellectual property policy (IPP) laws ensured licensing of university inventions to existing and new businesses for development and commercialization. Small businesses were given preference in licensing over others[2]. Universities in the US have understood the importance of technology transfer and have adopted various approaches for its successful implementation. As illustrated by Boh *et al.*[9], these approaches may be classified into: (1) Encoop model, (2) coordinated model and (3) Laissez-faire model for

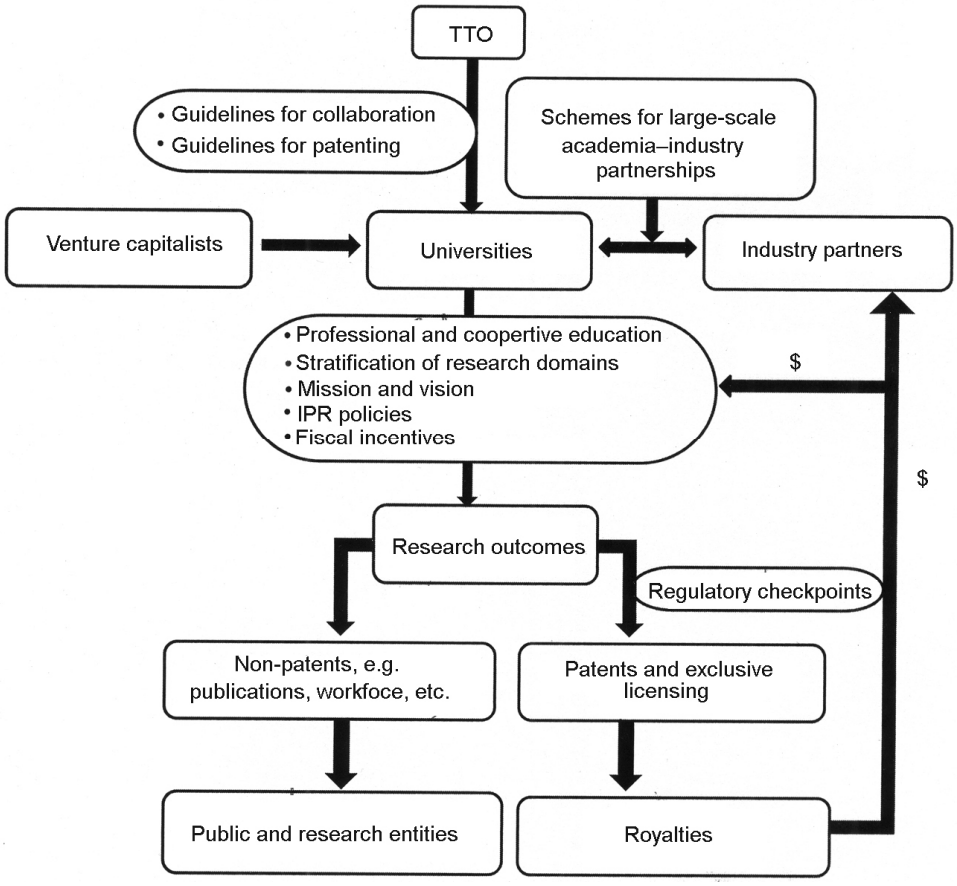

Figure 1. Proposed model for technology transfer in India. Technology Transfer Office (TTO) of every university should draft guidelines for collaboration and patenting to be followed by the respective university. Schemes including fiscal incentives that encourage large-scale academia–industry partnerships and investments from venture capitalists in small businesses and start-ups should be adopted. Every university should have a mission statement and complementary Intellectual Property Rights (IPR) policy which will facilitate decisions whether to patent or disseminate an invention through non-patent means. The university share of profits arising from commercialization should be channelized for furthering its R&D pipeline.

technology transfer. The German R&D system, on the other hand, is best characterized by limited Government interference, stratification of research domains and utilization of inherent technological strengths, thus providing ample space for technological advancements and commercialization[10,11].

Recommendation to Indian universities

There is growing emphasis on the flow of technology between university, Government and industry with equal flux in order to lubricate the friction between science, economics and policies called the triple-helix model. This would bridge the gap between academia and industry and encourage a tectonic shift from innovation in a single direction to convection of technology along different trajectories[12]. As stated by Bozeman[13], a successful technology transfer model, in its entirety, would account for the social, political, regional, economic and scientific impact by a calculated approach.

Based on the dynamics of technology transfer in developed countries such as the US and Germany, it is vividly apparent that India needs to establish a system inculcating the appropriate attributes in its model for technology transfer, while ignoring others which are not applicable to the Indian R&D scenario. Adopting the Bayh–Dole model in its entirety could be counter-productive. It is important to define the paraphernalia needed for efficient technology transfer before sweeping changes are implemented.

Technology transfer office: As emphasized by Nandagopal[14], each institution must dedicate a technology transfer office (TTO) for the purpose of review of university policies and decision-making process for commercialization of research. In addition, the TTO should also provide guidance based on the level of publicly funded research, capabilities of industry partners and nature of university linkages.

Industry capabilities: The Indian Government and universities should incentivize public–private partnerships to ensue successful technology transfer. Several schemes such as Small Business Innovation Research Initiative (SBIRI) by the DBT, Science and Technology Parks of IIT Khargapur, NIT Tiruchirapalli; New Millennium Indian Technology Leadership Initiatives (NMITLI) and Fund for Accelerating Start-ups in Technology (FAST) have been launched by the Indian academic institutions to encourage small businesses and start-ups. While these are in operation, the government and universities must provide further impetus to large-scale commercialization.

Spanning the scope of industry–academia partnerships over a greater latitude and expanding the scale of commercialization would stimulate technology transfer to a great extent[15].

Fiscal incentives: The existing fiscal incentives should be redesigned in order to minimize transaction costs and maximize technology incubation and commercialization in order to encourage collaboration between academia and industry[16].

IPR policies: The application of strong intellectual property rights (IPR) policies and regulatory checkpoints ensures patenting of appropriate technologies while making other technologies accessible for use by the public and other research entities. While patents are imperative incentives for technology transfer, the transmission of institutional research by non-patent means needs to be understood.

Education: Professional cooperative education and cross-disciplinary programmes such as those in the US are excellent platforms to encourage professional networking and transmission of ideas.

Access to venture capitalists and moderate risk exposure: Growth is best characterized by willingness to expand scope of research while concentrating on core competencies. A conservative approach could damage the spine of university spin-offs and entrepreneurship.

Defined mission and vision: Stratification of universities based on nature of research (e.g. fundamental versus applied) will improve research focus and efficiency.

Based on the above inferences, a model which is suited for our culture is proposed in Figure 1.

Conclusion

India would do well to revamp the existing pattern of technology transfer characterized by limited commercialization. While we could borrow from successful models existing in the developed countries, discretion is warranted and wholesome adaptation of their policies should be discouraged. We should focus on our inherent strength and adopt strategies accordingly to meet our requirements. The model proposed by us could be adopted to achieve this objective.

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