

**UNIVERSITY-INDUSTRY LINKAGE FOR THE
RAPID GROWTH OF ENGINEERING
INDUSTRIES IN PAKISTAN**

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ABSTRACT

This paper reviews the trends of two types in the industrial sectors around the world; the phenomenon of incubating new startup technology companies and the concept of close bonds between R&D institutes (especially academia based) & the industries. The paper also tries to shed some light on the emergence of knowledge-based economy (the K-Economy) resulting from these trends and reviews new economic powers on the face of the globe who are capitalizing on this concept. This paper tries to forecast the future of Pakistani engineering and technology based industries and suggests future directions which may be pursued for their rapid development and competitiveness enhancement. It also highlights some of the initiatives taken by National University of Sciences and Technology, Pakistan in this regard such as first Technology Incubator of Pakistan and the proposed National Innovation System concept for our country.

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History of Mankind in the distant past has been marked by inventions (even though a result of hard work still a number of them accidental), our more recent past and present is, however, a bearer of flaring flags of *Innovation*. Today, perhaps, we are in a world that has less chances of coming up with something out of the odds than creating something innovative from existing technologies with a commercial application. Consumers of engineering and technological products come across gadgets almost daily that are making their lives easier, more productive and enjoyable than ever before. Most of these products have far more sophisticated feature-set than their predecessors yet no one can claim that they have produced something new or something that was unthinkable earlier. The process of enhancing and maturing the products of common use is evolving with each passing day, making them of greater business value. Consequently the markets, business and industries are transforming at a rapid rate as well and the demand for innovative solutions and product features. But who can provide these solutions; who is the one with enough time, resources, ambition as well as the brains to keep on researching new ways of making a process or a product more useful? No one needs to be told the vital importance possessed by the answer to this question. Strangely however no one ever needed to ask this question; reason... because the role of the 'who' in our questions was always played by someone, someone who was never asked to do the job but still he kept on doing it. Then who is this person and why did he keep on doing it!? To solve this puzzle of mystery man and to reveal his face lets take a look at the person who has been responsible for the 'inventions' marking their emergence in the history of man-kind and why did he do those.

If you take a deep look into the history then you'll notice that most of the inventions were driven by the struggle and consistent efforts of people who were always fascinated by the intriguing attributes of nature, pushed by their zeal to explore the phenomenon of unexplainable and dedicating their lives for the cause of greatest gift to humans by their creator; the thirst for "*Knowledge*". The world knows them with the names of researchers, scholars and scientists but more commonly they were called "*Teachers*". These were the people who were driven by their quest for acquiring more knowledge and transferring their knowledge to others. Their quest enabled them to explore the venues which were unknown before and make fascinating discoveries. Needless to say, the quest for knowledge is still on and it has now adopted a new direction what we get to call '*innovation*'. Whether it's the leaders of industrial revolutions from the west or the new tiger economies of Far East Asia their progress and development has been heavily contributed by the professors and researchers of universities and engineering colleges.

It wont be an exaggeration if it is said that our (i.e. Pakistan's) inability to make significant progress is because of the lack of applied R&D culture. While our

professors, teachers and researchers are lesser to no one and their research is equally valuable, their ability to make it commercially viable is often hampered by the unavailability of guidance or information about the potential industries. Unfortunately the situation is not any better the other around as well i.e. industries and service providers are often clueless to where should they look or who should they contact in case they need the help of a scholar/researcher.

Fortunately for us the model of such an institute or facility has been in use for some time now. This model has been successfully implemented in many countries and the rewards have been profound. As a matter of fact, the high value gained in the international markets and rapid progress made by countries like Korea, China and Malaysia is arguably a result of this model. Known as '*Technology Incubator*' (sometimes also called '*Science and Technology Park*') as tempting as it may sound by the discussion so far, still needs a very delicate approach for implementation in a new place. Like any other strategy one needs to transform this model according to the unique environment and needs of a country to maximize its impact. What a Technology Incubator strives to accomplish is the linkage between the academic environment and the hardcore engineering industry. It helps researchers from universities to get collaborative projects with industry and helps industries find a person with appropriate skills suiting their needs.

Aligned with the strategy of bringing together the industry and the academia, a Technology Incubator also encourages new technology based businesses amongst the faculty members and students. Getting the confidence of a whole team of professional experts on its back a Technology Incubator can help nurture ideas by researchers and scholars into self-sustainable, profitable businesses; a process called '*Incubation*' (the source Technology Incubators derive their names from). This can contribute towards the Socio-economic development of a country by introducing a whole new breed of start-up technology-based companies. Names like Intel, HP and Cisco are examples of the potential startup companies from a Technology Incubator. More prominent examples are the technology and engineering sectors of China, Korea and Malaysia. In a period spanning little over 15 years these countries have transformed themselves into one of the largest economies of the world by harnessing the power of incubation process. Huge developments made through this process are credited not to just industry but rather to the power of knowledge to innovate new solutions and evolve existing ones. One has to admit that it is rightly an era of '*Knowledge-based Economy*,' where knowledge is the driving force behind the economic development. Knowledge-based Economy or the K-Economy inflicts that the application for knowledge and its sharing is as much important as its acquisition.

For a country like Pakistan the adoption of such a process is of grave importance to revive its industrial sector. Engineering Industry of Pakistan has enjoyed success in small chunks as a result of some really hard work but the growing competition and the challenges that international markets present are causes of concern. Pakistan has been doing well in the areas of Textile Engineering, Electrical Goods Manufacturing and Light Engineering Sector but already these

sectors are facing difficulties and are losing business to companies of other countries. One important direction in which we need to make headway progress to overcome our deficiency is encouraging applied research and facilitating its usage in the industry.

We are fortunate that we have all the raw ingredients for this endeavor; we have very talented engineers and scientists, we have excellent (if not completely outstanding) engineering and science schools and universities and a fairly even spread over of technical/engineering schools in the form of polytechnic institutes and vocational training institutes. What we lack is the drive to create a synergy effect of all these institutes and formation of an inter-alliance to create a '*National Innovation System.*' Technology Incubation Centre (TIC) under the flag of National University of Sciences and Technology (NUST) has already started a proactive approach for proposing a National Innovation System. Ideally such a system can be formed by setting up Academia-Industry partnership building facilities, to be called Technology Innovation Centres (TICs). These centres can act as a gateway between the Industrial sector and the academic institutes or organizations where research & development activities are carried out. The idea is to establish resource centres where R&D resources of different universities and academic institutes are combined together to focus on the problem solving of the Industrial sector at the local level, new product development for attracting more investment in the sector, existing product feature enhancements and process productivity improvement to increase the competitiveness of the existing Industries. In so doing TICs will ensure the maximization of the affordability of new technologies for the Industries. Since industrial units are scattered all over the country at different geographical locations, therefore, it makes sense that these TICs should be established at each of the regional levels where Industries exist so that the fruit of the scientific and technological development is made available at the grass root level. This argument is also supported by the fact that most of the industries fall under the category of Small and Medium Enterprises (SME). The benefits of having small regional TICs will include among others

- Focus on the regional issues of Industries
- Easy access to the facilities for Industries
- Maximum dependency on local resources of the region
- Support and opportunities for local researchers without regional biasing
- Easy management of operations and management of TICs
- Benefits of technological developments as well as new job opportunities for local population thus contributing towards social development and poverty alleviation

To achieve the objective of establishing a hi-tech Industrial sector in Pakistan it seems logical that a bottom up approach should be adopted. That is

1. Regional TICs should be formed at district level; to be called District Innovation Centres (DICs)
2. These DICs can be established at a regional institute/college or university
3. DICs should be funded and managed by their local district governments
4. Incentives such as tax rebate etc should be given to SME and large industry sectors to attract funding for DICs
5. Similar to DICs Provincial Innovation Centres PICs should be formed to protect the interest of Industrial sector and promote the development of SMEs through a culture of R&D at provincial level.
6. A National Innovation Centre should be formed to produce the cluster effect of all of these Innovation Centres and build an inter-alliance of the Innovation Centres to form a National Innovation System

To realize this strategy of National Innovation System for the growth of industries at Pakistan we need to bring Doctors, scholars and researchers belonging to the Engineering and Applied Sciences fields, mostly serving public institutes/organizations, out of the confining walls of their institutes and organizations and should expose them to opportunities those lay for them in the Industrial sector for mutual benefit of the both. This can be accomplished by offering incentives to the engineering scholars much the same way the medical practitioners have been offered with

- Researchers can be allowed to provide consultancy to the Industrial sector in their off duty times
- Access and use of public facilities should be allowed within the allowed limits those assure the protection of privacy and property of these institutes.
- Due rewards should be ensured for the researchers
- Intellectual Property Rights of the researcher should be protected while protecting the interest of organizations providing investments for the projects.
- Contract between industrial organizations and researcher should be facilitated and legal assistance should be provided

District Innovation Centres (DICs)

The DICs are of prime importance in the formation of National Innovation System. Their role is to bridge the gap between the academic institutes/research facilities and the industries of the region. These DICs will act as incubators/hatcheries for new technologies and products. They will be responsible for

- Maintaining database of industries in the region under the jurisdiction of local district government
- Maintaining database of academic institutes/R&D facilities (Public/Private universities, Polytechnic/Vocational Training Institutes, Public/Private organizations)
- Facilitating the process of finding right organization for the right industry/SME (“Match-making”)
- Protecting the interest of all the stakeholders
 - Protecting the investments of industries contributed to collaborative research/venture capital
 - Protecting the intellectual property rights of the researchers
 - Protecting the interest of Academic / R&D institutes – ensuring balance between the primary responsibilities and consultancy / research services of researchers
 - Ensuring SME growth through technological innovations
- Providing legal/consultancy services
- Nurturing the new/startup technology companies
- Reducing the risk and expense of investment and increase the success rate of new startup SMEs
- Fostering new products, new business and new technology
- Providing guidance in commercializing R&D achievements
- Providing location for cooperation of academia and industry
- Providing test services and speed up the development of products
- Organizing training courses, related information and consultation for Industries

Provincial Innovation Centers (PICs)

PICs will form the next layer of National Innovation System. They will be responsible for

- Facilitating the Inter-alliance between DICs at provincial level
- Ensuring expensive/rare technological resource sharing between DICs
- Helping resource levelling between areas having high industrial density and relatively low industrial density as well as between areas having high number of R&D institutes/facilities and areas with low number of R&D institutes/facilities

National Innovation Centre (NIC)

The top most layer of the National Innovation System will be formed by National Innovation Centre (NIC). The responsibilities of NIC will include

- Establishing an infrastructure of National Innovation System
- Overseeing the operations and activities of DICs and PICs
- Setting up a diverse information and support system
- Enhancing the development of DICs and PICs
- Upgrading traditional industries by acquiring new technologies
- Establishing contact between connected domestic and foreign institutes to bring the fruit of latest technological innovations to Industry
- Organizing academic activities and skill training courses for Industries
- Finding the new export markets and maximizing the participation in existing export markets for the products of local industries
- Spreading the awareness among the industries and preparing them for the challenges and opportunities presented with the introduction of WTO regime and other international agreements like South Asia Preferential Trade Agreement (SAPTA) and South Asia Free Trade Agreement (SAFTA).
- Publishing journals, periodicals, books and electronic publications

Establishment of such a model system can greatly help us revive our industrial sector while our engineers and researchers will be able to continue doing what they do best... Innovate! Perhaps with an even greater zeal. This approach, if adopted, would redress the poverty alleviation problem through capacity building measures of the SME sector and thus create and sustain jobs creation at the local level.

