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UNIVERSITIES, RESEARCH AND DEVELOPMENT ORGANIZATIONS AND
INTELLECTUAL PROPERTY

GENERAL OVERVIEW OF THE LINKS BETWEEN EDUCATION, RESEARCH,
PUBLIC INTEREST AND INTELLECTUAL PROPERTY RIGHTS

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I. INTRODUCTION

1. Education, Training and Research in both universities, research institutions and middle level training colleges are important national activities for economic development of any country and most government invest heavily in this sector as a criteria for rapid industrial growth. There are several stakeholders with specific interests and expectations in university education, training and research. These include the government, universities, R&D institutions, industry, the public, students as well as the professional societies. This paper looks at the interests and expectations of these stakeholders on research and university education and the levels of the realization of these expectations in developing countries. Using the success experiences from few selected developed countries, recommendations for the way forward for universities and R&D institutions in developing countries, is given.

II. PARTNERS AND STAKEHOLDERS IN RESEARCH AND UNIVERSITY EDUCATION

2. There are several stakeholders in the sector of Research and university Education. These include:

- Government
- Industry
- University and research institutions
- Society
- The public, students and parents
- Professional Societies, and
- National IP system

3. The stakeholders mentioned above contribute to the activities of universities and R&D institutions and therefore have various expectations from them. The degree of realization of these expectations defines the level of satisfaction of the various stakeholders with respect to the performance of universities and research institutions and their readiness to give further support to the sector. What are the expectations and to what extent are they met? These are discussed briefly here below.

A. Expectations of The Stakeholders

a. Government

4. The government is a major stakeholder since;

- it invest heavily in the provision of the infrastructure, for education, training and research,
- it provides funds to pay staff salaries, scholarship for students and to a limited extent, research money,
- it is a major employer of the graduates and consumer of any innovation and research findings from R&D activities

5. Because of its contribution, the government expects the universities and R&D institutions to play a critical role in the creation of national wealth through;

- provision of highly trained and competent manpower, who will effectively be involved in national development,
- provision of solutions for problems of national development,
- development and dissemination of technology for industrial development,
- Effectively contribute towards poverty reduction, employment.

b. Industry

6. Like the government, industries are also major stakeholders since;

- through taxation, industries directly finance the activities of the universities and R&D institutions,
- industries provide attachment places for students training,
- industries are major employers of graduates from universities
- industries are the potential users of technologies, innovations, inventions and research findings developed by universities and research institutions

7. Because of this, the industries have the following expectations:

- Production of quality graduates who are technical and scientifically competent
- Provision of solutions to technical problems through consultancy
- Development of new technologies, products and process for the development of industries including small and medium scale enterprises
- Assistance with the adaptation of new technologies

c. Universities and R&D Institutions

8. All universities have Visions and Missions of being the best in terms of training, research and consultancy as well as contributing effectively to national development. To achieve this, universities expect:

- To admit the best students and train them to become highly qualified and competent professionals
- Have adequate laboratory and research facilities
- Attract and retain best lecturers and technical staff
- Improve products and processes through research and development
- Improve industrial performance of the local industries through consultancy and provision of demand driven and technology oriented short training
- Develop new technologies, processes and products and commercialize them to industries
- Spearhead the growth of small and medium scale enterprises
- Develop a strong and sustainable university-industry links
- To meet the above expectations, universities must have sufficient funds and mechanisms for the management of technology transfer from university to the consumers.

d. Parents and Students

9. Apart from paying taxes, in some cases the parents contribute financially to the well being of their sons and daughters while at the universities. The students have to put sufficient efforts to obtain admissions in the universities in their chosen disciplines.

e. Expectation

10. The parents and the students expect that the students will be adequately prepared in their training programs to launch their careers in self or other employment.

f. The Professional Society and The Public

11. The professional societies expect to have members who are well trained in their disciplines and confident to contribute effectively in the national development, being able to keep up with new technologies as well as develop new ones. The society expects professional who can make things work and keep them working. As tax payers and consumers they expect good value for their money.

g. National Patent Offices

12. National Patent Offices, expect from universities and research institutions, generation of new and patentable ideas which should be reflected in the quantity of national patent applications. The universities and R&D institutions are also expected to sufficiently make use of patent information services for their innovations and research activities as well as assist in the commercialization of the available new technologies.

B. Level of realization of these expectations

13. In developing countries, most of the expectations mentioned above are not met, as briefly discussed here below.

a. Government and Public

14. Although it is acceptable that in most countries, universities to contribute effectively to the creation of the national wealth through the development of high quality human resources, now and then, one hears of complains about the deteriorating quality of graduates. Furthermore, with increasing numbers of unemployed graduates due to the inability of the economy to expend and absorb the graduates, the value of the university education is changing in the eyes of the public.

15. On the other hand, the second mandate of the universities and the sole mandate of R&D institutions, i.e. the application of knowledge into the production of commodity goods, has been given little attention and has remained underdeveloped, in most universities and institutions of developing countries. The contribution of the universities and research institutions on the provision of new technologies and commercialization of innovations,

inventions and research findings to assisting in the development of industries and Small and Medium Scale Enterprises, has been negligible. Innovations and new ideas, if ever they are generated, never leave the shelves of the University dons to be commercialized for the common interest of the population.

b. Industry

16. In December 1990, Moi University held a workshop on "*Developing a Sustainable University-Industry Links*". The Workshop was co-organized by the Federation of Kenya Employers and was sponsored by United Nations Development Program (UNDP). The purpose of the workshop was to bring together university staff and managers and industrialists from industries to discuss ways of establishing a sustainable University-Industry Links. The representatives from the industries raised several complains concerning the performance of local universities. Top, amongst the complains, were:

- That to-date the Kenyan industries have not benefited much from the research activities of the local universities and research institutions. The industries were suffering, going down and facing stiff competitions from imported goods but universities are just looking the other side. Perennial problems such as poor resource management, use of old technology, lack of spare parts, inadequate process optimization and acquisitions and adaptation of technology, are some of the areas where the industries look upon universities for solutions. The Universities have not helped and the university dons are still seen by industries as living in ivory towers. They are seen to be insensitive to the needs of the society and can not be relied on to provide solutions for technical and developmental problems or generate innovations and appropriate technology to assist industries as well as small and medium scale enterprises.
- That the quality of training of university graduates is decreasing and universities do not regularly review their curricula to conform with ever changing needs of the society. One industrialist, in his paper, stressed that in human resource management, comparative advantage is increasingly being built not around the natural resources but around human capital. The situation demands that education and skills of employees should be appreciated to assist enterprises to achieve their business and management objectives and make them effectively compete in a liberalized economy. High investment in people should allow the development of capacity to introduce technological change and innovation.

c. Universities

- Due to ever decreasing funding, universities find it difficult to adequately realise their missions and objectives since they lack funds to provide quality training, purchase laboratory and research equipment and consumables as well as finance field attachment and practical exposure.
- Due to low pay, universities and research institutions are increasingly finding it difficult to attract and retain staff. Some of those who stay give halfhearted services as they spent most time "*moonlighting*."
- University and industry collaboration is weak and few institutions are putting in place measures to improve the situations.

- University staff lacks the required entrepreneurial skills and experience for effective commercialization of their innovations and research findings. Few universities, if any, have put in place structure to provide supports services for innovations and inventions.
- Universities do not have in place units which, can stimulate innovations and develop adequate awareness on intellectual property rights. Furthermore, most universities do not have in place intellectual property policy, which can stimulate innovations, conducting of demand driven research as well as commercialization of innovations and research findings. University staff requires competency on patenting, innovation commercialization and contract negotiations.

III. STRATEGIES FOR INCOME GENERATION BY UNIVERSITIES AND RESEARCH INSTITUTIONS

17. It has been shown that most universities in most developing countries cannot adequately realise their missions and objectives and meet the expectations of its various partners and stakeholders in education, training and research due to lack of adequate funding and structures to provide support services to income generating activities. Currently most universities in Africa are over depending on government and donor funding. With the decrease support from government and donor agencies, universities are being forced into a tight situation where they find their operation very difficult. Yet universities have high concentration of well trained and qualified staff, whose skills could be utilized to generate sufficient income for the universities. And this is possible, if the experience from some selected developed countries, which is briefly described below, is anything to go by.

A. Experience of the Commission of Higher Education of Kenya (CHE)

18. In 1992, the Commission of Higher Education of Kenya (CHE) visited some selected countries in Europe, America, Asia and Africa to study the contributions of the universities to the economic development of their respective countries. The CHE also wanted to understand the strategies these institutions have put in place, for the sustainability of their training and research activities. Their findings showed that most universities in Europe and USA and some in Asia and Latin America have systems in place which enhance income-generations through innovation, commercialization of innovation, inventions and research findings as well as effective utilization of intellectual property rights. Through these activities, apart from effectively contributing to the economic and industrial development of the countries, sustainable partnerships of the universities with industries have been realized.

19. A typical representative of the above success is the Federal Republic of Germany. There, for example, the major links between universities and industries is through research. Universities being major centers of research benefits from the linkage through research contracts they receive from companies. Technology Transfer Centers (TTCs) is another important link between universities and industries. The TTCs provide consultancy services for companies and institutions as well as to small and medium size companies. Another form of linkages between University and industry is through Business Incubating Centers where young entrepreneurs with innovative business ideas as well as researchers are helped to mould the ideas into successful enterprises. In most cases the business ideas originates from innovation or research findings undertaken in a university or research institutions.

20. In Sweden, the most important link between universities and industries is the Technology Parks, which promote the utilization of innovations, inventions and research findings from universities and R&D institutions. Some of the functions of the Technology Parks are:

- Assist the researchers in the commercialization of their innovation and research
- Give customized education program in the form of courses or seminars with the aim of stimulating the innovation process
- Give advisory program concerning business development, financing as well as the establishment of researchers- and university based companies
- Acts as small business incubators and assist in the formation of new companies

21. In the United States strong working relationship between university and industry also exists. This phenomenon has been spurred by the Federal Government decision in 1982 to grant universities in the United States the right to patent their innovations. This has enabled scientists to talk directly with industries. There are five types of alliances:

- Research collaborations
- Sponsored research
- Licensing of intellectual property
- Start ups and equity participation in new ventures

22. Some universities in Asia and Latin America are also actively involved in technology transfer activities. For example in Mexico, apart from donation of equipment and provision of attachment places by industries, universities have third level of cooperation with industries, which is partnership in research and production of patentable innovations. In Venezuela the Simon Bolivar University has established a Foundation (University Company) which links university professors with industries for sponsored and contract research. Innovations developed are owned by the Foundation, whereas the professors are paid for their innovations. In Korea, universities have linkages with the industries through consultancy and ownership of various companies, whereas in India, the India Institute of Technology, Delhi has established the Foundation for Innovation and Technology Transfer (FITT) to bridge the gap between the research institutions and industries. The FITT provides a delivery system for the ideas emanating from the research institutes to be developed for industrial use. The functions of FITT include technology development and commercialization of innovations and research findings.

B. Practical Experience of the Author

23. In May this year, the author of this paper participated in a 10-day workshop in Germany. During the workshop, the participants were exposed to the activities of several organizations, concerned with business incubation, technology transfer, as well as innovation and invention support systems. These organizations have not only assisted universities and research institutions to generate income, but also to contribute effectively to the industrial development of their regions.

24. One of the organizations, is the Steinbeis Foundation, which is based in Stuttgart, and currently manages 405 technology transfer centers in Germany, 289 of which are based in universities. In 1999, utilizing a staff force of 3595 people comprising of 615 professors, 2585 scientific and technical staff, the foundations centers worked with over 20,000 small and medium size enterprises and generated income of 164 million-DM.

25. Another organisation visited is the Fraunhofer Gesellschaft, which is a leading organisation of institutes for applied research in Germany, with headquarter in Munich. Conducting contract research projects for industry and government, it provides its customers with economic and immediately applicable solutions for their specific problems. Currently the Fraunhofer Gesellschaft has 47 research institutes located over Germany, having a total of 9000 equivalent employees, mainly scientists and engineers. In 1999, the institutes together undertook annual research contracts amounting to more than 1.3 billion German marks. One of the 47 institutes of the organisation is responsible for patent processing and the commercialisation of the innovations and inventions from the institutes. The institute has enhanced awareness on patenting within the organisation such that in 1997, the organisation filed 398 patents and it currently accounts for about 50 % of all the patent applications from publicly funded German research organisations.

26. As an example of a Business Incubation Centre, is the Aachen Corporation for Innovation and Technology Transfer (AGIT), which in co-operation with the business promotion and structural development organisations in Aachen region, has helped to successfully transform the region from a coal mining district to a technology region. This has been achieved through, amongst others, the exploitation of the existing research and technology potentials of the region's universities. AGIT was founded in 1983 and was officially opened in 1984 as the first business incubator in the then Western Germany. Currently there are 12 Business Incubators managed by AGIT. They have a total of 18,300 m² of space for offices, laboratories and production floors. Some 85 companies are currently being coached in these incubators. The requirement for admission of the new business enterprises in AGIT is a novel business idea or an interest in the commercialisation of innovation, invention or research findings. Current clients include entrepreneurs direct from the university, inventors and people from the industry. Through these services, AGIT has a success rate of 90 %. That is out of 100 new business in the incubator, 90 succeed to grow into fully pledged business in five years. This is commendable compared to the average success rate of 50 % for those business started in Germany without going through the incubation process.

27. An example of a university, which is making money by providing services related to intellectual property rights is Cornell University of USA. Through Cornell Research Foundation (CRF), which is the business arm of the university, Cornell University provides Intellectual Property and other business related services to all Cornell employees and is responsible for obtaining appropriate patents or copyright protection on all Cornell owned intellectual property. CRF also provides services on commercialisation of innovations and research findings from the university's staff. Through the activities of the Cornell Research Foundation, Cornell University has established that;

- Patents are effective means of deriving economic values from research development and for enhancing support of research activities. Hundreds of Cornell University staff, researchers and their research programs currently benefit financially from their patented and licensed technologies.

- Patents are often the best way of developing and disseminating a technology. Unless a patent exist, it is unlikely that industry will make investment in the process of developing and commercialising a product and many inventions will simply “*sit on the shell*” benefiting no one.
- Patents are typically essential as a basis for starting companies based on university inventions and discoveries.
- The process of obtaining a patent and marketing it to the industry provides a highly effective means of developing a meaningful interaction between university and industry and strengthening University-Industry Links.

28. Some of these experiences are discussed into more details in the following papers:

- (i) Needs for and examples of Intellectual Property Policy
- (ii) Needs for innovations and inventions support structures or services for universities

C. Way Forward for Our Universities and Research Institutions

29. The experience from the Commission of Higher Education of Kenya (CHE) outline in section III.A. and the author’s experience described in section III.B. can serve as possible strategies which our universities and research institutions may wish to pursue in order to generate funds to finance their training and research need. These can be summarized as follows:

- Universities and research institutions should have in place an autonomous structure within the institutions to promote innovation activities and bring awareness on the importance of Intellectual Property Rights not only as a source of income but also as a stimulants for the development of a sustainable university industry links. Such units may also undertake patent information services.
- Where there are no active units for technology transfer, universities should set up technology transfer centers. The operations of such centers should be autonomous, self sustaining and delinked from the operation of the universities.
- Universities and research institutions should have some form of business incubation services to provide technical and business assistance to young entrepreneurs engaged in the development of technically oriented products, processes and services.
- Universities and research institutions should not shy away from creating companies, particularly those based on innovations and research findings from the activities of these institutions.
- For the success of all these research and technology development activities, universities require to develop a clear intellectual property policy and strive to make it well understood by the researchers.

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