SOME ASPECTS OF RESEARCH FUNDING ON ENGINEERING & TECHNOLOGY IN BANGLADESH

Professor Dr. Md. Mazharul Hoque[1], Zobair Ibn Awal[2], S. M. Sohel Mahmud[3] and Kazi Md. Shifun Newaz[3]

[1] Professor, Department of Civil Engineering & Director, Accident Research Centre (ARC)

[2] Jr. research Fellow/Lecturer, Accident Research Centre (ARC)

[3] Research Assistant, Accident Research Centre (ARC)

Bangladesh University of Engineering & Technology (BUET), Dhaka 1000

E-mail: dirarc@arc.buet.ac.bd

Abstract: Funding support in research and development activities in engineering and technology is indeed fundamental from national development perspective. Innovation of new ideas, technologies, products and services are essentially dependent on the continuous research and development. The paper reviews the research funding characteristics for the universities in developed countries and discerns some of the good practices. This paper further highlights the trend of funding support to the public universities in Bangladesh and attempts to discuss some key aspects. The issue of research funding support in engineering and technology has been put forward as a mater of discussion with the perspective of economic development of Bangladesh.

1. INTRODUCTION

Adequate and sustained spending on Research and Development (R&D) is fundamentally important to the advancement of scientific and technological progress and has historically been viewed as the route to economic development. This has become increasingly clear as many governments of developed countries provide considerable funds, primarily to universities, for scientific, engineering and technological research as well as social science research [1]. In the recent past scientific and technological research became increasingly systematised and discovered that continuous investment in research and development could be a key element of success in competitive strategy. Indeed the strength in basic research is a feature of all strong economics. Importantly scientific research provides new ideas that enable engineers to develop new technology, which, in turn, fuels the economy of modern nations [2,3]. It is now abundantly clear that higher education and research are key factors for any country to realise economic development [4]. This paper attempts to examine some characteristics of funding, support in research and development both in the context of developed and developing countries. The issue of increasing research funding support in engineering and technology has been put forward as a matter of discussion with the perspective of economic development in developing countries like Bangladesh.

2. INVESTMENT IN RESEARCH AND DEVELOPMENT: WORLD SCENARIO

Research and Development (R&D) expenditure and intensity are two of the key indicators used to monitor resources devoted to Science and Technology worldwide. The evolution of these indicators over the last decade, looking for emerging trends, in both developed and developing regions can be observed from the facts presented here. Studies reveal that over the period from 1990-2000, world expenditure on R&D almost doubled, from US$ 410 billion to US$ 755 billion in current purchasing power parities (PPPs). At the end of the century, 80% of expenditure came from OECD countries (Table 1).

Table 1: World Expenditure on R&D in US$ PPP by Region, 1990 & 2000 [5].

Region	1990: US$ PPP 410 bil	2000: US$ PPP 755 bil
Europe	33.9%	27.2%
North America	38.2%	37.2%
Latin America and the Caribbean	2.8%	2.9%
Asia	23.0%	30.5%
Africa	1.3%	0.8%
Oceania	1.0%	1.1%

Despite continuous growth, the R&D intensity (measured by the ratio between Gross Domestic Expenditure in R&D (GERD) and Gross Domestic Product (GDP)) declined slightly for Europe from 1.8% to 1.7% (shown in Figure 1). The decline is also similar for Asia and Africa as well. This implies that, despite sustained growth of world GDP during the 1990s, although countries spent more on R&D in 2000 than in 1990, they devoted a smaller share of their total economic resources to these activities.

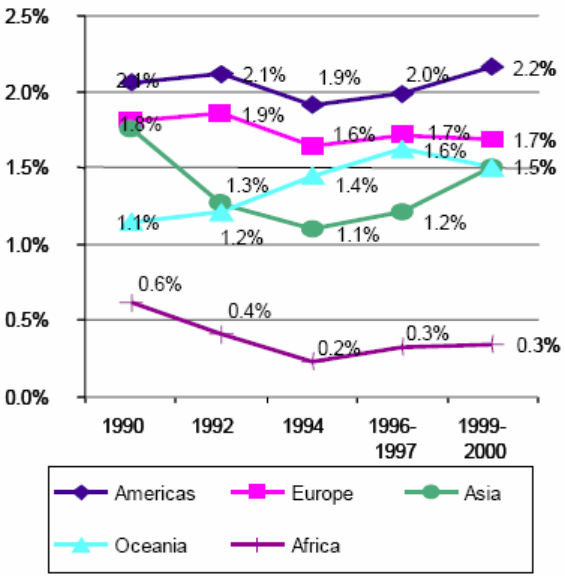

Figure 1: R&D intensity (GERD/GDP) by continent, 1990-2000 [5].

2.1 Trends in more developed Regions

Throughout the decade, North America has been the leading spender on R&D. In 2000, the region spent US$ PPP 302 billion on R&D, representing 37.2% of the total world expenditure. Asia follows behind North America and invests 30.5% of world R&D expenditure. Countries in the Asian region more than doubled their R&D investments from 1990-2000 (from US$ PPP 94.2 billion in 1990 to 235.6 billion in 2000). On the other hand, the GERD/GDP ratio for Asia dropped from 1.8% in 1990 to 1.5% in 2000, falling to its lowest point in 1994. Its recovery was driven by growing expenditure in China. Meanwhile, Japan's R&D intensity remained stable at approximately 3%. Europe has the third highest level of R&D investment, with expenditure of US$ PPP 202.9 billion. Its share of global investment declined more than in North America, from 33.9% in 1990 to 27.2% in 2000. Europe's research intensity remained stable over the decade, at approximately the 1.7% value [5].

2.2 Trends in developing regions

Despite efforts to increase investments in R&D, expenditure remains very low in developing countries. In 2000, developing countries spent 0.9% of their GDP on R&D, still falling short of the target of 1% mentioned in various S&T policy documents and international declarations for over 30 years. Nevertheless, there is considerable variation across countries. The so called "New Industrialised Economies of South-East Asia" have long surpassed that benchmark, reflecting a solid recovery after the economic crisis of 1997. China reached the 1% R&D intensity goal in 2000 and now plays an important role in global R&D. These countries are responsible for pulling up the 'developing country average' close to the 1% benchmark. On the other hand, India - the other large Asian economy – has been struggling over the decade around the 0.7% mark [5].

3. INVESTMENT IN RESEARCH AND DEVELOPMENT (R&D) IN BANGLADESH

Information regarding expenditure on research and development in Bangladesh is sparse. The amount of spending on research and development is often quoted as less than 0.1 percent of GDP [6]. However, an amount of about Tk 62 crore has been allocated for research activities in the annual national budget of Tk 78,431 core in the fiscal year 2007-2008. This research allocation represents only 0.08 percent of the total national budget and is considered to be quite low compared with desired level of research expenditure. Major sectors that receive annual research allocation from the national budget are Science and Technology (23%), Bangladesh Agriculture Research Institute (19%), Rice Research programs (16%), Atomic Energy Commission (14%), Planning Department (8%) and Bangladesh Scientific Industrial Research Council's (7%). The percent of research fund allocation for University Grands Commission is only 2 percent of the entire allocated research fund in Bangladesh [7].

4. RESEARCH FUNDING IN THE PUBLIC UNIVERSITIES OF BANGLADESH

Overall funding (which includes research funding as well) for the public universities of Bangladesh is managed primarily from government allocated fund within the budget of the educational sector and almost zero funding from the industries. Trends of the budget allocation for universities in the national budget are shown in Figure 2.

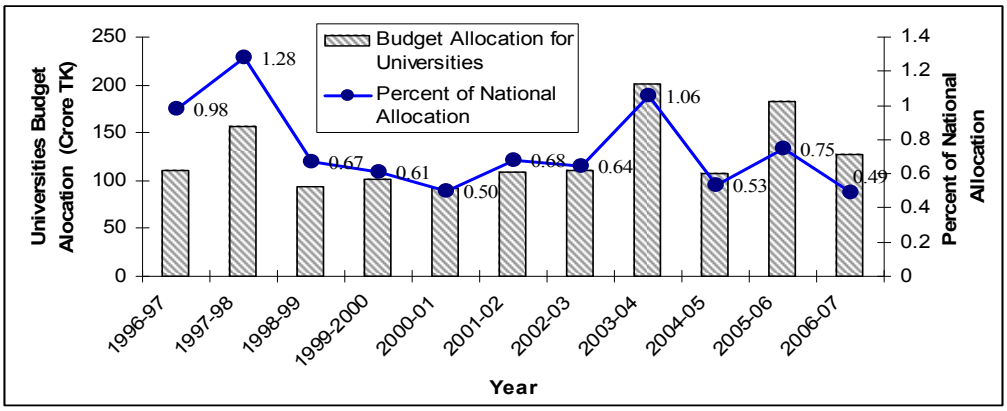

Figure 2: Trends of Budget Allocation for Universities in National Budget [8].

Table 2 shows the annual expenditure of the public universities during the years 2001 to 2005. On average it is observed that almost seventy percent of the total university expenditure goes for providing staff salary, seventeen percent for administrative and maintenance purpose and only thirteen percent goes for education and related expenses (such as class room and lab facilities). Therefore, it is apparent form the facts that there is no specific budget provision in the total expenditure for university level research, let alone funding support for engineering and technology based research. Although, however, some may raise the point that few research projects are being taken from the Education and Relevant sector, but this funding is not legitimate and very little by the amount.

Table 2: Share of expenditure at the public universities of Bangladesh [8].

Year	Salary (%)	Administration & Maintenance (%)	Education Related Expenditure (%)	Total
2004-2005	66.0	19.0	15.0	100
2003-2004	69.2	18.4	12.4	100
2002-2003	70.6	15.9	13.5	100
2001-2002	71.7	16.1	12.2	100
2000-2001	72.1	15.6	12.3	100
Average	**69.9**	**17.0**	**13.1**	**100**

The facts shown above are from the funding available for university expenditure from the University Grants Commission (UGC) of Bangladesh. However, UGC recognizes the demands for conducting advanced research and thereby arranges a separate channel for conducting research projects at various universities in Bangladesh. The Department of Research and Publication of UGC provides this kind of funding facilities towards university research at three different categories namely, i) Arts & Humanities, ii) Social Science and iii) Science & Engineering. The science and engineering category consists of six sub-divisions: i) Agriculture, ii) Biology, iii) Chemistry, iv) Medical Science, v) General Science and vi) Engineering. Studies reveal that on average sixty eight percent of the entire project expenses are from the science and engineering category, fourteen percent from the arts & humanities category and around nineteen percent from the social science category. From the preceding discussion it appears that in terms of actual spending in research the amount of budget allocated annually is considered to be much lower in the context of engineering education and research. This is also clearly evident when the university spending is analysed with respect to student overhead spending (Table 3).

Table 3: Overall student share in public universities and their overhead spending [8].

Categories of Universities	**No. of students (%)**	**Annual avg. overhead spending (Taka)**	**Annual avg. overhead spending (%)**
General Universities	87,267 (75.0)	29711	8.8
Engineering Universities	22,449 (19.3)	49855	14.7
Agriculture Universities	5,823 (5.0)	99499	29.3
Medical Universities	858 (0.7)	159907	47.2
	1,16,397 (100.0)	338972	100.0

Another facet of research spending is examined by the number of research projects and the associated expenditures in different areas as shown in Figure 3. It is evident that engineering research projects fall far behind than projects in other areas. These scenarios indeed require increased attention.

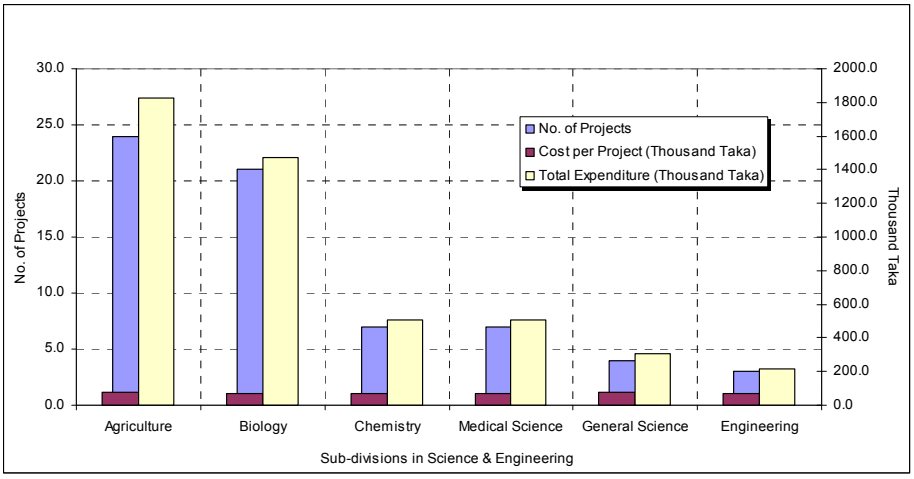

Figure 3: Research spending in different sectors [8].

5. THE NEED FOR INCREASING RESEARCH FUNDING AND THE WAY FORWARD

It has been particularly highlighted in the "Capacity Building in Higher Education and Research (CBHER) Workshop" [4] that investments in higher education and research serve a long-term development goal. Higher education and research especially within science and technology played noticeable role in the national developments in the successful developing countries (viz. Singapore and China). Both China and

India are in recent years demonstrating that clever use of research based modern technologies has been able to create economic development much more efficiently, as it was shown earlier by Singapore and South Korea. These successes have been also noticed in South Asia. India has started a billion dollar project with the purpose of strengthening engineering education at the "second level" of higher education institutions, Pakistan has increased funding for university research in Science and Technology by eight thousand per cent. It is important that this global trend has to be recognised in the context of Bangladesh and efforts are seen underway as there is a negotiation with the World Bank for conducting university research in Science & Technology.

6. DISCUSSIONS

The facts depicted in this paper are the glimpses of our higher education systems, particularly in the area of funding support towards research and development in engineering and technology. As it is observed that there is no significant relation between academia and industry, addressing the importance of collaboration and integration between the two in the advancement of national development and thereby promoting the standard of our livings is undoubtedly the most important contemporary demand. Therefore, it is time to discuss the significant efforts required towards understanding the necessity of engineering and technological research, roles of individual partners and the ways to promote such collaboration, demolish the constrains and barriers and find the ways forward.

One of very important roles has to be played by the "Government" in the process of industry-academia linkage. Because "Industry-University Partnership" has emerged frequently used terminology among industries, academics, and the government. Indeed it is attributable to many factors particularly promoting economic growth through technological innovation. In this respect besides industry and academia the government should perform as an initiator, promoter and supporter in the national innovation system. This argument becomes common for "transforming into knowledge-intensive economy," ensuring economic growths and generation of employment opportunities by promoting innovative start-ups and industries, taking cognizance of academic contribution to social welfare via the major channel of technology transfers.
Based on the review and study on research funding aspects, the following major points/issues are considered vitally important and perhaps these should be addressed with due urgency:

- Recognition by the government and the community at large of the important role that science, engineering and technology and research in particular must play in the scene/area of economic and societal development in Bangladesh.
- Augmentation of university operating funding from the government so that universities can increase their support for independent and basic research.
- Along with requisite funding, the availability of trained and committed individuals is fundamentally essential for meeting the growing necessities of the industries and universities in promoting research and development and hence for the advancement of technology and economic prosperity.
- Government organizations are required to make vigorous efforts to seek industrial partners and establish various collaborations with industries and universities.
- Significant efforts are needed to motivate and seek commitment of the government and industry in taking part in research and development activities (innovation, increased productivity and in facing global competition particularly high tech competitive products and markets).
- Stimulate discussions/suggestions by constituting national Forum of science, engineering and technology in collaboration with university, industry and government participation (bodies like IEB, IAB, engineering and technological societies).

- Creation of National Research Council, National Technology Strategy, Academy of Engineering and Technological Science, formation of Scientific, Engineering and Technological societies etc. are particularly important.
- National commitment to science, engineering and technology must surely be taken most seriously. We, engineering and technological professionals must ourselves become more involve in the problems of the government and the development of policies and programs of the country (ignoring statements like on inadequate funding supports, facilities for research and development).
- Provide research facilities for interest groups or individuals by launching incubator in the university for promoting engineering and technological advancement and innovation.
- Strengthening and augmentation of institutional linkage programs for collaborative research through exchange of faculties and researcher.
- Industry should raise its expenditure on research and development urgently to make research more pragmatic to local context and thereby help them be more competitive globally.

This particular study is a preliminary one and is subject to further scrutiny and revision. Further work is underway to address the issue of research funding on engineering and technology in Bangladesh. Additional views and comments would be invaluable.

6. CONCLUDING COMMENTS

BUET is fundamentally involved in competent human resource development in the field of Engineering, Architecture and Planning which requires high levels of training, research and intellectual commitment. Indeed research is needed to nourish excellence in teaching. Further promoting BUET as leader in the field of Engineering and Technology will require legitimate funding, strengthening of research facilities and removing uncertainties and barriers for the new developments. It is important to integrate education, research and real life application at the higher education system particularly at the universities where problem based learning is practiced at all levels. Indeed impetus on such integration is vital for economic growth and thereby achieves national development objectives.

REFERENCES

1. Wikipedia: *http://en.wikipedia.org/wiki/Research_funding*.
2. *Standler, R.B., Funding of Basic Research in Physical Science in the USA, Web address:* www.rbs0.com/funding.pdf*, USA, 7 November 2004.*
3. Mills, D., An introduction to the UK higher education research funding model, Univ. of Oxford.
4. Thulstrup, E.W., Hansen, J.A., and Gaardhøje, J.J., *Recommendations for Capacity Building in Higher Education and Research: A Key Component of Efficient Global Development, Capacity Building in Higher Education and Research (CBHER) Workshop*, Niels Bohr Institute in Copenhagen, May 17-18, 2005.
5. UIS Bulletin on Science and Technology Statistics, *A Decade of Investment in Research and Development (R&D): 1990-2000,* Issue No. 1, April 2004.
6. Shamsuddin, A.K.M., *Academia–Industry Linkage for Education and Research in Bangladesh: Views from the Private Sector*, Keynote presentation at the seminar organised by BUETAA, EEB 2007, 10 November 2007.
7. National Budget in Bangladesh, 2007-08, Ministry of Finance, Government of Bangladesh (GOB).
8. *Annual Reports of the Bangladesh University Grants Commission*, Published by the Bangladesh University Grants Commission (UGC), 2001-2005.