Measurement for Generation and Dissemination of Knowledge – a case study for India, by Mr. Ashish Kumar , former DG of CSO of Government of India

This article represents the essential of the first step of GDKP model

1. Introduction:

There has been increasing emphasis in economies towards investment in development of technology and innovation so that processes for production of goods and services may become cost efficient, effective and provide better quality of services. Such improvements in production of goods and services require on one hand generation of new knowledge and on the other hand dissemination of this accumulated knowledge for its absorption and usage by large number of producers of goods and services to improve the production processes. Results of both these processes can be seen in terms of increasing growth in economic value addition. It may be noted here that growth in the value addition or GDP can be through two processes- (i) increasing demand of goods and services results in increasing production and hence increasing value addition and (ii) improvement in the production processes results in increased value addition by efficient use of intermediate inputs. This may also be due to improvement of quality of product realising higher value of output and hence high value addition with the same input cost. Increasing computerisation of processes in economies has been resulting in efficiency gains and hence the value addition in the processes of production of both goods and service.

2. **Key functions in knowledge based economy**:

In the knowledge-based economy, the science and technology contributes to the key functions of: i) knowledge production – developing and providing new knowledge in terms of research and development; ii) knowledge transmission – educating and developing human resources; and iii) knowledge transfer – disseminating knowledge and providing inputs to problem solving.

A. Knowledge production:-

The science system has traditionally been considered the primary producer of new knowledge, largely through basic research at universities and at Government laboratories. This new knowledge is generally termed “science” and has traditionally been distinguished from knowledge generated by more applied or commercial research, which is closer to the market and the “technology” end of the spectrum. In the knowledge-based economy, the distinction between basic and applied research and between science and technology has become somewhat blurred. Both research in pure science and its application in terms of technology development contribute to the development of new knowledge in the society.

B. Knowledge transmission:-

The crucial element in knowledge transmission is education and training of scientists and engineers. In the knowledge-based economy, learning becomes extremely important in determining the fate of individuals, firms and national economies. Human capabilities for learning new skills and applying them are key to absorbing and using new technologies. Properly-trained

researchers and technicians are essential for producing and applying both scientific and technological knowledge. Educational institutions specially universities, are central to educating and training the research workforce for the knowledge-based economy.

C. Knowledge transfer:

Transferring and disseminating knowledge throughout the economy play an important role in their adoption in the production processes. Knowledge-based economies recognize that the dissemination and adoption of knowledge is just as significant as its creation. This has lead to development of knowledge distribution systems and systems for dissemination of

information relating to innovation. These systems help in use of knowledge in the economy and develop linkages. These systems and networks are crucial for a country to diffuse innovations and to absorb and maximise the contribution of technology to production processes and product development.

Components of knowledge base of an economy:

There are basically four components of knowledge based economic development. Therefore each of these components can be measured by a few indicators suitable for each component:

. (i) **Research and Development (R&D) and Technology:-** This is the key area for development of knowledge in the society. Economies invest resources for basic research as well as development of technology for its adoption and use. Total expenditure on Research and Development per capita and total expenditure on R and D as a percentage of GDP are good measures to study the emphasis given by an economy in development of new knowledge. There are some other subsidiary indicators like, High-technology exports as a proportion of manufacturing exports, Number of scientists and engineers in R and D, Average annual number of patents granted to residents and Per capita expenditure on R & D by the corporate sector.

. (ii) **Computer Infrastructure:** - Mainly focused on computer power per capita and connection to the internet.

. (iii) **Infostructure:** - Mainly focused on investment in telecommunication, telephones in use, Cellular mobile subscribers, Televisions, Radios, Fax machines, International call cost and Newspaper circulation.

. (iv) **Education and Training:-** Mainly focused total expenditure on education per capita, Literacy rate, Student-teacher ratio (primary), Student teacher ratio (secondary), Secondary enrolment and Higher education enrolment.

Comprehensive Measure of knowledge production and dissemination

4.1 There is a need to develop a comprehensive measure of knowledge production and dissemination. This measure would not only measure current contribution in value addition in the economy by these activities but would also be indicative of future course of economic activity and

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hence the direction and level of GDP growth in long term. 4.2 It is possible to measure this indicator using Supply Use table presently being constructed

by economies for the purpose of validation of the compilation of Gross Domestic Product. The supply use table for a year provides total supply of goods and services in the economy on one hand and use of these goods and services on the other.

4.3 Total value of goods and services produced in the economy are at basic prices. Thereafter, these are valued at producer's price after making due adjustments of product taxes levied on each product and subsidies given by the Government. Further, imports of goods and services are added to obtain the total supply in the economy. Thereafter, trade & transport margin on each product is added to obtain total supply at market price. Similarly, in the Use table, goods consumed by various industries for intermediate consumption are recorded in addition to their total final use. The final use includes consumption of goods and services by private individuals including Non-profit institutions serving households, Government, Gross Capital Formation and Exports. The two tables are balanced in such a manner that supply of goods and services in the economy is equal to its use.

4.4 It is worth mentioning that economies with better organized official statistical systems provide far more disaggregated information in terms of type of goods and services and also in terms of activities than the countries with less organized systems.

4.5 Since the two tables are balanced in terms of use and supply of various

goods and service, it becomes easier to identify the goods and services which are relevant for the purpose of knowledge related activities. In case of Indian economy, it is observed that the following five products are directly relevant for knowledge related activities:

(i) (ii) (iii) (iv) (v)

Research & Development Computer related services Education related services Business services including Legal services Post and telecommunication services

4.6 Some discussion on each of these services would be relevant in the present context: Total value of the activities relating to Research & Development is directly relevant from the point of view of measure of knowledge generation in the economy. This is measured in terms of cost and thus is total expenditure on the activity is taken into account. SNA, 2008 has classified this expenditure as capital expenditure and hence it adds to the capital formation in the economy.

The second element “computer related services” is also directly relevant especially in view of its wider application in all spheres of economic activities. This item comprises of all the value of services generated for the purpose of domestic consumption or exported for use by other countries.

The third component “Education related services” is equally important for measuring the value of knowledge dissemination in the economy. This component measures the total value of education services generated in the economy. These are compiled using cost approach for public sector institutions and market value for private institutions. This, however, does not include education services generated by specialised institutions in agriculture, medicine etc.

The fourth component “Business and Legal services” comprises of consultancy and management services, accounting & book keeping services, architectural, engineering and advertising services, and is therefore considered relevant for the purpose of computation of value of knowledge

dissemination.

The fifth component “posts and telecommunication services” which is equally relevant since this apart from postal and telecommunication services includes internet and online information dissemination services.

Measurement for INDIA’S PRELIMINARY GDKP IN TWO YEARS By Mr. Ashish Kumar, former DG of CSO (PDF. N.5)

In Indian context, based on the draft supply and use tables prepared recently for the years 2011-12 and 2012- 13 the following preliminary estimates of GDP and GDKP have been obtained and are given in table below.

Year	GDP (Billion Rs)	GDKP (Billion Rs)	GDKP as% of GDP	Rate of Growth	
				GDP	GD
2011-12	87.79	9.39	10.7	-	-
2012-13	99.90	10.89	10.9	13.8	15

Note- 1 billion Rs= 10^12 Rs It may be observed that the GDKP as percentage of GDP has increased from 10.7 percent to

10.9 percent in just one year from 2011-12 to 2012-13. Further, the growth rate of GDKP is higher at 15.9 percent compared to the growth rate of GDP which was 13.8 percent. It may be noted that these comparisons are made at current prices.

5.2 Share of each of these components of the GDKP has special significance. Largest contributor to GDKP is computer related services which is around 30 percent of total GDKP. The table below provides the shares of each of these components in the two years.

S.No.	Knowledge Product	Share of each product in GDKP	
		2011-12	2012-13
1.	Communication services	14.11	13.85
2.	Research & Development Services	2.61	2.85
3.	Legal services	3.43	3.57
4.	Other Business services	20.97	19.68
5.	Computer related services	30.08	31.36
6.	Education services	28.80	28.68
	Total	100	100

The table above also provides that the statistic so generated has special policy implication. The objective of the economies should be to achieve higher GDKP growth which will not only lead into higher size of knowledge economy but also higher growth of GDP.

Limitation:

It may be noted that this study uses the manner in which the data is compiled for the purpose of Supply Use Table. Proper and accurate estimation of GDKP would require further disaggregation of products. Present compilation has not captured the knowledge gained in the production processes and utilized for its improvement at the shop floor.

Proposal:

India has been a leader in generating knowledge and its dissemination. This has also resulted in improvement in efficiency of production systems both for goods and services. There is a need to bring this new measure as main measure of growth of economies. The system of measurement of growth of economies through GDP and its growth developed in the period when manufacturing sector was becoming the most important sector and production processes were being designed to develop its operations. Now in this new era of knowledge economy, the metric to measure growth has to change. The new metric has to focus on the growth of knowledge and its dissemination. The above suggested measure is a better metric for measuring the growth of economies. Overall growth in GDP shall also become more and more dependent on the growth of knowledge economies. The GDKP is a measure which can be widely accepted and used for comparison of progress of various economies. Standards, which are very close to the standards adopted by the System of National Accounts, can be used for the purpose. Some of the economists have suggested that Computation based on the System of National Accounts cannot be used for compilation of any metric of knowledge economy. Above work has established that it is possible to measure this component of economy. The measure can be further improved by improving the classifications presently adopted in the System of National accounts especially in Supply Use Tables. Ministry of Statistics & Programme Implementation has to take lead in the following terms:

(i)

(ii) (iii)

(iv)

Immediately set up system for compilation of Supply Use Tables for each year it brings out its estimates of GDP growth. Even quarterly estimates should also be compiled using SUT to ensure consistency and regular

Validation of quality of estimates released. Should take up compilation of GDKP each year and release it along with GDP and other aggregates following the same calendar of release.

There is a need to improve the quality of services sector data in the system of National Accounts. Special surveys to get robust estimates of value addition in knowledge generation and knowledge dissemination should be taken up. There is a need to develop system for training of policy makers, statisticians and economists in use of GDKP and related aggregates for their policy analysis and policy making function.

emphasizing that this is a new measure and should be accepted at the highest level for

It is worth its adoption in United Nations so that it may become a metric to be generated by all the developed and developing economies.

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