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The Knowledge-based Economy: Trends and Implications for Pakistan

RUKHSANA KALIM and SULEMAN AZIZ LODHI

I. INTRODUCTION

Economic history has witnessed transformation from Agriculture based to Manufacturing based economies over the time. This transformation had its effects on social structure of the communities, as new types of jobs were created in the manufacturing industries, and new life styles of metropolitan culture evolved. A similar transformation is now taking place as; business has grown global over the last years, making the present business atmosphere further competitive, fast and fluid. Technological and political events taking place across the world affect us as strongly as something happening in our neighbourhood.

The two most recent and prominent developments of present times that have changed our economic activities are:

(1) Globalisation;
(2) Increase in Information and Communication Technologies (ICT).

Globalisation is most obvious, as the volume of global trade and products has expanded manyfold. The world economies are opening up to new world horizons. Developments in Information Technology has increased the pace of the events, bringing new products to markets from all over the world, increasing the global watch and reach of the organisations. As a result of this, the companies are forced to reduce the costs and product development time of their products.

Second prominent development taking place during this time is the increase in ICT. These ICTs (particularly Intranets/Internet) have provided new channels and means of acquiring knowledge and opened new doors of promising opportunities like e-business. Sharp decrease in cost of computer hardware and software, plus improvement in software development has been responsible for increasing number of firms using computers in their business processes. Computer has proved itself to be a revolutionary tool for management, its data and information processing capabilities has improved management in all domains.

Rukhsana Kalim is Associate Professor at the Institute of Leadership and Management, Lahore. Suleman Aziz Lodhi is Information Systems Manager at All-Pakistan Textile Mills Association (APTMA), Lahore.

"Knowledge centric" view of firm has lately emerged. "The economists, academics, and commentators agree that a firm can best be seen as a coordinated collection of capabilities that is somehow bounded by its own history. And limited in its effectiveness by its own current cognitive and social skill" [Prusak (2001)].

The "New Economic" system emerging in global arena presently has a growing share of "E-enabled and E-businesses". Productivity in manufacturing is increasing and a decline in factory jobs (as a share of total employment) is noted. Jobs in services sector are growing, as most of the industries and firms are organising work around technology. The sources of competitive advantage in "Old Economy" also called "Heavy Economy" like access to raw material, transportation routes, or customer markets, a large labour pool are now becoming less important. The new economic success factors are effective home-grown technological innovation and entrepreneurship. The most valuable input for the firm now is the skill and talent of their workforce, a pool of skilled workers is the most important industry locational factor. This emerging economic system due to its reliance on Knowledge is loosely defined as "Knowledge-based Economy".

The objective of this paper is to bring the topic of "Knowledge based Economy" in the focus of the research community in Pakistan. A detailed discussion on the Knowledge-based Economy in the world scenario is made. The paper also attempts to compare Pakistan's position among other developing countries in the Knowledge-based Economy. In the light of the discussion in depth, some policy guidelines may be suggested for Pakistan.

Paper is structured as follows: Section II highlights basic features of the knowledge-based economy. In Section III, relationship between knowledge and the economy is established in view of the available information. Section IV, presents some techniques to measure knowledge. Competitiveness of different countries is measured in Section V. In Section VI, some policy guidelines are suggested for Pakistan to compete in the New Economy. Finally Section VII concludes the major findings of the study.

II. KNOWLEDGE-BASED ECONOMY—SOME FEATURES

Five megatrends[1] have been introduced by Skyrme (1999) to describe the features of the knowledge-based economy by assuming that information and knowledge pervades in all sectors of industry as well as in all new industries based around them. The features observable in the knowledge economy are:

(1) Every industry is in the process of becoming more knowledge intensive.
(2) Smart Products are present that use information or knowledge to provide better functionality or service and can command premium prices.

[1]The term "megatrend" was first used by Naibitt (1982) to describe a fundamental underlying trend shaping the future.

(3) Higher information to weight ratios exists in this economy. For example, the financial value of United States exports has increased twenty times more, while the physical weight of goods exported is about the same.
(4) Value in intangibles: It means that the market value of most companies is several times higher than the value of their physical assets as recorded in their balance sheets. This is basically due to the role of intangibles, such as know-how, information systems, patents and brands whose value is not recorded by traditional accounting methods.
(5) Trade in intangibles grows in these economies.

Wyllie (1998) identifies thirty-three distinctive trends, each of which has potential ramifications for individuals, organisations and government.

The ANSI[2]/GKEC[3] (2001) Standards Committee which is working on American National Standards for Knowledge Management Vocabulary [ANSI/GKEC (2001)] agrees with OECD (2000) and perceives the knowledge-based economy as; which is directly based on the production, distribution, and the use of knowledge and information. A knowledge-intensive organisation involves intensive use of knowledge and individual professional members of the organisation have high levels of esoteric knowledge that cannot be widely shared, that is, such members are specialised and cannot readily be substituted for one another [OECD (2000)].

In a knowledge-based economy, the production of ideas, not goods, is the source for economic growth [Neef, *et al.* (1998)]. According to OECD (1996) "knowledge is now recognised as the driver of productivity and economic growth".

Trade benefits gained by the developing countries in the "Knowledge-based economy" would depend on the level of integration between their business processes and their trading partners around the world. Countries that are better prepared for the integration in world economy would be able to gain share in world exports. The job quality and structure would change as the economies are transformed into "Knowledge Economy". The OECD (1996) estimates that in advanced industrial societies eight out of every ten jobs are for knowledge workers. Jobs in manufacturing would be replaced by new jobs of "Knowledge workers" as the new business model matures.

III. RELATIONSHIP BETWEEN KNOWLEDGE AND THE ECONOMY

World Bank (2002) regressed knowledge and ICT composite indexes of some developing and developed countries to analyse the determinants of trade patterns for

[2]American National Standards Institute.

[3]Global Knowledge Economics Council is a not-for-profit organisation formed to discuss and select macro-, meso-, micro-, and firm-level plans, policies, and metrics to measure and increase efficiency of knowledge markets and the quality of knowledge at all levels.

the periods of 1979–99. A positive and non-linear correlation is found between "Knowledge and ICT and the level of development across countries. The fit of the regression is high for the ICT index ($R^2 = 0.8$). Results show that communications, computers penetration, and access to the internet are highly correlated with income per capita. The relationship for the knowledge index and development is also high. GDP per capita explains about 60 percent of the variance in the knowledge index ($R^2 = 0.6$).

An effort is also made by the World Bank (2000) to explore the determinants of trade structure around the world, with a special focus on the role of "new" endowments, including ICT and knowledge. Figure 1 shows the World export data and the relative share of product groups developed by Learner's 10 commodity aggregates (1995) for the periods of 1970 to 1999. It is seen that share of machinery exports has increased steadily over the years, the "capital extensive" group and "labour extensive" group does not show the same growth, but are rather on the same export level. Petroleum which is a natural mineral has also not gained any export share, over the years. Growth rate of machinery exports in world trade is the highest in all groups, while office machinery and word processing has the highest rate among all machinery products (Table 1).

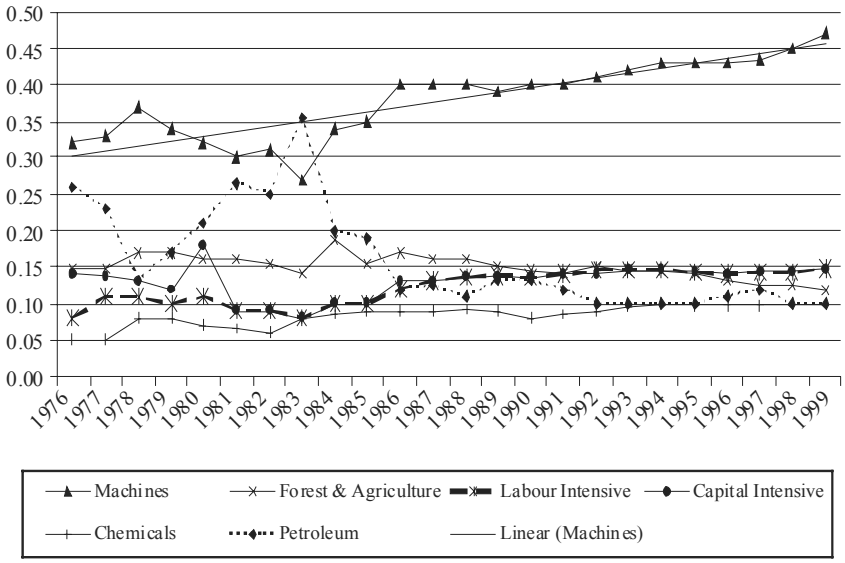


Fig. 1. Share of World Merchandise Exports, 1976–99.

Table 1

Growth of World Machine Exports, 1990–99

(Percentage)

Product	Annual Growth Rate
Arms	0.3
Metal Working	3.7
Specialised	3.9
Photography	4.4
General Industry	6.8
Road Vehicles	7.0
Other Vehicles	7.6
Power Generating	8.0
Professionals and Scientific Instruments	8.8
Telecommunications and Sound	9.7
Office and Data Processing	10.7
Electrical	11.9
Total	**8.2**

Source: World Bank (2002).

A similar picture is observed at micro-level, by Strassman (1999), where he measured "The Value of Knowledge" for Abbott[4] labs and showed that the portion of firm's capital in the form of Knowledge has increased over the years (see Figure 2 and Table 2)**.**

Based on the data it can be safely stated that the amount of "Knowledge Capital" maintained by the research and development firm has increased many times, and now a major portion of the firm Capital assets are in the form of "Knowledge".

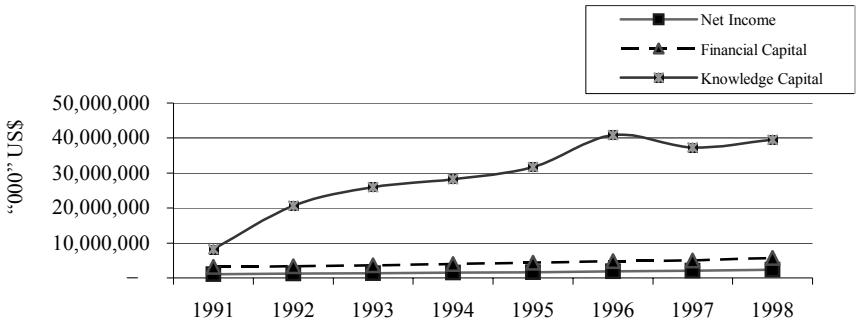


Fig. 2. Calculating Knowledge Capital.

[4]Founded in 1888 by Dr Wallace Calvin Abbott, a Chicago physician, Abbott Laboratories is a broad-based health care company. Its principal businesses include pharmaceuticals and medical products, including hospital-based medicines and devices.

Table 2

Calculating Knowledge Capital Abbott Labs

(Income in Thousands $)

Year	Net Income	Financial Capital	Interest Rate %	Knowledge Capital
1991	1,088,745	3,202,987	9.54	8,209,434
1992	1,239,057	3,347,641	5.16	20,665,092
1993	1,399,126	3,674,929	4.72	25,967,571
1994	1,516,683	4,049,400	4.69	28,289,257
1995	1,688,700	4,396,847	4.68	31,686,486
1996	1,882,033	4,820,182	4.12	40,860,231
1997	2,094,462	4,998,677	4.95	37,313,687
1998	2,333,231	5,713,661	5.16	39,503,994

The Knowledge based organisations like Abbot Labs or software companies like Microsoft[5] must continuously introduce new products to stay competitive and maintain their market share. This requires the firms to build their Knowledge Capital by spending a considerable amount of money in R&D.

Sveiby (1997) has stressed on knowledge as the "New Organisational Wealth" of the companies and its importance as a strategic asset. Companies on realising this have started to monitor and manage the flow of knowledge in their internal processes.

This is where Knowledge Management (KM) enters the arena. It would not be appropriate to discuss KM in detail presently as we are basically concerned with development of Knowledge Economies. Earl and Scott (1998) listed several definitions of Knowledge Management Davenport (1996) and gives further suggestions. The definitions are similar and they all echo some common purposes of Knowledge Management, which are:

- *Creating* knowledge, i.e. Knowledge Management should support innovation;
- *Sharing* and *recycling* knowledge;
- *Capturing*—turning personal knowledge into organisational knowledge;
- *Reducing risk* of losing valuable knowledge; and
- *Creating value* from knowledge.

Management of Knowledge has proved to be not only cost effective, but a business edge for the companies. The savings made by effective flow of Knowledge is especially high for companies that have Knowledge centric processes or a geographically distributed setups.

[5]One of the largest software companies based in USA.

Shell[6], Chevron[7], and Siemens[8] are among the many companies that are implementing KM programmes to improve their management processes. Stemke (2001) stated in his presentation at APQC[9] conference that Chevron has adopted a new policy to improve flow of knowledge within the organisation. The programme has improved capital efficiency of the company by 10–15 percent, and the drilling time has reduced by 10–40 percent. Unnik (2001) claims the philosophy adopted by the Shell Group under KM programme as "working smarter instead of harder, working together for maximum benefit thus achieving breakthrough performance through people sharing and applying talents, learning's and resources globally". The benefits for Shell are at least 200 MM$/annum (based on a value review completed in 2000).

Similarly Alfeis, Muller, and Wagner (2001) of Siemens has claimed that International Revenue generated through Knowledge Exchange by Siemens in FY 99/00 has a total turn over of 146 million Euro.

Considering the direction of micro and macro indicators over the last few decades we should have sound reasons to believe that there is a shift in international economy towards Knowledge dependent exports. The economic development is now more reliant on the Knowledge of workers in a work place and position of a country in trade balance is linked to its "Knowledge assets".

IV. DEVELOPING A SYSTEM TO MEASURE INTANGIBLE ASSETS

One of the first publications creating awareness on the importance of Knowledge for the working of organisations was "Mobilising Invisible Assets" by Itami in 1980 [quoted by Sullivan (2000)] in Japan. Sveiby published his first writing "The Know-How Company" on managing intangible assets in 1986 [Sullivan (2000)] followed by a number of other publications.

The concept of maximising the usage of knowledge in organisations in Sweden was initiated by the work of Sveiby and Risling in 1986. Sveiby gave a theoretical framework for reporting intangible assets of an organisation, and coined the concepts of "Structural Capital" and "Human/Individual Capital", giving the idea that organisation sells knowledge created by their employees. Large departments in firms like accounting, computer or HR-departments can be viewed as "Knowledge

[6]Royal Dutch/Shell is multi-national Group providing services in the energy sector. Exploration and refining of oil and gas, R&D in renewable energy—from hydrogen, solar, geothermal and wind sources for power generation.

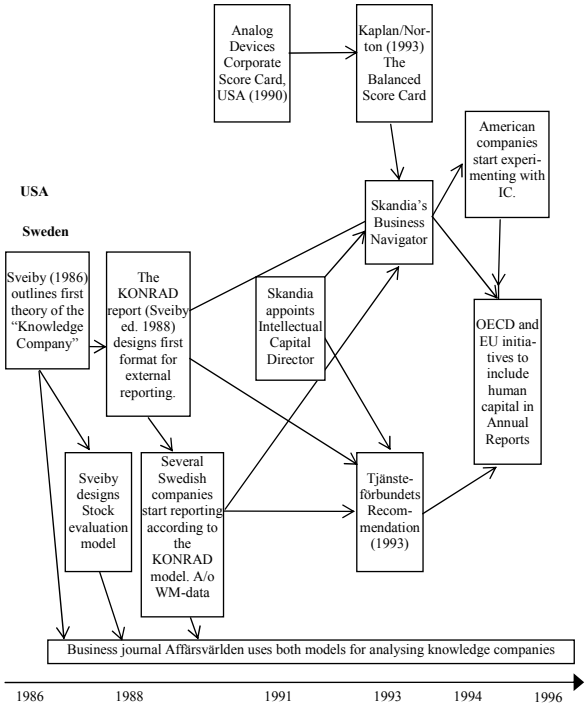
[7]Chevron Co.—Based in San Ramon, Calif., Chevron Products Co. is one of the largest refiners and marketers of petroleum products in the United States. It is also one of the top three asphalt sellers.

[8]Siemens—A multi-National company founded in Berlin. It is a global leader in electrical engineering and electronics. Delivering services across a broad industry groups including: information and communications; automation and control; power; transportation; medical solutions; components; lighting and financial services.

[9]American Productivity and Quality Centre.

Organisation". Consequently a number of firms in Sweden started implementing the concept [Svieby (2001)].

Figure 3 shows major developments that took place in Sweden and USA during 1986 to 1996 in the domain of measuring intangible assets (non-financial management information systems). The Swedish community has led the way for "Measuring Intangibles" in organisations. It is following two tracks; the PEI[10] is focusing on "Human Resource Accounting", and the other known as the "Konard track[11]" [Svieby (2001)]. The Konrad track of measuring intangibles is developed by a group of managers from different companies forming "Konrad Group". Purpose of measuring and reporting intangible assets by "Knowledge Organisations" was an effort for improving public reporting of the companies.



Major developments in measuring Intangible assets of an organisation in Sweden and USA
(Development in non-financial management information systems)
Source: Sveiby + Nilsson and Strand (1996).

Fig. 3.

[10]Personnel Economics Institute, School of Business, Stockholm University.

[11]A group of 7 persons from leading business organisations in Sweden decided to work on Intellectual Capital (I.C) issue. They formed the Konrad Group (the Group was called Konrad because it first met on November 12, 1987 - November 12 is Konrad Day in the Swedish calendar).

An important development was "stock evaluation model" based on the concepts by Sveiby in 1987, but it was for the internal use of business journal Affärsvärlden[12] (Model not published). The business magazine started analysing high knowledge based sectors like IT and consulting sector on the new concepts and using the model to give advice for selling or buying of stocks of companies listed at Stockholm Stock Exchange.

The Swedish Council for Service Industries recommended its member companies in 1993 to show human capital in their annual reports. The indicators were mainly based on the Konrad Group model with additional indicators from Skandia's "Business Navigator[13]". It was via Skandia's Business Navigator that Intellectual Capital assessment found their way into the USA and Canada. Some work on IC was done by Analog Devices Corporate in USA, but it was later that the Balanced Score Card (BSC) was developed by Norton and Kaplan in 1993 [Svieby (2001)].

As there is no unit for quantifying Knowledge, and it can not be measured directly, "indicators" and "ratios" were developed to measure "knowledge" (as human capital) and "knowledge flow" indirectly. The idea was further developed by other companies WM-data[14] and Skandia, companies started publishing "intangible asset" indicators with their annual financial statements.

New Knowledge indicating terms like number of employees, revenue-generating persons, employee turnover percent, seniority of staff were published in annual reports. There is no standard pattern or indictors for reporting human capital. Hence organisations are at liberty to develop the indicators which they prefer.

V. MEASURING COMPETITIVENESS OF A NATION IN KNOWLEDGE-BASED ECONOMY

Invest in Sweden Agency (ISA) is the first national investment organisation to measure corporate intellectual capital to assess country potential and compare nations' competitiveness. ISA considers that international investments will be increasingly determined by intellectual capital of nations.

ISA 1999 Report declares, "Intellectual capital forms the root of a corporation—and of a nation—that supplies the nourishment for future strength and growth. A new analytical method enables these previously unevaluated resources to be assessed and compared. This can be an important tool for selecting an international location for knowledge-based companies".

[12]It is a weekly business journal focused on companies and analysis of the entire stock market, including politics. With readership to primarily Swedish top management and financial analysts; a magazine for decision-makers. It has a circulation of 24,200.

[13]Skandia is a financial service company. It was one of the first companies to develop an integrated intellectual capital model called business-navigator. Intangibles were not shown in the balance sheet of companies previously.

[14] WM-data is an IT consultancy firm in Sweden, giving services to worldwide clients.

ISA has adapted the model of IC-Navigator[15] of Skandia company, and modified it to asses competitiveness of a country in Knowledge based economy. The five indicators identified for determining competitiveness of a country by ISA are:

1. renewal, development and innovation: the "power of innovation";
2. knowledge capacity: the "power of exchange of knowledge" at a national and international level;
3. human capital;
4. information technologies; and
5. investment in intellectual capital.

World Bank study (2002) present data on ICT and knowledge of different countries. Data can be used to depict the relative position of a country with respect to others in these key areas of development (Table 3).

Table 3

Indicators of ICT and Knowledge as a Percentage of the United States Levels

	Information and Communication Technology				Knowledge			
	Telephone Mainlines (Per 1,000 People)	Mobile Phones (Per 1,000 People)	Internet Host (Per 1,000 People)	Personal Computers (Per 1,000 People)	R& D As Share of GNI	R&D Scientists (Per Million People)	Patent Residents and Non-Residents (Per 1,000 People)	Patent Applica-tions in US (Per 1,000 People)
China	11.73	5.02	0.02	1.34	24.85	10.33	5.5	0.03
India	3.66	0.34	0.01	0.5	28.35	3.89	1.08	0.04
Korea, Rep	65.74	73.7	4.04	35.11	87.76	56.18	285.36	20.88
Thailand	12.77	16.08	0.38	4.61	5.63	3.01	9.61	0.09
Germany	83.29	21.08	70.72	61.74	87.76	76.32	232.99	34.86
Japan	79.03	18.4	151.66	51.83	108.02	138.52	371.8	72.87
United States	100	100	100	100	100	100	100	100
Low Income Countries	3.05	0.67	0.03	0.86	n.a	n.a	30.8	n.a
Middle Income Countries	14.78	12.51	0.85	4.89	33.62	18.02	35.83	n.a
High Income Countries	84.04	111.29	65.6	69.52	89.35	86.13	334.78	69.24*

Source: World Bank (2002).

n.a = Not Available.

* = Average of the corresponding countries included in this table.

Four indicators given in Table 3 show the level of ICT development in an economy and four are showing innovation activity. Most of the indicators are self-explanatory. Patent applications filed by nationals and non-nationals are indicator of both innovation activity and as a measure of the need and ability of a state to protect intellectual property. Mobile phones and telephones are indicators for measuring depth of connectivity in a country. Based on averages for 1995 to 2000 or 1990 to

[15]A model for assessing IC of an organisation, also labelled as Business Navigator.

1999 data show the country variables expressed as a percentage of the U.S levels (Table 3).

It is observed that among the developing countries Korea has the strongest indicators of ICT and Knowledge development, while other countries have shallow developments in this field. Korea spends almost as much as the United States on R & D. The other three Asian countries (China, India, and Thailand) show very low levels of knowledge and ICT development. Among developed countries Japan seems to proceed rapidly the knowledge-based economy as compared to Germany.

Data on science and technology and high tech. exports depict the relative position of Pakistan with its competitive countries (Table 4). The Science and Technology development indicators show feeble position of Pakistan when compared with other developing countries like China, India and Thailand. Korea has a stable development in Science and Technology and seems to be in a better position to compete in Knowledge-based economy. Low number of registered Trade Marks in Pakistan shows its level of commitment for intellectual property rights.

Pakistan has half the number of R&D Scientists and Engineers in India and 3 percent of the number of R&D Scientists and Engineers in Korea. Similarly, the Articles published in scientific journals in Pakistan (1997) are about 3 percent of Indian publications and 5 percent of Korea. The High Technology Exports also follow the same pattern as Pakistan's exports are not even comparable to the exports of China, India Korea, and Thailand (Table 4). India is spending a much higher percentage of GNI on R&D than China, while Korea is spending much more on R&D than any of its competitive countries. Where does Pakistan stand here?—We can not say anything due to lack of relevant data.

Overall, the High Technology exports of Low Income Countries are about 7 percent of their manufactured exports and for Middle Income group this figure is 16 percent where as for the High Income Countries the export percentage figure goes to 22 percent of manufactured exports.

As earlier mentioned, ICT plays an important role in the development and sustenance of Knowledge-based organisations. It is obvious from Table 5 that Korea has a stable development in this domain also, making the best record among the developing countries. Pakistan and India have similar development in communication channels like number of daily newspapers and radios (per 1,000 people). The personal computer usage is also comparable between the two countries. The gap starts at the number of internet users, Number of Internet users in Pakistan are 2 percent of the number of users in India. Number of secured servers in Pakistan is about 5 percent of that installed in India. Number of secure servers in China and Korea are much higher than that in Pakistan. ICT expenditure as a percent of GDP in 2000 is the highest in Korea (6.6 percent) followed by Chine (5.4). Unfortunately no such record is available for Pakistan.

Table 4

Science and Technology Development Indicators

Country Group	Scientists and Engineers in R&D (per Million People 1990–2000	Technicians in R&D per Million People 1990–2000	Science and Engineering Students % of Total Tertiary Level Students 1987–1997	Science and Technology Journals Articles 1997	Expenditure for R&D % of GNI 1989–2000	High-technology Exports		Royalty and License Fees		Patent Applications Filed		Trademark Applica-tion Filed
						$ Millions 2000	% of Manufactured Exports 2000	Receipts $ Millions 2000	Payments $ Millions 2000	Residents 1999	Non-Residents 1999	
China	459	187	43	9,081	0.06	40,837	19	80	1,281	146	52,202	165,122
India	158	115	25	8,439	0.62	1,245	4	83	306	14	38,348	66,378
Pakistan	**78**	**14**	**32**	**232**	**–**	**30**	**0.0**	**6**	**28**	**–**	**–**	**7,762**
Bangladesh	51	32	47	130	–	4	0	0	4	32	184	–
Korea, Rep	2,139	574	32	4,619	2.7	53,950	35	688	3,221	56,214	76,913	87,332
Thailand	102	75	18	356	0.10	13,949	32	9	710	477	4,594	22,439
Low income	**–**		**28**	**13,565**	**–**	**5,766**	**7**	**105**	**1,108**	**7,027**	**1,342,958**	**–**
Middle income	**818**	**255**	**39**	**61,733**	**–**	**150,982**	**16**	**1,768**	**9,956**	**90,268**	**1,578,263**	**–**
East Asia and Pacific	496	193	43	14,817	0.88	100,485	25	784	5,409	56,541	298,643	–
Europe and Central Asia	2,212	478	44	34,905	0.83	15,567	10	313	1,753	35,952	1,373,268	–
Latin America and Carib	287	–	30	10,075	0.58	40,497	16	501	2,666	3,618	284,873	–
Middle East and N. Africa	–		29	3,106	–	–	1	106	614	1,008	6,364	–
South Asia	158	114	24	8,896	0.62	–	3	87	338	14	79,611	–
High Income	**3,344**		**25**	**437,339**	**2.30**	**847,043**	**22**	**70,321**	**62,988**	**713,112**	**3,256,586**	**–**
Europe	2,141	951	38	117,764	1.97	277,585	16	11,019	23,422	123,795	1,652,255	–

Source: Science and Technology—World Bank Indicators 2002.

On aggregate, the total number of secure servers is respectively 279, 5,573 and 115,650 in Low Income, Low and Middle Income, and High Income countries (Table 5). The data show that Pakistan has a lot do if it wants its businesses to compete in international trade in the New Economy.

VI. GUIDELINES FOR PAKISTAN

One of the major obstacles in assessing precisely the Pakistan's comparative position among other countries in the knowledge-based economy is non availability of data on key parameters without which effective planning can not take place. However, some of the future policy guidelines may be suggested.

- **A Comprehensive Strategy Based on Research and Sound Economic Principles is Needed**

As stressed in the objectives of the paper extensive research is needed on the topic to explore how the development of knowledge-based economy is going to affect Pakistan's trade balance, jobs structure , life-styles, emerging businesses and especially the new competitive advantage in global business.

- **Facilitate Use of ICT in Businesses and Government Sector should be Facilitated**

We have discussed a shift in world economy towards Knowledge-based products. Globalisation and developments in ICT has changed the business scenario. International trading partners should have their systems upgraded for better communications with EDI [Electronic Data Interchange] standards. A decision-maker in a large buying house in Europe or USA would compare the price and quality of product that he intends to buy from Pakistan, China, or India. He would prefer to trade with a business that has a better EDI integration with his system. A better EDI means less paper work and time saving for the buyer, which would ultimately result in cost savings for the buyer.

- **Investment in Human Capital**

Investrnent can facilitate in adjusting to the Knowledge-based economy by providing a stable macro policies for "human capital development". Quantity and quality of research journals published by the universities need to be improved. This implies that funds for research and development must be increased sufficiently. Use of computers in education and link between scholars and researchers in R&D of different universities and industrial organisations must be improved.

The digital divide between those who have internet access and those without it be reduced by facilitating ICT development. Liberalising telecommunication industry and promotion of e-business and e-government with lowering telecommunication costs will help in promoting national and international trade.

Table 5

ICT Development Indicators

Country Group	Daily News-paper (Per 1,000 People) 1998	Radios (Per 1,000 People) 2000	Television * in 2000		Personal Computers * per 1,000 People in 2000	Personal Computers Installed in Education in 2000	Internet				ICT Expenditure	
			Set per 1,000	Cable Subscribers per 1,000			Users Thousands * in 2000	Service Providers Charge $ in 2001	Telephone Usage Charge $ in 2002	Secure Servers in 2001	% of GDP in 2000	Per Capita in 2000
China	–	339	293	61.1	15.9	1,539,843	22,500	7	0.14	184	5.4	46
India	48	121	78	38.5	4.5	161,014	5,000	10	0.18	122	4	18
Pakistan	**30**	**105**	**131**	**0.1**	**4.2**	**–**	**134**	**13**	**0.20**	**6**	**–**	**–**
Bangladesh	53	49	7	–	1.5	–	100	17	0.33	1	–	–
Korea, Rep	393	1,033	364	177.4	237.9	405,492	19,040	8	0.00	345	6.6	641
Thailand	64	235	284	2.5	24.3	225,832	2,300	9	0.75	116	3.6	71
Low Income	**42**	**156**	**91**	**–**	**5.1**	**–**	**9,337**	**33**	**0**	**279**	**–**	**–**
Middle income	**–**	362	275	52.6	33.1	**–**	87,311	17	0	5,294	**–**	**–**
East Asia and Pacific	–	306	252	52.4	21.7	–	51,943	20	0	940	–	–
Europe and Central Asia	102	448	380	–	45.4	–	14,648	15	0	1,694	–	–
Latin America and Carib	71	413	269	20.1	43.6	–	19,086	–	–	2,185	–	–
Middle East and N. Africa	33	277	172	–	31.2	–	1,864	27	0	67	–	–
South Asia	8	112	75	37.8	4.2	–	5,413	13	0	135	–	–
High Income	**285**	**1,280**	**641**	**173.8**	**392.7**	**–**	**269,821**	**11**	**1**	**115,650**	**–**	**–**
Europe	209	811	568	127.2	267.3	–	65,863	–	13	11,741	–	–

Source: Information Age—World Bank Indicators 2002.

- **Reinforce Economic and Social Fundamentals**

In a Knowledge-based economy Government should pay high priority for ensuring that benefit of growth are shared by all, knowledge capital is very fluid it moves out of countries that do not have a retaining capacity for it. Labour laws and intellectual property rights may be implemented strictly to ensure a fair return to knowledge workers.

Private sector organisations would also have to change their work practices to compete in Knowledge Economy. The foremost effort should be to improvement working conditions and compensations for the "knowledge-worker". Equally important is the improvement in our management systems to raise it to international standards. This would include implementation of ISO certifications relating to management, environment and social accountability.

VII. CONCLUSIONS

The paper has discussed in detail the features of the knowledge-based economy and the progress of world economies towards stepping into the new economy. The discussion has revealed that the global knowledge revolution, led by information and communications technology, is at the doorstep of all countries. In case of Pakistan, this door has to be open to turn ideas and technologies into competitive businesses. The share of high technology exports to manufactured exports in the world is rising. Pakistan must adapt to the business norms of the new economy so as to integrate its businesses in international trading system; otherwise Pakistan is at risk of loosing even its present share of world exports.

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Comments

The choice of topic by the authors is very timely. As of today, Pakistan faces a number of challenges both at governance and economic levels. On the one hand, information communication and technology (ICT) thrives in the globalisation phenomenon to its fullest. On the other, WTO and its trade liberalisation regime challenges to open up world markets for international competition. Development of an indigenous knowledge base becomes the sole source of long-term survival of a nation in the years ahead.

Though the paper discusses the history behind the idea of "the Knowledge-based Economy" with Sweden's example in focus, yet when it super-imposes the same idea on Pakistan while the trends and implications are not fully analysed. Most of the comparisons and statistics just highlight the supply side of ICT where the focus should have been on the demand side—like the type of knowledge and technology is to be used in specific sectors or industries of the country, or by answering how the need for intellectual capital is to be fulfilled using indigenous resources and local knowledge. My humble advice is that a case study on Pakistan from a specific sector would have sufficed.

Undoubtedly, the theme of the paper was excellent focusing on development of human resources and adding them as intellectual capital both in the measurement of state-of-economy and a resource-of-a-company respectively. The intellectual capital barometer shows us the exiting delicacy, between the developed and the developing countries, given birth to nomenclatures like "Digital Divide" and "Development Deprivation".

May be due to lack of time, the recommendations by the authors are of very general nature where specifications are direly required. Again the domestic problems which Pakistan face for the promotion and development of intellectual capital are undermined.

In Pakistan awareness about intellectual property and intellectual capital in non-existent and endangered. There is no sense of awareness how to promote local and domestic knowledge and promote it into a profitable business. To the extent the higher education level is totally influenced by foreign perspectives and examples. There has been no serious effort done to customise or indigenise the knowledge-base according to local needs.

In Pakistan there its hard to find practice and theory in one individual. Knowledge has become a mere source of verbosity to impress others whereas one has never practiced. I would like to given one open example. In every city of Pakistan there are thousands of self-made motor-mechanics without any formal education vs. Japan which has become the leading exporter of motor-vehicles just by tapping its intellectual capital. Another example is of marble and granite industry on

which the economics of Greece and Italy base today vs. Pakistan which has all the resources of natural stone but due to the business in the hands of people who are not formally educated, the sector faces serious troubles.

The fate of a nation is in the hands of every national—as rightly said by Iqbal years ago is the only way of survival. Practice and theory must be united only then real intellectual capital development can take place in Pakistan. And this revolution must take place at the grass-roots level which in, simple word means making a mason an architect through formal education and contributing in development of knowledge through R&D, not mason becoming an architect by default over the years.

Last but not least, I will request the authors to expand the scope of this excellent study which will become a very valuable and unique research work drawing comparison between the state-of-economic-development and domestic knowledge-base.

Yousaf Haroon

National Post-Graduate Institute of Telecommunications
and Informatics,
Islamabad.