

## **A Strategic Tool for Managing Intellectual Capital of Pakistan**

KAMRAN YOUSEF SANDHU, SULEMAN AZIZ LODHI,  
and AHMAD ZOGO MEMON

In the post-industrial world, the Intellectual Capital (IC) of nations has become critical for wealth and value creation. In this era of knowledge-based economy, one real challenge that a nation faces is maintenance of its economic growth and its competitiveness in the international market. Policy-makers presently need to have a strategic management tool to measure and develop IC assets of a country. The paper extends the framework of Skandia Navigator [Edvinsson and Malone (1997)] from the corporate to the national level and develops a tool on the extended framework to visualise the intellectual capital of Pakistan.

The Intellectual Capital of a country is indirectly visualised through various indices. These indices change from year to year, not necessarily in a consistent manner, so that having a general view would be baffling. To overcome this limitation, this paper proposes three methods of measuring the change in IC based on Financial Index (FI), Human Index (HI), Process Index (PI), Market Index (MI) and Research Index (RI). These tools produce composite IC indices for Pakistan (2005-2010) that can be useful for the development of national policies.

*Keywords:* Intellectual Capital Measurement, Knowledge Management, Strategic Management, Pakistan Economy

### **1. INTRODUCTION**

The phenomenon of globalisation has stiffened competition among industrial countries, while the emergence of information technology has accelerated the shift towards innovation-driven societies [Bismuth and Tojo (2008)]. Intellectual Capital provides the foundation for socio-economic development and value creation for modern societies. It determines the competitiveness of a country by linking key resources for national wealth creation and represents the strength of a nation [Malhotra (2003)]. As the dynamics of nation's economy are shifting towards knowledge orientation instead of natural resources, the importance and significance of intellectual capital is growing. There is now an immediate need to evaluate the measure and map the IC for countries, regions, cities [see Pomeda, *et al.* (2002); Bontis (2004); Bonfour and Edvinsson (2004); Lerro, *et al.* (2005); Pascher and Shachar (2005)].

Kamran Yousef Sandhu <sandhuonly@hotmail.com> is Project Director/Principal of Pakistan Readymade Garments Technical Training Institute (PRGTTI)/National College of Business Administration and Economics (NCBA&E), Lahore. Suleman Aziz Lodhi <sulemanlodhi@yahoo.com> is Head of Department, Business Administration, Leads University, Lahore. Ahmad Zogo Memon <azogo.memon@gmail.com> is Professor, Statistics Department, National College of Business Administration and Economics (NCBA&E), Lahore.

*Authors' Note:* The authors are grateful to Dr Rashid Amjad, Vice-Chancellor/Editor *PDR*, Pakistan Institute of Development Economics, Islamabad, for his valuable comments in improving this paper.

Roos, *et al.* (2005) explains that in the era of knowledge economy business resources comprise 20 percent tangible value and 80 percent intangible value. It is argued that focusing on tangible assets of a country and ignoring the intangibles slows down or even stops the economic growth of a country. Moreover, contemporary measurement techniques used for economic development are focused on the financial aspects alone and ignore the intangible aspects of national wealth. The paper advocates the inclusion of intellectual capital as a regular feature of annual development reports.

There is no consensus yet on the definition of IC, its measurement and management. A number of methods and classifications of intellectual capital were developed during the last twenty years, but as a scientific approach, the field of national IC is still in a formative stage. As the world's economy is transforming from industrial to knowledge-based societies, it is important for Pakistan to get into this era by orienting its IC management towards competitiveness not only in the region but also in the developed world.

## 2. CONCEPTUAL FRAMEWORK OF THE STUDY

The Intellectual Capital of a country is indirectly visualised through various indices. These individual indices may change from year to year not necessarily in the same direction making it difficult to form a general view. For example, an analysis using five years data covering 2005–2010 shows that the Human (HI) and Research (RI) indices in Pakistan are increasing, while the Financial (FI), Process (PI) and Market (MI) indices are decreasing. To overcome this limitation, this paper proposes three methods that are based on these five indices.

The study follows a three-stage process to achieve this end: in the first stage, Skandia Navigator which is a recognised strategic management tool used in corporate sector is extended for measuring the IC of nations. Then country specific indicators are developed for measuring the IC assets for Pakistan and finally, in the last stage, a composite index is developed and weighted data of five years is plotted to visualise the IC performance of the country.

The secondary data for the study is collected from various official sources such as the *Economic Survey of Pakistan 2009-10* of the Ministry of Finance, publications of the Federal Bureau of Statistics, Ministry of Science and Technology, State Bank of Pakistan and the Higher Education Commission. Data has also been collected from reputed databanks like WDI, ILO, and CIA Fact book.

## 3. LITERATURE REVIEW

IC is being viewed by researchers in different perspectives. Machlup (1962) coined the word “intellectual capital” and has used it to highlight the importance of knowledge as essential for growth and development. The intellectual capital thought is further expanded and built on by Drucker (1993) in his description of the post-capitalist society. Drucker highlights the importance and the advent of a society that is dominated by knowledge resources and the competitive landscape of intellectual capital allocation. Stewart (1994) describes IC as something that is intangible but is still important. Moore (1996) notes IC as customer capital, innovation capital and

organisational capital. While Edvinsson and Malone (1997) explain Intellectual Capital as “realising your company’s true value by finding its hidden brainpower” and define IC as the sum of knowledge, information, intellectual property, expertise and human mind’s creative ability which could be converted into value. Edvinsson while developing the IC model explains that Skandia defines IC as the possession of knowledge, applied experience, organisational technology, customer relationships and professional skills that provide a competitive edge in the market. As the domain is still in its emergent stage, researchers are giving their own nomenclature to IC [Luthy (1998)], but mostly researchers agree that IC includes hidden values of company, region and country in the form of knowledge.

For IC measurement, there are four approaches [Luthy (1998); Roos, *et al.* (2005)]. One approach identifies and evaluates different components of IC in terms of money. The other multiplies excess percentage of return on assets with company’s average tangible assets to calculate extra annual earnings. Then the value of IC is calculated on dividing these extra annual earnings by company’s average cost of capital. The third approach focuses on cost and tries to compute the IC through the difference between market and book value. Another approach calculates a composite index of IC after identifying and reporting different components on a scorecard.

World Bank (2008) KAM has been developed under the Knowledge for Development Programme. The objective of KAM is to find out challenges and opportunities for countries so they will continue to move towards a knowledge-based economy. To measure the performance of a country, four Knowledge Economy pillars have been developed. These are—Economic Incentive and Institutional Regime, Education, Innovation and Information and Communications Technologies. There are 83 structural and qualitative variables for 140 countries of the world. Variables are normalised on a scale of 0 to 10 relative to other countries in the comparison group. The OECD (2001) Science report recognises that investment in knowledge is by nature much more difficult to measure. A rough indication can be gained by including public and private spending on higher education, expenditure on R&D and investment in software. Malhotra (2003) explains that “In the formative phase of developing theoretically sound measures, OECD interprets the inputs rather than outputs or outcomes as representative of a knowledge-based economy”.

There are also some other models which are at their conceptual stage. These models may be helpful in the future for developing IC measurement frameworks and related indicators for regional and international comparison of socio-economic development. UNECE conducted an assessment of existing practices and methodologies for valuing intellectual capital. The objective was to support the innovation and commercialisation of knowledge assets. The assessment focused on appraisal of intellectual assets (inventions), intellectual property rights (patents), valuation of managerial flexibility, stock market valuation of companies, and R&D project valuation [UN (2003)]. The recommendations were for sustainable innovation and value creation process. The valuation process examined the human resources as an innovative domain and recommended that more focus was required for the same. The eEurope national knowledge assets measurement models focus on forming an information society which is based on knowledge sharing and generation. Their focus is on the digitisation for the

public sector. To get customer trust, their priority is to develop an innovative entrepreneurial culture and a socially inclusive process to support the subject. The European KM Forum tool describes itself as “the initial concepts for assessing the maturity of organisations towards KM”. This model gives more importance to human motivation and commitment as this has been ignored in many other models. Interestingly, it also focused on the human motivation issues that have been generally neglected in other tools for knowledge assets’ measurement. Moreover, most metrics and indicators from this forum are yet to be developed based upon a very comprehensive knowledge audit questionnaire. The definition of ‘e-readiness’ is the extent to which a market is conducive to Internet-based opportunities to demarcate areas where government policy can guide investment for growth. To compare and appraise the e-business, the Economic Intelligence Unit has developed a comparative index ranking system. Popular interest in Internet and Web-based interconnected infrastructures started with the worldwide discussions on development of National Information Infrastructures in early 1990s [Malhotra, *et al.* (1995)]. It is evident in World Bank and OECD studies that there are many overlaps in the indices and indicators used in these comparisons with the structural and process aspects of ICT infrastructures. On the other hand, ICT represents one of the structural inputs that must be leveraged by human appropriation and utilisation for performance [Hildebrand (1999)].

#### 4. IC MEASUREMENT TOOL FOR PAKISTAN

There are various perspectives from which national wealth can be accessed, for instance the status with regard to education, health, ICT, poverty, and gender empowerment [Bontis (2004)]. The underlying framework is based on the scorecard approach in which IC components are identified and reviewed for better decision making. As Skandia Navigator is a strategic management tool, we firstly need to define the vision of a nation in order to determine the development path for the country. This vision is taken from the directions given by the founders of the nation. Secondly, the socio-economic progress of the country on the development path is measured. This progress is determined by measuring the IC indicators on five facets. The combined result of the five indices gives a scorecard picture of the country progressing towards its vision. Pakistan came into being with the vision of welfare state, in which there will be no discrimination and the state will have a modern infrastructure to compete with the rest of the world. But the current situation reveals that we have deviated from that vision. Pakistan is suffering from chronic bad governance, which has resulted in grave policy imbalances. The lack of alignment of the policies with the needs of the system, has resulted in corruption, inflation, shortage of energy, water and many other problems. No doubt Pakistan has set millennium goals for its success but the question is whether the policies and methods adopted can achieve the goals and whether these have any relationship with the original vision set by the Father of the Nation.

The concepts with regard to the indicators discussed in this paper are given below. The selection of components relevant to an indicator has the endorsement of a number of experts in various business organisations.

#### 4.1. Financial Capital Indicators

Financial capital reflects the tangible economic achievements of a country. It can be measured using indicators such as GDP, the structure of industry, workforce, growth rate of services and products per year, etc. To derive the Pakistan National Financial Index (PNFI), the real growth rate of GDP, exports, federal government's revenue receipts, gold and foreign exchange reserves and the growth of the manufacturing sector (percent of GDP) have been selected as the *five* vital components of the economy of Pakistan.

#### 4.2. Market Capital Indicators

The market capital of a country reflects the relationship of a country with its trading partners in terms of exports and imports. It presents a country's capabilities to provide competitive services to its clients compared to other competing countries. The indicators selected to measure the Market Capital of Pakistan are balance of trade, foreign direct investment, tourism, and workers' remittances etc. Foreign relations play an important role in the economy of a country. To derive the Pakistan National Market Index (PNMI) *five* indicators have been selected. Bontis (2004) explains that market capital is the social intelligence which is being created by elements such as laws, market institutes and social networks. He also holds that it is basically a social capital backed by foreign relations that is attained through satisfying the other country's needs and demands.

#### 4.3. Human Capital Indicators

Bontis (2004) describes human capital as the knowledge, competence and education of individuals in realising national tasks and goals. It is obvious that the economic growth of a country is closely associated with the development of human capital. A higher literacy rate helps to adopt new technologies, new ideas, research and development etc. Along with that the health and earning power of the human resource also reflect the standard of living. For Pakistan National Human Index (PNHI), *five* indicators have been selected which are employed total, expenditure on education as percent of GDP, women empowerment, health expenditure as a percentage of GNP and literacy rate. Bontis (2004) stated that the human capital of a country begins with the intellectual wealth of its population OECD (2001). The concept of intellectual wealth is versatile and includes knowledge about the facts, laws, principles along with less defined knowledge of teamwork and communication skills.

#### 4.4. Process Capital Indicators

Process capital represents the infrastructure of a country. Pakistan's growth is based on agriculture, manufacturing and services sector. Secondly, it's economy is in a transition stage from agriculture to manufacturing and then to services. *Five* indicators here have been selected keeping in mind the transition stage factor. These indicators selected for Pakistan National Process Index (PNPI) are agriculture sector growth as percent of GDP, water availability, services sector growth, IP broad band consumption/inhabitants and electricity/power.

#### 4.5. Renewal and Development Capital

Renewal and Development capital is defined as a nation's real investment to increase its future competitiveness. This includes investment and support to research and development programme, higher education, patents etc. Four indicators selected for Pakistan National Research Index (PNRI) are growth in number of PhDs, number of patents registered with Pakistan, citable documents, development and non-development expenditure on higher education.

### 5. DEVELOPING PAKISTAN INDICES FOR IC

Maintenance of the official statistics is the responsibility of the Bureau of Statistics and the State Bank of Pakistan. Consistent yearly data is required for scholars and policy-makers for further analysis and making development programmes. But unfortunately, some social and economic indicators which are being used by other nations have not been added into the data bases of Pakistan. This generates a gap in understanding the current situation and status of the economy. However, to complete the research, we have data (Appendix I) taken from *Economic Survey of Pakistan*, State Bank of Pakistan, Federal Bureau of Statistics, Water and Power Division of Pakistan, Intellectual Property Organisation, *The Global Competitiveness Report 2009-10* and *SCImago Journal and Country Ranking* etc. This study is quantitative and is based on six years' data. The six-year period was selected because it presents long-term planning of the project being initiated.

#### 5.1. Proposed Methods

We develop the year-wise PNFI, PNMI, PNHI, PNPI and PNRI of IC following three approaches (without reference to their limitations in this section). First we consider the information on a component with the unit in its current form and linearly mix the relevant components attaching specified weights. The percentage change in the yearly weighted component over the base period 2005 is computed to measure the change in the IC. The second option considers the percentage change of each component over its value in the base period 2005 and then a weighted composite index for IC is computed. The third option is similar to the second method with equal weights. These methods are likely to produce different perceptions but the choice of an option calls for rational support. Appendix III shows the individual graphs depicting the percentage change of each component relative to its value in the base period 2005.

The choice of a weight to reflect the importance of a component in an indicator is a debatable subject but as a principle of Scandia Navigator, weights are assigned in view of importance and the degree of an indicator's value. For our study, these weights (given in Appendix II) were formulated through direct consultation with more than 20 experts from different organisations such as the Chamber of Commerce and Industry, associations, statisticians and academicians.

##### 5.1.1. Pakistan National Financial Index (PNFI)

To derive the Pakistan National Financial Index, five indicators have been selected. These indicators have been selected after detailed discussion with field experts. Table 1 outlines the summary of these indicators using information provided in Appendices I and II, while Figure 1 gives its graph in three different methods with weights assigned to all the indicators. The highest weight has been assigned to exports on the basis that the financial capital will improve with increase in exports.

Table 1

*Pakistan National Financial Index (PNFI)*

Years	Option 1	Option 2	Option 3
FY05	0	0	0
FY06	0.079	-0.027	-0.028
FY07	0.314	0.114	0.106
FY08	0.107	-0.066	-0.071
FY09	-0.018	-0.182	-0.176
FY10	-0.030	-0.116	-0.106

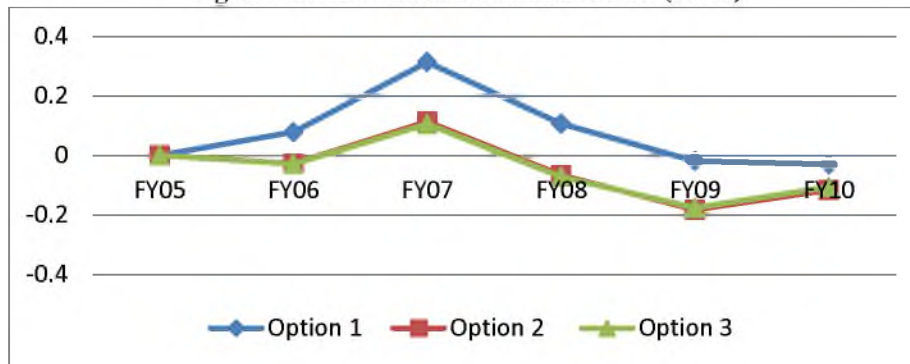
**Fig. 1. Pakistan National Financial Index (PNFI)**

Figure 1 shows a nearly perfect consistence in the trends by the last two options. All three options display similar trends in PNFI. The decline in this index from 2008 till 2010 may be attributed to the war on terrorism and energy crisis affecting exports, revenue collection, decrease in gold and foreign exchange reserves and industry value added.

**5.1.2. Pakistan National Human Index (PNHI)**

For Pakistan National Human Index, the five indicators 'labour force, expenditure on education, women empowerment, and health expenditure and literacy rate were used to compute Table 2.

Table 2

*Pakistan National Human Index*

Years	Option 1	Option 2	Option 3
FY 2005	0	0	0
FY 06	0.034	-0.003	-0.003
FY 07	0.206	0.101	0.101
FY 08	0.335	0.153	0.153
FY 09	0.516	0.151	0.151
FY 10	0.613	0.188	0.188

**Fig. 2. Pakistan National Human Index (PNHI)**

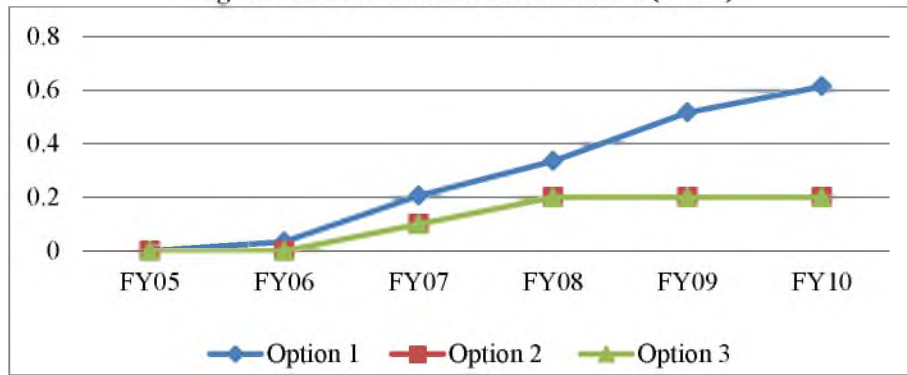


Figure 2 reveals the growing PNHI by both methods.

**5.1.3. Pakistan National Market Index (PNMI)**

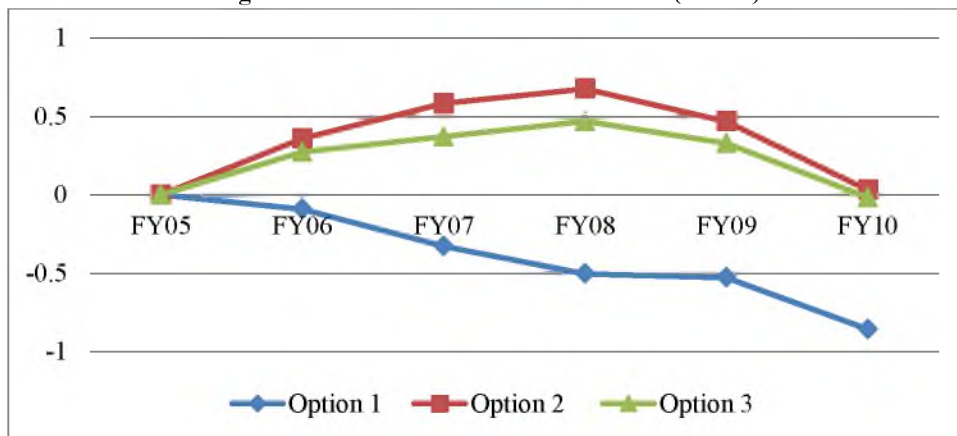
To visualise Pakistan National Human Index over the years, the four indicators in Appendix I and the information on weights in Appendix II go to make up Table 3 and Figure 3.

Table 3

*Pakistan National Market Index (PNMI)*

Years	Option 1	Option 2	Option 3
FY 2005	0	0	0
FY 06	-0.092	0.358	0.272
FY 07	-0.329	0.584	0.370
FY 08	-0.505	0.675	0.469
FY 09	-0.529	0.467	0.328
FY 10	-0.859	0.031	-0.018

**Fig. 3. Pakistan National Market Index (PNMI)**





#### 5.1.4. Pakistan National Process Index (PNPI)

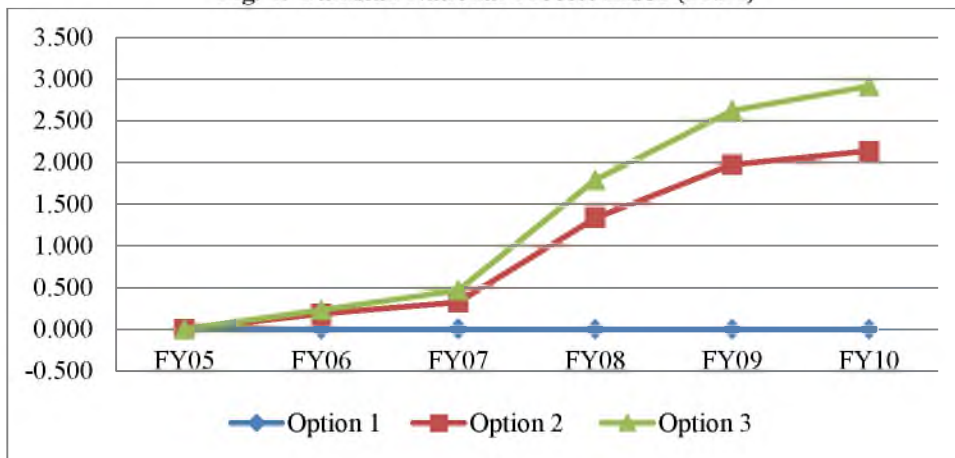
Pakistan National Process Indices are given in Table 4 and Figure 4.

Table 4

*Pakistan National Process index*

Years	Option 1	Option 2	Option 3
FY 2005	0.000	0	0
FY 06	0.000	0.186	0.229
FY 07	0.001	0.321	0.466
FY 08	-0.002	1.332	1.787
FY 09	-0.001	1.971	2.619
FY 10	-0.002	2.137	2.911

**Fig. 4. Pakistan National Process Index (PNPI)**



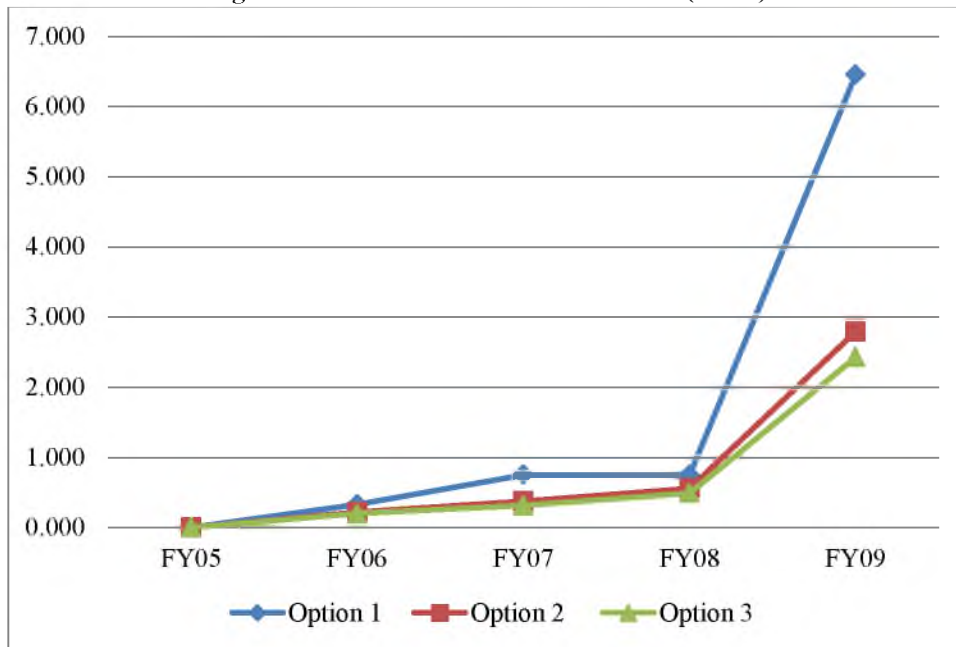
#### 5.1.5. Pakistan National Research Index (PNRI)

For Pakistan National Research Index, the four components are 'growth in number of PhDs, number of patents registered with Pakistan, citable documents and development and non-development expenditures on education. Table 5 outlines the results on these indices based on information in Appendices I, II.

Table 5

*Pakistan National Research Index*

Years	Option 1	Option 2	Option 3
FY 2005	0.000	0	0
FY 06	0.326	0.220	0.200
FY 07	0.749	0.373	0.312
FY 08	0.747	0.553	0.488
FY 09	6.453	2.788	2.427

**Fig. 5. Pakistan National Research Index (PNRI)**

## 5.2. IC Management Tool for Pakistan

The prime purpose of the research is to give an idea how the five broad IC indices have been undergoing changes from 2005 onward. Essentially these measures are useful for strategic planning and policy development for the uplift of the country's socio-economic status. The five indices relating to IC, that is, PNFI, PNMI, PNHI, PNPI and PNRI when viewed simultaneously send a message, a concern and a guideline. Below, for the convenience of readers we present this information on indices developed in Figure 7.

These indices capture the effects of government policies and the effects of crises that Pakistan has been a victim of. PNFI exhibits the financial performance from year to year with year 2005 as a base. Similarly, PNMI, PNHI, PNPI and PNRI provide a comparative picture in their spheres of activities through the years.

Each indicator is based on three to five relevant components. Three methods were initiated to consolidate each basket of components to compare performance of a specific activity with what its position was during the year 2005. The first method uses information on a component in its unit, the weightage is given and indices for comparison computed. The other two methods first express the percentage change in the component relative to 2005, and then the weights are assigned. The units essentially influence an indicator and in some cases may distort the comparison. As for the other two methods, the second option appears more realistic in measuring a change.

The second option seems most appealing in measuring the change in each PN indicator relating to IC. We provide below a graph showing year-wise information on these PN indicators to afford simultaneous comparison of their performance.

**Fig. 7. IC Management Tool for Pakistan Reflecting Socio-economic Status (Option 2)**



## 6. PRACTICAL IMPLICATIONS

Policy-makers are now beginning to understand the true impact of globalisation, as businesses integrate into networked economies around the world. The experience is relatively new for the policy-makers as they grasp the underlining dynamics of how recession in one country could cause an even larger recession in another country at the other end of the globe. They are now also becoming more aware of the interdependent nature of national policies. Initiatives taken to improve literacy under education policy are beneficial not only for health related initiatives, but they also strengthen economic activities in a region. Similarly, foreign policy of a country cannot work in isolation; it will have corresponding effect on the country's trade policy.

The increasing interdependency in the global environment requires that policy-makers adopted management tools that could handle the connectivity and complexity of the emerging challenges. This research is based on six years data using Skandia Navigator as the reference framework, and designed for Pakistan proposing three options to measure change in PNFI, PNMI, PNHI, PNPI and PNRI (Figure 7) that can be used to visualise the economic performance of a country and the status of the processes on which the economic performance is dependent. It provides the status of the integrated economic linkages at the specific country level. Policy-makers with an understating of these linkages would be able to use the resources of a country more effectively as they would be able to give importance to tangible as well as intangible assets of a country. The economic managers would have to admit that planning for economic growth in isolation is no longer applicable; they would have to pay equal attention to processes, and human factor indicators at the same time. The IC of a nation is the combined effect of these

assets that results in better well being of a country. This tool can be used by the Government of Pakistan to measure the socio-economic performance and to determine the strength and weakness of the country for better decision making.

## Appendices

### Appendix I

#### Business and Economic Data for 2005–2010

Table 6

##### *Pakistan National Financial Index Indicators*

Years	GDP-Real Growth Rate	Export-fob (Billion US\$)	Total Revenue as % of GDP	Gold and Foreign Exchange Reserves Million US \$	Industry Value Added (% of GDP)
FY05	9	16388	13.80	11227.00	27
FY06	5.8	17119	14.20	12810.00	27
FY07	6.8	20207	14.90	16414.00	27
FY08	3.7	18918	14.60	11465.00	27
FY09	1.2	15159	14.50	12190.00	25
FY10	4.1	14218	14.70	12995.50	25

Table 7

##### *Pakistan National Human Indicators*

	Employed Labour Force (Million)	Education Expenditure as % of GNP	Women Empowerment- Female Labour Force Participation	Health and Nutrition Expenditures (Rs Billion)	Literacy Rate (%)
FY05	42.4	2	39%	38.00	53%
FY06	43.2	2	33%	40.00	54%
FY07	47.3	2	34%	50.00	56%
FY08	48.1	2	34%	60.00	55%
FY09	49.5	2	22%	74.00	57%
FY10	52.7	2	23%	79.00	58%

Table 8

##### *Pakistan National Market Data and Indicators*

	Balance of Trade (Million US\$)	Foreign Direct Investment in Pakistan (Million US\$)	Foreigner Visitors at Archaeological Museums in Pakistan	Worker's Remittances (Million US\$)
FY05	-8259	1524	27496.80	4152.29
FY06	-9495	3521	22626.00	4588.03
FY07	-14820	5139.6	15823.00	5490.97
FY08	-12492	5409.8	7801.00	6448.84
FY09	-10144	3719.8	6082.00	7810.95
FY10	-8024	2030.7	1330.50	6549.87

Table 9

*Pakistan National Process Data and Indicators*

	Agriculture Growth (Percent)	Water Availability (MAF)	Services sector Growth (% of GDP)	IP Broad Band Consumption/ Inhabitants(kbps)	Electricity- Firm Supply (MW)
FY05	6.5	135.68	0.49	0.005	15082
FY06	6.3	137.78	0.57	0.01	15072
FY07	4.1	137.8	0.53	0.018	15091
FY08	1	142.44	0.85	0.05	15055
FY09	4	142.86	0.70	0.07	15055
FY10	2	142	0.59	0.08	15055

Table 10

*Pakistan National Research Data and Indicators*

	Growth in Number of PhDs	Number of Patents Registered with Pakistan	Citable Documents	Development and Non- Development Expenditure on Higher Education (Million Rs)
FY05	326	416	2,358	15,935.68
FY06	407	393	2,981	21,384.29
FY07	432	247	3,598	28,741.68
FY08	613	188	4,406	27,926.95
FY09	675	447	5,348	132,186.83

## Appendix - II

Table 11

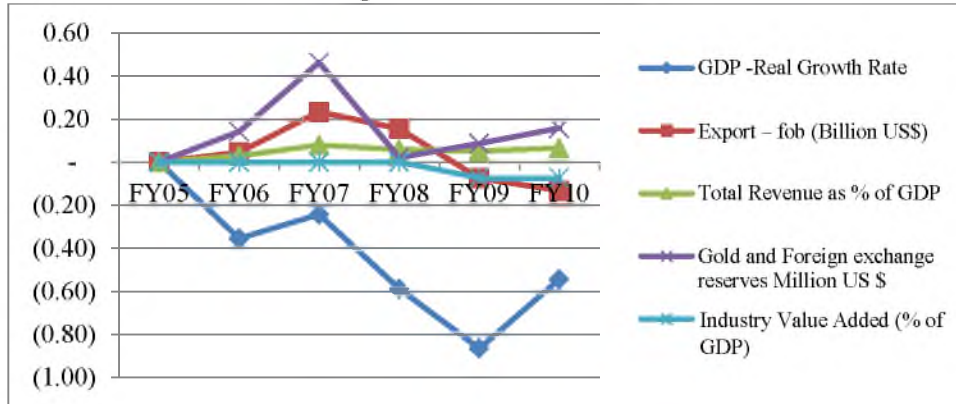
*Allocation of Weight*

PNFI		PNHI		PNMI		PNPI		PNRI	
Weight	Indicators	Weight	Indicators	Weight	Indicators	Weight	Indicators	Weight	Indicators
20	GDP -Real Growth Rate	20	Employed Labour Force (Million)	15	Balance of Trade (Million US\$)	25	Agriculture Growth (Percent)	25	Growth in Number of PhDs
25	Export- job (Billion US\$)	20	Education Expendi- ture as % of GNP	30	Foreign Direct Investment in Pakistan (Million US\$)	20	Water Availability (MAF)	20	Number of Patents Registered with Pakistan
15	Total Revenue as % of GDP	15	Women Empower- ment - Female Labour Force Participa- tion	25	Foreigner Visitors at Archaeolo- gical Museums in Pakistan	25	Services Sector Growth (% of GDP)	25	Citeable Documents
20	Gold and Foreign Exchange Reserves Million US \$	20	Health and Nutrition Expendi- tures (Rs Billion)	30	Worker's Remittances (Million US\$)	15	IP Broad Band Consump- tion/Inha- bitants (kbps)	30	Develop- ment and Non- Develop- ment Expendi- ture on Higher Education (Million Rs)
20	Industry Value Added (% of GDP)	25	Literacy Rate (%)	-	-	15	Electricity- Firm Supply (MW)	-	-
100		100		100		100		100	

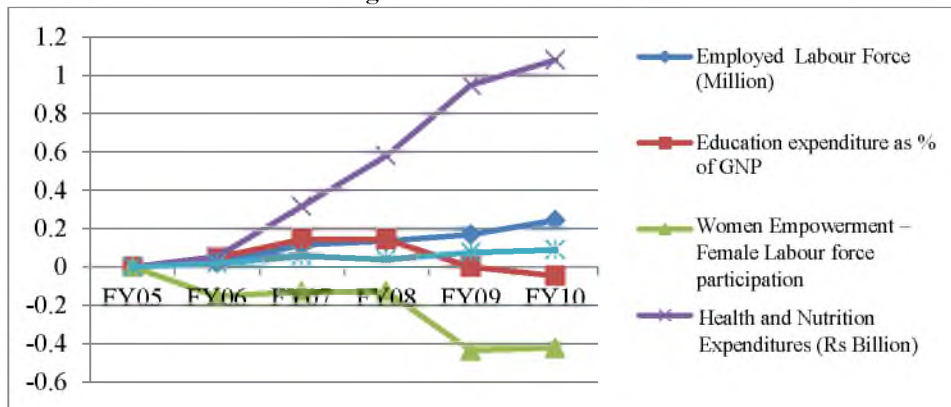
**Appendix III**

Individual graphs showing percentage change of each component relative to its value in the base period 2005.

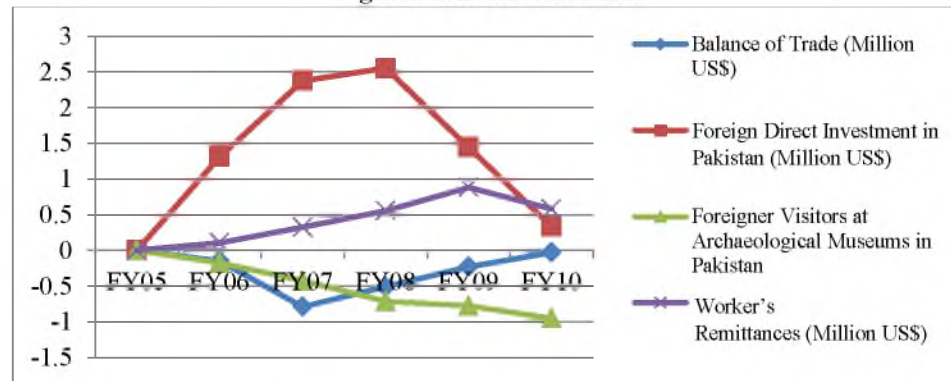
**Fig. 8. Financial Indicators**

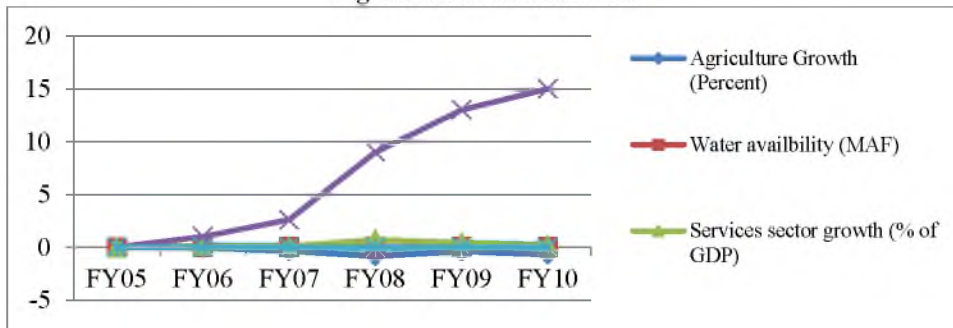
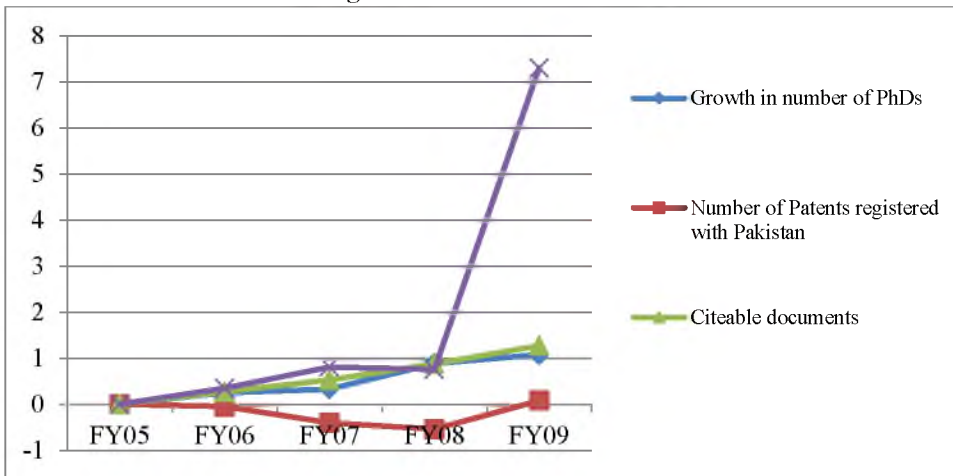


**Fig. 9. Human Indicators**



**Fig. 10. Market Indicators**



**Fig. 11. Process Indicators****Fig. 12. Research Indicators**

## REFERENCES

- Bismuth, A. and Y. Tojo (2008) Creating Value from Intellectual Assets. *Journal of Intellectual Capital* 9:2, 228–245.
- Bonfour, A. and L. Edvinsson (2004) *Intellectual Capital for Communities: Nations, Regions and Cities*. London: Elsevier.
- Bontis, N. (2004) National Intellectual Capital Index: A United Nations Initiative for the Arab Region. *Journal of Intellectual Capital* 5, 13–39.
- Drucker, P. F. (1993) *Post-Capitalist Society*. New York, NY: HarperCollins.
- Edvinsson, L. and M. S. Malone (1997) *Intellectual Capital: Realising Your Company's True Value by Finding its Hidden Brain Power*. New York: Harper Business Press.
- Hildebrand, C. (1999) Intellectual Capitalism: Does KM=IT? *CIO Enterprise*. Available from [http://www.cio.com/archive/enterprise/091599\\_ic\\_content.html](http://www.cio.com/archive/enterprise/091599_ic_content.html).
- Lerro, Antonio, Carlucci Daniela, and Schiuma Giovanni (2005) *Intellectual Capital Index. Relationships between Intellectual Capital Index and Value Creation Capability within Italian Regions*. Frontiers of E-Business Research.
- Luthy, D. H. (1998) Intellectual Capital and Its Measurement. Proceedings of the Asian Pacific Interdisciplinary Research in Accounting Conference (APIRA), Osaka, Japan.

- Machlup, F. (1962) *The Production and Distribution of Knowledge in the United States*. Princeton, NJ: Princeton University Press.
- Malhotra, Y. (2003) *Managing and Measuring Knowledge Assets in the Public Sector*. Syracuse University, Syracuse, New York. (Working Paper.)
- Malhotra, Y., A. Al-Shehri, and J. J. Jones (1995) *National Information Infrastructure: Myths, Metaphors and Realities*. University of Pittsburgh School of Information Science, 1995. (Working Paper) Available from <http://www.brint.com/papers/nii/>. Accessed
- Moore, N. G. (1996) Editorial Note on Measuring Corporate IQ. *Chief Executive*, November.
- OECD (2001) *The OECD Science, Technology, and Industry Scoreboard 2001: Towards a Knowledge-Based Economy*.
- Pasher, Edna and Sigal Shachar (2005) *The Intellectual Capital of the State Israel, w: Intellectual Capital for Communities, Nations, Regions and Cities*. A. Bonfour, L. Edvinsson, Elsevier Butterworth-Heinemann, London.
- Pomeda, J., M. Carlos Rodrigues, C. Rivera, M. Murcia, and V. Lidia (2002) *Towards an Intellectual Capital of Madrid: New Insight and Developments*. Paper presented at the Transparent Enterprise. The Value of Intangibles, 25-26 November, Madrid, Spain.
- Roos, G., S. Pike, and L. Fernstrom (2005) *Managing Intellectual Capital in Practice*. Oxford: Elsevier/Butterworth-Heinemann, UK.
- Stewart, T. (1994) Your Company's Most Valuable Asset: Intellectual Capital. *Fortune* 130:7, 28–33.
- United Nations (2003) United Nations Economic and Social Council Committee of Experts on Public Administration. *Status of and Trends in the Development of E-Government*. New York.
- World Bank (2008) *The Knowledge Assessment Methodology and Scoreboards*. Available at: [www.worldbank.org](http://www.worldbank.org).