National Knowledge Commission

Report to the Nation 2007

सत्यमेव जयते

Government of India

National Knowledge Commission

Report to the Nation 2007

Government of India

Foreword

As the National Knowledge Commission (NKC) presents its second annual Report to the Nation, we are excited about the UPA government's commitment to the knowledge initiatives in the XIth Plan adopted by the National Development Council. The Plan places high priority on education as a central instrument for achieving rapid and inclusive growth with specific emphasis on expansion, excellence and equity. This is reflected in the proposed allocation of Rs. 3 trillion, a five fold increase over the Xth Plan. The share of education in the total plan will accordingly increase, from 7.7 percent to 20 percent, representing a credible progress towards the target of 6 percent of GDP. The vision of the Prime Minister and support of our leadership from across the political spectrum is indeed laudable. This is a landmark initiative in the history of government planning. We believe the education agenda outlined in the XIth Plan is a critical step towards realizing the objective of an equitable society. It is also fundamental to our continuing growth, employment generation, infrastructure development and other developmental priorities.

The second Report to the Nation includes recommendations on Portals, Health Information Network, Legal Education, Medical Education, Management Education, Open & Distance Education, Open Educational Resources, Innovation, Intellectual Property Rights, Legal Framework for Public Funded Research and Traditional Health Systems. Together in the last two reports the Commission has covered 20 subjects and outlined about 160 concrete action items. The Commission also published, in November 2007, a compilation of its recommendations on education, to coincide with the final deliberations on the XIth Plan document. Most of our recommendations on Education, Vocational Training, Libraries, Translation, National Knowledge Network, Innovation, IPRs, Traditional Health Systems etc are integrated in the Plan and adequately funded.

Our recommendations, also accessible through the web, have been widely distributed, discussed, debated and are being considered at various levels in the government for implementation. The Commission has received excellent input and advice from academicians, scientists, teachers and various other stakeholders from both public and private domains, Central and State governments and the Planning Commission. The Prime Minister's Office and the Cabinet Secretariat have provided tremendous support in taking our recommendations forward. We are indeed thankful to all of them for their support and encouragement.

While releasing the first NKC Report to the Nation on January 12th 2007, the PM emphasized that the Commission "must be involved in ensuring the implementation of their innovative ideas". The focus of our work has therefore been on ensuring that while the Central government designs appropriate strategies supported by financial allocations to implement our recommendations, we engage simultaneously with diverse stakeholders to build up a groundswell of favourable opinion and assist preparation of implementing strategies at the grassroots. Continuing dialogue with a wide and diverse set of stakeholders has been a critical part of our process both in formulating recommendations and in their subsequent dissemination. We have tried to provide a platform for sharing and debating ideas, a critical requisite for accepting and steering change.

We are now moving on to the next stage of our work which is formulating Knowledge Initiatives at the State and the District levels to ensure that there is institutional and mental preparedness at the grass root level to absorb the financial outlays of the XI Plan. At present we are engaged in discussions with about 17 States to this end.

Based on our work on implementation with various government ministries and agencies in the last one year, we have learned the following:

- There is indeed a great deal of enthusiasm and emphasis on education as a means for achieving personal growth and development. The growing aspirations of children and parents across the cross-section of society are reflected in an increasing demand for education, which has far exceeded the supply.
- There is still resistance at various levels in the government, to new ideas, experimentation, process re-engineering, external interventions, transparency and accountability, due to rigid organizational structures with territorial mind sets.
- As a result, the real challenge lies in organizational innovation with new regulatory frameworks, new delivery systems, new processes etc. In their absence, increasing resources could well result in more of the same.
- Our country is too large, too complex and too diverse for 'one size fits all' solutions. Decentralization and community participation at the local level would be the key to devising effective programmes for implementation.
- We need to create various collaborative models, dispelling mutual suspicions. Public-private-partnerships, academia- industry partnerships, academia-research laboratories, Public-NGOs, Public-community etc. will need to be the models rather than working in separate compartments.
- This can be done most effectively through launching focused missions on education in a variety of areas, with appropriate leadership, autonomy, flexibility, accountability, tangible deliverables, measurable milestones and well defined specific goals.
- Innovation and entrepreneurship have been and would continue to be the key drivers of India's growth story. Together with skilled manpower, they form the pyramid on which our economic powerhouse will emerge. Our education system at all levels, namely, school, vocational, higher and technical must respond to this challenge.

We look forward to working with diverse stakeholders including the Central and State governments to build synergies for bringing about the generational changes we have proposed. Critical to the realization of this objective, is effective implementation that takes into account some of the organizational and structural changes outlined above. This will require concerted effort with an open mind from all quarters and active participation of the community. NKC hopes to serve as a catalyst in this mission.

Sam Pitroda
Chairman
National Knowledge Commission

Contents

Terms of Reference and Organization 6

I. Introduction to NKC 7
Members 9
Methodology 12
NKC Snapshot 14

II. NKC Blueprint for Reform 15
NKC Recommendations 16
Follow up on NKC Recommendations 23

III. Highlights of Recommendations 2006 29

IV. Recommendations Submitted in 2007 33
Portals 34
Health Information Network 36
Legal Education 39
Medical Education 42
Management Education 45
Open & Distance Education 48
Open Educational Resources 51
Innovation 53
Intellectual Property Rights 54
Legal framework for Public Funded Research 59
Traditional Health Systems 61

V. NKC Consultations 65
Stakeholders' Inputs 66
Public Outreach 68
Presentations to State Governments 69
Members of Working Groups 2007 70

Terms of Reference and Organization

The National Knowledge Commission (NKC) was constituted on 13th June 2005 as a high level advisory body to the Prime Minister of India. The vision for NKC was articulated by Dr. Manmohan Singh, Prime Minister of India, in the following words:

"The time has come to create a second wave of institution building, and of excellence in the fields of education, research and capability building."

The Terms of Reference of NKC are:

- Build excellence in the educational system to meet the knowledge challenges of the 21st century and increase India's competitive advantage in fields of knowledge.
- Promote creation of knowledge in Science & Technology laboratories.
- Improve the management of institutions engaged in Intellectual Property Rights.
- Promote knowledge applications in Agriculture and Industry.
- Promote the use of knowledge capabilities in making government an effective, transparent and accountable service provider to the citizen and promote widespread sharing of knowledge to maximize public benefit.

National Knowledge Commission has a designated time-frame of three years from 2nd October 2005 to 2nd October 2008

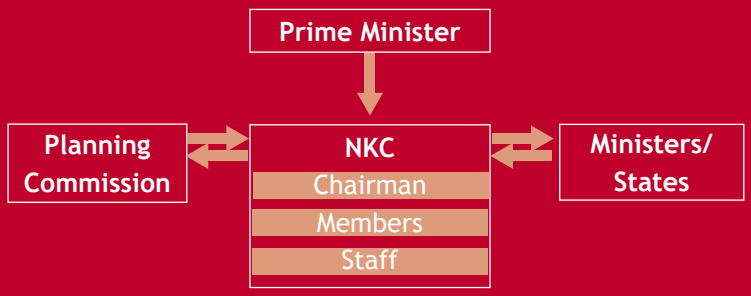
The second Report of NKC gives on overview of all the recommendations submitted by the Commission, as well as the follow up on the first set of recommendations. The full text of the recommendations submitted in 2007 and details of NKC consultations are also included in this report.

Organization

NKC consists of seven members, including the Chairman. All members perform their duties on a part-time basis and do not claim any remuneration.

The Members are assisted in their duties by a small Technical Support Staff headed by an Executive Director seconded to the NKC by the government. The Commission is also free to co-opt experts to assist in the management of its tasks.

The Planning Commission is the nodal agency for the NKC for planning and budgeting purposes as well as for handling Parliament submissions or responses.



Introduction to NKC

Members

Mr. Sam Pitroda (Chairman)

Mr. Pitroda has spent four decades in the world of telecommunications, having pioneered its use as a means to expedite the process of development and nation building, and in bridging the global communications divide. His professional career has been divided between the three continents of North America, Asia and Europe, and he has received international acclaim for using telecommunications as a tool for national development.

As Adviser to Prime Minister Rajiv Gandhi, Mr. Pitroda helped to build India's telecommunications and information technology infrastructure. He was the founding Chairman of the Telecom Commission in India and headed the National Technology Missions on Drinking Water, Literacy, Immunization, Oilseeds and Dairy. In these roles, he made a notable contribution to India's developmental planning and policy approaches.

Mr. Pitroda has owned and run several companies in the United States and Europe; as an inventor he owns more than 75 patents worldwide.

Dr. Ashok Ganguly

Dr. Ganguly is the Chairman of Firstsource Ltd. and ABP Pvt. Ltd., and a Director on the Central Board of the Reserve Bank of India, since November 2000. He heads his own consulting company, Technology Network India Pvt. Ltd. He also currently serves as a non-executive director of Mahindra & Mahindra, Wipro Ltd., Tata AIG Life Insurance Co Ltd. and ICICI Knowledge Park.

He is a member of the Prime Minister's Council on Trade and Industry as well as the Investment Commission. Dr. Ganguly's professional career spanned 35 years with Unilever Plc/N.V. He was the Chairman of Hindustan Lever Ltd. from 1980 to 1990 and a member of the Unilever Board from 1990 to 1997, with responsibility for worldwide research and technology.

He was member of the Science Advisory Council to the Prime Minister of India (1985-89) and the UK Advisory Board of Research Councils (1991-94). A recipient of the Padma Bhushan and an Honorary Professor at the Chinese Academy of Science, Dr. Ganguly has authored three books – *Industry and Liberalization*, *Strategic Manufacturing for Competitive Advantage* and *Business Driven R&D - Managing Knowledge to Create Wealth.*

Professor P. Balaram

Professor P. Balaram is a Professor of Molecular Biophysics and currently the Director of the Indian Institute of Science, Bangalore. Prior to this, he was Lecturer (1973-77), Assistant Professor (1977-82), Associate Professor (1982-85), Chairman, Molecular Biophysics Unit (1995-2000) and Chairman, Division of Biological Sciences (2002-05) at the Institute. His main research interests are in bio-organic chemistry and molecular biophysics. He is the author of over 370 research papers. He received his M.Sc. from IIT Kanpur (1969) and Ph.D. in Chemistry from Carnegie-Mellon, Pittsburgh, USA (1972).

Professor Balaram is a Fellow of the Indian Academy of Sciences, Indian National Science Academy and the Third World Academy of Sciences, Trieste, Italy. Professor Balaram has received many awards and honours in recognition of his work, including the Shanti Swarup Bhatnagar Prize, CSIR (1986), Alumni Award for Excellence in Research, IISc (1991), TWAS Award in Chemistry (1994), G.D. Birla Award for Scientific Research (1994) and the Padma Shri awarded by the Government of India (2002).

Professor Balaram has delivered a number of lectures and served on the Editorial Boards of journals, both national and international. He currently serves on many committees of the Government of India, and is a Member of the Science Advisory Committee to the Union Cabinet, Board of Research in Nuclear Science of DAE, Advisory Board of CSIR and Scientific Advisory Council to the Prime Minister. He has been the Editor of *"Current Science"* for over ten years.

Dr. Jayati Ghosh

Dr. Ghosh is a Professor of Economics and Chairperson of the Centre for Economic Studies and Planning,

School of Social Sciences, Jawaharlal Nehru University, and is an alumna of Delhi University, Jawaharlal Nehru University and the University of Cambridge. Her research interests include globalization, international trade and finance, employment patterns in developing countries, macroeconomic policy, and issues related to gender and development.

Her published works include *Crisis as a Conquest: Learning from East Asia, The Market that Failed: A Decade of Neoliberal Economic Reforms in India* and *Work and Well-being in the Age of Finance* (co-authored with Prof. C.P. Chandrashekhar). She was the principal author of the West Bengal Human Development Report 2004 which received the UNDP Award for excellence in analysis, and numerous academic papers. She is a regular columnist for leading journals and periodicals.

Dr. Ghosh is involved in managing several public information websites, a founder of the Economic Research Foundation, and is the Executive Secretary of International Development Economics Associates (IDEAS), an international network of heterodox development economists. She chaired the Andhra Pradesh Commission on Farmers' Welfare in 2004, and continues to be closely involved in working with progressive organizations and social movements.

Dr. Deepak Nayyar

Dr. Nayyar is a Professor of Economics at Jawaharlal Nehru University, and has taught at the universities of Oxford and Sussex, and the Indian Institute of Management, Kolkata. He was Vice Chancellor of the University of Delhi from 2000 to 2005. He served as Economic Adviser in the Ministry of Commerce, Chief Economic Adviser to the Government of India and Secretary in the Ministry of Finance.

A graduate of St. Stephen's College, University of Delhi, he became a Rhodes Scholar and obtained a D.Phil in Economics from Balliol College, Oxford. He has received the VKRV Rao Award for his contribution to research in Economics. His books include *India's Exports and Export Policies, The Intelligent Person's Guide to Liberalization, Governing Globalization: Issues and Institutions* and *Migration, Remittances and Capital Flows: The Indian Experience.*

Dr. Nayyar is an Honorary Fellow of Balliol College and Chairman of the Advisory Council for the Department of International Development, Queen Elizabeth House, University of Oxford. He is the Vice President of the International Association of Universities, Paris and Chairman of the Board of Governors of the World Institute for Development Economics Research, Helsinki. He served as a Member of the World Commission on the Social Dimension of Globalization.

Mr. Nandan Nilekani

One of the founders of Infosys Technologies Ltd., Mr. Nilekani is the Co-Chairman of the Board of Directors. He has formerly held the post of Managing Director, President and Chief Operating Officer at Infosys.

Mr. Nilekani co-founded India's National Association of Software and Service Companies (NASSCOM). He is Vice-Chairman of The Conference Board, Inc. – an international research and business membership organization and Member of the London Business School's Asia-Pacific Regional Advisory Board. He has served as Chairman of the Government of India's IT Task Force for the power sector. He was a member of the insider trading subcommittee of the Securities and Exchange Board of India (SEBI), and of the Reserve Bank of India's Advisory Group on corporate governance. He is also a member of the review committee of the Jawaharlal Nehru National Urban Renewal Mission and serves on the Board of Reuters as a non-executive member.

His many honours include Fortune magazine's 'Asia's Businessmen of the Year 2003' award (along with Infosys Chairman Mr. N.R. Narayana Murthy), the Corporate Citizen of the Year Award at the Asia Business Leader Awards (2004) and Padma Bhushan (2006). In 2002 and 2003, he was named among the 'World's Most Respected Business Leaders', according to a global survey by Financial Times and PricewaterhouseCoopers. Mr. Nilekani became one of the youngest entrepreneurs to join 20 global leaders on the prestigious World Economic Forum (WEF) Foundation Board in January 2006.

Dr. Sujatha Ramdorai

Sujatha Ramdorai is a Professor at the School of Mathematics, Tata Institute of Fundamental Research (TIFR). She has held visiting positions in several universities and research institutions around the world. Currently she is a visiting Professor at Chennai Mathematical Institute.

Dr. Ramdorai is a recipient of the Shanti Swarup Bhatnagar Award and the ICTP Srinivasa Ramanujan Medal awarded by the Norwegian Academy of Science and Letters. Her research interest focuses on algebraic number theory. She has also been involved with issues related to education and research, especially in the pure Sciences in India.

She has authored several research papers in internationally reputed journals and has collaborated widely in her research work. She is the co-author (with Prof. J. Coates) of *Cyclotomic Fields and Zeta Values*.

Methodology

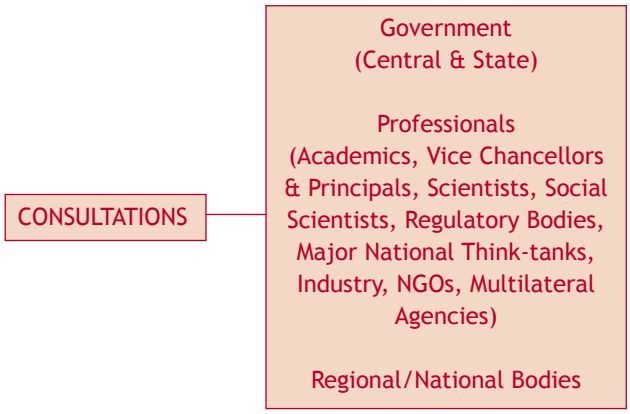
- Identification of key focus areas
- Identification of diverse stakeholders and understanding major issues in the area
- Constitution of Working Groups and organizing of workshops/seminars, extensive formal and informal consultations with concerned experts and stakeholders
- Consultation with administrative Ministries & the Planning Commission
- Discussion in NKC to finalize recommendations in the form of letter to the PM from the Chairman
- Letter to PM containing key recommendations, first steps, financial implications etc. supported by the relevant explanatory documents by NKC
- Dissemination of recommendations to state govts., civil society and other stakeholders
- Initiating the implementation of the recommendations under the aegis of the Prime Minister's Office
- Coordinating and following up implementation of proposals

Working Groups: Libraries, Language, Agriculture, Health Information Network, Undergraduate Education, Medical Education, Legal Education, Management Education, Engineering Education, Traditional Health Systems, More Students in Maths and Science, Open and Distance Education.

Workshops/Seminars: Literacy, Translation, Networks, School Education, Muslim Education, Vocational Education, Open and Distance Education, Intellectual Property Rights, Science and Technology, Agriculture, Open Education Resources.

Surveys: Innovation, Health Information Network, Traditional Health Systems, Entrepreneurship.

The methodology followed by the National Knowledge Commission involves identification of focus areas in the first instance. This selection arises from wide consultation, within and outside the government. Thereafter, diverse stakeholders in these focus areas are identified and the major issues highlighted. Given the fact that the Government is already undertaking initiatives in some of NKC's focus areas, selection of areas also takes into account an analysis of unique value addition by the NKC. This could be either through proposing innovative solutions for conventional problems or bringing together disparate groups working on an area.



After the identification of focus areas, Working Groups of specialists and practitioners are constituted. Working Groups typically consist of five to ten experts, and meet periodically over three to four months in order to prepare a report. Working Group reports are one of the inputs used by the NKC during deliberations to frame its recommendations. In addition, workshops and seminars are held periodically along with informal consultations with concerned experts and stakeholders to get as broad-based a point of view as possible. For issues requiring an understanding of a very broad spectrum of experiences, a survey may also be undertaken. NKC has adopted different approaches for different focus areas, with the aim of setting in place a process that is as inclusive and participatory as possible. Through this process, NKC serves as a forum to bring together diverse opinions in order to understand the issues in depth. At this stage of discussion, representatives from the relevant ministries are actively involved.

Following this, NKC Members discuss the issues raised during Consultations and in the Working Group Reports to finalize recommendations. After several rounds of deliberations, a letter is sent to the Prime Minister containing key recommendations, first steps, financial implications etc., supported by relevant explanatory documents.

Widespread dissemination of NKC recommendations to state governments, civil society and other stakeholders takes place after the recommendations have been received by the Prime Minister and the relevant ministries. The implementation of the recommendations under the aegis of the Prime Minister's Office is then initiated, along with coordination and follow up with various implementing agencies.

NKC Snapshot

Recommendations Submitted in 2006

- Libraries
- Translation
- English Language Teaching
- National Knowledge Network
- Right to Education
- Vocational Education & Training
- Higher Education
- National Science and Social Science Foundation
- E-governance

Recommendations Submitted in 2007

- Health Information Network
- Portals
- Open Educational Courseware
- Legal Education
- Medical Education
- Management Education
- Open and Distance Education
- Intellectual Property Rights
- Innovation
- Traditional Health Systems
- Legal Framework for Public Funded Research

Work in Process

- Portals (Biodiversity & Teacher Training)
- School Education, Muslim Education and Literacy
- Engineering Education
- More Students in Science and Maths
- More Ph.Ds
- Entrepreneurship
- Agriculture

Potential Future Areas

(Under Discussion)

- Knowledge Needs of Small & Medium Enterprises
- Government Process Re-engineering

NKC Blueprint for Reform

NKC Recommendations

To take its mandate forward, NKC focused its deliberations on five key areas: enhancing access to knowledge, reinvigorating institutions where knowledge concepts are imparted, creating favourable ecosystems for making India a global leader in creation of knowledge, promoting applications of knowledge for sustained and inclusive growth and using knowledge applications in delivery of public services. Institutional reform and optimal utilization of the potential of ICT were recurrent pivots of NKC deliberations. NKC has submitted specific recommendations to the Government on 20 issues till the end of December 2007. Of these, 11 were submitted during 2007, which are reproduced later in the Report. Those submitted in 2006 were included in the last report. Recommendations are under formulation in respect of some other issues.

Overview of Recommendations Submitted

The core of NKC recommendations relate to institutions of learning, particularly at the higher level. Supplementing this core are recommendations for revitalizing associated sectors like libraries, creating a digital broadband network interconnecting all research and education institutions, and promoting a vibrant translation industry to create better access for all groups. Recommendations were also made by NKC on enhancing systems of knowledge creation. These included suggestions on creating a better environment for innovation in the country, a robust intellectual property rights regime, incentivizing research in universities, promoting traditional health systems and creating a better framework for delivery of government services to citizens through a citizen centric e-governance programme.

Right to Education

The 86th constitutional amendment act resulted in the Right to Education being made a Fundamental Right. Following this commitment, NKC believes that the central government must enforce legislation on Right to Education. NKC has reiterated the need to ensure that a financial provision requiring the central government to provide the bulk of the additional funds needed for realizing the Right to Education must be there in the central legislation. Further, the responsibility of the Government, at different levels, must be recognized and made justiciable.

Higher Education

In Higher Education, NKC has focused on the three crucial aspects of expansion, excellence and inclusion. There are about 350 odd universities and 18,000 colleges providing higher education in the country, to about 10% of the relevant age group. This is extremely inadequate in a country where the demographic dividend by way of a young population of about 550 million youth, is a much talked about asset. If we are to achieve a Gross Enrolment Ratio (GER) of 15% and above by 2015, we need to substantially increase the number of higher education institutions (HEIs) in our country. While this expansion will have to be achieved in part through increased public spending on higher education, it will also require diversifying the sources of financing to encourage private participation, philanthropic contributions and industry linkages. To this end, the current barriers to entry in setting up HEIs are very high relying primarily on legislation. NKC's recommendation to set up an Independent Regulatory Authority for Higher Education (IRAHE), at an arm's length from all stakeholders, that would accord degree granting power to universities, is one way to supplement the process of setting up universities through legislation. The regulator would also be responsible for monitoring standards and settling disputes. This will streamline regulation of higher education in the country which at present is marked by a multiplicity of regulators, often with overlapping mandates. A plethora of regulations without adequate autonomy or accountability for institutions has resulted in a system that is over regulated and under governed.

Addressing the need for both expansion and quality, NKC has also recommended setting up of 50 national universities. To ensure quality NKC has called for reform of existing universities including frequent curricula revisions, introduction of course credit

system, enhancing reliance on internal assessment, encouraging research, and reforming governance of institutions. Further, there is an urgent need to restructure the system of affiliated undergraduate colleges which no longer provides a viable model for quality higher education. Creating more department based unitary universities and giving greater autonomy to existing institutions should be explored. Instead of a single accreditation agency created with state monopoly, multiple accreditation agencies maybe licensed by the IRAHE to do the ratings. Backed by stringent information disclosure norms, this would empower students with reliable information and would be a mechanism for ensuring accountability. Quality may also be enhanced through upgradation of infrastructure, attracting and retaining talented faculty through introducing salary differentials, greater research opportunities, faculty exchange programmes etc.

NKC believes that all deserving students should have access to higher education, irrespective of their socio-economic background. While the government heavily subsidizes university education by keeping fees low, there is better value created for this subsidization by ensuring well funded scholarships and affirmative action that takes into account the multi dimensionality of deprivation.

Open and Distance Education & Open Educational Resources

Distance education can provide access to education for a large number of students, including for learners with special needs. With the proliferation of media like television, radio and Internet, its reach can be significantly increased. NKC recommendations on distance education focus on creating a national ICT infrastructure, developing web based common open resources, establishing a credit bank and providing a national testing service. Regulation of distance education would be performed by a sub committee under the proposed independent regulatory authority. To supplement this, NKC also recommends that the production of quality content & leveraging global open educational resources, needs to be focused on in a comprehensive manner. We need to encourage open access for all material-research papers, books, periodicals etc and develop a network enabled delivery infrastructure.

Professional Education

The centres streams in many ways exemplify the problems that plague our higher education system, especially the regulatory framework. NKC has therefore recommended that the present regime of regulation in all professional education streams, be replaced by subgroups on different streams under the proposed independent regulator. This would have to be accompanied by independent multiple accreditation agencies that provide reliable ratings. Other measures include allowing greater autonomy to institutions, reforming the current examination system, developing contemporary curricula that are regularly updated and encouraging research. Hiring and retaining talented faculty is a significant problem in all professional education streams, as more lucrative career opportunities are available outside academia in their disciplines. A slew of measures such as introducing salary differentials, permitting opportunities in professional practises and consultancy services may need to be explored. Indian Law schools need to orient themselves to meet the growing international dimensions of legal education and of the legal profession. Centres for Advanced Legal Studies and Research (CALSAR), one in each region, have been proposed by NKC to carry out cutting edge research on various aspects of law. These centres would also serve as think-tanks for advising the government in national and international fora. Regional imbalances in medical education would be a limiting factor in providing affordable health care for all sections. Medical education therefore would need to strengthen its focus on public health. It was felt that the quality of management education should be enhanced through increasing its social relevance as well as looking at a programme of mentoring for the proliferating institutions.

Vocational Education and Training

While Higher Education enrolment has to increase markedly, the skill requirement of the growing economy means that a large proportion of our labour force needs to be provided vocational education and be trained in adequate skills. This skill element has to be integrated with the higher education system to ensure maximum mobility. NKC's recommendations focus on increasing the flexibility of vocational education and training (VET), within the mainstream education system. They point to a need for quantifying and monitoring

the impact of vocational education. At present, reliable data and information on this aspect is not available. While the resource allocation for vocational education needs to be increased, we also need to look at expanding capacity through innovative delivery models, including robust public private partnerships. PPP frameworks need to be well thought out and devised keeping in mind the specificities for the sector. Given that only 7% of the country's labour force is in the organized sector, enhancing training options available for the unorganized and informal sector will be critical for enhancing the productivity of the bulk of our working population. It is necessary to ensure a robust regulatory and accreditation framework, along with proper certification of vocational education and training. This will allow easier mobility into higher education streams, enhancing the value of such training and providing continuous opportunity for upgradation of these skills. Vocational education and training therefore needs a concerted re-branding effort to increase its value and ability to command higher incomes.

Libraries

Education systems, formal and informal, while being critical, are not the only components of a knowledge society. NKC's mandate therefore is wider than building excellence in our education system, and stretches to several key associated sectors that propel a knowledge based economy and society. Critical to this are domains which create access to knowledge. To this end NKC has suggested reforms for revitalizing the entire library and information services (LIS) sector in the country. India has a vast network of libraries in the public and private domains. However, they often lie in various stages of disuse. Libraries can be revitalized, not merely as repositories of texts, but as dynamic centres for the sharing and dissemination of knowledge. NKC recommendations highlight some basic lacunae such as the lack of a comprehensive census of libraries in the country. They focus on modernizing the management of libraries to ensure greater community participation; including creating models for public private partnerships in LIS development. Leveraging ICT for various applications such as cataloguing, digitization of content, creating e-journals etc, is also highlighted. To give the sector sustained attention, NKC recommended the setting up of an independent and autonomous National Commission on libraries which would be responsible for undertaking a host of measures and streamlining all initiatives for the development of the sector.

English Language

An inclusive society is the foundation for a knowledge society. Language is significant, not only as a medium of instruction or a means of communication but also as a determinant of access. In the current scenario, an understanding and command over the English language, is a most important determinant of access to higher education, employment possibilities and social opportunities. NKC therefore recommends that the teaching of English as a language should be introduced, along with the first language (either mother tongue or the regional language) of the child, starting from Class I. Further, NKC has also focused on the need to reform the pedagogy of English language teaching and learning, to reduce the disproportionate emphasis on grammar and focus on creating meaningful learning experiences for the child. Given that language learning is contingent on the environment, all available media including audio visual and print should be used to supplement traditional teaching methods.

Translation

In a multilingual country, translation should play a critical role in making available knowledge to different linguistic groups. Translation here implies not just translation of literary texts, but across a range of areas. These would include translation of pedagogic materials at all levels, especially in the sciences and social sciences, translation of content- as e-governance applications becomes increasingly localized and ubiquitous, and also different types of translation both human and machine aided. It may therefore become a commercially viable activity with a very high direct and indirect employment generation potential. To this end NKC recommended setting up a National Translation Mission with a focus on promoting translation activities across the country. The Mission would undertake a host of activities such as setting up a storehouse of information on all aspects of translation, providing quality training and education for translators, creating and maintaining various tools for translation including digital tools, setting up a national web portal on translation, organizing conferences, book launches, festivals and fellowships and promoting research and development of translation as a discipline.

Knowledge Network

An important recommendation emerging from NKC is to interconnect all knowledge institutions throughout the country, through an electronic digital broadband network with gigabit capabilities, to encourage sharing of resources and collaborative research. In a country like India where resources are limited and unevenly distributed in the education system; by way of quality of faculty, course materials and infrastructure, some of the limitations may be over come by providing interconnectivity that allows institutions to share their resources and best practices, as well as promotes excellence by allowing cutting edge collaborative research. It is critical that a special purpose vehicle comprising of stakeholders, including professionals and industry representatives should be tasked with managing the day to day working of this network to ensure that there is ownership of this network by the user community, rather than it being managed as a state administered scheme.

Health Information Network

Another significant network related recommendation of NKC pertains to creating a comprehensive health information network. The developments in information and communication technology have created new opportunities for enhancing the efficiency of health care delivery. In this context NKC believes that the country needs to develop a web-based network, connecting all health care establishments, in both private and public sectors. When fully functional, all health care transactions will be recorded electronically and this data will be available in the health data vault to authorized users, when they need it and where they need it. For this purpose a common Electronic Health Record (EHR) based on open source solutions needs to be created and disseminated widely. NKC recommendations focus on establishing national standards for clinical terminology and health informatics. They highlight the need to create a policy framework for promoting the use of IT in health care and the attendant measures to ensure security of data. The implementation of these recommendations would require setting up an institutional body with appropriate professionals with domain expertise, adequate budget, time tables, and measurable milestones. A policy framework put in place now, and a focused organization to implement plans for the coming years will ensure enormous improvements in health care delivery in India.

Portals

NKC has also proposed creating national web based portals on certain key sectors such as Water, Energy, Environment, Education, Food, Health, Agriculture, Employment, Citizens Rights etc. The portals would serve as a single window for information on the given sector for all stakeholders, from students to researchers and practitioners in the field. These portals should be managed by a consortium consisting of representatives from a wide range of stakeholders to ensure that they are not owned by any one organization, but have a national character. NKC facilitated the setting up of two portals: one on Water, championed by Arghyam Trust and another on Energy championed by The Energy Research Institute (TERI). Work on a bio-diversity portal and a teachers' education portal has also been initiated.

Intellectual Property Rights

For India to become a global knowledge leader, we would need to be at the forefront of creating knowledge. This requires a favourable eco-system that not only protects the ingenuity of the creator but also rewards knowledge creation through commercial applications. In order to facilitate the creation of knowledge NKC has recommended scaling up efforts to build a world class IPR infrastructure, including steps to modernize the patent offices with computerization, e-filing, process re-engineering, human resource development, transparency, documentation, accessibility and building global standards. IPR training in IP Offices as well as in educational institutions needs to be intensified, and IPR Cells should be developed. In addition NKC has recommended establishing new structures such as a separate IPR Tribunal, a national institution for cutting edge IPR policy and a Global Technology Acquisition Fund. NKC recommendations also highlight the need to protect traditional knowledge, create incentives for it and also explore mechanisms for identification of key IPR issues in new technology areas.

Legal Framework for Public Funded Research

Further, to revitalize research in universities and give an impetus to public funded research there is a requirement for enacting a legislation that would

give universities and research institutions ownership and patent rights over inventions arising out of government funded research. This will create an enabling environment for commercialization of such inventions through licensing arrangements where inventors would also be allowed to receive a share of the royalty. However, the proposed enactment should incorporate important safeguards for exceptional circumstances where the government could be given 'march in rights' to protect public good.

National Science and Social Science Foundation

A National Science and Social Science Foundation (NS3F) was recommended by NKC to look at all knowledge as one seamless entity. The objectives of the NS3F would be to suggest policy initiatives to make India a leader in the creation and use of new knowledge in all areas of natural, physical, agricultural, health, and social sciences. The NS3F would also ensure that science and technology are maximum used for betterment of the lives of our people.

Innovation

Innovation is a key driver of growth based on knowledge inputs. NKC conducted an extensive survey on the status of innovation in the country. NKC's Innovation Survey reveals that innovation is emerging as one of the key factors in India's economic growth, where both large firms and SMEs have increased innovation related revenues. The strategic prioritization of innovation has also increased significantly since the start of economic liberalization. Crucial firm level structures and processes play a key role in innovation, but skill shortage arising out of lack of emphasis on experimentation/problem solving in the curricula is a critical barrier. There is also need for more effective synergy between industry, government, the educational system, R&D environment and the consumer. Further a comprehensive campaign is needed across the entire economy from the grassroots to the large firm level to make India a global leader in innovation.

Traditional Health Systems

India has an immensely rich and complex indigenous medical heritage. With medical pluralism increasingly being recognized as the way forward in meeting the health requirements of people, we have an opportunity to provide quality health care based both on traditional health systems and more conventional evidence based biomedical sciences. NKC has recommended that major efforts be undertaken to provide quality education in traditional medicine. Evidence-based approaches should also be introduced into the current educational framework, possibly through institutions of the standard of IISc, IITs and AIIMS, with commensurate financial outlays. NKC recommendations focus on the need for strengthening research through concerted higher investments and more rigorous methodologies, ensuring internationally acceptable standardization and documentation of herbal medications, promoting clinical trials, along with adhering to a world-class certification process. This will assist the achievement of internationally acceptable standards for good manufacturing, laboratory, clinical, agricultural and collection practices. Another aspect highlighted by NKC recommendations is the need to create a suitable IPR framework for better protection of the sources of traditional medical knowledge, while at the same time ensuring that sufficient incentives are created for commercialization of traditional medications. Efforts already ongoing for a Traditional Knowledge Digital Library (TKDL) should be diversified and expanded to include medical knowledge.

E-governance

To enhance the efficacy of delivery of services by the government, NKC has reiterated that e-governance should be an opportunity not merely for computerization of age old processes, but a step towards re-thinking our systems and processes to ensure greater efficiency and citizen orientation. NKC recommendations focus on re-engineering government processes to change the basic pattern of governance for simplicity, transparency, productivity and efficiency. They highlight the need for developing common standards and deploying a common platform/infrastructure for e-governance. Further 10 to 20 important services that make a critical difference to citizens may be selected, simplified and offered as web-based services, along with beginning all new national programmes (like Bharat Nirman, Rural Employment Guarantee Scheme, etc.) with well-engineered e-governance implementation and web interface. This will ensure speedy delivery, productivity and efficiency of services making them

citizen centric and ensuring that the right people get the benefits.

Overview of Recommendations Under Formulation

School Education

Complexity of the issues involved in School Education and their regional diversity necessitate consultations on a scale wider than any other work done by NKC. A series of workshops were therefore held around the country, addressing issues of quantity, quality, management and access in school education. A wide range of stakeholders were involved in the consultations, including representatives from the government and bureaucracy, school administrators, teachers, personnel from DIETs and SCERTs, educationists, NGOs/civil society organizations and private education providers.

At the end of an extensive process of discussion and consultation, some of the key areas of intervention that have emerged are:

- Institutional reform within SSA and other central schemes to allow greater flexibility for the States and optimize learning outcomes.
- Streamlining the methodology of data collection to ensure timely access to reliable data, including data for tracking the actual coverage of schools.
- A set of minimum requirements, norms and standards for all schools.
- Improvement and regulation of teacher training institutions, expansion and reform of in-service teacher training and creation of linkages with the university system, restoring dignity of school teaching as a profession, and simultaneously devising transparent systems for ensuring accountability of school teachers, setting up a national portal for teachers to exchange ideas, information and experiences.
- Undertaking curricular reform in light of the National Curriculum Framework, 2005 to make it more flexible and relevant, and simultaneously change the examination system, especially at the board level, to reduce the pressure for rote-learning.
- Building infrastructure for new technologies, especially ICT, for cost-effective use of resources, innovative pedagogical strategies and wider exposure for students and teachers.
- Evolving special strategies to ensure greater access to school education in backward and remote locations, ensure greater enrolment of girls and students from marginalized social groups, and address special needs of labouring children, children of migrant workers and the differently abled.
- Expanding the National Literacy Mission and reorient its programmes to address the intellectual, physical and emotional needs of those too old to benefit from the SSA.
- Enhancing the capacity of the private sector to make positive contributions.

Attracting more Talented Students in Maths and Science

NKC believes that a strong foundation in pure sciences will help India in building excellence in technology, propel economic growth and consequently raise living standards for all. We need to therefore induct and nurture talented students in this field. Wide consultations have been held with professors, college teachers, scientists and industry associations. For this purpose, NKC conducted four workshops, one each at TIFR, IISc, Delhi University and SN Bose Centre for Basic Sciences. In addition, interviews with experts from academia, research and industry were held. A working group has now been constituted to formulate strategies for attracting more talented students in Maths and Science.

The following key issues are being deliberated upon:

- Changing the way sciences are taught: issues of pedagogy, teacher training, teacher compensation, evaluation, curriculum and methodology.
- Diversifying career opportunities in Science: increasing attractiveness of existing careers and generating new opportunities through collaborations between industry, universities and research institutes.
- Strengthening infrastructure: optimizing use of available infrastructure and diversifying sources of funding through public private partnerships.
- Undertaking Science popularization programmes on a large scale.

Engineering Education

Despite the proliferation of engineering colleges in some parts of India, quantity, quality and access continue to be areas of major concern. In addition, faculty

shortages, irrelevant curricula and unemployment of graduates plague the system. A Working Group of eminent experts from academia and industry has been constituted which is deliberating on the following major issues:

- Enhancing access including reduction in regional disparities.
- Attracting and retaining faculty.
- Encouraging research.
- Strengthening and encouraging optimal use of existing infrastructure.
- Curriculum reform to meet technological obsolescence and industry needs.
- Changing teaching and evaluation methodologies, giving greater autonomy to teachers and institutions to encourage creative teaching and problem solving.
- Greater industry-academia interaction to bridge the skill gap and promote R & D.
- Reform of regulatory institutions and the system of accreditation.

Knowledge Applications in Agriculture

NKC believes that appropriate application of knowledge in agriculture is essential to boost the agrarian economy and give the Indian farmer a competitive edge in the global market. However, despite the diverse mix of actors engaged in knowledge generation and application in agriculture, its utilization at the ground level remains poor. The scope of research and extension must be expanded beyond technology transfer to encompass a wide range of services relating to knowledge creation, exchange, access and use. NKC has constituted a working group in order to arrive at concrete proposals for reform in this area. Some of the key issues under consideration are:

- Examine existing paradigms of research and extension in view of the new challenges and opportunities facing Indian agriculture.
- Evolve research priorities in areas where it is urgently needed, like rain fed agriculture, water management and soil health, as well as in high-potential areas of growth like organic farming, food processing and horticulture.
- Identify norms, rules and practices that isolate the public research and extension system from other players engaged in knowledge generation and application, and make suggestions for institutional reform.
- Look into restructuring the curriculum and the structure of assessment and incentives in the National Agricultural Research System (NARS) in order to encourage innovation and increase engagement with the field.
- Examine current initiatives for agricultural extension and suggest mechanisms for ensuring more operational freedom at the field level, to bring about a more decentralized, participatory and locally responsive system.
- Expand the scope and expertise of extension workers and enable them to provide an integrated range of services, incorporating local and indigenous knowledge, market information systems, credit and labour market knowledge.
- Focus on making small farm agriculture remunerative by enhancing the capacity of small farmers to access high value markets.
- Examine the implication of private sector participation in agricultural research and extension and devise frameworks for productive public-private partnerships.

Entrepreneurship

In view of the critical role played by Entrepreneurship in wealth creation and employment generation, NKC is currently engaged in a nationwide survey on the subject. Interviews have been held with over 160 entrepreneurs across a wide range of sectors in various cities, along with consultations with diverse stakeholders such as Industry Associations and Chambers of Commerce, educational institutions, incubation centres, banks, angel investors, seed capital funders, venture capitalists and entrepreneur networks. In its forthcoming report on Entrepreneurship, NKC will highlight some crucial trigger points that will foster the growth of Entrepreneurship in the country, as well as identify crucial bottlenecks. NKC will also formulate recommendations on creating a favourable ecosystem to facilitate entrepreneurship. Widespread dissemination of the report and consultations on implementation with stakeholders will be undertaken to facilitate exchange of good practices and to recognize and celebrate entrepreneurship.

Follow up on NKC Recommendations

In view of the critical role that knowledge institutions would play in making India a global leader in the 21st Century and in meeting the growing aspirations of the large component of the young in India's population, there was little doubt that education and related sectors would merit large infusion of resources in the XI Plan. It was also apparent that institutional reform would need to supplement this infusion. NKC was envisaged by the Government as one of the key concurrent processes for the XI Plan: 2007-12. Recommendations of NKC have been key inputs in formulating broad contours of the XI Plan.

NKC perceived the follow up on its recommendations as:

a) commitment of financial resources in the XI Plan with stress on institutional reform;
b) wide dissemination of NKC recommendations and discussion thereon for engaging diverse stakeholders to create favourable opinion towards reform; and
c) preparation of detailed strategies and plans for implementation at the State level.

The progress made in each of these is presented below.

A. XI Plan 2007-2012

The XI Plan, approved at the meeting of the National Development Council on 19th December 2007, places the highest priority on education as a centred instrument for achieving rapid and inclusive growth. This is reflected in the five fold increase in resources allocation. At Rs. 2.70 lakh crore, it constitutes 20% of the Plan, representing a credible progress towards the target of 6% of GDP. The following paragraphs summarize the major components of the XI Plan relating to the recommendations made by NKC. They appear in the same order as in the Plan.

E-governance for Better Service Delivery etc. (Volume I: Inclusive Growth)

- Process re-engineering to be the most crucial element of the agenda to make delivery of services citizen centric.
- Creation of a common service delivery platform including state wide networks, common service centres and last mile connectivity.
- A body with PM as Chair to prescribe deliverables and milestones for the national e-governance Plan.
- Make use of e-governance in implementation of all major flagship programmes.

Vocational Training & Skill Development (Volume I: Inclusive Growth)

Launch a National Skill Development Mission with an outlay of Rs. 31,200 crore to increase capacity from 2.5 million to 10 million per annum. The National Skill Development Mission would:

- Encourage ministries to expand existing public sector skill development infrastructure and its utilization by five fold.
- Modernize existing public sector infrastructure to get into PPP mode with functional and governance autonomy, establish a credible accreditation system and a guidance framework for all accrediting agencies, encourage agencies to rate institutions on standardized outcomes, and establish a "National Skill Inventory" and a "National Database for Skill Deficiency Mapping" on a national web portal.
- Set up a National Qualifications Frame-work, which establishes equivalence and provides horizontal mobility between various vocational, technical and academic streams at more than one career points and a Trainee Placement and Tracking System for effective evaluation and future policy planning.
- Enlarge the coverage of skill spectrum to 1000 trades with relevance to our emerging needs, while making a distinction between structural, interventional and last mile unemployability, and correspondingly set up programmes for 24 months, 12 months and 6 months duration. "Finishing Schools" will be encouraged to take care of last mile unemployability.
- Create a "National Skill Development Fund" imposing a universal skill development obligation on industry to invest in skill development of SCs/

STs/OBCs/Minorities/others candidates from BPL families – as their contribution to affirmative action combined with matching Government contribution.

- Facilitate repositioning of employment exchanges as outreach points of the Mission for storing and providing information on employment and skill development and to function as career counselling centres.
- Enlarge the 50,000 Skill Development Centres programme eventually into a "Virtual Skill Development Resource Network' for web based learning.

Innovation (Volume I: Inclusive Growth)

- Put in place a National Innovation Policy which encourages competition among enterprises, greater diffusion of knowledge and increased support to early stage technology development initiatives and grassroots level innovators.
- Foster increased collaboration among the R&D institutes, Universities and private sector enterprises and leverage upon their cumulative strengths in designing and implementing various innovation programmes.
- Create new interface structures to forge partnerships between academia and industry.

School Education (Volume II: Social Sector)

- Reorient Sarva Shiksha Abhiyan bringing in a strong rights focus to make Right to Education a reality: ensure basic learning conditions, special focus on Maths, Science & English, common syllabi, curriculum and pedagogy.
- Gradually reduce Central Government's funding over the Plan period rather than move immediately to 50:50.
- Ensure minimum standards and norms for public and private schools and address systemic issues of accountability and decentralization of decision making, teacher recruitment, teacher training, learning outcome measurement, teacher motivation.
- Recognize and encourage the role of private providers.
- Special focus on disadvantaged groups and educationally backward areas.
- Scheme for universal access and quality at the secondary stage; set up 6,000 model schools one in each Block, upgrade 15,000 primary schools to secondary level, additional infrastructure and additional teachers, hundred percent trained teachers.
- Use ICT based pedagogy and learning aids, provide broadband connectivity to all the Government and Government aided secondary schools.
- Strengthen teacher training and professional development.

Higher & Technical Education (Volume II: Social Sector)

- Expansion, inclusion and rapid movement in quality by enhancing public spending, encouraging private initiatives and initiating the long overdue major institutional and policy reforms, will form the core of the XI Plan effort.
- Improve quality: work on a detailed reforms agenda including: a) admission, curriculum and assessment; b) accreditation & ratings; c) teachers competence and motivation; and d) restructure affiliated colleges and research for policy formulation.
- An apex independent regulatory mechanism accompanied by greater autonomy and internal accountability; establish a high level committee to suggest specific reforms.
- Quantitative expansion through establishment of new government and private funded institutions and increased intake in existing institutions.
- Reduce disparities based on gender, caste, region etc. through differential support.
- Establish 30 new Central Universities, 16 in States where they do not exist and 14 as World Class Universities (all India admissions, course credits, regular syllabi revision, incentives for faculty, strong linkage with industry and research institutions, no affiliated colleges, outsource non teaching functions).
- Provide flexibility to universities to raise fees accompanied by scholarships, fellowships and student loans.
- Establish a National Science & Engineering Research Board for rejuvenation of research in Universities.
- Launch a national Mission in education through ICT coverage in all the Universities and colleges; broadband connectivity through National Knowledge Network and requisite nodes within

institutions; to be implemented through an empowered committee.

- Revitalize and reform polytechnics through industry linkage and teacher development, establish 210 community colleges and 700 polytechnics.
- Strengthen open universities and reform statutory bodies, scale up SAKSHAT as the education portal for 50 crore people.

Libraries (Volume II: Social Sector)

- Develop Public Libraries including Rural Public Libraries.
- Special collections and technological support for visually challenged and hearing impaired.

Translation (Volume II: Social Sector)

- A National Translation Mission for promoting Translator education including specialized courses in translation technology.
- Translate at least five good literary works in every language into all other major languages.

Legislative Framework for Public Funded Research (Volume II: Social Sector)

There is a need for an appropriate legislative framework for incentivizing innovators and commercialization of public funded R & D, where the Government, the recipients of funds, the inventor as well as the public benefit from the protection and commercialization of IP.

Traditional Health Systems (Volume II: Social Sector)

The Plan recognizes that no single system of health care has the capacity to solve all of the society's health needs. It lays special thrust on strengthening professional education, strategic research programmes, promotion of best clinical practices, technology upgradation in industry, setting internationally acceptable pharmacopeial standards, conserving medicinal flora, fauna, metals and minerals, utilizing human resources of AYUSH in the national health programmes and strengthening IPRs with the ultimate aim of enhancing the outreach of AYUSH health care in an accessible, acceptable, affordable and qualitative manner.

Intellectual Property Rights (Volume III: Economic Sector)

- Undertake the second phase of modernization of IP offices to address the needs of human

Organizational Issues

The XIth Plan broadly incorporates many recommendations of NKC. The focus on expanding the capacity of institutions in higher and technical education, the need to evolve robust PPP models in vocational education and training, revamping libraries through greater community participation, the necessity of creating a digital broadband network for interconnecting research and education institutions and the importance of process re-engineering for e-governance initiatives, are all issues highlighted by NKC. However, a crucial aspect of NKC recommendations and perhaps the most significant innovation in many of them focuses on organizational and institutional reforms in some of our key knowledge sectors. During the extensive consultations undertaken by NKC, what emerged as an important feedback was that we need to fundamentally rethink some of our delivery mechanisms. Sustained efforts at improving the quality of school education, creating resources for institutions of higher learning, maintaining a vibrant library network, imparting vocational skills etc have not yielded results commensurate with the effort often because of the mode of delivery.

NKC therefore stressed the need to create appropriate institutional frameworks for the implementation of its recommendations:

- A National Commission on Libraries, comprising of stakeholders including professionals, was suggested as an autonomous organization to undertake the task of revitalizing the sector in a comprehensive manner.
- A special purpose vehicle (SPV) outside the government framework was recommended to manage the day to day working of the proposed Knowledge Network. This SPV would have adequate professional expertise and representation from a range of stakeholders including industry, government and user institutions.
- A National Translation Mission was proposed to provide a boost to translation activities nationwide and streamline the task of implementing the Commission's recommendations on the sector. The Mission was envisaged as an independent organization with financial and administrative autonomy.
- An Independent Regulatory Authority for Higher Education (IRAHE), at an arm's length from all stakeholders was recommended to replace the existing multiple regulators. This would not only reduce barriers to entry but also ensure uniformity of regulation among different branches of higher education.

NKC strongly believes that as resource allocation increases, institutional reforms and organizational changes may become the crucial bottleneck that hamper progress. Rapid changes are taking place in different sectors of the economy, in this scenario education and associated knowledge sectors would need to keep pace with this change to continue to be relevant. We require paradigm shifts in our delivery mechanisms to ensure that we create institutions and structures that are sustainable, have the ownership of the community and are accountable to them.

resources development, training, awareness and infrastructure besides regular updating of the IT facilities.

- Indian IPO would be made an International Searching Authority and an International Preliminary Examining Authority under the Patent Co-operation Treaty of WIPO

B. Public Outreach & Website

Policy interventions by the Central & state Governments will be necessary but not sufficient for reorienting our knowledge institutions. Critical to enhancing quality and forging partnerships among various stakeholders is paradigm shifts in perspectives and changing mindsets. Engaging a wide set of stakeholders has therefore been an integral part of the NKC process. This has taken several forms:

a) Discussions and deliberations in Working Groups, sub-Committees, Seminars, Workshops etc. both at the national and regional levels to obtain inputs for formulating recommendations. Details regarding these consultations are given later in this Report.

b) Public outreach after the recommendations were submitted focused on two major areas – libraries and higher education. The seminars and workshops organized for libraries engaged professionals as well as administrators to work out detailed plans and to create a movement towards reform. On higher education, the focus has been on interaction with college teachers and administrators to build consensus and exchange good practices for improving quality through measures such as semester system, course credits, enhancing accountability of teachers, teacher training, curriculum reform etc. In some larger seminars, issues of regulation, accreditation, access etc. have been discussed.

c) Disseminate NKC recommendations/ compilations/reports to as many stakeholders as possible. Both traditional mail and emails have been used to send out NKC documents to around 20,000 stakeholders. These include Ministers and officials in the Central and State Governments, District Collectors, Universities, deemed universities, colleges, professionals, academics, autonomous bodies, NGOs, multilateral donors, Indian Embassies abroad etc.

d) Maintaining a dynamic, interactive and well-populated website. While the main website is in English, translated pages are available in ten other languages namely Hindi, Bangla, Kannada, Assamese, Tamil, Urdu, Nepali, Oriya, Manipuri and Malayalam. All reports of Working Groups, records of other consultations and texts of recommendations are available in a user friendly format. The Resources section provides links to web based resources on issues under consideration of NKC. There is a Discussion Board for expressing opinions and suggestions on knowledge related issues. The website is proposed to be scaled up to a portal on knowledge. The website has been accessed by more than 100,000 unique visitors.

C. Knowledge Initiatives at State and District Levels

While interventions of the Central Government would be critical in policy formulation and allocation of financial resources, any perceptible and sustained reform in knowledge institutions would require action by the state Governments. In fact, knowledge institutions can meet fully the needs of the community only if plans are tailored at the District level within the broad contours of National and State level frameworks.

With this perspective, NKC took care to engage with State and district level stakeholders right through its process of consultation. Further, copies of NKC's Report to the Nation and a summary of its recommendations were sent out right down to the District level. In addition, presentations on NKC recommendations were made to State Chief Secretaries and other concerned Departmental heads. Where possible, NKC Advisers also apprised the Chief Ministers of the NKC blueprint for reform. The details of the State level visits are presented later in this Report. The State Governments have appointed state level nodal officers to follow up on NKC recommendations.

With the XI Plan having been approved at the NDC with the concomitant assurance of financial resources, the stage is now set for specific schemes and programmes to be taken up both at the State and District levels. To facilitate and expedite the process, NKC has prepared a template each for

State Knowledge Initiative and District Knowledge Initiative. Assistance will be provided by NKC to the State governments and select District authorities in preparing detailed Work Plans. These would consist of a package of initiatives culled out from NKC recommendations and the XI Plan, with detailed activities, milestones and financial outlays.

State level plans will facilitate Central and state level budgetary allocations and the District Plans will facilitate allocation of resources from the State budget. The areas covered will be School Education, Vocational Education & Training, Higher & Technical Education, Libraries, Translation, Knowledge Network, English language teaching, Health Information Network and Traditional Health Systems. It is expected that such plans will be rolled out for all the States by the end of 2008. NKC proposes to conduct workshops for State nodal officers and select District officials to facilitate formulation of these plans and exchange good practices.

Highlights of Recommendations 2006

Libraries

- Set up a National Commission on Libraries
- Prepare a National Census of all Libraries
- Revamp Library Information Science (LIS) Education, Training and Research facilities
- Re-assess staffing of libraries
- Set up a Central Library Fund
- Modernize library management, encourage greater community participation in library management
- Promote Information and Communication Technology (ICT) applications in all libraries
- Facilitate donation and maintenance of private collections
- Encourage Public Private Partnerships in LIS development

Translation

- Provide impetus for developing translation as an industry
- Establish a store-house of information on all aspects of translation involving Indian languages
- Promote printed as well as virtual publication of translation studies
- Create and maintain various tools for translation and encourage machine translation
- Provide quality training and education for translators
- Translate pedagogic materials at all levels specifically in the natural and social sciences
- Project Indian languages and literatures through high-quality translation
- Set up a national web portal on translation
- Organize Annual National Conferences on translation
- Promote book launches, festivals, fellowships and prizes for translation.
- Set up a National Mission on Translation for this purpose.

English Language Teaching

- Introduce English, along with the first language starting from Class I in school
- Modify pedagogy of language learning and teaching and reduce disproportionate emphasis on grammar and rules
- Train the approximately 4 million school teachers regardless of their subject expertise through vacation training programmes or other short-term courses
- Induct graduates with high proficiency in English and good communication skills without formal teacher-training qualifications
- Develop pedagogically sound English textbooks from Class I-XII
- Language learning must be integrated with content learning
- Create language learning opportunities inside and outside the class room using all available media-audio-visual, print etc.

National Knowledge Network

- Interconnect all knowledge institutions throughout the country, through an electronic digital broadband network with adequate capabilities (minimum access speed of 100mbps or more) to encourage sharing of resources and collaborative research
- Utilize various available options including existing commercial networks for this purpose.
- The network will be based on Internet Protocol (IP) and Multi-Packet Labeled Services (MPLS) technology
- A Special Purpose Vehicle (SPV) consisting of major stakeholders should manage the day to day working
- Security of data along with privacy and confidentiality to be ensured
- Initially consider using existing commercial networks, and shifting to a hybrid network with a central Core of a relatively few nodes, and an outer network
- One time capital support to be given to user institutions to set up a high speed Local Area Network

Right to Education

- Legislation on Right to Education must be enforced by the central government following from the commitment made in the Constitutional Amendment Article 21A
- The legislation must include a financial provision requiring the Central Government to provide the bulk of the additional funds needed to ensure Right to Education
- The responsibility of the Government, at different levels, must be recognized to ensure justiciability.

- The legislation must include a schedule of norms and standards to specify minimum quality of education
- Appropriate procedures must be set in place to outline a redressal mechanism.

Higher Education

- Create more universities expanding to around 1500 universities nationwide, to enable India to attain a gross enrolment ratio of at least 15% by 2015
- Establish an Independent Regulatory Authority for Higher Education (IRAHE)
- Increase public spending and diversify sources of financing
- Promote enhanced quality through measures such as upgrading infrastructure, introduction of salary differentials, etc.
- Establish 50 National Universities as multi disciplinary exemplars with admissions on an all India basis
- Ensure access for all deserving students through well funded scholarships and affirmative action
- Affirmative action should address multiple dimensions of deprivation
- Reform existing universities to ensure curricula revisions, introduce course credit system, enhance reliance on internal assessment, encourage research, reform governance etc.
- Restructure the system of affiliated undergraduate colleges

Vocational Education

- Increase the flexibility of VET within the mainstream education system
- Quantify and monitor the impact of vocational education
- Increase resource allocation to vocational education
- Expand capacity through innovative delivery models
- Enhance the training options available for the unorganized and informal sector
- Ensure a robust regulatory and accreditation framework
- Ensure proper certification
- Undertake a re-branding exercise

National Science and Social Science Foundation

- Set up a National Science and Social Science Foundation (NS3F) which will look at all knowledge as one seamless entity
- The Foundation to suggest policy initiatives to make India a leader in the creation and use of knowledge, to ensure that science and technology are maximally used for the betterment of the lives of people, and to develop the scientific temper in the country

E-Governance

- Re-engineer government processes first, to change basic governance pattern for simplicity, transparency, productivity and efficiency
- Develop common standards and deploy common platform/infrastructure for e-governance
- Select 10 to 20 important services that make a critical difference, simplify them and offer them as web-based services
- Begin all new national programmes (like Bharat Nirman, Rural Employment Guarantee Scheme, etc.) with well-engineered e-governance implementation and web interface
- Create a focused organization with structures that can operate in mission mode to drive the national e-governance plan.

Recommendations Submitted in 2007

Portals

9th January 2007

Recognizing that the Internet constitutes a powerful and democratic source of information and knowledge, the National Knowledge Commission (NKC) deliberated on ways to create a series of web portals. These web portals should become a decisive tool in the popular movements in support of the right to information, decentralization, transparency, accountability and people's participation.

In order to increase openness and enhance accessibility, NKC recommends the creation of web portals to aggregate, organize and present relevant and useful content in local languages, in a highly uniform, customisable, user friendly and personalized way for several key areas related to basic human needs.

In this context the Commission recommends the following:

1. Create national portals for basic needs: National web-based portals should be set up on certain key sectors such as Water, Energy, Environment, Education, Food, Health, Agriculture, Employment, Citizen Rights etc. These would serve as a single point of access for consolidated information, applications and resources on the sector and will cater to a wide spectrum of users from citizens, entrepreneurs, small scale industries, students, professionals, researchers, local practitioners etc.

2. Management and ownership by consortium: While the government will be a key partner in the initial set up, the portals should be managed by a consortium with adequate representation from a wide range of stakeholders from the sector including NGOs, Research and Scientific Groups, Academic Institutions, Advocacy Groups, Government Agencies/Departments, International Bodies, Other Funding Agencies, Private Sector, Technology Experts, Educators, e-Learning experts, etc.

This will ensure that:

- The portal remains a dynamic repository of information from multiple sources to aggregate content.
- A collaborative model is adopted so that all stakeholders such as citizens, NGOs, businesses etc. participate in the creation, collaboration, sharing and discussions in a rich and meaningful way such that information cannot be monopolized by any one group.
- The portal would have greater community ownership in order to ensure its success
- Experiences, technology, processes etc. would be shared between various portals

3. Establish procedures: A set of procedures should be followed for setting up Portals:

- Agreement on the subject area
- Identification of champion/lead organization/s
- Submission of proposal on architecture of the portal by the champion organizations for consideration of the Commission
- Identification of stakeholders and partners and setting up of framework for portal management.
- Development of content
- Launch of Portal
- Development of rich, useful and relevant content

The cycle is expected to take between nine months to a year to complete, at the end of which a portal would be put in place which could then continuously be enhanced, populated and promoted.

4. Provide access to government held data: There are a host of issues related to data for a portal, such as sourcing, validation, quality and formats. The government is a major source of extensive data on various sectors. All government departments should easily make available data sets they have, in a digital format to the portal consortium. Data from different sectors needs to be analyzed holistically so that planning becomes more data-driven and reflects the ground situation. This means that data that is traditionally collected and managed separately, unrelated to each other, should now be seen together. There are no platforms or mechanisms currently in place to allow this to be done easily. Clear guidelines should be developed under which this data could be sourced in appropriate formats and regularly updated. The Right

to Information may make this easier, but it continues to be a long drawn process. These procedures need to be streamlined and made simpler.

5. Encourage collaborative funding: The Portal effort can escalate quickly as the scale of content, partnerships and the scope is very large. The issue of funding for the effort includes big line items like technology development, map preparation, data gathering, developing applications, content creation, organizing and coordinating partnerships. Solutions need to be evolved depending on the sector in question. Several possibilities including public private partnerships and new business models should be explored. The government may also look at providing some public money for these efforts through grants.

6. Reform mapping policy: The advance in computer based Geographic Information Systems (GIS) has given mapping and use of maps a huge impetus in various fields. The ability to make sense of large amounts of interrelated data in spatial and attribute form has helped in visual decision making in various areas such as Agriculture, Transport, Disaster Management etc. An unambiguous mapping policy coupled with clear guidelines for use of spatial data are necessary to share GIS data and thereby maximize the use of cutting edge technology and applications. Under the new mapping policy announced in May 2005, there is still some ambiguity about publishing of GIS maps on the Internet by NGOs, Government and other development oriented agencies. Rich GIS based content in various sectors like Water, Health, Education etc can be delivered by various organizations and bodies in order to share information, foster an informed debate and allow for more effective planning. The mapping policy needs to allow for such access and provide clear guidelines.

7. Enhance Internet penetration and access: At this stage, the use of Portals may be limited by the low Internet penetration in the country, where less than 5% of population has access to Internet. To address this challenge it is essential that the portal team should work proactively with NGO and Government networks, use mass distributions channels like radio, television and the print media to ensure this knowledge is leveraged to precipitate change on the ground. There needs to be a firm commitment to support alternate non-web outreach methods that make this knowledge accessible to all sections of society (the digital haves and havenots).

An alternate IT technology can support those who do not have Internet access. This calls for a locally resident tool that is run on a desktop PC which can provide information and run applications pertaining to specific topics. Since these applications are not relying on the Internet or storing information at a distant server, they can be used locally at the site without network connectivity.

Subsequently, it would be useful to be able to connect to a server to upload local data or download updates and information. These software thick client applications can be the source of bottom-up data, since NGOs and individuals can upload local data over the Internet for analysis at a central server. This provides an alternative bottom- up way of collecting fine grained local data in a continuous manner.

The portal will thus address the needs of a very diverse spectrum of users from researchers and policy makers to local practitioners at the ground level who stand to benefit greatly from the comprehensive availability of information on a sector relevant for them in an open and transparent manner.

8. Translate into Indian languages: The portals should be translated into all Indian languages to reach a wider audience. Interactive applications and e-learning content must be made available in local languages for it to be relevant.

Health Information Network

12th October 2007

The National Knowledge Commission (NKC) is convinced that extensive use of IT in health care will promote the delivery of efficient health care in the country. However as the use of IT in the management of healthcare and medical knowledge will increase, the health care establishments will develop and use their own health IT systems. It has been the experience of western countries that these individually developed systems are often not interoperable with other establishments, which makes the health care system inefficient and expensive. NKC believes that India has a unique opportunity to learn from the world experience and adopt only the proven best practices in the field.

In this context NKC constituted a working group, under the chairmanship of Dr. N.K. Ganguly, Chairman Indian Council for Medical Research (ICMR) to study the use of IT in future health care. The working group studied the future need, conducted several meetings and deliberations, and held consultations with various national and international experts. NKC believes that the use of IT in health care needs a national direction for its proper implementation and makes the following recommendations for developing a Health Information Network:

1. Initiate Development of Indian Health Information Network

India needs to develop a web-based network, connecting all health care establishments, in both private and public sector. When fully functional, all health care transactions will be recorded electronically and this data will be available in the health data vault to authorized users when they need it and where they need it.

The proposed Knowledge Network with gigabit capabilities may provide the backbone and network infrastructure on which the Health Information Network may ride. The network will be a 'hub and spoke model.' All health care establishments in a district will connect to a central data repository at the district level. All the district nodal data repositories will connect with a state level data bank, which in turn will connect with a central data bank.

There should be active involvement of private and public health entities to effectively address the creation of this network, portals, electronic health records, health data vault, security, privacy and other related issues in future, which will encourage the participation of the following:

- Citizens
- Health care providers and payers
- Education, research institutions and investigators
- Government departments and institutions
- Public health agencies and NGOs
- Pharmaceutical industry and medical device makers
- Telemedicine institutions
- Software and hardware developers

The ready availability of information will accrue enormous benefits to public health planning, medical education, cost control, medical research, drug development, prevention of fraud, disaster management and improved patient care.

2. Establish National Standards for Clinical Terminology and Health Informatics

For a web based interoperable national grid it is imperative to have common clinical nomenclature, or else disparate programmes developed by the industry will not be interoperable. The clinical standards will establish a common lexicon to be used in electronic transactions. This will enable all geographically scattered entities to communicate in one common language and facilitate data transmission and collection. It is important to develop common nomenclature standards for the traditional medical systems, as large numbers of people depend on these systems for their medical needs. Besides the common clinical language, adoption of a common national standard in health informatics will facilitate the messaging, collation and analysis of data.

3. Create a Common Electronic Health Record (EHR)

An electronic health record (EHR) is the record of a person from birth to death where all heath care encounters are recorded. Health transactions are presently recorded in a paper format, like a hospital patient chart, prescriptions, laboratory tests etc. The technology to capture and store this information electronically already exists and has been developed by many private and public organizations in India. For uniform data capture, storage and subsequent use, it is recommended to create a common national EHR based on common clinical and IT standards. The record should be able to capture data generated by the 'traditional medicine' health providers. To promote the early adoption of the health IT, this EHR may be given free of cost or at subsidized rates to all users. The other IT tools and applications can be developed by the private industry and should be compatible with the national EHR.

4. Frame Policies to Promote use of IT in Health Care

The use of IT in health care needs an impetus from the government; otherwise the development and penetration will be slow and arbitrary. These policies should be formed, not to hamper, but promote the health IT business in the country and generate employment in this sector. The central government should declare a time period after which all transactions in health care in the country will be in electronic format. Sufficient time should be given for the health establishments to adopt electronic transaction. NKC feels 7-10 years is an adequate time for all parties to evolve electronic transactions after which all health establishments should be able to comply.

5. Create Appropriate Policy Framework to Protect Health Data of Citizens

The integrity of data at the primary data collection site will determine the usefulness of this enterprise. To ensure that only correct patient and other health data is collected, it is of utmost importance to gain the confidence of the citizens that their health data will not be misused by the health providers, insurance companies, employers and the government. Both technological and legal framework is important to achieve this. While encryption, anonymity and other IT security measures should be in place; it is also important to have rules in place. It is important to maintain confidentiality and security of the personal health data and to govern the access and use of data.

6. Medical Informatics to be Part of Medical and Paramedical Curriculum

Medical education needs to take full advantage of the power of ICT. A well-structured health informatics curriculum needs to be made an integral part of medical education at all levels. Basic ICT facilities, such as good quality access to Internet and e-Journals, need to be made compulsory for all medical colleges in the country. For capacity building, ICT tools should be effectively deployed to train the large number of health workers. Short and medium term courses need to be developed and made available on the net to address training needs of all health workers in the field. It should be made affordable, accessible and easily available for small players. There is a need to evolve common formats for data reporting to facilitate IT enablement of medical manpower at all levels. Education related portals should also be set up for training of medical manpower.

7. Create an Institutional Framework for Implementation

An autonomous body with the Ministry of Health should be responsible for planning and implementing the project in a time bound manner. This body should be autonomous and a non-profit organization with representation from private, public and voluntary sectors.[1] All stakeholders should be represented in this body and it should have the resources to promote and implement the plan. It should also have the authority to ensure the smooth functioning of the Indian Health Information Network.

The objectives for this institutional body will be:

- To formulate an implementation plan
- To coordinate the participation of all stake holders
- To create linkages with e-governance, medical education network

[1] It may be modeled after the Canadian Health Infoway, which is a non-profit autonomous body funded by the federal and provincial governments in Canada.

- To ensure financial viability of the project
- To set up a comprehensive and interactive national health portal
- To suggest common national standards
- To protect confidentiality and security of data
- To facilitate the ownership, access and flow of data
- To maintain and upgrade the system in future

The next step in the development of Indian Health Information Network is to formalize the institutional body with appropriate professional people with domain expertise, adequate budget, time tables, and measurable milestones to implement these recommendations. The body may consider conducting pilot programmes before scaling at the national level.

Legal Education

15th October, 2007

The National Knowledge Commission, while deliberating on issues related to knowledge concepts, recognizes legal education as an important constituent of professional education. The vision of legal education is to provide justice-oriented education essential to the realization of values enshrined in the Constitution of India. In keeping with this vision, legal education must aim at preparing legal professionals who will play decisive leadership roles, not only as advocates practising in courts, but also as academics, legislators, judges, policy makers, public officials, civil society activists as well as legal counsels in the private sector, maintaining the highest standards of professional ethics and a spirit of public service. Legal education should also prepare professionals equipped to meet the new challenges and dimensions of internationalization, where the nature and organization of law and legal practice are undergoing a paradigm shift. Further, there is need for original and path breaking legal research to create new legal knowledge and ideas that will help meet these challenges in a manner responsive to the needs of the country and the ideals and goals of our Constitution. As part of a consultative process, NKC constituted a Working Group of experts, including distinguished members of the Bar, the bench and academia under the chairmanship of Justice M. Jagannadha Rao to suggest necessary measures to improve the quality of legal education in India. Based on further consultations with stakeholders, NKC has proposed the following:

1. Regulatory Reform: A New Standing Committee for Legal Education

A new regulatory mechanism under the Independent Regulatory Authority for Higher Education (IRAHE), vested with powers to deal with all aspects of legal education and whose decisions are binding on the institutions teaching law and on the union and state governments should be established. The Standing Committee for Legal Education may consist of 25 persons (including eminent lawyers, members of the Bar Council of India/BCI, judges, academics, representatives from trade, commerce and industry, economists, social workers, students and others) and it must aim at revamping legal education to meet the needs and challenges of all sections of society.

At the time of enactment of the Advocates Act, 1961, it was envisaged that legal education would only produce lawyers for the courts and accordingly the BCI had been entrusted with the limited role of 'promoting legal education and laying down minimum standards of legal education' required for students who 'are entitled to practice'. In the last 50 years, and particularly after liberalization in 1991, the entire concept of legal education has changed considerably. Today, legal education has to meet not only the requirements of the Bar but also the new needs of trade, commerce and industry, in the context of growing internationalization of the profession. The need for improvement in overall quality to match global standards has become even more salient when viewed from such a perspective. In light of the changed scenario in the last 50 years and the existing gaps and deficiencies in overall quality, it is clear that the BCI has neither the power under the Advocates Act, 1961 nor the expertise to meet the new challenges both domestically and internationally. It is, therefore, necessary to constitute a new regulatory mechanism with a vision both of social and international goals, to deal with all aspects of legal education and to cater to the needs of the present and the future. The BCI would however continue to exercise its powers to recommend minimum standards required for practice in the courts. Further, the BCI would continue to enjoy its powers of discipline so far as the members of the Bar are concerned.

2. Prioritize Quality and Develop a Rating System

There is a need to develop an independent Rating System based on a set of agreed criteria to assess the standard of all institutions teaching law as a mechanism to ensure consistent academic quality throughout the country. The criteria for rating would be evolved by the Standing Committee for Legal Education while the rating would be done by independent agencies licensed by IRAHE for the purpose. Recognition could be either granted or withdrawn on the basis of

such ratings. The rating results should be reviewed annually, regularly updated, monitored and made available in the public domain.

3. Curriculum Development

Curriculum should be made contemporary, integrated with other disciplines ensuring regular feedback from stakeholders. Autonomy may be granted to universities, National Law Schools (NLSUs) and other law schools to decide the core and optional courses to be offered. This is a departure from current practice where the BCI largely determines curricula and syllabi. A committee should be formed that includes faculty and practitioners and seeks student feedback to discuss curricula, syllabi and reading material of all core and optional courses, and devise a 'model' syllabus for all core and optional courses. Law schools and universities would be free to use and depart from the 'model' syllabus.

Law teaching must be interwoven with related contemporary issues, including international and comparative law perspectives. The curricula and syllabi must be based in a multidisciplinary body of social science and scientific knowledge. Curriculum development should include expanding the domain of optional courses, providing deeper understanding of professional ethics, modernizing clinic courses, mainstreaming legal aid programmes and developing innovative pedagogic methods. Legal education must also be socially engaged and sensitize students on issues of social justice.

4. Examination System

The prevailing examination systems may be revised and evaluation methods be developed that test critical reasoning by encouraging essential analytical, writing and communication skills. The end-semester examination should be problem-oriented, combining theoretical and problem oriented approaches rather than merely test memory. Project papers, project and subject viva, along with an end-semester examination to be considered as pedagogic methods imperative for improving quality.

5. Measures to Attract and Retain Talented Faculty

To attract and retain talented faculty, better incentives, including improving remuneration and service conditions may be introduced. It may be necessary to think of salary differentials within and between universities and law schools along with other means of attracting and retaining talented faculty members. Such salary differentials between and within universities and law schools could be effective without being large. This will help retain talent in legal academia where the problem of inadequate remuneration is far more acute than in other disciplines. Salary differentials could be considered as a means to retain quality talent and also promote a culture of excellence.

To foster quality and create better incentives, there is also need to remove fetters on faculty that pertain to opportunities in legal practice (such as consultancy assignments and legal practice in courts). These reforms need to be introduced in a balanced, reasonable and regulated manner to ensure adequate incentivization for faculty without compromising on the maintenance of consistent academic quality. As a further incentive, it is necessary to create better opportunities for active involvement of academia in the shaping of national legal education policy.

There is also need to reconsider existing promotional schemes and avenues to promote meritorious faculty members. Other incentives for faculty include fully paid sabbaticals; adequate House Rent Allowance (HRA); instituting awards to honour reputed teachers and researchers at national and institutional levels; flexibility to appoint law teachers without having an LL.M degree if the individual has proven academic or professional credentials; faculty exchange programmes with leading universities abroad and upgrading existing infrastructure.

6. Developing a Research Tradition in Law Schools and Universities

Creating a tradition of research in law schools and universities is imperative if India has to transform itself from being only a consumer of available legal knowledge to being a leading producer in the world of new legal knowledge and ideas. The following measures are required to develop such a serious culture of research: emphasizing analytical writing skills and research methodology as integral aspects of the LL.B programme; creating excellent infrastructure (including research friendly library facilities, availability of computers and Internet; digitization of case law; access to latest journals and legal databases

available worldwide); rationalizing the teaching load to leave faculty members sufficient time for research; granting sabbatical leave to faculty to undertake research; creating incentives if research results in peer reviewed publications, either through additional increments (beyond the UGC scheme) or in any other appropriate manner; institutionalizing periodic faculty seminars; establishing quality peer-reviewed journals; prescribing research output as one of the criteria for promotion; creating a database of citations to identify the most cited and influential writings as well as considering such data for promotion purposes; establishing prerequisites such as a mandatory dissertation in the LL.M programme, a pre-registration presentation and a course in methodology for M.Phil and PhD programmes respectively; and establishing four new centres for advanced legal research.

7. Centres for Advanced Legal Studies and Research (CALSAR)

There is need to set up four autonomous, well networked Centres for Advanced Legal Studies and Research (CALSAR), one in each region, to carry out cutting edge research on various aspects of law and also serve as a think-tank for advising the government in national and international fora. The CALSARs would maintain adequate linkages and institutionalized interaction opportunities with law schools and universities, including continuing legal education for faculty. Some other specific functions and objectives of these centres would include: publishing a peer reviewed journal of international quality; facilitating multi disciplinary approaches to law; institutionalizing arrangements for scholars in residence; organizing workshops and undertaking in-depth research on new and developing areas of law.

Each CALSAR would require an initial investment of around Rs. 50 crore to build an academic complex, conference facilities, a world-class library and other infrastructure. These institutes would also need to be provided with an annual budget to the tune of Rs. 5 crore for salaries, fellowships, administrative expenses and related expenses. The initial investment and the annual budgets should be borne by the central and respective state governments (that would host the CALSAR) respectively, but the CALSARs should gradually aim at financial self-sustenance, through innovative financial methods.

8. Financing of Legal Education

It is for law schools and universities to decide the level of fees but as a norm, fees should meet at least 20% of the total expenditure in universities. This should be subject to two conditions: first, needy students should be provided with a fee waiver plus scholarships to meet their costs; second, universities should not be penalized by the UGC for the resources raised from higher fees through matching deductions from their grants-in aid. The central and state ministries may also be urged to endow chairs on specialized branches of law. State financing can be complemented with endowments from the private sector, including synergistic arrangements such as appropriate public private partnerships. Incentives such as tax holidays for donations above a high minimum threshold by the corporate sector may be considered. Institutions should be given the autonomy to evolve their own innovative methods of financing to maximize infrastructure and resource utilization.

9. Dimensions of Internationalization

Building world class law schools today will require creatively responding to the growing international dimensions of legal education and of the legal profession, where it is becoming increasingly necessary to incorporate international and comparative perspectives, along with necessary understanding of domestic law. Suggested initiatives to promote such international perspectives include building collaborations and partnerships with noted foreign universities for award of joint/dual degrees; finding ways of evolving transnational curricula to be taught jointly by a global faculty through video conferencing and Internet modes; as well as creating international faculty, international courses and international exchange opportunities among students.

10. Technology for Dissemination of Legal Knowledge

For maximum dissemination of legal knowledge, all information available in the Indian Law Institute ("ILI"), Supreme Court Library, Indian Society for International Law ("ISIL") as well as those of all law schools, universities and public institutions in the country, be networked and digitized. Such networking is in addition to the need for adequate infrastructure such as computers, law journals, legal databases and excellent libraries in the institutions teaching law.

Medical Education

16th October, 2007

The quality, the quantity, distribution and availability of human resources for the health sector in India at present, need to be improved substantially to deliver care-driven, rural oriented and equitable health services. Over the years, health related education and training has become more urban oriented, doctor-centric and technology-driven. The environment of medical education needs to be both nationally sensitive and globally competitive. To realize these objectives, our medical education system needs radical reforms.

The National Knowledge Commission (NKC) therefore considered it imperative to carry out a comprehensive appraisal of the system. For this purpose, Working Group was constituted which included some of the most distinguished members of the medical profession in India, chaired by Dr. Sneha Bhargava, former Director, AIIMS. Based on the inputs provided by the Working Group and further consultations with concerned stakeholders, NKC recommended the following:

1. Regulation and Accreditation

Regulation

At present, medical education in India is regulated by the Medical Council of India (MCI). This system of regulation is neither adequate nor appropriate to meet the needs of the profession. Therefore, in conformity with NKC recommendations on Higher Education, a Standing Committee within the structure of the Independent Regulatory Authority for Higher Education (IRAHE) may be constituted. The primary function of the Standing Committee will be to ensure that medical practice and teaching are updated and revised regularly and minimum quality standards are maintained. The members of the Standing Committee would include faculty from recognized universities, practising physicians, members of civil society, students and a director from autonomous institutions representing educators. The Chairman and the members of the Standing Committee would be accountable to IRAHE. The Standing Committee would look into manpower planning and development based on disease-profile, doctor-population ratio and skill-mix ratio.

Professional Councils

The Indian Medical Council Act should be amended such that MCI functions only as a professional association, with powers to conduct nationwide examinations, and to provide licenses for those who wish to join the profession. Similar changes are needed for all the other Councils viz. Nursing Council, Pharmacy Council, Dental Council and Rehabilitation Council.

Accreditation

IRAHE should be empowered to license suitable agencies for accreditation. Accreditation agencies could award different degrees of accreditation, such as “Full”, “Provisional” or “On Probation” and have the power to de-recognize. Institutions would have to ensure transparency in their admission processes, able and responsible faculties, a multidisciplinary academic learning environment, transparency in assessment of students and close linkages with regional health care and delivery systems, in order to be accredited.

Admission

Policies of admission and fee structure of private colleges have to be regulated, not only to stop them from becoming sources of political and financial power but also to arrest falling standards. There should be only one All India Common Entrance Test for all students who would like to get admission to Self Financing Medical Colleges. Since the CBSE conducted examination for the 15% All India quota in Government Medical Colleges is taken by a very large number of students, this would appear to be the ideal examination whose ambit can be expanded. All self-financing Medical Colleges should announce their fees in their prospectus so that students can make their choice for admission. Information Technology should be used to increase transparency and efficiency in the admission, examination, administration, teaching, content delivery and other related processes.

2. Quality

Curriculum

All institutions must constitute Curriculum Committees that plan curricula and instructional methods, which are regularly updated. The structure and composition of the curriculum must describe the content, scope and sequencing of the courses, including the balance between core and optional courses. Integration of ICT in the learning process is essential. Incorporating new skills like management, disciplines like health economics and frontier areas like bioinformatics should be considered.

Standards test

An independent and standardized National Exit Examination at the end of 4½ years of study, is essential to conduct a national level assessment of skills and knowledge. The National Exit Examination could be conducted immediately after the University examination, and would also serve as a postgraduate entrance exam.

Internship Assessment

The internship year must be assessed to ensure skill development. The current practice of students continuing to study in the internship year without going to clinics needs to be addressed. There must be compulsory rotation from the teaching hospital to the community and district hospital during the internship period. Duration of the term in the district hospital should be six months, in the Community Health Centre three months and in the tertiary care hospital the remaining three months. Each intern should be assigned a "mentor" at the district hospital and the credits should be based on the assessment by the mentor. The entrance to postgraduate programmes should be based on a summation of the pre- & post-internship examinations.

Continuing Education

There is a need to revamp Continuing Medical Education (CME) based on distance learning. All professionals should be required to undergo a re-certification process every five years, which can be evaluated by credits earned through CME. ICT can be used extensively to provide CME at the convenience of the learner.

3. Faculty Development

Teaching

Attracting and retaining quality faculty should be accorded top priority. Measures such as opportunities to attend international conferences regularly, sabbaticals, dual appointments, rewarding research, fast-track promotions, and dissociating remuneration from government pay scales should be explored. All institutions must clearly lay down exact definitions of what constitutes conflict of interest for faculty members in public medical colleges, who have a private practice in addition to their official duties, and receive a full time teacher's salary. Those who flout these regulations should be penalized.

Research

With a view to encouraging research in medicine, a Mentored Medical Student Research Programme should be set up as a catalyst to introduce medical students to a potential career in patient-oriented/community-oriented research including interdisciplinary research. Two points of entry into PhD programmes should be considered: one after MBBS and another after MD depending on the student's interest. The government should facilitate setting up of research centres in medical colleges. Validating Indian Systems of Medicine using bio-sciences tools should form an integral component of the research effort.

Training

Five Regional Centres for teacher training/faculty development should be set up so that teachers from the outlying regions can be sent to these centres periodically for up-gradation of their teaching skills.

4. Post-graduate Education

General Physicians

The medical profession needs to be structured like a pyramid with the base made up of general physicians. At present there is little if any space for such doctors in post-graduate courses. Therefore, we suggest that adequate representation should be given to general physicians while carrying out expansion of post-graduate seats such that 50% seats are reserved for general physicians. New streams for post graduation should be looked at based on needs.

Admissions

Admission to post-graduate courses should be done on the basis of credits received in the National Exit Examination and pre- and post-internship clinically oriented exams after internship. There is a need to reserve post-graduate seats (up to 20% of total available seats) for graduates who have worked in rural areas for at least three years.

5. Regional Balance

Location Priorities

The number of medical colleges in relation to population in some states is much higher than in other states. The Central Government should aid new colleges in these states to address this regional disparity. For instance, north eastern states require urgent attention in this context. The Central Government can develop a list of priority sites for establishing new colleges where the impact of new clinical facilities would benefit the surrounding rural population.

Role Models

Further at least one institution should be identified in each State that can serve as a centre of excellence and role model for the other institutions of the state. These institutions should have state-of-the-art infrastructural equipment such as research laboratories, teacher training facilities, and libraries, as well as talented faculty of adequate strength to act as a common resource and also to serve as a benchmark of excellence.

Medical education cannot be standalone. It requires support in the form of trained nurses, pharmacists, paramedic workers. It must all also serve the essential purpose of delivering health care to the people. Therefore, NKC also set out some recommendations on education for supporting services and public health.

6. Education for Support Services

Nursing

There is a need to create additional capacity for training nursing staff. In addition, every district hospital should have attached to it a nursing school, which offers diploma in nursing specifically to operate primary health centres as nurse practitioners. A career growth pathway should be ensured for nurses after a specific period of primary health care service. For graduate nurses in city hospitals, specialized courses for family nurse practitioners, nurse anesthetists and in areas of tertiary care are recommended.

Pharmacy

Pharmacy education should be popularized and the number of seats for pharmacy education should be increased substantially. Gradual phasing out of untrained pharmacists should be considered.

Paramedics

The role of Paramedic workers should be expanded. A Paramedical Council needs to be immediately established, which would prepare training programmes for multi skill and speciality technicians and oversee their delivery and quality. Paramedics, such as compounders, dressers, and laboratory technicians can also perform public health functions, such as health education, providing immunization, and first aid. Such a health worker could be trained through vocational training at the higher secondary level followed by a one year diploma. Career paths should be built into their service in order to retain them because international demand is high.

7. Public Health

Education

A three tiered structure consisting of a one year diploma course, a three year B.Sc. course and a three year Master's course may be introduced. These programmes can be attached to departments of Community Medicine in all medical colleges for providing hands on training. All universities, all district hospitals and the Public Health Foundation of India can run them.

ASHA

The role of Accredited Social Health Activists (ASHA) needs to be re-conceptualized within this framework, and ASHA must be viewed as an accessible and effective health worker. The training period of the ASHA needs to be lengthened from its current duration. Steps should be taken to review the system of remuneration and improve the working conditions of the ASHA workers.

Management Education

15th October, 2007

Management education has seen phenomenal growth in the past six years with the number of institutions providing undergraduate and post-graduate level courses rising to over 1700. Of these, more than 1000 were added after the year 2000. This has been possible largely due to the entrepreneurial initiative of promoters, taking advantage of the ever increasing demand for management graduates, hence management education. Unfortunately, this has also led to an exploitative and commercial environment with quality being compromised. Regulatory focus only on physical infrastructure rather than research, qualified faculty and relevance of courses has created a mismatch between supply and demand.

As a part of its consultative process, NKC constituted a Working Group of experts from academia and industry under the chairmanship of Mr. P.M. Sinha. The names of the members are listed in the annexe to this letter. Based on the Working Group's inputs and consultations with concerned stakeholders, NKC proposed the following set of initiatives:

1. New Regulatory Framework

NKC advocates good governance rather than the prevalent system of a prior control being exercised by AICTE in this sphere. The current regulatory regime focuses on punitive actions rather than on nurturing institutions. NKC proposes that an autonomous Standing Committee for Management Education be set up under the Independent Regulatory Authority for Higher Education. Its main role would be to exercise due diligence at the point it approves a license to grant degrees/diplomas. In doing so, it would assess the academic credibility and the financial viability of the proposed institution on the basis of information submitted in accordance with the stipulated criteria. It will apply exactly the same norms to public and private institutions, just as it will apply the same norms to domestic and international institutions. It would, in addition, license agencies to take care of accreditation. Other responsibilities of the Standing Committee will be to collate as well as communicate information on Management Educational Entities (MEEs)[1]; set up an information exchange; conduct demand forecasting of managerial manpower and develop and maintain a low cost e-monitoring system.

2. Grading Institutions

The Standing Committee will stipulate grading norms and nominate independent rating agencies to assess and categorize MEEs. Mushrooming private MEEs necessitate a reliable rating system to help the market function better, enabling students and employers to compare different MEEs. Hence, a two stage rating process is recommended. In the first stage, rating covering infrastructure may be mandated before an MEE can admit students. The second stage would consist of rating of quality (admission process, teaching, research and publications) which shall be conducted every three years to ensure accountability. Grading norms for each of these steps should be established in consultation with experts. CRISIL and ICRA were consulted in the process and they have agreed to undertake rating of MEEs. The Standing Committee shall decide on a fair and transparent mechanism to deal with conflicting points of view between a rating agency and an MEE.

3. Accreditation

For MEEs which wish to go beyond rating, the Standing Committee shall determine the criteria and the processes of accreditation in consultation with experts from academia and industry. Mentoring to help MEEs sustain quality standards should be an integral part of the process. Select international accreditations may also be recognized. Branding of accreditation, similar to international standards such as ISO 9001, may be considered to encourage MEEs to pursue excellence.

[1] In view of the variety of institutions delivering management education, MEE is used to cover all educational institutions; Institutes, Departments, Affiliated and Autonomous colleges, Departments in Deemed Universities, Private Business Schools etc.

4. Improve Access

In addition to the framework of affirmative action already in place, we suggest improving access based on work experience and educational loans. NKC believes that management education can be made available to a much wider student community by adopting a two pronged approach. First, we suggest that more weightage be assigned to work experience in admissions. This would help in overcoming disadvantages faced by prospective students due to lack of proficiency in English. Secondly, steps may be taken to ensure easier access to educational loans through banks. Default concerns can be addressed if the respective MEE and the first employer cooperate with the banks. MEEs must also offer scholarships to socially disadvantaged students.

5. Social Context

It is essential to widen the scope of management studies and enhance its relevance.

- Sensitize management education to our unique socio-cultural situation by including India specific case studies in the curriculum, reflecting our diversity and incorporating traditional wisdom.
- Integrate management with other knowledge sources and increase research funding for management and supporting disciplines. With globalization, the need for management education to pursue a wider scope and realize a more wholesome impact on society has increased. Management departments in universities should therefore draw upon knowledge sources in other departments.
- Encourage MEEs to design and offer executive programmes for government officials, NGOs and defence personnel. Short term courses for government officials will help them in their role as economic managers.
- Revamp the existing Bachelor's degree in management, the Bachelor's in Business Administration, to cater to the burgeoning need of management graduates. Compulsory apprenticeship in organizations and study of under managed sector areas should be included as part of the programme. The current bookish nature of the curriculum is not sufficient to prepare students for junior management levels.
- Distance learning has considerable potential in this domain. We therefore need to fully realize the potential of Online Management Programmes to bridge the demand-supply gap.

6. Faculty Development

Non availability of adequate proficient faculty is a major constraint for sustainable growth of quality management education in India. An autonomous, financially sound and academically credible institute with active support from the leading management institutes, industry and Government should be set up for faculty development. Standards for curriculum covering the entire spectrum need to be set. Active involvement of MEE faculty in training, conferences, industry engagement and curriculum revision should be encouraged. Given the current demand-supply gap, additional faculty would need to be attracted by appropriate incentives.

7. Mentoring

To achieve excellence in the field of management, NKC recommends that all the leading Management Institutions adopt 3-4 MEEs for mentoring and upgradation of quality. Funding and other modalities can be mutually worked out between the institutions.

8. New Institutions

There is a need for a new wave of management institutions which will focus on entrepreneurship, leadership and innovation. These institutions will enable to launch India in to the global arena, without the legacy associated with operating in a protected environment. These institutions should set new standards and become role models for MEEs that have the desire to become leaders in the global market place. Incentives need to be provided to Indian entrepreneurs/corporates to setup institutions of excellence on their own or in collaboration with foreign universities. We could also consider allowing reputed foreign universities to enter this field, regulations for them being at par with private institutions.

9. Autonomy

All existing management institutes excluding management departments in universities should register with the Standing Committee of IRAHE and be accorded independent status. In the case of MEEs set up by Central and State governments, government

should be treated as a promoter. Registered institutes will benefit from the Standing Committee's mentoring and better funding opportunities apart from other advantages associated with autonomy.

10. Governance

NKC recommends a board of governors for all MEEs, consisting of 50% independent members as there are independent directors under Company Law. The key focus of the governing board should be to continuously improve quality of education and research. For this purpose, they would have to maximize the resource/fund inflows and allocate/spend them purposively and efficiently. The Board should encourage faculty to publish reputed journals and publications, obtain regular feedback from students on teaching-learning process, obtain recruiter feedback for improving quality, institutionalize faculty evaluation and management system and encourage faculty to write India based case studies. The appointment of Directors of public MEEs should be freed from direct or indirect interventions on part of the governments, for these should be based on search processes and peer judgement alone. Likewise, the appointment of directors of private MEEs should be based on a transparent selection process. This would of course be accompanied by enhanced accountability based on performance indicators and independent external evaluation.

11. Non-traditional Management Education

The need for better management in education, health, local government, co-operatives, and civil society organizations and so on has often been felt. However, the experience of graduates of Institute of Rural Management and Institute of Forestry Management shows that a lack of advancement opportunities in the Government acts as a barrier to the success of such programmes. There is a need to establish career opportunities in public management, and systematize recruitment and retention policies. Structure of fees for these courses should be formulated in accordance with earning opportunities. We also need to encourage reputed MEEs to develop specialized courses for agri-business, rural banking, public utilities, regulatory agencies and services sector in the coming years as private players entering this space would create demand for the same. The Standing Committee should undertake a study in this field to institutionalize these programmes.

Open and Distance Education

2nd November, 2007

The National Knowledge Commission (NKC) believes that a radical reform of the system of Open and Distance Education (ODE) is imperative to achieve the objectives of expansion, inclusion and excellence in higher education. The significance is obvious. For one, more than one-fifth of the students enrolled in higher education are in the ODE stream. For another, ODE has an enormous potential to spread higher education opportunities beyond the brick and mortar world. But there are reasons for concern. First, the quality of higher education provided in large segments of ODE, particularly in correspondence courses in universities, leaves much to be desired. Second, it is not sufficiently recognized that ODE provides educational opportunities not only to those who discontinue formal education on account of economic or social compulsions, but also to young school leavers who are simply unable to secure admission in the formal stream at universities. It is time to address these problems. There is a clear need to improve the quality of ODE and to make it more appropriate to the needs of society. It is just as important to expand opportunities in higher education through the use of technology in ODE. It would not be possible to attain a gross enrolment ratio of 15% by 2015 without a massive expansion in ODE. In this endeavour, we must not forget that ODE is seen as inferior to conventional classroom learning. This perception, and the reality, both need change. We must realize that ODE is not simply a mode of educational delivery, but an integrated discipline engaged in the creation of knowledge.

In light of the above, NKC constituted a Working Group composed of distinguished experts in this field, chaired by Prof. Ram Takwale, former Vice-Chancellor, IGNOU. Based on inputs provided by the working group and consultations with stakeholders, NKC recommended the following reforms:

1. Create a National ICT Infrastructure for Networking ODE Institutions

A national Information and Communication Technology (ICT) infrastructure must be set up through government support for networking all ODE institutions. In this regard, we recommend that the digital broadband Knowledge Network proposed by NKC should have provision for interconnecting the major ODE institutions and their study centres in the first phase itself. Eventually, minimum connectivity of 2 Mbps must be extended to the study centres of all ODE institutions. A national ICT backbone would enhance access and e-governance in ODE, and enable the dissemination of knowledge across all modes, that is, print, audio-visual and Internet based multimedia.

2. Set up a National Education Foundation to Develop Web-based Common Open Resources

A National Educational Foundation with a one-time infusion of adequate funds must be established to develop a web-based repository of high quality educational resources. Open Educational Resources (OER) must be created online through a collaborative process, pooling in the efforts and expertise of all major institutions of higher education. The OER repository would supply pedagogical software for various programmes run through ODE and be available for utilization by all ODE institutions. An enabling legal framework that would allow unrestricted access without compromising intellectual authorship must be devised for this purpose.

3. Establish a Credit Bank to Effect Transition to a Course Credit System

Transition to a course credit system must be carried out to enable the learner to undertake programmes across all ODE institutions and disciplines. As a part of this process, an autonomous credit bank must be established for storing and filing credits acquired by every learner. In addition, admission criteria and the system of credits should be as flexible and adaptable as possible. Provisions must be made for multiple entry points and exit points, a flexible time-table and assessment mechanisms for supporting life-long learning.

4. Establish a National Education Testing Service for Assessing ODE Students

An autonomous National Education Testing Service (NETS) must be established through legislation and invested with functional powers and responsibility for assessing all potential graduates in ODE. This unified examination system would test the learners' ability to perform intellectual and practical tasks. All courses, degrees and activities offered through ODE should be certified through this system.

5. Facilitate Convergence with Conventional Universities

The lack of convergence between programmes run by open universities and correspondence courses offered by the distance education wings of conventional educational institutions is a cause of great concern. Rather than function as parallel systems at odds with each other, open universities must forge organizational alignments with conventional universities geared towards common goals and strategies. They must engage each other in the collaborative creation of pedagogical resources via OER and its delivery along shared modes. Programmes and courses offered by each should be subject to the same stringent norms of quality assurance. This implies that the distance education departments operating within conventional universities must be encouraged to put correspondence courses through the NETS for purposes of assessment. At the same time, universities must also ensure that their distance education programmes are not stand-alone, but should benefit from regular interaction with university departments in concerned disciplines. The aim of such convergence is to eventually enable learners to move freely from one system to the other.

6. Set up a Research Foundation to Support Research Activity in ODE

An autonomous and well-endowed Research Foundation must be established to commission and facilitate multidimensional and multidisciplinary research in ODE. In addition, a favourable environment for research must be created by setting up infrastructure like libraries, digital databases and online journals, holding regular workshops and seminars, granting sabbatical leave for undertaking research, establishing a peer reviewed journal to provide a platform for publication for scholars, and other such measures. A robust research environment is essential to accord ODE value as a discipline, as opposed to it being consigned to a 'mode'.

7. Overhaul Training Programmes for Educators

Training and orientation programmes must be conceptualized to enable educators and administrators to effectively utilize technology to cater to diverse learners' interests. The content of the training modules must promote familiarity with the theories and practices of self-learning. Their delivery should take place through several modes, including web-supported, audio-visual and face-to-face interaction on a regular basis with experts, practitioners and peers. Most importantly, these packages must be updated regularly and administered directly. The B.Ed. curriculum must also be revised, updated and made to emphasize theories and practices of self-learning.

8. Increase Access for Learners with Special Needs

Special Education Committees must be set up in all ODE institutions to address the needs of learners with disabilities as well as senior citizens. These committees must devise mechanisms to ensure their participation and provide effective mechanisms for monitoring, evaluation of policies, and collection of feedback. Admission criteria and time tables must be flexible enough to provide diverse options for meeting programme requirements to differently able learners and senior citizens. Pedagogical tools and components from the open educational resources must be adaptable to alternative formats for special learning needs. This could include, for example, Braille, colour-contrast texts and voice recordings for the visually disabled.

9. Create a New Standing Committee for the Regulation of ODE

At present, the Distance Education Council (DEC) under IGNOU arbitrates standards and disburses funds for ODE institutions across the country. NKC believes that this arrangement cannot provide adequate and appropriate regulation. A new regulatory mechanism must be established by appointing a Standing Committee on Open and Distance

Education under the Independent Regulatory Authority for Higher Education (IRAHE) proposed by NKC. This statutory body would be responsible for developing broad criteria for accreditation as well as laying down standards for quality assurance. It would be accountable to stakeholders at all levels and to IRAHE, and have representation from public, private and social institutions involved in the education and development sectors. These include the central open university, state open universities, private open universities, conventional education institutes, as well as chairpersons of the specialized bodies to be set up to look into infrastructural requirements of ODE.

In addition, two specialized bodies should be established under the aegis of the Standing Committee:

(i) A Technical Advisory Group with representatives from the IT sector, telecom, space and industry should be constituted to provide guidelines, ensure flexibility and track the latest developments in application. The most important function would be to devise common standards for labelling learning content developed by different agencies in order to support indexing, storage, discovery and retrieval of this content by multiple tools across multiple repositories.

(ii) An Advisory Group on Pedagogical Content Management should be set up to provide guidelines on curricular content and development of repositories, exchange of material, access to students and other such issues.

The Standing Committee on Open and Distance Education would also serve as the nodal agency for the National Educational Foundation on open educational resources, the National Education Testing Service (NETS) and the Credit Bank.

10. Develop a System for Quality Assessment

Reliable external assessment is valued by employers, students and other stakeholders in the given context of a market driven economy. In view of this, a rating system to assess the standard of all institutions imparting ODE must be evolved and made publicly available. The Standing Committee would stipulate grading norms and independent rating agencies would be licensed by IRAHE to carry out this function. In addition, it is recommended that every ODE institution has an internal quality assurance cell to ensure that statutory quality compliances are regularly met.

Establishment of the new organizations proposed above, namely, the National Education Testing Service, the Credit Bank, the National Educational Foundation for developing common open resources, the Technical Advisory Group and the Advisory Group on Pedagogical Content Management would initially require financial support from the government. Additional finances for networking ODE institutions and creating access centres, developing training programmes for educators and administrators and providing scholarships and services for needy students would also be required.

Open Educational Resources

2nd November, 2007

Our success in the knowledge economy hinges to a large extent on upgrading the quality of, and enhancing the access to, education. One of the most effective ways of achieving this would be to stimulate the development and dissemination of quality Open Access (OA) materials and Open Educational Resources (OER) through broadband Internet connectivity. This would facilitate easy and widespread access to high quality educational resources and drastically improve the teaching paradigm for all our students. As a part of its consultative process, NKC constituted a Working Group of experts, including distinguished members from the academia, government, private sector and users to suggest necessary measures to improve the quality of Open Access in India. NKC consultations with stakeholders helped identify a few key reform proposals which are elaborated as follows:

1. Support the Production of Quality Content by a Select set of Indian Institutions

A set of key institutions should be selected and experts representing diverse knowledge areas like agriculture, engineering, medicine, arts, humanities, science, education, etc. should be asked to develop standards-based content, which can be customized to diverse user needs. This should be made available not only to Indian institutions but also for global use. The efforts made through the project of Ministry of Human Resources Development – National Programme on Technology Enhanced Learning (NPTEL) for creation of OER in the areas of Engineering and Technology should be applied in other areas of education also. The content in the repositories should be multimedia, interactive and available in different regional languages. These projects should cover a wide range of subjects mentioned above. To speed up the creation, adaptation, and utilization of OER, it is necessary to launch a 'National *E-content* and *Curriculum* Initiative'.

2. Leverage Global Open Educational Resources

Sustainable development of quality content relevant to India is a difficult and expensive proposition, given the diverse needs of various sectors in our emerging knowledge economy. Emerging international and national initiatives are offering quality educational content as open resources. It is vital for India to leverage these initiatives as they are readily available for adoption and adaptation and to serve as a model for further indigenous content production. NKC found that there are already 200-300 free knowledge repositories available across the world. The National Knowledge Commission (NKC) is separately disseminating this information through its website.

3. Encourage Open Access

Open Access material stimulates research and helps students, teachers and researchers across the world, as discussed in the attached report. Therefore at the policy level, all research articles published by Indian authors receiving substantial government or public funding must be made available under Open Access and should be archived in the standard OA format at least on his/her website. As a next step, a national academic OA portal should be developed. The government should allocate resources to increase the current digitization efforts of books and periodicals which are outside copyright protection. Separate funding should be allocated to develop a new high quality OCR software package so that new and old fonts in many different Indian languages can be converted into ISCI/ASCI code and OA portals and servers could be upgraded regularly. Appropriate financial resources should be earmarked for these endeavours. This will also facilitate machine translation of these valuable resources.

4. Develop Network-enabled Delivery Infrastructure

Along with the national initiative for content development, we must develop a network-enabled delivery infrastructure with a focus on two primary areas: access and delivery. For access to the network,

high bandwidth connections across institutions and a national backbone that provides advanced networking capabilities are major requirements. Additionally, connectivity to global networks is essential. Delivery of the OER content would be done through distributed repositories of educational resources.

5. Create a Faculty and Institutional Development Programme

Faculty development and teacher training is the primary area that needs to be addressed in order to realize the benefits of extended access and improved quality through OER. The training programme must develop domain competencies and teaching skills using new educational technologies. The training will also help developers of new OER and in contextualizing existing educational resources. Centres at specific institutions should be identified so that the faculty of these institutions will eventually own, modify, and expand OER repositories. These must be integrated into university curricula and organizational structures. The availability of learning management systems and other quizzing, authoring and collaborating tools should be increased. The evaluation system should be based on the use of the content and the pedagogy in OER.

To implement and monitor the above recommendations urgently and efficiently, the Government of India may designate a suitable organization or establish a new institution with necessary mandate to achieve the above objectives. This institute may serve the following functions:

- Provide leadership and coordination of network-based open education resources
- Select institutional collaborations for developing content
- Develop adoption support strategies
- Recommend and monitor standards for content development and adoption
- Advise on policy implications vis-à-vis licensing, intellectual property rights, etc.
- Identify and set benchmarks based on global best practices
- Establish relationships with global OA and OER initiatives.

Innovation

5th July, 2007

The National Knowledge Commission identified the role of innovation as one of the key factors in India's economic growth. Innovation is a process to achieve measurable value enhancement in any commercial activity, through introduction of new or improved goods, services, operational and organizational processes. It is a significant factor in facilitating competitiveness, improvement in market share and quality as well as reduction in costs.

NKC conducted a nationwide survey among large firms, as well as small and medium enterprises to explore the role being played by innovation in fuelling India's economic growth. The NKC Survey reveals that Innovation Intensity (i.e. the percentage of revenue derived from products/services which are less than 3 years old) has increased for large firms as well as small and medium enterprises. The strategic prioritization of innovation as a factor critical to growth and competitiveness has also achieved significant prominence since the start of economic liberalization in India. The NKC Survey further highlights crucial parameters at the firm level that have enabled some firms to be more innovative than others, including the role of structural frameworks and processes. It is expected that dissemination of the survey results across India's industrial spectrum will highlight best practices in industry and thereby also generate catalytic impact on a wider scale.

However, it is pertinent to point out that the most critical external barrier for both large firms and small and medium enterprises is skill shortage arising out of lack of emphasis on industrial innovation, problem-solving, design, experimentation, etc in the education curricula. There is also need for more effective collaboration between industry, universities and R&D institutions. Systematic reform of the higher education system (including skill based marketable vocational education) in India is essential to develop the required intellectual capital as well as generate effective synergies among industry, government, the educational system, the R&D environment and the consumer. Innovation is a complex activity that requires widespread interaction across the entire economy, from the grassroots to the large firm level. NKC recommends a comprehensive campaign to address these issues and to spur efforts to make India a global leader in innovation.

Intellectual Property Rights

15th October, 2007

A nation's future and its ability to compete in the global market depend greatly on how it generates new ideas and innovates in science and technology. Intellectual Property creation and protection are critical issues in global knowledge based competition. Countries like China, Japan and Korea have improved their respective IPR systems through intense capacity building efforts, with a view to achieving greater innovation. It has become imperative for India to scale up efforts to build a world class IPR infrastructure and ensure that IPR is used in the best national interest for more extensive innovative research, technology transfer, wealth creation and overall benefit of society. NKC's consultations with various stakeholders have helped to identify some key areas that will facilitate such systemic reform. Some of these areas involve the granting of product and process patents, in which both the configuration of the state mechanism for patent examination and the systematization of a substantive perspective of patent examination keeping both treaty obligations and national interests in mind are crucial issues. Other critical areas involve alternative non-patent modalities for the creation and sharing of knowledge and inventions. Below, one area, namely, the configuration of the patent examination mechanisms, is discussed, with some reference to allied issues in patent utilization.

1. Modernization of IP Offices

1.1 The processes in the IP offices need to become more accessible and user friendly and therefore, the ultimate objective of all efforts to modernize the patent offices must be to facilitate more transparency and procedural ease for the inventor as well as the common man. NKC is aware of the initiatives proposed by the Ministry of Commerce and Industry in this regard, especially those pertaining to modernization of infrastructure, computerization, digitization, e-filing, re-engineering of procedures with information technology integration, human resource development, efficiency, transparency of procedures and creation of an operational environment of global standards. The need to be sensitive to the needs of the everyday citizen is crucial if the IP offices have to transform themselves into service providers delivering solutions with the greatest efficiency and highest quality standards. In this respect, some suggestions are as follows:

- The patent offices must be adequately e-enabled in real time with adequate search facilities so that all its transactions are transparent and publicly accessible.
- The examination procedures, practices and decisions in the IP offices should be streamlined and consistent
- A new detailed and clear manual of the examination procedure and practice, accompanied by full text versions of all the relevant IP laws of the country, should be created, periodically updated and made available to the public, in soft and hard copy. Interested stakeholders, particularly including civil society as the major stakeholder, must be involved in its preparation This is particularly important since new Indian patent examination procedures will need to be devised keeping both treaty obligations and national interests in mind, and the creation of an adversarial process of patent examination will be crucial in these procedures.
- There must be an educational section for public awareness on IP (including the current status of IP law on various topics) made available in the public domain in all official languages of the country.
- The patent granting procedure must involve adequate web based notification of an application with complete details to give sufficient opportunity for any pre-grant objections to be filed. It is particularly essential to provide e-access in real time to all steps of a patent application, from the detailed patent description, examination reports at each stage and all amendments introduced at various points, in order to maintain complete transparency.
- There is urgent need to develop a comprehensive patent database that provides the latest information on patents, including patent applications and decisions of patent offices. At the same time,

the patent offices must have access to relevant international databases and search engines, including databases with prior art literature.

- To achieve the best global standards in quality and access, the IP offices should aim to become International Search Authority (ISA) and International Preliminary Examination Authority (IPEA) under the PCT and to this end, aim to conform to the PCT standards in respect of possession or access to minimum documentation, number of administrative and technically qualified staff and IT support systems.
- Efforts should also be made to develop quantifiable indices for measuring, monitoring and managing quality and efficiency.
- To ensure that the services of the IP offices reach the common people engaged in rural technologies, artisanry, crafts and traditional knowledge, there should be special schemes and establishments in the patent offices to deal with claims involving the creation and protection of traditional knowledge in its various forms. Since ensuring effective and competent legal representation is a critical problem for such groups, mechanisms should be evolved that incentivize such representation by the best patent lawyers in the country.
- For each sector of highly technical patents, it may be necessary to constitute specific empowered committees of experts as part of the patent evaluation process in the patent office to decide on the suitability of granting a patent, in accordance with the provisions of the law. These committees must adhere to strict time bound procedures of examination and sufficient safeguards must also be maintained to ensure confidentiality and prevent any subversion of the process.

2. Incentive Mechanisms to Attract and Retain Quality Talent

2.1 An incentive driven system of human resources management, including fast track career structures for deserving staff should be developed within the IP offices to attract and retain competent personnel. As the IP Offices will be competing with the private industry to attract qualified scientists and engineers, they will need to reach out proactively to institutions of eminence. Candidates applying for the post of a patent examiner must be tested on a combination of skills, such as scientific/technical knowledge, practical experience of such knowledge, critical analysis, written and oral communication skills and problem solving. Further, to ensure the availability of trained personnel in all technology sectors, the appointment of such personnel should be done periodically in a manner that ensures adequate proportional representation of each sector, by considering as an illustrative benchmark, the volume of applications and grants in the sector.

2.2 In order to deal with the existing problem of attrition of trained examiners to scientific/technical institutions and the private sector, Flexible Complementing Scheme which has been applied to scientific and technical group "A" posts should also be implemented for the technical staff of the IP Offices. Furthermore, pay scales of patent examiners should be increased for those who successfully undergo IPR training. Additionally, a fast track career should be provided to examiners who consistently perform exceptionally better than average. To this end, a transparent annual confidential reporting system should be introduced. In this context, it is important that performance in IP offices must be measured on the basis of turnaround time for applications and decisions as well as the sustainability and tenability of the decisions made, and not on the basis of the rate of rejection/acceptance of applications.

3. Training and Human Resources Development for IP Offices

3.1 There is need to intensify IPR training efforts in the IP Offices and Intellectual Property Training Institute (IPTI), including induction sessions for new staff, mid career courses and regular exposure to global best practices in IPR, wherever available, keeping in mind the best national interest. At the same time, there must be relevant safeguard procedures in place to avoid potential conflict of interest issues between trainer and trainee. The overriding aim of IPR training is to ensure legal and technological competence consistent with the best international standards. For training of IP Office personnel, an in-house Professional Development Committee (PDC) should also be formed. The PDC should identify training

requirements of the IP Offices and collaborate with IPTI to impart up-to-date IP training. Steps could also be taken to invite Indian scientists located in India and abroad who have experience in patent examination processes to participate in training initiatives with Indian patent examiners. However, in-country expertise must be urgently developed for training and sensitizing IP regulatory staff in the new India-specific treaty-compliant patent examination procedures that will be required for the new IP offices.

3.2 The IPTI should, with active involvement from stakeholders, prepare a comprehensive induction-training course for new patent examiners on various IP topics such as patent searches (including international databases), substantive requirements for patentability of an application, examination procedure as well as drafting of objections to the grant of a patent, where a list of standard clauses of objections could be developed. Such a course could be of duration of three/six months. The course material should be standardized and could be made available on the Intranet. Once again, procedures for maintaining the adversarial nature of the new India-specific treaty-compliant patent examination process must form a major component of these programmes.

After the completion of the induction-training programme, a senior patent examiner could be assigned to each examiner as a training officer who would act as a mentor by supervizing work, providing further training on a case-by-case basis and eventually reporting on the work of the examiner. Such training could last for a period of about six months. The IPTI should also provide advanced level courses in examination and international IPR issues after about a year to eighteen months, including courses on pre-grant and post-grant opposition procedures.

The IPTI should also collaborate with legal associations and organizations to set up specialized certificate and diploma courses in IPR and hold qualifying examinations for a patent attorney to act before the IP Offices. This would ensure that highest professional standards are maintained. Appropriate public private partnerships (PPPs) could also be evolved for this purpose.

4. IPR Education and Development of IPR Cells

4.1 Educational efforts on IPR must go beyond the IP offices and reach out to scientists and engineers working in national research institutes, universities, industry, the Bar, as well as to researchers and students, not just in the metropolitan areas but also in the smaller towns and rural areas of the country. Law schools throughout the country must also design specialized up-to-date courses and programmes on IPR and the process of creating faculty chairs on the subject must also be intensified through better incentives for academia. Business schools also need to incorporate IPR dimensions in their curricula.

4.2 There is also an urgent need to set up IPR Cells in major scientific and educational institutions in the country with trained staff, competent in the law and technical aspects of relevant disciplines.

5. Establishment of a New Institution for Cutting Edge Policy Expertise

5.1 The sheer complexity and scale of IPR capacity building for the 21st century require an independent world-class institute exclusively devoted to the field of IP. Once established, a National Institute of Intellectual Property Management (NIIPM), located in New Delhi, would be responsible for imparting training on a regular basis to various stakeholders, conducting cutting edge research, serving as a think tank to advise the government on IPR issues as well as conducting public awareness on IPR. Crucial parameters to set up the NIIPM include the establishment of an infrastructure of international standards, development of human resource expertise and aspects relating to finance. Initially, the NIIPM could be funded by the central government. Gradually through public –private partnerships and other innovative financial mechanisms, the revenue generated from training programmes would aim at ensuring self- sufficiency in the long run. The mandate of such an institution must involve policy research on the procedures to be adopted for patent examination so as to yield crucial input for periodic revision of these procedures. Also, this mandate must transcend the limited purview of the patent-oriented process for intellectual

property management and must address itself innovatively to systematic exploration of other modalities for social utilization of knowledge and inventions through structures such as copyrights and commons.

6. IPR Tribunal, Special Rules of Procedure and Judicial Training

6.1 Efficient enforcement is an indispensable facet of a strong IPR regime. IPR has emerged as a specialized area within law with urgent demands for speedy and efficient disposal of cases. It has become necessary to create a separate tribunal with jurisdiction over disputes in all aspects of IPR and develop a pool of competent judges who are trained in the legal as well as the technical aspects of IPR. The IPR Tribunal should be designed to deal with the appeals arising from the decisions of IP offices. In case of appeals where issues to be decided involve technical considerations, the tribunal should consist of three judges having considerable experience in law, where at least two of them also have technical qualifications.

6.2 To avoid undue delays and legal uncertainties, detailed and streamlined procedures with fixed time limits should be chalked out for the IPR Tribunal after consultations with stakeholders, including civil society. There should be a strict adherence to these procedures.

6.3 Training of the judiciary in IPR needs to be viewed as an essential IPR enforcement issue. The National Judicial Academy is already engaged in training judges on a variety of areas, including IPR. Such training efforts have to be intensified and the establishment of the NIIPM would be a significant step in this regard.

7. Protection of Traditional Knowledge (TK) through Traditional Knowledge Digital Library (TKDL) and Promoting Incentives for Wealth Creation from TK

7.1 The creation of the TKDL database is a significant effort to codify and classify traditional knowledge of the country. While there is increasing recognition of the important role of the TKDL to prevent misappropriation and grant of 'wrong patents' as well as to provide incentives for innovation and wealth creation, the key challenge here is to ensure its effective utilization to achieve these objectives.

7.2 The Government of India has also already taken steps to allow access of the TKDL database to some international patent offices under non-disclosure agreements for the purpose of search and examination. Steps need to be taken for the use and incorporation of TKDL into the minimum search documentation lists of International Search Authorities and other patent offices, while processing patent applications. Further, to prevent misappropriation and to facilitate more transparency, it is also necessary to disclose and declare all pertinent sources of information relating to TK in patent applications.

7.3 To create incentives for commercialization of TK, companies should be able to access the TKDL upon payment of adequate user fees and subject to the condition that inventions arising out of the TKDL would require royalty sharing with the government. The government should also take active steps to encourage investments in TK through collaborative efforts with industry and civil society. Innovative financial mechanisms should be evolved so that the revenue generated by the government from commercialization of TKDL and other commercially synergistic initiatives is used to create a TK Development Fund. The proceeds of the fund would be used to conserve TK generally, conduct research on TK, expand the TKDL and benefit communities that have contributed to the creation of TK.

8. IP and Small and Medium Enterprises (SMEs)

8.1 It is crucial at the governmental level to invest in the IP needs of SMEs. There is need to facilitate better awareness on the strategic aspects of creating, managing, protecting and leveraging IP as a tool to further business opportunities and enable wealth creation. SMEs are emerging as crucial players in the global knowledge economy and unlike larger firms, they may not have the necessary resources to make the best use of IP. In

this context, it is essential for special awareness campaigns for SMEs so that they are made fully aware of the various implications of IP and optimally translates such understandings into their everyday business practices.

9. Global Technology Acquisition Fund

9.1 The strategic positioning of India as a technology superpower will depend not just on development indigenous technological expertise, but also on the ability to make crucial technology acquisitions in the global market. Countries like Japan and Korea have successfully used such acquisitions to expand their IP portfolio and some Indian companies, especially in the pharmaceuticals and biotech sectors, have already been engaged in such acquisitions. However, such examples are sporadic and there is need for a national strategy on technology acquisition, with the aim of leapfrogging our expertise in key areas. A Global Technology Acquisition Fund, created by the central government, could be a significant step forward in facilitating such acquisitions, especially for the SMEs. The funds could be parked with a financial institution or a special purpose vehicle (SPV) could be created to manage the fund, with members of industry and S&T invited as board members. Relevant financial instruments, including support in the form of loans and equity, could be evolved, for such technology intensive acquisition.

10. IPR and New Technologies

10.1 It has become imperative for technical institutions, scientists, examiners and other relevant stakeholders to be fully aware of the IPR dimensions of new and rapidly changing technologies, especially in ICT, biotechnology, nano-technology, electronics, engineering, bio-informatics etc. There is therefore, need for high powered expert bodies that can help identify IPR issues arising out of each of such areas, with a view to evolving necessary IPR policies that would optimally foster greater global competitiveness for Indian industry as well as ensure faster innovation, wealth creation and overall development.

Legal Framework for Public Funded Research

16th January, 2007

The National Knowledge Commission while deliberating on issues related to the creation and application of knowledge recognizes the need to provide impetus to government funded research and to translate this knowledge into relevant and useful applications to benefit the widest cross-section of people. NKC's consultation with diverse stakeholders has revealed that there is a need to provide incentives to increase innovations, collaborations, licensing and commercialization.

It is therefore recommended to enact legislation that creates a uniform legal framework for the government funded research and gives universities and research institutions ownership and patent rights. This will create an enabling environment for them to commercialize such inventions through licensing arrangements where inventors would also be allowed to receive a share of the royalty. Conferring ownership rights on universities and linking such ownership with the patent system and the market, will make research more attractive and in the process bring about a radical change in the research landscape in India. The proposed enactment could also incorporate important safeguards for exceptional circumstances where the government could be given 'march in rights' to protect the public good.

Uniformity of policy for inventions generated out of government-funded research will provide incentives to various stakeholders as follows:

- **Government:** The government could retain the right to a non-exclusive, non-transferable, irrevocable paid up license to practice the invention throughout the world. It could also have the responsibility and power to monitor the implementation of the act by a provision that requires concerned parties to report to the government on an annual basis on matters pertaining to utilization of the invention. Since the patent applications would be filed and owned by the relevant institutions, the government would be spared from bearing the costs of filing applications. The government could also be given the right to own the invention where the party decides not to retain title or fails to file the requisite patent application. Finally, 'march in rights' accorded to the government in certain situations involving the public good as well as exceptions for circumstances involving, *inter alia*, national security and defence imperatives would help assuage fears on the same.
- **Universities/R&D:** For universities and research institutions, revenue generating incentives lie in ownership and control over the fruits of research generated out of government funds. This should encourage filing patents in their own name and entering into commercialization processes with industry. Further, the inventor, through profit sharing of royalties from licenses, would also get rewarded accordingly. The proposed enactment could also provide that the balance of any royalties or income earned after payment of expenses, be ploughed back for scientific research and education.
- **Industry:** A higher degree of industry participation in university research will result due to clear legal title, a uniform legal regime for all government funded research, commercial gain through collaborative arrangements, opportunities to obtain exclusive licenses and new businesses opportunities for the new inventions.
- **People:** Finally, the taxpayer, whose resources are used in government funding of research, will also get the benefit of inventions, in the form of products and services once they are commercialized and made available in the market.

Issues that need special attention in drafting the proposed legislation are:

- Calculating exact ratios in which revenues will be divided and the percentage made available to various stakeholders including the actual inventor
- Understanding national security implications where they arise and carving out exceptions in such situations

- Identifying specific guidelines, rules and existing provisions of laws that need to be overridden to bring a uniform legislation in place for inventions arising out of government funded research
- Establishing the precise nature of various licensing arrangements as well as conditions governing the grant of exclusive licenses where applicable
- Clarifying situations requiring the invocation of 'march in rights' for government intervention and clarification of exceptional situations to the general right of ownership
- Determining whether plant varieties come under the scope of 'inventions' in light of India's own patent and plant varieties, legislation and analyzing the relationships between the proposed act and India's own patent and plant varieties acts

There are precedents for such legislation such as the American enactment entitled the Patent and Trademark Law Amendments Act, enacted in 1980 and commonly known as the Bayh-Dole Act. It is perhaps significant to note that in the United States, before the Bayh-Dole Act was enacted, the country's federal agencies owned about 28,000 patents, out of which only 5% were licensed to industry to develop commercial products. Subsequent to the enactment of the said act, there has been a massive rise in the number of patents filed by and granted to universities, the number of universities involved in patenting and licensing of inventions and in the number of new companies that have been set up on the basis of new inventions licensed by universities. There have also been innovative breakthroughs in the form of inventions, technologies and processes, arising from university research. Economic activity of a scale running into billions of dollars has been generated, further creating new jobs in the economy.

In NKC's view, introduction of legislation generally along the lines of the Bayh-Dole Act, while keeping in mind India's specific interests, is necessary to help scientific research develop far reaching innovations, generate employment and function as a vehicle of significant economic growth.

Traditional Health Systems

12th December, 2007

The current global health sector trends suggest that medical pluralism, to which Indian traditional medical systems can contribute critical components, will shape the future of healthcare. This shift from singularity to plurality is taking place because it is becoming increasingly evident that no single source of health science has the capacity to contribute solutions to all of society's health needs. India has a comparative advantage and can be a world leader in the era of medical pluralism because it has strong foundations in evidence-based biomedical sciences as well as an immensely rich and complex indigenous medical heritage of its own. The Government has already undertaken and encouraged several initiatives in the area of traditional medicine within the country including establishment of the Department of AYUSH in the Ministry of Health and creating support programmes in S&T agencies like CSIR, ICMR, DBT & DST. To accelerate this momentum, the National Knowledge Commission (NKC) consulted extensively with diverse stakeholders within the related fields and also constituted a Working Group of researchers, private sector representatives and policy-makers. NKC recommendations on strategies to promote the knowledge systems of traditional medicine are as follows:

1. **Transform traditional medicine education:** The quality of and access to education in traditional medicine in the country needs urgent improvement. There are currently 450 poorly endowed colleges (undergraduate and post-graduate) admitting around 25,000 students in the country. These colleges are not training students to play leadership roles in the emerging era of medical pluralism. The major reason for this lacuna is that education in traditional medicine fails to provide the transformational catalysis necessary to link traditional medical system sources to evidence-based approaches. This has led to isolation of such education and lack of its pluralistic integration into mainstream evidence-based medicine education, which is essential if India's traditional medical heritage is to find its rightful place in global medical pluralism.

   It is recommended that efforts be made to introduce evidence-based approaches into the current educational framework, possibly through institutions of the standard of IISc, IITs and AIIMS with commensurate financial outlays.

2. **Strengthen research on traditional health systems:** Investments in research and development of traditional medicine have been sub-critical and fragmented resulting in scarcity of evidence about the efficacy of Traditional Health System (THS). In addition, these efforts have also been frequently characterized by a lack of rigorous evidence-based approaches. There has also been little appreciation of the role that social science research must play in comprehending the variety of societal perceptions and responses so critical to ideas of medical pluralism. There is a need to urgently establish a network of world-class research programmes in different parts of the country to address these lacunae, with appropriate institutional and incentive structures. It is essential for India to make original, rigorously evidence-based contributions to the world of medicine in fields such as pharmaco-genomics, immunology, drug discovery and cardiology via imaginative examination of traditional ideas such as prakriti, rasayana or rasa.

3. **Strengthen pharmacopoeial standards:** Despite extensive documentation of medicinal plants, there is a strong need for creating internationally acceptable pharmacopoeias for herbal medications, as well as eco-system specific, regional pharmacopoeias for various bio-geographic regions of India.

4. **Increase quality and quantity of clinical trials & certification:** Promotion of traditional medicine goes hand-in-hand with increase in the quality of rigorous, yet sensitively designed clinical trials to support or refute traditional medical claims of efficacy. Also, lack of information on toxicological data/safety studies makes it difficult to evaluate

the risk profile of traditional medications. There is a need for greater institutional enabling of such evaluations and trials. These should be accompanied by a world-class certification process, which will assist the achievement of internationally acceptable standards for good manufacturing, laboratory, clinical, agricultural and collection practices. The pre-clinical and clinical efficacy validation and standardization of ten best THS products for global market should be supported as a flagship project. Similarly technological up-gradation of the manufacturing units involved in manufacture of these successful products to international standards must be carried out.

5. **Digitize traditional knowledge:** The work underway for creating a comprehensive Traditional Knowledge Digital Library (TKDL) should be diversified and expanded. A major programme should be established for digitization of India's medical manuscripts (located both within India & abroad) and for making this digital library accessible to teaching and research institutions in India. To modernize data-mining from the vast corpus of traditional medical literature, an all-India coordinated, "Traditional Knowledge Informatics Programme" should be constructed to create a comprehensive list of available plant material-medica (2,000 species), their products (40,000 formulations) and clinical applications (5,000 conditions).

6. **Create suitable framework of intellectual property rights:** Emphasis should be put on creating suitable Intellectual Property Rights framework in the country for protection of the sources of traditional medical knowledge. At the same time sufficient incentives should be created for commercialization of traditional medications. Steps should be taken for the use and incorporation of TKDL, with all pertinent sources of information, into the minimum search documentation lists of International Search Authorities and other patent offices while processing patent applications. Lack of clarity regarding the 'ownership' issue for traditional knowledge must be addressed in the TKDL. This is especially pressing since underprivileged communities are commonly the primary sources of such knowledge. The need is to create IPR systems that ensure that such knowledge remains in the public domain and is "protected" for the communities of origin through mechanisms such as Geographical Indicators (GIs).

   An approach to the commercial dissemination of traditional medications will be to allow companies to access TKDL upon payment of adequate user fees and subject to the condition that invention arising out of the TKDL would require royalty sharing. Both user fees and royalty must be shared between government and the communities identified as the sources of the knowledge, and innovative modalities will need to be found to administer such distribution. The revenue generated by the government from commercialization of TKDL and other commercially synergistic initiatives should be used to create a *'Traditional Knowledge Development Fund'* and its proceeds should be used for conservation, evidence-based analysis and research on traditional knowledge and for the benefit of communities that have contributed to the creation of traditional knowledge.

7. **Establish goals for conservation of natural resources:** Natural populations of around 12% of the 6000 species of potentially medicinal plants are currently estimated to be under threat due to degradation and loss of habitats alongside unsustainable ways of harvesting and lack of cultivation. The problem of growing scarcity also leads to the danger of more counterfeit material being marketed. It is therefore necessary to support conservation and sustainable harvesting efforts in the forestry sector and cultivation in the agricultural sector. Direct support for conservation and cultivation as well as indirect methods through incentive policies should be pursued for nurturing these plant resources. The wild gene pool of India's medicinal plants should be secured, via establishment of a nation wide network of 300 "Forest Gene Banks" across the 10 bio-geographic regions of the country.

8. **Support non-Government and Corporate initiatives for promotion of THS:** The non-government and private sector have played an important role in building the public image of

traditional health sciences. Non-governmental research and education institutions, NGOs and corporates with a global vision must be strategically supported in the interest of enhancing national and international awareness of India's rich health system heritage.

9. **Promote international cooperation:** International cooperation in exploration of traditional health systems must be given a big boost through substantial initiatives like strategic research collaborations with reputed research centres and establishing wellness centres in countries that offer promising market opportunities. EXIM bank of India must be supported to work with industry to open world markets for these products and services.

10. **Support primary healthcare in rural areas:** With 70% of Indian population relying on traditional medicine for primary health care in the absence of adequate state primary health care, it becomes necessary to establish evidence-based guidelines for this informal-sector usage. A nation-wide network of Home Herbal Garden and Community Herbal Gardens (CHG) can be created to support the primary health care needs of rural communities for those plants and medications established as efficacious by evidence-based research.

11. **Create a major re-branding exercise of Indian traditional medicine:** Better branding of Indian traditional medicines proven to be effective in well-designed clinical trials can increase safe and effective healthcare options. Such proven medications should be integrated with the national healthcare system. Such evidence-based, well-validated and uniquely Indian holistic healthcare system combinations must be marketed extensively globally.

In order to achieve these goals as rapidly and efficiently as possible, the Government of India may consider establishing a National Mission on Traditional Health Knowledge (NMTHK), which would take up these tasks in an organized way. It should be a relatively small body in terms of its own infrastructure with powers to enable it to recommend targeted funding in identified areas. It should support initiatives at many different levels, including state and local levels, and coordinate with Ministries of Health, Science & Technology, Forestry, Agriculture and Commerce as well as with the NGOs and private sector. The Mission leader must be a person with high public credibility, have extensive knowledge and experience in the field with established managerial capabilities and experience of dealing with all the concerned stakeholders.

NKC Consultations

Stakeholders' Inputs

Literacy

National Seminar, New Delhi, 30 July, 2006

Translation

1. Workshop on Translation, New Delhi, 11th February, 2006
2. Translation in the Sciences and Social Sciences, New Delhi, 8 July, 2006
3. Workshop on National Translation Mission, Mysore, 12-13 April, 2007

National Knowledge Network

Stakeholders Workshop on Research and Educational Network for India, New Delhi, 10 October, 2006

Portal

1. Stakeholders Workshop on India Energy Portal, New Delhi, 25 June, 2007
2. Stakeholders Workshop on India Biodiversity Portal, New Delhi, 16 October, 2007

School Education

1. National Workshop, New Delhi, 29 July, 2006
2. Listening forum with school children and NKC Chairman, Mr. Sam Pitroda, New Delhi, 13 January, 2007
3. Regional Level Workshops
   i. Regional Workshop on School Education for the Southern Region, (Karnataka, Andhra Pradesh, Tamil Nadu, Puducherry, Kerala) National Institute of Advances Studies (NIAS), Bangalore, 17-18 July, 2007
   ii. Regional Workshop on School Education for the Central Region (Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh) Indian Institute of Management, Lucknow, 3-4 August, 2007
   iii. Regional Workshop on School Education for the Eastern Region, (West Bengal and Orissa), Indian Council of Social Science Research (Eastern Branch), Kolkata 25-26 August, 2007
   iv. Regional Workshop on School Education for the North-East Region (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura) Indian Institute of Technology, Guwahati 11-12 September, 2007
   v. Regional Workshop on School Education for the Northern Region (Jammu and Kashmir, Punjab, Haryana, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Chandigarh (UT), Delhi) India Habitat Centre, Delhi 20 November, 2007
   vi. Regional Workshop on School Education for the Western Region (Maharashtra, Chhattisgarh, Rajasthan, Gujarat) Indian Institute of Education, Pune 23 November, 2007
4. National Seminar involving educationists, academics, representatives from the government, private schools and civil society organizations, New Delhi, 10 December, 2007

Muslim Education

National Workshop, New Delhi, 23 September, 2006.

Vocational Education

National Workshop, New Delhi, 11 April, 2006

Open and Distance Education

Symposium on Open Educational Resources, New Delhi, 31 July, 2006

Intellectual Property Rights

Symposium on Intellectual Property Rights (IPR) Protection and Management in India, New Delhi, 10 October, 2006

Science and Technology

1. Brainstorming Session for the identification of High Impact Areas in Science and Technology, New Delhi, 31 July, 2006

2. Meeting with Dr. Bement, Director, National Science Foundation (NSF), USA, New Delhi, 17-18 October, 2006

More Talented Students in Maths and Science

Workshops on attracting more talented students in Maths and Science held at:

1. Tata Institute of Fundamental Research, Mumbai, 16 August, 2007
2. IISc, Bangalore, 23 August, 2007
3. South Campus, Delhi University, 10 September, 2007
4. SN Bose Centre for Basic Sciences, Kolkata, 5 October, 2007

Innovation

NKC-PHDCCI Workshop on Innovation in Small and Medium Enterprises

1. Taj Residency, Lucknow, 6 November, 2006
2. PHD Chamber of Commerce and Industry, New Delhi, 18 December, 2006
3. Indian Institute of Management, Bangalore, 5 January, 2007

Entrepreneurship

1. Entrepreneurship Pilot Discussion, New Delhi, 23 December, 2006
2. Interviews for Entrepreneurship Study

i. Pune, Mahratta Chambers of Commerce, Industries and Agriculture (MCCIA), 13-15 February, 2007
ii. Kolkata, Bengal Chambers of Commerce and Industry (BCCI), 18-20 July, 2007
iii. Chennai, Confederation of Indian Industries (CII), Chennai, 22-24 August, 2007
iv. Ahmedabad, Gujarat Chambers of Commerce and Industry (GCCI), 10-12 September, 2007
v. Hyderabad, Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCCI), 18-20 September, 2007
vi. Bengaluru, Federation of Karnataka Chambers of Commerce and Industry (FKCCI), 24-26 October, 2007

Agriculture

Workshop on Agricultural Research and Extension, New Delhi, 15 January, 2007

Public Outreach

Libraries

1. Library Outreach Workshop, Indian Institute of Technology, New Delhi, 19 May, 2007
2. Library Outreach Programme for the Northeastern States, Mizoram University, Aizawl, 5 June, 2007
3. Library Outreach Programme for the Eastern Region, National Library, Kolkata, 7 June, 2007
4. Library Outreach Programme for Libraries in the Social Science sector, NASSDOC, New Delhi, 2 July, 2007
5. Library Outreach Programme for School Libraries, NCERT, New Delhi, 20 July, 2007

Higher Education

1. Discussion on NKC Recommendations
   i. Select College Principals, New Delhi, 12 September, 2007
   ii. National Seminar: Vice Chancellors, Academicians, Teacher Associations, Bangalore University, Centre for Educational and Social Studies, Bangalore, 19-20 September, 2007
   iii. Select College Principals, St. Xavier's College, Mumbai, 28 September, 2007
   iv. Vice Chancellors, Head of departments, North Eastern Hill University (NEHU), Shillong, Meghalaya, 22 November, 2007
   v. Select College Principals, Patna, 10 December, 2007
   vi. Select College Principals, Pune, 8 December, 2007
2. Higher Education Summit, FICCI, 2-3 November, 2007
3. Consultative meeting on Perspectives on Higher Education, USEFI, 15 November, 2007
4. Right to Education-Actions Now, Aspen Institute and CII, 19 December, 2007

Presentations to State Governments

1. Bihar Secretariat, Patna
   Bihar, 8 January, 2008
2. Uttar Pradesh Secretariat, Lucknow,
   Uttar Pradesh, 3 January, 2008
3. Karnataka Secretariat, Bangalore,
   Karnataka, 4 December,, 2007
4. Orissa Secretariat, Bhubaneswar,
   Orissa, 27 November,, 2007
5. Himachal Pradesh Secretariat, Shimla,
   Himachal Pradesh, 21 November, 2007
6. Jharkhand Secretariat, Ranchi,
   Jharkhand, 13 November, 2007
7. Assam Secretariat, Guwahati,
   Assam, 29 October, 2007
8. Madhya Pradesh Secretariat, Bhopal,
   Madhya Pradesh, 18 October, 2007
9. Chhattisgarh Secretariat, Raipur,
   Chhattisgarh, 27 September, 2007
10. Maharashtra Secretariat, Mumbai,
    Maharashtra, 24 September, 2007
11. Punjab Secretariat, Chandigarh,
    Punjab, 27 August, 2007
12. West Bengal Secretariat, Kolkata,
    West Bengal, 10 August, 2007
13. Uttarakhand Secretariat, Dehradun,
    Uttarakhand, 6 August, 2007
14. Rajasthan Secretariat, Jaipur,
    Rajasthan, 4 August, 2007
15. Tamil Nadu Secretariat, Chennai,
    Tamil Nadu, 14 July, 2007
16. Puducherry Secretariat, Puducherry,
    Puducherry, 13 July, 2007
17. MCRHRD, Hyderabad,
    Andhra Pradesh, 25 June, 2007
18. Delhi Secretariat, Delhi,
    Delhi, 5 June, 2007

Members of Working Groups 2007

Health Information Network

1. Prof. N.K. Ganguly
   Chairman, Indian Council of Medical Research
2. Dr. B.S. Bedi
   Adviser, CDAC & Media Lab Asia,
   Former Senior Director & Head Med. Electronics and Telemedicine
   Dept. of IT, Govt. of India (GoI)
3. Mr. Partha Chattopadhya
   CD (DRS), Ministry of Health and Family Welfare, (GoI)
4. Dr. Shiban Ganju
   Convener, I HIND
5. Dr. Shiva Kumar
   Member, National Advisory Council
6. Dr. Ramakrishnan
   Director General, CDAC
7. Prof. K. Srinath Reddy
   President, Public Health Foundation of India
8. Mr. Rajdeep Sahrawat
   Vice President, NASSCOM
9. Mr. Raj Shah
   CEO, Capital Technology Information Services (CTIS)
10. Dr. Y.K. Sharma
    Deputy Director General, NIC

Legal Education

1. Justice M. Jagannadha Rao, Chairperson
   Former Judge, Supreme Court of India
   Former Chairperson, Law Commission of India
2. Justice Leila Seth, Member
   Former Judge, Delhi High Court
   Former Chief Justice, High Court of Himachal Pradesh
3. Prof. N.R. Madhava Menon, Member
   Former Vice Chancellor, National Law School of India University (NLSIU), Bangalore
   Former Vice Chancellor, West Bengal National University of Juridical Sciences (NUJS) Kolkata
   Former Director, National Judicial Academy, Bhopal
4. Mr. P.P. Rao, Member
   Senior Advocate, Supreme Court of India
5. Prof. B.S. Chimni, Member
   Former Vice Chancellor, NUJS, Kolkata
   Professor, Jawaharlal Nehru University, New Delhi
6. Mr. Nishith Desai, Member
   Managing Partner, Nishith Desai Associates, Mumbai
7. Dr. Mohan Gopal, Member
   Former Vice Chancellor, NLSIU, Bangalore
   Director, National Judicial Academy, Bhopal

Medical Education

1. Dr. Sneh Bhargava
   AIIMS, New Delhi
2. Dr. N.G. Desai
   IHBAS, Delhi
3. Dr. N.K. Ganguly
   ICMR, New Delhi
4. Dr. V.I. Mathan
   CMC, Vellore
5. Dr. G.N. Rao
   LVP Eye Institute, Hyderabad
6. Dr. S.K. Reddy
   AIIMS, New Delhi
7. Dr. S.K. Sarin
   G.B. Pant Hospital, New Delhi
8. Dr. D. Shetty
   Narayana Hrudayalaya, Bangalore
9. Dr. K.K. Talwar
   PGIMER, Chandigarh
10. Dr. P.N. Tandon, National Brain Research Centre, Haryana
11. Dr. M.S. Valiathan
    INSA

Management Education

1. Mr. P.M. Sinha
   Pepsi India
2. Prof. Amitava Bose
   IIM, Kolkata
3. Prof. Jahar Saha
   IIM, Ahmedabad

4. Prof. K.R.S. Murthy
   IIM, Bangalore
5. Dr. Nachiket Mor
   Dy. Managing Director, ICICI Bank, Mumbai
6. Mr. R. Gopalkrishnan
   Executive Director, Tata Sons, Mumbai

Open and Distance Education

1. Prof. Ram Takwale (Chairman)
   Former Vice-Chancellor, Indira Gandhi National Open University, Yashwantrao Chavan Maharashtra Open University
2. Prof. Badrinath Koul
   Former Pro-Vice-Chancellor, IGNOU
3. Prof. Salil Mishra,
   Reader of History, School of Social Sciences, IGNOU
4. Prof. Parvin Sinclair
   Director, School of Sciences, IGNOU
5. Dr. Vijay Kumar
   Assistant Provost and Director of Academic Computing, MIT
6. Prof. V.S. Prasad
   Director, National Assessment and Accreditation Council (NAAC), Bangalore
   Former Vice-Chancellor, Dr. B.R. Ambedkar Open University, Hyderabad
7. Dr. B.S. Bhatia
   Former Director, Development and Education Computing Unit (DECU)
   Space Applications Centre (SAC), Ahmedabad
8. Mr. Rajendra Pawar,
   Chairman, NIIT
9. Dr. Surabhi Banerjee
   Vice Chancellor, Netaji Subhas Open University (NSOU), Kolkata

Open Educational Resources

1. Dr. V. Balaji
   Head, KMS (Knowledge Management and Sharing) Group, ICRISAT (International Crops Research Institute for the Semi-Arid Tropics)
2. Dr. K. Mangala Sunder
   Webcourses Coordinator, NPTEL (National Programme on Technology Enhanced Learning), Indian Institute of Technology (IIT) Madras
3. Dr. Rajan Welukar
   Vice Chancellor, Yashwantrao Chavan Maharashtra Open University
4. Dr. H.P. Dikshit
   NBHM Professor, PDPM,
   Indian Institute of Information Technology
5. Anand Patwardhan
   Executive Director, Technology Information Forecasting and Assessment Council (TIFAC)
6. Dr. Subbiah Arunachalam
   MS Swaminathan Foundation
7. Dr. Vijay Kumar, Co-convener
   Asst. Provost and Director of Academic Computing, MIT
8. Dr. A.S. Kolaskar, Convener
   Advisor, National Knowledge Commission

Traditional Health Systems

1. Mr. Ravi Prasad
   CEO, Himalaya Drugs
2. Mr. Amit Agarwal,
   Director R&D, Natural Remedies, Bangalore
3. Mr. S.R. Rao
   Head (HR), EXIM Bank, Mumbai
4. Dr. B.G. Krishnaswamy, Representative,
   Arya Vaidya Pharmacy, Coimbatore
5. Dr. Narendra Bhatt,
   CEO, The ZANDU Pharmaceutical Works Ltd., Mumbai
6. Dr. Bhushan Patwardhan
   Professor & Director, Interdisciplinary School of Health Sciences, University of Pune
7. Dr. G.G. Gangadharan
   Joint Director, FRLHT, Bangalore
8. Dr. Padma Venkat
   Joint Director, FRLHT, Bangalore
   Vaidya Vilas Nanal, Pune
9. Dr. Urmila Thatte
   M.D., D.N.B., Ph.D., Dept., of Clinical Pharmacology, TN Medical College & BYL Nair Hospital, Mumbai
10. Mr. B.S. Sajwan
    CEO, NMPB, GoI, New Delhi
11. Dr. Vasantha Muthuswamy
    Sr. Deputy Director General & Chief, ICMR, New Delhi Mr. Verghese Samuel, JS, AYUSH
12. Dr. P.M. Bhargava
    Former Vice Chairman, KC, GoI

13. Darshan Shankar
    FRLHT

Agriculture

1. Dr. Bala Ravi (Chairman)
   Advisor,
   M.S. Swaminathan Research Foundation
2. Dr. Suman Sahai
   Convener, Gene Campaign
3. Dr. Rajeswari Raina
   Senior Research Fellow,
   Centre for Policy Research
4. Dr. Rasheed Sulaiman V
   Director, Centre for Research on Innovation and Science Policy
5. Dr. Ramanjaneyulu G.V.
   Executive Director, Centre for Sustainable Agriculture
6. Mr. Debashish Mitra
   Founder and Managing Director,
   Calypso Foods
7. Dr. Vijay Jawandhia
   Shetkari Sanghatana Paik
8. Dr. P. Geethakutty,
   Head, Centre for Gender Studies,
   National Institute of Rural Development
9. Prof. S. Venku Reddy,
   Executive Director, Participatory Rural Development Initiatives
10. Dr. N.K. Sanghi
    Adviser, Watershed Support Services and Activities Network (WASSAN)
11. Mr. R. Kevichusa (retd.)
    Former Official Department of Agriculture,
    Government of Nagaland

More Students in Maths and Science

1. Prof. J. Sashidhara Prasad
   Ex-vice-Chancellor, University of Mysore
2. Mr. Ramji Raghavan
   Chairman, Agastya International Foundation
3. Prof. Dipankar Chatterji
   Convener, KVPY Program, IISc
4. Dr. Savithri Singh
   Principal, Acharya Narendra Dev College
5. Prof. L.K. Maheshwari
   Director, Birla Institute of Technology and Science
6. Dr. M. Vidyasagar
   Executive Vice President,
   Tata Consultancy Services
7. Prof. S.C. Lakhotia
   Banaras Hindu University

Advisers and Staff Members
National Knowledge Commission

Dr. Ashok Kolaskar
Adviser
a.kolaskar@nic.in

Mr. S Regunathan
Adviser
s.regunathan@nic.in

Dr. Kiran Datar
Adviser
k.datar@nic.in

Mr. Sunil Bahri
Executive Director
s.bahri@nic.in

Ms. Aditi Saraf
Research Associate
a.saraf@nic.in

Ms. Mitakshara Kumari
Research Associate
m.kumari@nic.in

Ms. Megha Pradhan
Research Associate
m.pradhan@nic.in

Mr. Amlan Goswami
Research Associate
a.goswami@nic.in

Ms. Pallavi Raghavan
Research Associate
p.raghavan@nic.in

Ms. Namita Dalmia
Research Associate
n.dalmia@nic.in

Ms. Deepti Ayyanki
Research Assistant
d.ayyanki@nic.in

Ms. Pratibha Bajaj
Research Associate
p.bajaj@nic.in

Ms. Aashima Seth
Executive Assistant
a.chaney@nic.in