Fostering Innovation in Universities and Higher Educational Institutions

Preamble:
The Ministry of Human Resources Development, University Grants Commission and IIT Bombay organised a one-day brainstorming workshop of Vice Chancellors and Directors of higher educational institutions on March 1, 2012 at IIT Bombay, The objective of the workshop is to share experiences and deliberate on specific steps that universities and Government can take in fostering innovations. The concept note of the workshop is given in Annexure 1.

This was attended by select Vice Chancellors of Central and State Universities and Directors of IISERs. A list of participants in given in Annexure 2.

The Agenda for the workshop is given in Annexure 3.

The record of the presentations and discussion held on this National Innovation Day Workshop on March 1st 2012 is given below.

1. Welcome by Prof. Devang V. Khakhar, Director, IIT Bombay

   Prof. Devang V. Khakhar, Director IIT Bombay warmly welcomed all the participants to the Workshop arranged by MHRD and UGC. He hoped that the deliberations on the day would result in some specific items to work on including schemes that could be funded by the MHRD to help and support innovation. He thanked the participants for agreeing to spare time from their busy schedules at a very short notice.

2. Goals of Workshop - MHRD Perspective - Ms. Vibha Puri Das, Secretary- Higher Education, MHRD (Annexure 4)

   Ms. Vibha Puri Das thanked the participants for being part of the day’s meeting being organized by MHRD, UGC and IIT Bombay. In the recent Science Day address by the Prime Minister, the concept of Innovation as a theme was given great emphasis. The Universities are an important resource as generators/creators of innovation and have to be looked at afresh for providing support and fostering a culture of innovation in these entities. Historically, Universities have been regarded as creators and disseminators of knowledge, but wealth creation from knowledge and deployment to the society is also very important.
The National Innovation Council of the Government of India was set up to discuss, analyse and help implement strategies for inclusive innovation in India and to prepare a Roadmap for Innovation 2010-2020. The five main parameters for promoting innovation include
i. Platform for innovation,
ii. A focus point for innovation,
iii. An ecosystem for guiding/fostering innovation
iv. Focus on drivers for innovation and
v. Expand Space for Discourse on Innovation in the country (www.innovationcouncil.gov.in)

She commented that it is important to incentivise the innovators and the government should set up an enabling environment and mechanisms to promote innovation within the educational institutes. Existing barriers could be identified and specific suggestions for removal can be provided to the Ministry.

The current 12th five year plan highlights Innovation as an important agenda. The four major action items identified include providing an enabling environment for fostering innovation, fostering innovation cluster in India, making ICT as a tool for innovation and taking it beyond elite and centrally funded institutions to the unreached population and setting up of an IPR regime for protecting and creation of wealth from innovation. It is important to ensure that open source resources and IPR legislation co exist. The Ministry has set up 17 IPR Chairs across the country and a road map on IPR is expected to emerge from this support. The copyright Act of India is one of the leading pieces of legislation in the world and could be a leading light in the developing world.

She commented that the concept note has been shared with all the participants (Annexure 1) and looked forward to exciting deliberations during the day

3. Introduction of participants:
The workshop was attended by 44 participants. This included Vice Chancellors and their nominees from various Central and State Universities and also Directors of different Indian Institutes of Science Research and Education (IISER).

4. Ecosystem for Innovation - An IIT Bombay experience - Director, IIT Bombay
Prof. Devang V.Khakhar, Director IIT Bombay made a presentation on importance of innovation in the overall academic system and as a case study, the ecosystem that exists in IIT Bombay for
promoting and fostering innovation (Annexure 5). He reiterated the fact that the National Innovation Council led by Mr. Sam Pitroda was set up to develop a national strategy on innovation with an Indian model in mind. The role of Universities should be to generate appropriate manpower through education of people with a mindset to innovate. For this systems need to be created for innovating, incubating business and licensing technologies.

Two main ingredients need to be built in namely education and R&D. Strong educational foundation is needed by having programmes offering depth and breadth, dynamic curriculum evolving and changing with needs, encouraging analytical and questioning attitudes, exposure to research early on, exposure to entrepreneurship along with emphasis on extracurricular activities. In addition, strong research programmes should be established in Institutes with

- support for project administration,
- a sound IP policy and support mechanisms for IP protection and deployment,
- incentives for inventors and
- support for technology transfer and incubation.

Also collaboration on both national and international levels is needed to generate a critical mass of researchers in any domain. He commented that amongst the Vice chancellors present, there were only a few that he had interacted with and hoped that more interactions would be possible in the future.

He gave a brief overview of IIT Bombay commenting on its vision ‘to be the fountainhead of new ideas and of innovators in technology and science’ and a mission statement ‘to create an ambience in which new ideas, research and scholarship flourish and from which the leaders and innovators of tomorrow emerge’.

The academic structure at the Institute included various departments Centres and Inter disciplinary programmes (IDPs) in all areas of science, engineering, humanities and management. The Undergraduate (UG) programme was flexible and evolved with time. Research was given emphasis through UG Research Opportunities Programme (UROP) and supervised learning programmes (SLP) were offered to students. Students participated in various activities including cultural, competitions, entrepreneurship and research. (e.g Pratham student satellite project).

Nearly 10 years ago, an incubator was set up at Kanwal Rekhi School of Information Technology (KReSIT) and the Society for Innovation and Entrepreneurship (SINE) in 2004, to
help ideas and technologies developed within the Institute to be taken to entrepreneurship. SINE offered soft support through advise on setting up a company, networking support etc. and provided a vibrant ecosystem by synthesising entrepreneurship related activities on the campus. This included incubation related support, academic activities, student related activities such as eCell, competitions etc., providing seed fund, creating a network of mentors and other services, bringing in various stakeholders together and associating with organisations focusing on entrepreneurship in India. Around 44 companies have been incubated with many successes. Details are available in Annexure 5.

5. Enabling Structures / Facilitation of Research - Dean (R&D), IIT Bombay

Prof. Rangan Banerjee, Dean of Research and Development, IIT Bombay gave an overview of the various mechanisms, processes as part of the enabling structures at IIT Bombay to promote and facilitate research. The presentation is available as Annexure 6.

He commented that education and research are closely inter-linked. The output of the Institute is creation of human capital, knowhow, technology, new products and processes. The common metrics of R&D are research publications, R&D earnings and IPRs generated. IITB has shown a healthy growth in all these metrics.

The Institute has given emphasis to administrative enablers in order to facilitate R&D activities. Effective decentralisation of decision making is given to functionaries such as Deans, Heads and Principal Investigators who have been empowered with financial autonomy within rules and norms. Clear cut rules and processes have been established. All processes have been made online including purchases. This enables the Principal investigators to view the funds in the projects and the expenditure, recruitment and IP management activities.

The Institute promotes the culture of access and availability of high end equipment as central facilities to all researchers through clear cut guidelines via online systems for logging user requests and access. In addition, an initiative to procure research infrastructure facilities is ongoing to expand the availability of high end equipment. The Institute’s has made focussed efforts to catalyse interdisciplinary research in areas of national importance.

Examples of Research Consortia and centres include the Centre for Nanoelectronics (CEN), Power Anser Laboratory, VLSI Research Consortium, Centre for Excellence in Telecom (IITB –
Tata Teleservices), National Solar Thermal Research, Testing and Simulation Facility etc. New research centres were being established done through a process of identifying interested faculty, having discussion / brain storming to articulate a road map and then seeking funding from concerned government bodies for research and education. Centres for climate change studies, rural development and healthcare have already been established and some of the new ones in the final stages included centre for homeland security, water research initiative, centre for urban studies and combustion.

The Institute aims to work towards research that makes a difference to Indian society, to solving the nation’s problems and to training quality manpower with learning-by-doing method. This is expected to result in improved products, process, technology and knowhow.

The Institute funds seed grants, bridge grants and matching grants. New faculty are given a seed grant to start their research career at the Institute. In addition for all faculty, a part of overheads received in projects is transferred to a Research development fund. Bridge grant is given for researchers in between project grants and also matching grant was given in case of shortfall for doing a specific project. Students are encouraged to present their work at conferences and fund support is made available for them and also for grants for societal based projects.

There is a well defined streamlined online process for handling consulting. Faculty receive 70% of all consulting revenues. The institute takes up the cost for IP protection both national and international (through a process). Disclosures are made online to reduce time and a panel of patent attorneys has been appointed in various domains. The IPs generated are aggregated and advertised through newspaper advertisements, brochures and websites to attract potential licensees. A process has been set up for incubation through Society for Innovation and Entrepreneurship (SINE). A new initiative to proactively review the thesis work of post graduate students to assess IP potential was started. Last year, around 650 theses were evaluated resulting in around 17 inventions disclosed which were under process of protection.

Manpower recruitment for projects is supported with flexible and quick procedures. Also partial financial support is given to faculty to hire staff to help in administrative work.
A dedicated technical section works in the area of IP management, contracts and agreements, technology licensing and spearheading new initiatives, dissemination through brochures, exhibitions etc. and industry liaison.

Incentives provided for R&D include research awards, publication based awards, technology development awards and Chair Professorships. In addition, an initiative called Enthuse was taken to attract students to research. Groups of faculty gave research based talks at post dinner sessions in student residences and funds are provided for student group research activities. The research outputs were showcased at student based events in Techfest.

He concluded the presentation by stating that IIT Bombay has made the transition from an UG Institute to a predominantly post graduate (PG) Institute and is now taking steps to ensure that its research makes a difference.

6. Enabling Structures / Facilitation of Innovation in Academics – Dean (AP), IIT Bombay

Prof. Shivaprasad, Dean Academic Programmes, IIT Bombay gave a brief on the teaching innovations at IIT Bombay (Annexure 7). He commented that the academic programme at the Institute has evolved and changed based on feedback from students and faculty. The aim was to take care of the different students admitted to the system and to work towards providing a research focus in education.

When students enter the UG programmes, often they are confused about the subjects and are more driven by market forces and social pressures than their genuine interest. Hence it was felt that an appropriate education should be provided which allows them to choose their subjects with time depending on the interest developed. Hence currently there is a reduced requirement for the basic B.Tech programme with only 250 credits. Flexibility is offered to learn many more subjects as per interest. Students could 'shop' around in different departments and take additional courses to the tune of 30 credits (Additional Learning).

Such Additional Learning could be focussed in another department leading to a ‘Minor’ in that subject, e.g a B.Tech in Civil Engineering with a Minor in Computer Science and Engineering Department. If a student is comfortable in his parent subject and wants to specialise in that area itself, the Additional Learning (of 30 credits) could work towards a ‘Honours’ in that subject. Lastly, motivated students could also take up Additional Learning aiming at both Minor and Honors (60 credits).
However, monitoring of the students through faculty advisors, under such programmes is important. The seats available for Minor programmes are restricted with the eligibility for additional courses depending upon the academic performance.

The Institute has also evolved new and innovative dual degree programmes and some of them are the B.Tech.-M.Tech., M.Sc.-Ph.D., M.Sc.-M.Tech., M.Tech.-Ph.D. along with the possibility of a seamless link of starting with B.Tech. and coming out with Ph.D.

The students are also given guidance and also help for coping with the study programmes. In the Institute Student Mentorship programme (ISMP), a group of 8-10 students are assigned a student mentor for addressing their academic and non-academic issues. In turn the student mentor could discuss and seek advice from his/her Head of Department (HOD) or faculty in charge. At times the English speaking capabilities are poor and the mentors help in improving these skills. The Slow Pace Programme addressed those students who were weak in academics and language skills. They were offered less courses per semester along with training in English. The Academic Rehabilitation Programme (ARP) enables taking weak students out of a programme, provide mentorship and reallocate courses for helping them move ahead.

The Institute also actively participates in distance education programmes. The Centre for Distance Education in Engineering Programme (CDEEP) conducted a number of courses for the outside community and the National Programme for Technology Enhanced Learning (NPTEL) funded by the MHRD through e-learning aimed at enhancing the quality of engineering education in the country. Additional efforts such as the ‘Teach 1000 Teachers’ project were also taken up by the Institute to share quality teaching with the rest of the country.

**Discussion:**

Ms. Puri commented that focussed presentations were made by IITB highlighting the education and research ecosystem. She said that looking inwards, two levels of innovations need to be looked at- innovation in education through courses / management and innovation in research and management where much more incentives need to be established. The focus of higher education has to shift towards research and better managing the research outcomes. Flexibility has to be built in along with incentives and appropriate monitoring. A different kind of partnership has to be brought in between faculty and students such as the examples of Enthuse and Techconnect mentioned. Looking outwards, it is important to see the impact made on
society. IITB had given an overview of their proactive processes and some of these may be worth replicating.

Comments from various participants:

- Mr.K.P.Singh, UGC commented that concrete suggestions were needed as an outcome from this workshop to result in changes in Universities.
- E. Haribabu, Pro Vice-Chancellor, University of Hyderabad: IITB has set many interesting examples which universities should look at to emulate within their circumstances. IITB has the unique advantage of its location. Other universities should review the innovations needed based on their location and local issues. A mechanism for connectivity between industry cluster and innovations was important.
- Prof. P. N. Ghosh, Vice-Chancellor Jadavpur University: There is good talent in the under graduate level but often it is difficult to attract Postgraduates and queried about steps taken by IITB to address this. Director IIT Bombay commented that a small fraction of students go for higher studies since the undergrads get good jobs and hence have no desire to continue further studies. The students are motivated to research early on, through Enthuse programmes to help them get interested in research.
- Mr.K.P.Singh, UGC mentioned that IITs usually focussed on the urban and industrial sector and asked about innovations reaching the rural sector and what are the mechanisms of providing education, healthcare and technology flow. In his response, Prof. Khakhar said that IIT Bombay has a dedicated Centre for Technology Alternatives for Rural Applications (CTARA) to address issues related to rural applications where students take up field work in rural locations. In addition, faculty of the Rural Technology Action Group (RuTAG) are focussing on research relevant to rural areas. In education, the Teach a Teacher outreach programme of Prof.D.B.Phatak enabled a large reach to teachers across the country. IITB also has the Indian National Users Programme (INUP) for access of the Nanoelectronics facilities to researchers and students across the country. A number of activities are being pursued by the Institute and this can be shared with other Universities and help in setting up such structures.

7. University experiences in fostering Innovation - Prof. Dinesh Singh, Vice-Chancellor, Delhi University

Prof. Dinesh Singh, Vice Chancellor Delhi University initially expressed his happiness in being at this workshop and sharing his experience at the Delhi University. Innovations happen only
when there are real life challenges which captures the imagination and tortures the mind. He
gave the example of Gandhiji who wanted to work out a winning plan to gain independence for
India. During his meeting with Dr.Rajaji in Chennai, he got the idea of having a national level
peaceful strike to gain the momentum for the country’s independence. So, it is important to think
out of the box which is the best guiding principle for motivation and spurring innovation.

The role of University is very versatile because the vast number of different disciplines can
address large challenges together eg. Delhi needs an efficient transportation system and
important components for this include signaling systems, ticketing system, management
aspects, engineering challenges etc. A large number of different disciplines can come together
and address this very effectively. A critical number of undergraduates are needed for the right
kind of innovation to happen. A mechanical segregation between UG and PhD students as in
the Universities of the West is not desirable.

Delhi University (DU) had started an Innovation Scheme Award project along with the 80
constituent colleges taught by DU faculty. A real world challenge was posed to change the
curriculum. A group of 10 UG with three faculty members and one mentor from outside DU were
expected to submit a report within one month. Nearly 2000UGs and 600 faculty took up this
enormously diverse activity ranging from poetry to economics.

Another scheme tried in DU was the innovation cluster. It was felt that for a cluster or centre to
be successful, four themes were interlinked:

- One has to reach out to the slum/village cluster where more innovation is happening.
- One must connect with industry clusters reaching out to these themes
- The schemes should reach to the 80 constituent colleges and then to the nation.
- Management techniques are important to bring the group together, mentor them, have
group discussions etc.

He opined that administrators should stay away from the innovators after giving them a push
towards innovation and nurturing them along with incentivising their efforts.

Examples of innovation included the design of the wing of an aircraft, energy solutions etc. The
Biochemistry department had created a molecule and patented it and which found interest in a
Surat based Pharma company. The company used its idea to devise an accurate and quick test
for TB and with the help of government support, a company was incubated in DU to
commercialise this technology which gave back license fee to DU. It is thus important to involve industry and also take advantage of government support for this. After discussions with IIT Bombay he felt it is important to link up through the National Knowledge Network.

8. University experiences in fostering Innovation: Pro Vice-Chancellor, University of Hyderabad

E. Haribabu, Pro Vice-Chancellor, University of Hyderabad made a presentation on the Culture of Innovation for the 21st century India (Annexure 8). He commented that in knowledge production and application, academia played a significant role initially then through interaction with industry (double helix model). However now this activity can be taken up more effectively through the triple helix model of partnership between academia, industry and government.

The National system of innovation (NSI) looks at the interconnectivity of the three entities and the users of technology. This includes setting up various policies to emphasise innovation. These relationships include personal and financial knowledge and regulation flows among the nodes.

The new IPR regime from process to product patent mandates that new products and processes are created. It is important to understand the properties of materials but also to create new materials. Government has liberalised restrictions on imports and mandates R&D organisations to do more research. However the industry does not have adequate incentives or a compulsion to interact with academia. This model and emphasis has to change to promote meaningful innovation. Changes are needed so that industry is encouraged to interact with Academia. R&D units getting tax concessions should be mandated to utilize up to 25% of their R&D budget for collaboration with academia.

Significant capacities have to built up in academia and Public-public partnerships should get an strong impetus and frameworks made to guide these in the area of basic applied and strategy research. Collaborative frameworks should guide this partnership to produce upstream knowledge and give it to industry. The challenges for such partnerships included Identifying shared area of research and goals, participation in teaching programmes, sharing of resources – physical including land and human, credit sharing for the collaborative research and gains arising out of research and licensing research output for commercialisation.
He gave a brief about the University of Hyderabad which was set up in 1974 as a Central University with a vision to integrate knowledge from various branches of sciences, engineering and humanities. Emphasis was given on masters and research programmes and a recent initiative was the integrated five year programme in science and humanities and social sciences. The high output high impact university was considered as a University of Potential Excellence (UPE) and enjoyed special grants form UGC and undertook a large number of extra mural projects. Proposals were always interdisciplinary between groups of faculty and an incentive part of the overheads went back to researchers for their academic work. Various outreach programmes were undertaken and details are given in Annexure 6.

The university has a technology business incubator (TBI) and five spin off companies have been incubated. The TBI helped in creation of technology based new enterprises in the Pharma, Biotechnology and renewable energy fields and creating value added jobs and services, fostering the entrepreneurial spirit, speedy commercialisation of R&D outputs, developing new tools of technology transfer, creating technological awareness and providing specialised services to Small and Medium Enterprises (SMEs).

**Discussion:**
Ms. Puri commented that flexible learning formats need to be examined. It is important to ensure that flexible learning can lead to degrees. Sharing of resources is also very essential and UGC was working on this aspect and setting up models for implementation.

The Indian government has to pose grand challenges in the right way to academics which have to be articulated coherently in order to get a buy in and set the pace for innovation.

- **Prof. P. N. Ghosh, Vice Chancellor, Jadavpur University:** In general the quality of research in universities is not up to the mark; the aim is generally to get more publications for getting promotion. No university has a clear cut policy on patenting and UGC needs to formulate one. The IITB model could be adopted. However an individual IPR cell may not be needed for every university. Instead a cluster of universities could have an IPR cell on a shared basis. Funding for patenting could be given by the government.
- **Prof. A. Saha, Tripura University:** The public private partnership model was good and we should get access to more of such partnerships and private funding resources. Ms Puri clarified that this was not mutually exclusive from the suggested Public Public partnership.
- **Mr. K. P. Singh, UGC:** Incentives should be given to collaborate and catalyse innovations
• Prof. Jancy George, Central university of Kerala: A new Central University was established three years ago in the backward areas of South India. Scientists returning from the US have been recruited and have got some research grants but these are low key. There should be proactive effort from the government to involve such faculty in policy making decisions and motivate them to contribute to development in these areas. Appropriate courses need to be structures in the curriculum in these units.
• Prof. Mool Chand Sharma, Haryana University: Social innovations can be made by the backward area located institutions also. It is important to create fuzziness in the boundaries instead of breaking them. So the uniqueness of individual entities is retained however interactions are maintained. Multi/Inter disciplinary collaboration may not be possible in remote areas. Also partnership with different Government units is important. Creativity should be spurred and innovation planned for implementation of this creativity. Processes, methods, structures and team building are need for effective innovation to happen and a skilled leadership is essential to motivate, guide and generate this. Even here innovation is needed in building leadership.
• Director, IIT Bombay: Any structural constraints for setting up flexible learning programmes should be addressed adequately. Quick solution may not be possible but an action plan of what can be done should be discussed.
• Prof. A.K. Singh, Vice Chancellor, Allahabad University: The 125 year old University has a strong mindset. However new academic programmes and R&D processes as done at IIT Bombay were initiated and a lot of enthusiasm and willingness to change was observed. Ordinances can be changed and local mind sets are amenable to adopting new issues. University of Allahabad was one of the first to initiate the 4 years Bachelors of Science programme. Course and curriculum structure needs to be changed to encourage innovation. Localised innovation in needed for effectiveness. This was agreed to by the VC Jadavpur University.
• Prof. V. K. Singh, Director IISER Bhopal: Faculty should get sufficient time for research and translate that to teaching. Universities are isolated from research labs such as CSIR and DRDO and need to be able to collaborate with them more.
• Dr. E. Hari Babu, Pro-Vice-Chancellor, Hyderabad University: An enabling environment and organisation autonomy is important for the universities. Support from government is erratic at times with reduction of budget etc. The performing Universities should be supported well and more financial autonomy should be accorded like the IITs.
Ms Puri replied saying that many of these points are part of a report submitted to UGC and many reforms are on the anvil. The focus of the meeting is to identify the inhibiting factors and the incentives needed for innovation. Public public partnerships should be given a push with two or more universities / national labs forming innovation clusters.

- Prof. Furqan Qamar, Central University of Himachal Pradesh: It may not be easy to come up with a recipe by the end of the day and no single model can emerge. Sometimes innovation may not be welcome e.g. the recent innovations in the financial sector. Delhi University is perceived to be resistant to change in some basic policies yet is one of the most preferred academic entities. It may be appropriate to have multidisciplinary departments / centres that can accord appropriate degrees e.g. management development studies. The State Universities are struggling to survive with a 1:60 teacher: student ratio and a critical mass level of activity needs to be reached before innovation can take place.

- Prof. B.P. Sanjay, Central University of Tamil Nadu: The higher secondary level education is the weakest link for next level of higher education and is important to be addressed. The students at this stage in school should be educated to face the challenges of higher education and hand holding is needed for this.

- Prof. V. K. Singh, Director IISER Bhopal: Basic research is very important; the period for PhD programme should be reduced and instead a longer four year period should be instituted for the B.S. programme. Authorities do have the ability to bring in a lot of change and some improvisations were brought in at IISER Bhopal. Also distance learning is essential with quality teaching to come from premier institutions.

- Prof. Ambuj Sagar, Dean, Alumni Affairs and International Programmes, IIT Delhi: The route to innovation is evolutionary with no optimal path and may not be possible to finalise a clear proposal by end of the day. Academic institutions cannot do everything and hence should make their choices and follow them. A research driven innovation can be single or multidisciplinary, student driven, can be technology driven or societal. It is important to educate the students to be innovative and think differently so that become innovators of tomorrow. This day would be the beginning of the process to think and not the end.

9. Poster session- Case Study by IIT Bombay

As part of the workshop, a poster session was held after lunch where a number of innovation and research done at IITB was showcased. Nearly 60 posters were displayed in areas including industrial design, energy efficient technologies, novel sterling engines, solar photovoltaics, National Mission on Education through Information and Communications Technology (NME-
ICT) related projects, chemical processes and student driven projects. Some of the innovations were also displayed through models and demonstration units. A list of the posters is given in Annexure 9.

10. Fostering Innovations- IIM Experience – Prof. Anil Gupta, IIM Ahmedabad

Prof. Anil Gupta, made a presentation through Skype on ‘Fostering innovations and forging social, industrial and ecological connect’ (Annexure 10). He emphasised that the challenge for bringing in innovation was that young minds need to be turned around to become more enquiring. Role models need to be created and young talent supported. One had to build connections beyond the boundaries and link informal and formal knowledge systems. The problems faced by the various informal sectors should be highlighted and academics should be accountable for addressing and attempting to solve these societal problems.

Industrial and rural ‘shodhyastras’ should be organised to learn and share the mutual insights about resource management. In addition to literature search, patent review should also be mandatory for project development. Various platforms should be established for promoting originality, connectivity and collaborative problem solving culture.

The long existent National Social Service should be reviewed and reinvented as National Innovation Service to trigger creativity in schools, panchayats and tribal regions. A number of examples can be given for the innovative services created by locals for use in day to day life e.g. villagers from Manipal using the heat from chulhas to dry grain, scooter driven grain mills.

It is also important to create a cultural transition for irreverence and questioning attitude of students. The questioning minds should be given encouragement resulting in creativity while finding solutions and answers. The education content should be available in open source and a database of skilled/outstanding teachers should be made as a mentoring database for young innovators.

The formal and informal knowledge systems should be linked e.g. National Innovation Foundation (NIF) has agreements with CSIR, ICMR and Futures Group to set up mechanisms for innovation and adding value to grassroots innovators. Patents are one way of indexing or benchmarking innovations but thousands of technologies in the open source can be used effectively. Hence expanding the public domain of knowledge is an important obligation.
Lastly, academic environment has to be made innovative by

- being open,
- encouraging mixing of inside and outside,
- encouraging asking foolish questions,
- having a reverent atmosphere and
- is appreciative of creative ideas at all levels.

11. Open house discussion

- Ms. Puri started the discussion mentioning that Universities are the mainstay of innovations and also catalysing them. The last slide of Prof. Anil Gupta was an important issue to keep in mind regarding having an open academic environment with encouraging students asking foolish questions with an aim to probing /seeking solutions, pertinent to creativity. This kind of environment should be provided in classrooms, where teachers need not know all the answers but can seek them and get answers. A continuous comprehensive evaluation is very desirable.

- Prof. R. Amritavalli, Vice Chancellor In-charge, The English and Foreign Languages University: There are several issues in the language disciplines with no indigenous peer reviewed journal and little interaction between academics. Here innovations are not new molecules and a questioning attitude may not be a way out. The UGC’s academic performance index is very defeating and such cautionary points need to be noted. She suggested that awards for best research thesis could be instituted.

- Prof. K.N. Ganesh, Director, IISER Pune: Generally students are taught only to answer questions and not to ask them. As an exercise, one batch of students were asked to set questions for another batch of students and this had proved very successful. The students realized the difficulties in setting of questions and also read up well for this. So new innovative methods need to be brought in continuously to buy in student participation and their interest. In addition he commented that engineering and medical schools were part of university system in the west and this should be adopted in our country also. The PhD programmes need to train the students to be good leaders with exposure to IP, ethics, anti plagiarism and good research practices. A good post doctoral training is needed in the country and lifelong competency skills should be taught / developed. Similar to multi university consortia seen in UK, bidding for major project, regional consortia should be promoted.

- Prof. R.N. Mukherjee, Director, IISER Kolkata: Flexibility for academic programmes is needed with a give and take system. Students should enjoy science and research and should be
motivated through creativity and curiosity in learning. A Humanities and social science component is essential in science curriculum and programmes/ awards should be given to inspire the students to take on these subjects in higher education. Research should be curiosity driven, market driven or societal / need driven.

- Prof. E. V. Ramakrishnan, Dean, School of Language, Literature and Culture Studies, Central University of Gujarat: Lot of cut and paste research is happening in our country and monitoring is essential. He agreed with the issues raised related to the humanities related disciplines.

- Prof. Mool Chand Sharma, Central University of Haryana: A four way rectangular relationship is important- curriculum striking a balance between local, community, national and global needs, examination reforms as a integral part of teaching pedagogy and examination curriculum, a robust faculty development programme along with a very strong outreach programme.

- Prof. Jancy George, Central University of Kerala: The issues related to humanities area need to be addressed and focus on innovation should not be overdone. An indigenous model of innovation should be evolved. Not many teachers may find the proposal of irreverent questioning acceptable. The Indian culture includes reverence for teachers and elders and a questioning attitude consistent with our culture need to be inculcated. Teacher evaluation mechanism and allowing students to go outside of curriculum would be useful.

- Prof. Furqan Qamar, Central University of Himachal Pradesh: Suggested that curriculum should be addressed substantively.

- Dr. E. Hari Babu, Pro-Vice-Chancellor, University of Hyderabad: A curriculum should help train students for opportunity gazing, inculcating the spirit of innovation. This could be in language, technologies etc.

- Prof. B.P. Sanjay, Central University of Tamil Nadu: Mechanisms should be set up to train the NET/CSIR qualified teachers to be trained in order to be able to teach students.

Ms. Puri commented that provisions for Teaching Assistantships are available during research to gain experience in teaching. Director IITB felt that this opportunity should be given to our own PhDs and post docs. Haryana VC added that 2200 NET qualified lecturers were trained for a month on teaching pedagogy by UGC. Allahabad VC also commented that academic staff colleges could be requested to provide such training to new recruits. Dr. Lakshman Chaturvedi, Vice Chancellor, Guru Ghasidas Vishwavidhyalaya proposed that shortlisted
teachers be requested to give lectures to students and those selected from this exercise be interviewed.

- Prof. Ambuj Sagar, Dean, Alumni Affairs and International Programs, IIT Delhi: The student stakeholder is very important and they have their own way of innovation. It may be useful to have contests and get ideas from students on ways to promote innovation.

12. Way ahead

To structure the discussion and provide some suggestions for specific action, Dean R&D of IIT Bombay made a brief presentation on possible way ahead.(Annexure 11).

Mechanisms for seeding innovative projects across departments could be set up with fund provision for inter-disciplinary workshops and group activities. Mobility grants should be given to researchers to work with groups in other universities. Student innovations/research activities should be funded. Proposal writing should be encouraged and national innovation lecture series / demonstration activities should be instituted. Access to high end equipment should be given across universities and mobility grants given to researchers to wok with groups in other universities. A good and simple IP policy should be made with incentives to researchers from technology commercialisation. National patenting costs could be reimbursed and entrepreneurship related education / activities promoted. An important aspect is the decentralisation of internal systems and R&D administration.

To catalyse innovations in society, a Centre for Innovation support could be set up with inputs to be provided to innovators in region and funded by government. Workshops can be held with problem definition of relevance posed by industry, NGOs and society to be solved by students, / faculty. Dissemination of projects/ IP developed by universities should be emphasised which could be through an open day. Design studios can be set up to interact with innovators and experts. The impact of these efforts in a region should be benchmarked. Continuing Education/ Degrees/ Diplomas along with interaction with Schools to encourage innovation early on, setting up of incubators, Technology park / Research Park are other possible ways forward.

The roadmap ahead could include proposals from universities on schemes for internal and external innovation with specific timelines and expected outcome, National schemes on mobility grants, information exchange, high end equipment usage, workshops and an Innovation Advisory Committee in universities with Industry and society leaders as members.
Opinions were shared about the following:

- Ms. Puri commented that several universities have already launched initiatives and planned activities to catalyse internal innovations. MHRD should support and strengthen such initiatives.
- Students could work with two supervisors across departments
- Reimbursement of patent costs may need to be reviewed carefully since most technology licensing activities from academic institutions are loss making units. However, protection is needed to own it and a critical mass needs to be obtained for this in order to be able to deploy as per academic mandate.
- No common ground is available for all streams; different streams have to looked at differently and appropriate reforms brought in
- Ms. Puri commented that UGC could support a committee to review curriculum across disciplines but needs to get buy in from others also; everyone should own the reforms suggested by them and the specific ones needed by them; an inter university consortium (IUC) was proposed in the 12th plan for linguistics and higher education.
- Collaborative consortia could be set up between those who are ready to collaborate and cooperate in specific areas
- May be good to set up simple processes without major policy changes initially.
- Other universities should review the innovations needed based on their location and local issues. A mechanism for connectivity between industry cluster and innovations was important.

13. Closing Remarks

Ms. Puri concluded the session saying that the road map suggested by IIT Bombay provides specifics which could be implemented. She suggested that participant VCs could send their specific suggestions of schemes needed to encourage innovations. In addition, the following points were added.

- UGC will be able to take the IUC proposal forward
- UGC has a number of schemes which should be taken up by the universities
- Indo US portal in on the anvil and IIT Delhi is helping with the content.
- It is hoped to get ideas from the student community and the group present to take steps for way forward in a truly collaborative manner
• Proposals made by universities with activities under internal innovation, could be funded by MHRD for which the relevant scheme could be formulated. There could be a similar provision for Catalysing Innovation in Society.

She thanked all the participants present in the meeting and also to IIT Bombay for hosting this workshop at short notice.

Director, IIT Bombay thanked all the participants and mentioned that the presentations and the minutes of the meeting will be made available to all through a weblink in a week’s time.