INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

Research Scholars and Alumni Symposium - 2014

Post-Event Report

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Research Scholars and Alumni Symposium-2014

Indian Institute of Technology Bombay

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TABLE OF CONTENTS

Acknowledgments

Our sincerely thanks to The Director, Deans, Faculty members, Staff members and Students who had supported us in making the event successful. We express our sincere gratitude to MHRD, India for funding/supporting this event under the aegis of the 'Knowledge Innovation' initiative under Technical Education Quality Improvement Programme (TEQIP) TEQIP. We also thanks to the faculty members and students who were part of the organizing team which is listed in the Souvenir.

A. Introduction

Research Scholars and Alumni Symposium (RSAS-2014) is an institute symposium periodically organized by IIT Bombay. As knowledge sharing is very important for research, a seamless interaction with peer level researchers and professionals is desirable. RSAS-2014 was held under the aegis of the 'Knowledge Innovation' initiative under Technical Education Quality Improvement Programme (TEQIP) supported by the Ministry of Human Resources Development (MHRD), Government of India. A special feature of this edition of the symposium was participation of research scholars from other institutes (many of which are TEQIP supported). It was held on 7^{th} – 8^{th} March, 2014 at Victor Menezes Convention Center (VMCC), IIT Bombay. The following were the broad objectives of this symposium:

- To provide an opportunity for research scholars to get inspired from experiences of PhD alumni
- To encourage interaction between the research scholars from various institutes
- To offer a platform for showcasing doctoral research being carried out at IIT Bombay and other institutes
- To bridge gaps between academia and industry for productive and applied research
- To bring awareness about research and entrepreneurial career directions after PhD
- To deliberate on how to make research activities more meaningful and relevant from societal viewpoint

B. Participation of research scholars and faculty members from TEQIP supported institutes and other institutes

A meeting with research scholars and faculty members from neighboring TEQIP supported engineering colleges was held on 23^{rd} December 2013 to share the information about the objectives of RSAS-2014. Twenty eight faculty members and thirty five ME/PhD students from the following colleges attended the session:

Vidyavardhini College of Engineering,Vasai, St.Francis Institute of Technology, Mumbai, Shah & Anchor Kutchhi Engg College, Chembur, Shivajirao S. Jondhale Polytechnic, Asangaon, SGGS, Nanded, VJTI, Mumbai, Navrachana University, Vadodara, Gujrat, AIKTC, New Panvel, VPM's MPCOE, Ratnagiri, Gogte Institue of Technology,, Belgum, Karnataka, MET, Institute of Engineering, Nashik, SPIT, Mumbai, COEP, Pune, JDIE&T, Yeotmal, Government Polytechnic, Ratnagiri, and SRIRIT, Shiroda, Goa.

Expectations of these faculty members and students from RSAS, as well as issues faced by them were enlisted in the meeting, which are summarized as under:

- There is a necessity of a platform for research scholars from various institutes to interact.
- Interdisciplinary research should be encouraged and nurtured as it can play a significant role in applied research in academics and industries.
- Training sessions on research methodology and communication skills are necessary for research scholars.
- Administrative procedures regarding research scholars should be harmonized as far as possible across various institutes with similar standing in India.
- Exposure of intellectual property rights and entrepreneurship models should be given to research scholars.
- Knowledge on opportunities after PhD will be of great importance and a source of encouragement for research scholars.
- Part-time PhD students need to be adequately supported and facilitated.
- PhD internships by research scholars should be encouraged and well-supported if necessary.

The above discussion helped organizers to finalize the objectives and broad outline of RSAS 2014. Some of the participants from these TEQIP supported colleges volunteered to actively participate in the symposium.

Faculty members, students, and PhD alumni of IIT Bombay participated in large numbers in RSAS-2014. About 50 PhD alumni of IIT Bombay actively participated in the symposium. Out of 350 registered participants of the event, the number of participating students and faculty members from various other academic institutes, many of which are TEQIP supported, was nearly 100. These were mostly from nearby engineering colleges within Maharashtra like VJTI, COE Pune, BATU Lonere, VNIT Nagpur, G H Raisoni College of Engineering Nagpur etc. However, the number of participants from institutes such as IIT Kanpur, IIT Kharagpur, IIT Hyderabad, Karnataka University Dharwad, etc., was appreciable.

After the event, a questionnaire was distributed to participants for obtaining their feedback. The survey was designed to get feedback on various aspects of the event such as publicity, organization, program, hospitality, etc., and asked participants to rate their experience on a 4-point scale (Poor, Satisfactory, Good and Excellent). There were a total of 21 such questions along with an open-ended question asking for suggestions to improve future editions.

Responses to the survey were very positive and highly encouraging. The participants appreciated all the aspects of the symposium and expressed their wish to be a part of such events in future. The contents of the invited talks were in line with their expectations, and the symposium provided them an opportunity to interact with their peers from other institutes. Most participants spoke highly of the organization and publicity of the event and were happy with the accommodation facilities.

C. The Program

RSAS-2014 program consisted of invited lectures, group and panel discussions, technical presentations by research scholars, and interactive sessions between experienced PhD alumni and current research scholars within respective departments. A concise summary of the various activities is given below:

The morning session began with registration of the participants in VMCC at 8:30 am.

C.1 Inaugural function (9-10 am)

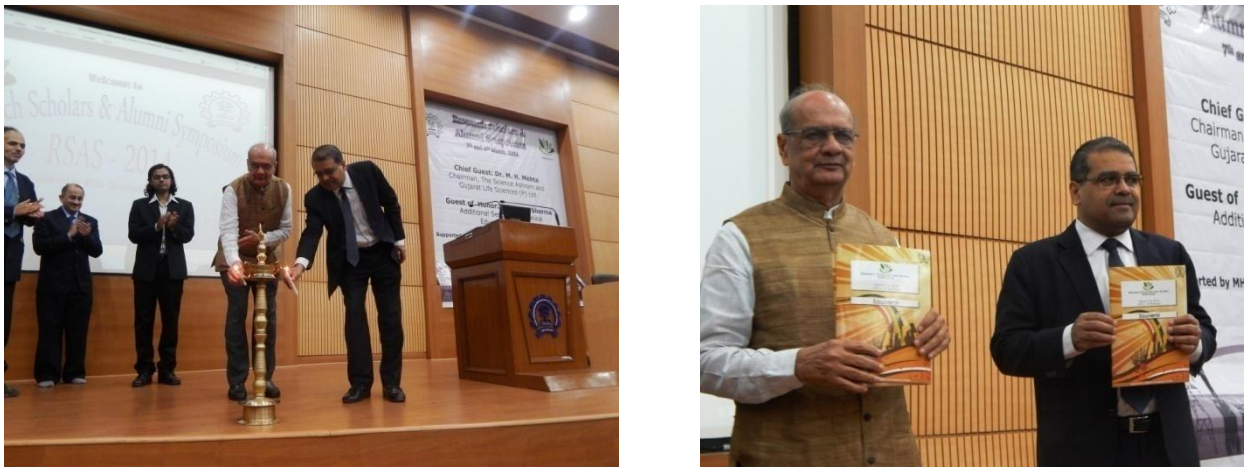
The inaugural function was graced by Padmashree Dr. M.H. Mehta (Chairman, Gujarat Life Science Pvt. Ltd.), Prof. Ravi Sinha (Dean ACR, IIT Bombay), Prof. V.M. Gadre (Head CDEEP, IIT Bombay), and Prof. S.V. Kulkarni (Faculty Coordinator RSAS-2014, IIT Bombay). Various faculty members of different academic units of IIT Bombay, PhD alumni of IIT Bombay, and research scholars of IIT Bombay and other institutes also attended the function.

(a) (b)

Picture 1: (a) View of inaugural function from dais, Prof. S. V. Kulkarni, Faculty Coordinator RSAS-2014 (first from left delivering the welcome address), Prof. V. M. Gadre, Head, CDEEP IIT Bombay (second from left sitting on the dais), Dr. M. H. Mehta, Chairman, Gujarat Life Science Pvt. Ltd. (third from left sitting on the dais), Prof. Ravi Sinha, Dean ACR IIT Bombay (second from right sitting on the dais), Mr. Gulshan Kumar, Overall Coordinator, RSAS-2014 (sitting at extreme right on the dais). (b) View of audience in VMCC auditorium hall during inaugural function.

❖ The inaugural function began by felicitation of all the dignitaries sitting on the dais.

- Prof. S.V Kulkarni welcomed the dignitaries, faculty members, alumni, and research scholars. He explained the purpose and objectives of the symposium, and further elaborated on the contents and special features of the program. He invited Dr. Mehta for lightning a ceremonial lamp and to release the RSAS souvenir.

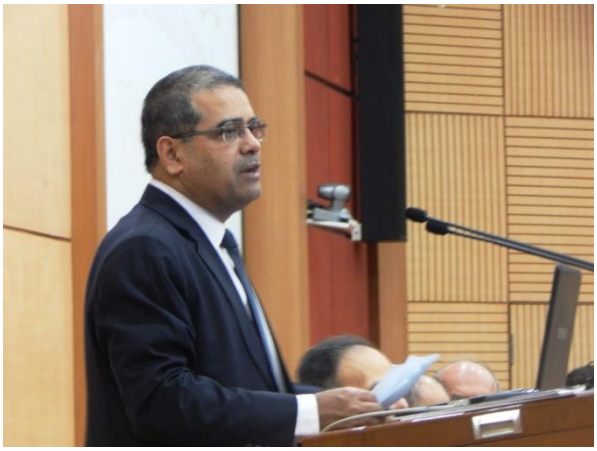


(a) (b)

Picture 2: (a) Dr. M.H Mehta and Dean ACR lightning the ceremonial lamp and (b) Souvenir being released in the inaugural session

- Prof. Ravi Sinha introduced the Chief Guest, Dr. M.H Mehta, by highlighting his work experience, contributions, and achievements. He also emphasized on improving students-alumni relations, and stressed that events like RSAS provide a platform for developing symbiotic relations between current research scholars and PhD alumni. He noted that the format of RSAS specifically works to foster interactions between research scholars from various colleges and between those within IIT Bombay.

- Dr. Mehta in his inaugural address emphasized the need for researchers to work on a list of common worldwide problems viz. hunger, poverty, sustainability, health, education, water desalination, gender inequality, and unemployment. He motivated them to engage in "Social Entrepreneurship" wherein they will get opportunities to serve the neediest segment of the population and help them in their survival. He concluded his address by recommending a "Golden Triangle" approach in which scientists, science managers, and top management become the three edges of the triangle and work synchronously to achieve these targets.



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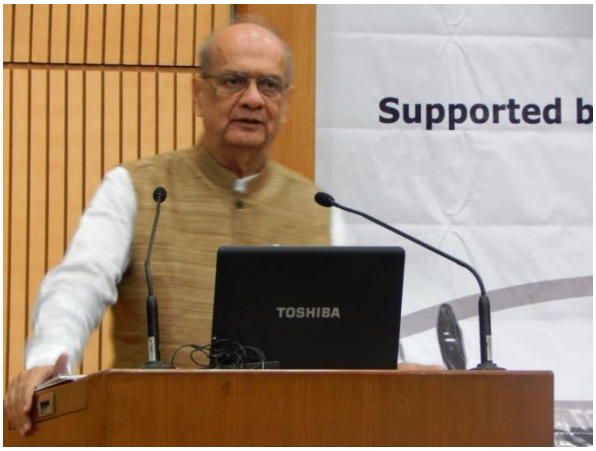

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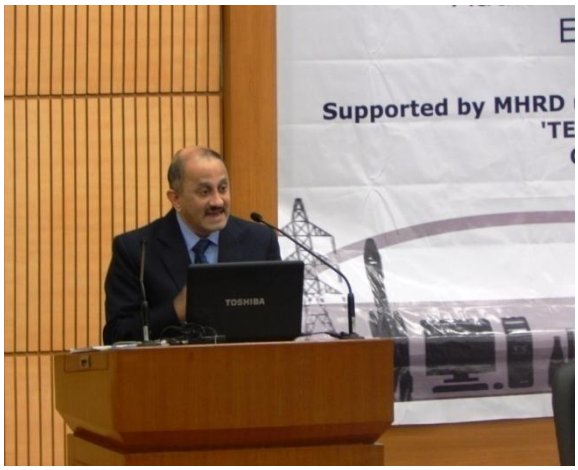
Picture 3: (a) Prof. Ravi Sinha introducing Dr. M.H. Mehta (b) Address by Dr. Mehta

- The inaugural talk was followed by the speech of Prof. V. M. Gadre (Head CDEEP) who talked about the motivation behind organizing this kind of event under the TEQIP programme. He also emphasized on the importance of the programs like TEQIP, which are supported by Ministry of Human Resources Development (MHRD), Government of India.

- At the end, a Vote of Thanks was delivered by Mr. Gulshan Kumar, the Overall Coordinator RSAS-2014 and the Institute Doctoral Representative 2013-14.



(a)

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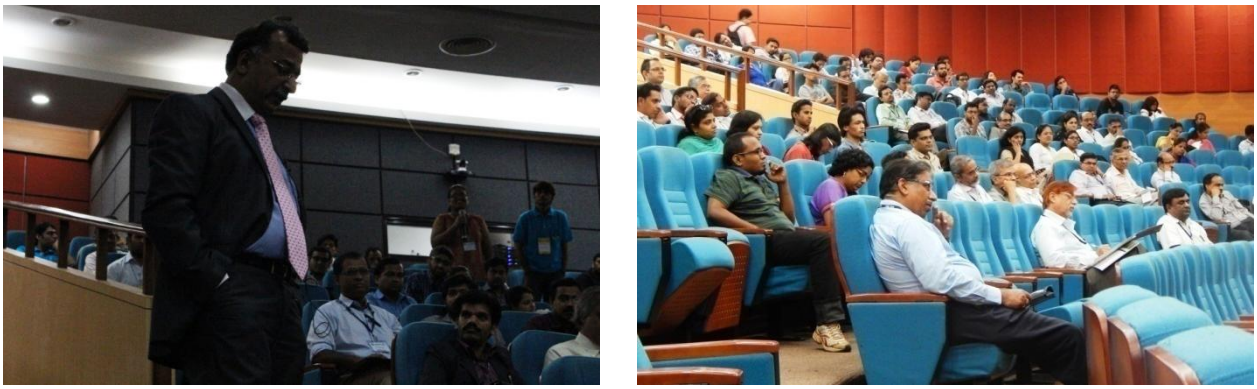
Picture 4: (a) Prof. V. M. Gadre telling the motivation behind organizing this kind of event under the TEQIP programme (b) Mr. Gulshan Kumar, the Overall Coordinator RSAS-2014 delivered the vote of thanks.

C.2 Invited Talks (10:30 am-11:30 am)

This session was chaired by Prof. M. C. Deo.

There were two invited talks in the morning session by PhD alumni of the institute. The first one was by Dr. S. Hariharan, CEO and Joint Managing Director of Solaris Chemtech Industries Limited, who is an alumnus of Chemistry Department. The theme for his talk was – "Mantra for researchers in these difficult times - Innovate or perish".

- Dr. Hariharan highlighted the need for innovations in one's career path to survive in today's competitive environment in all spheres of life. He analogized PhD journey with a real life scenario, and urged research scholars to reflect on their work and efforts to justify allocation of tax payers' money for funding their research. He also exhorted them to use the knowledge that they gain to create new jobs and new products. He further stressed on the need for a bridge between researchers and policymakers to have significant innovations and research output. Human capital, innovations, and operational excellence were identified by him as the three key challenges faced by businesses worldwide. He concluded his talk by summarizing the need for creative use of one's knowledge and regular updating of skills.



(a) (b)

Picture 5: (a) Dr. Hariharan giving the first invited talk and explaining about real life scenarios (b) attentive audience during the session in the VMCC hall.

The second talk was by Dr. Suresh Nair, Chief Technology Officer, NeST, and a PhD alumnus of Electrical Engineering Department. The theme for his talk was – "Strengthening the relationship between academia, industry, and research organizations."

- Dr. Nair started his address by bringing to the notice of the participants the sad state of documentation within research organizations. According to him, this results in inefficiencies in development of technologies, and also researchers' efforts may go unnoticed. He also highlighted inadequate industry-academia collaboration within the country. Institutions, students, industries, and society form different parts of a linked system. Therefore, he noted that increased collaboration of academia and industry will prove to be beneficial for all and is the need of the hour. With humorous anecdotes and examples, Dr. Nair engaged the audience and narrated importance of quality over quantity. He concluded his talk by exhorting research scholars to rely on their creativity rather than blatant copying.

(a)

(b)

Picture 6: (a) Dr. Suresh Nair gave the second talk of the morning session wherein he emphasized the importance of industry-academia collaboration (b) audience view during the session.

C.3 Group Discussions (11:30 am- 1:00 pm)

Seven group discussions (GDs) were held in parallel sessions between 11.30 am to 1.00 pm. RSAS volunteers under the guidance of Prof. SB Kedare coordinated the discussions. The seven group moderators summarized the corresponding discussions in a panel discussion which was moderated by Prof. A. Contractor in the last session of the first day. A summary of each GD is given below and the actionable items emerging out of GDs are given in a subsequent section.

GD Session 1: ***Research journey - Making it structured and joyful***

The discussion started with a round of opinions from participants on the topic. Issues in identification of a research problem, lack of creativity/innovations, and inability to handle disappointments were discussed. The group moderator, Prof. Uday Khedker (CSE Dept., IIT Bombay), elaborated a set of key aspects to make research joyful and successful. Importance of self-evaluation and collaborative approach for high quality research output was highlighted.

GD Session 2: ***Investment portfolio for Research and Development: How many eggs in which basket?***

The group moderator, Dr. E. S. Rao (Director and CEO, India Infrastructure Finance Company Limited) discussed about the 12th plan of the government and the funds allocated for development of 29 subsectors, viz. energy, transportation, telecommunication, social infrastructure, and urban planning. Financial innovations are essential along with technological breakthroughs to make projects sustainable. A need to build a culture for research and development was stressed.

GD Session 3: ***Is there disconnect between academic research and societal needs?***

The discussion started with a brief overview of variety of drivers for research. Research problems are often initiated/guided by trends in related literature. They are also many times decided by funding available. However, this can lead to disconnect between academic research and societal needs. There should be a sizable number of research problems undertaken in institutes that address societal issues, for which exposure to rural and urban issues, on a continuous basis, are essential for the academic community. Dr. Chandrika Bhimarao (Director, Discovery Informatics) was the moderator of the discussion.

GD Session 4: ***Strategies and policies for enhancing the contributions of research scholars in projects of national importance***

The moderator, Dr. Kallol Roy (Head, Research Reactor Maintenance Division, Reactor Group, BARC), started the discussion with an introduction to the current status of research in India. The discussion was focused on importance of self-sustenance, self-reliance, and

developing indigenous codes and instrumentation. It was concluded that multi-disciplinary research and interactions between researchers in academic institutes and research organizations are the key factors for translating research into products and processes that can contribute to the nation.

GD Session 5: ***Technical profile and skill-set of research scholars - Expectations from industry***

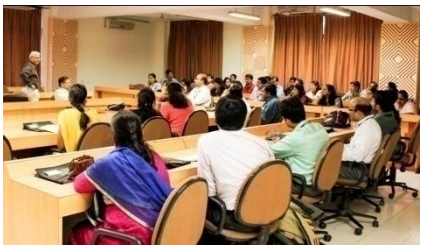
The discussion started with emphasis on the importance of inter-disciplinary knowledge, communication skills, and teamwork. The moderator, Dr. V. Ryali (Manager, GE Global Research Center, Bangalore), stressed the role of planning, framing of timelines, and budgeting in research. Main suggestions were to increase industrial internships, work on industrial research problems, enhance interactions with industry experts through invited talks and workshops, and have inter-departmental events.

GD Session 6: ***The inevitability of interdisciplinary research for new technologies***

The group moderator, Dr. Chaitanya Shah (Director, Mechemco Group, Mumbai), started the discussion highlighting a need for interdisciplinary research especially for applied and fundamental research. While IITs encourage interdisciplinary coursework and research, many other institutes need to also catch up. Symposiums and workshops with industrial experts should be encouraged to generate ideas for such research.

GD Session 7: ***Demographic impact of research and innovation: The rural-urban divide***

Three important pillars for technology development were identified in the group discussion as the interface between research and society/people, interactions between institutions, and interactions among departments within institutes. The necessity to inculcate interest in research in undergraduate and masters-level students was highlighted. Students should be given exposure to industrial problems, entrepreneurship, technology management, and societal needs. More initiatives for development and implementation of technologies for rural and urban areas, like the ones that have been taken in some of the IITs, are welcome. Dr. Binti Singh (Professor, Kamla Raheja Vidyanidhi Institute of Architecture) moderated the discussion.



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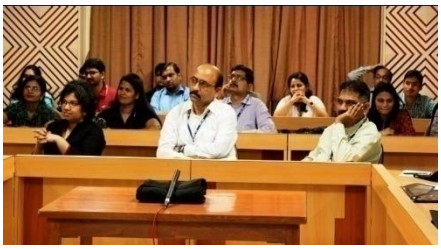

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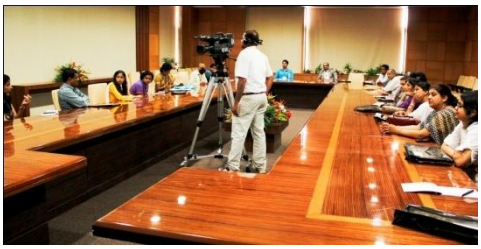

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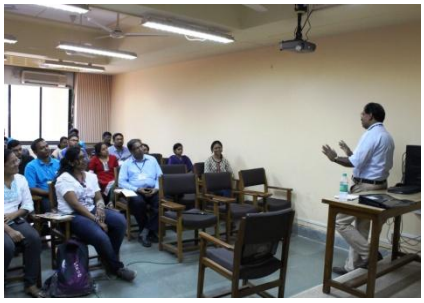

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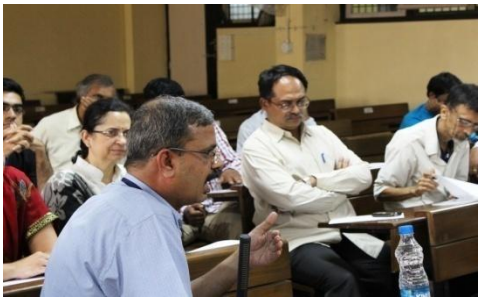

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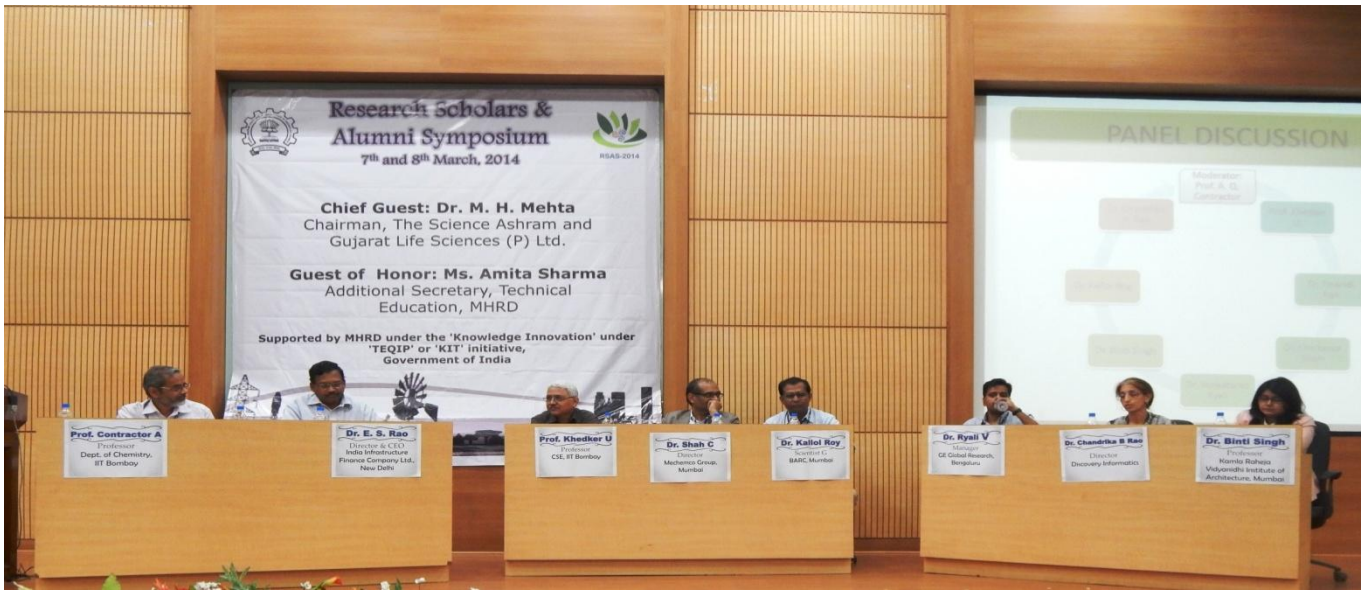


(g)

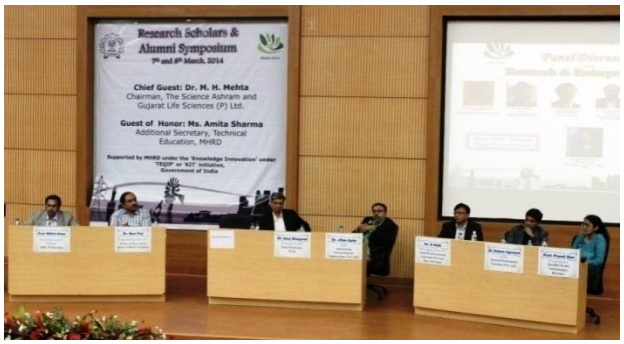
Picture 7: (a)-(f) Glimpse of the various GD sessions (g) Panelists of the summary session

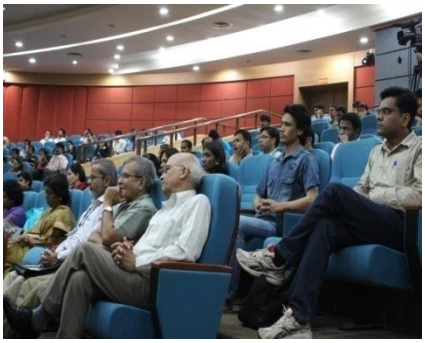
C.4 Panel Discussion on 'Research and Entrepreneurship' (2-3.30 pm)

The afternoon session started with a panel discussion on **Research and Entrepreneurship** moderated by Prof. Milind Atrey, Professor-In-Charge of SINE, IIT Bombay. The panelists were:

- Dr Ravi Pai, Engineering Director, Indian Division of Design of Silicon (D2S) Mentor Graphics
- Dr. Ajay Bhagwat, Managing Director, Renu Electronics, Pune
- Dr. Jiten Apte, Founding member of four start-ups
- Dr. S Naik, Managing Director Naik Environmental Engineers Pvt Ltd. Navi Mumbai
- Dr. Rajeev Agrawal, Founder-CEO, Innoviti
- Professor Preeti Rao, Co-Founder, SensiBol Audio Technologies, and Professor, EE Dept, IIT Bombay

The main question that was at the center of the discussion was: "In the current scenario, wherein entrepreneurship is being encouraged within academic environment, what should a research scholar do? Should he/she opt for a job or jump onto entrepreneurship?" The panelists, talking from their own experiences, agreed that having a research experience benefits while innovating solutions. However, they were clear that choice of entrepreneurship path depends a lot on the individual and his ability to take risk. They all agreed to the fact that it is the process of conducting research, rather than the actual research problem, that teaches the research scholars valuable lessons of patience and dedication needed to become a successful entrepreneur. Some of the panel members also reflected on their mistakes during their entrepreneurship journey and learning thereof. Further, they also talked about various hardships that one has to face after starting a venture and possible ways to tide over them.



(a) (b) (c)

Picture 8: (a) View of Research and Entrepreneurship panel discussion: panel members (b) view of the question round during the panel discussion (c) attentive audience during the session.

Prof. Atrey, in his summary, noted that entrepreneurship is more about the journey than the destination. With more support coming from the institute in the recent years, he believed that there would be more research scholars willing to take up this path.

C.5 Ms. Amita Sharma's talk

Ms. Amita Sharma, Additional Secretary, MHRD, was kind enough to accept the invitation to grace the event in the post-lunch session. She attended the session 'Research and Entrepreneurship' with interest. At the end of the session, Prof. Gadre requested her to address the gathering and give valuable advice to participating research scholars and faculty members.

Ms. Sharma, commenting on the previous session, noted that the discussion has given good insights into dynamics and correlation between research and entrepreneurship. She also observed that the discussion had touched upon the need for improvement in critical thinking abilities of students and for questioning existing conceptual frameworks. She commented that institutes like IITs and IIMs should try to institutionalize and support more programs on entrepreneurship. Finally, she mentioned that Government has approved a proposal of setting up a research park in IIT Bombay.

(a)

(b)

Picture 9: (a) Address by Ms. Amita Sharma, Additional Secretary, Technical Education, MHRD, Government of India. (b) Prof. Ravi Sinha presenting a token of appreciation on behalf of IIT Bombay to Ms. Amita Sharma.

Prof. Ravi Sinha's comments

Dean ACR, while sharing his views on the panel discussion, noted that the discussion highlighted a disconnect that exists between researchers and markets/society. He mentioned the programmes within IITB, like "Centre for Entrepreneurship", are trying to bridge this gap by bringing all stakeholders on the same platform. He informed the audience that the centre is planning to set up "Proof of Concept Lab" wherein anyone can test an idea or a product for its marketability.

C.6 Invited Talks (4-5 pm)

This session was chaired by Prof. A. B. Inamdar.

Dr. Vadiraj Ekundi (Head R&D, Hical Ltd.) gave a talk on "*Intellectual Property Rights in the Indian Context*". Starting with the historical account of IPR (Intellectual Property Right), he mentioned how the Indian Patent Act functions. Besides, he presented case studies and elaborated on execution of the patent act.

Dr. Sivan (Mission Director, GSLV-D5, ISRO) gave a talk on "*Role of research scholars in development of indigenous technologies.*" The talk focused on the recent GSLV launch by ISRO. He emphasized the evolution of technology for launch vehicles, and progress in payload capacity. Various challenges and problem areas were discussed. In addition, future scope in indigenous technology development was highlighted. This talk packed with technical details of research in launch vehicles was concluded with the mention of opportunities for young engineering researchers.

(a) (b) (c)

Figure 10: (a) Dr. Vaidraj Ekundi enlightening on Intellectual property rights (b) Dr. Sivan delivered the last invited talk of the afternoon session (c) audience during the session.

D. Technical Sessions

Abstracts were invited for the technical session. This session was categorized into two sections. One was for oral presentations and the other for poster presentations. Abstracts were invited from registrants who had opted to present their research in RSAS-2014. Sixty four abstracts were received, out of which 52 were selected for the technical session by a review committee. This committee comprised of faculty members from different departments. The committee categorized the selected abstracts for poster and oral sessions based on their contents.

D.1 Poster Session:

Out of 52 selected abstracts, 27 were scheduled for poster presentations. This session was arranged on the first day of the event, i.e. 7th March 2014, during tea breaks. There were two such slots in which the presenters presented their work and interacted with alumni, faculty members and fellow research scholars. RSAS volunteers coordinated the session under the guidance of Prof. S. V. Prabhu.

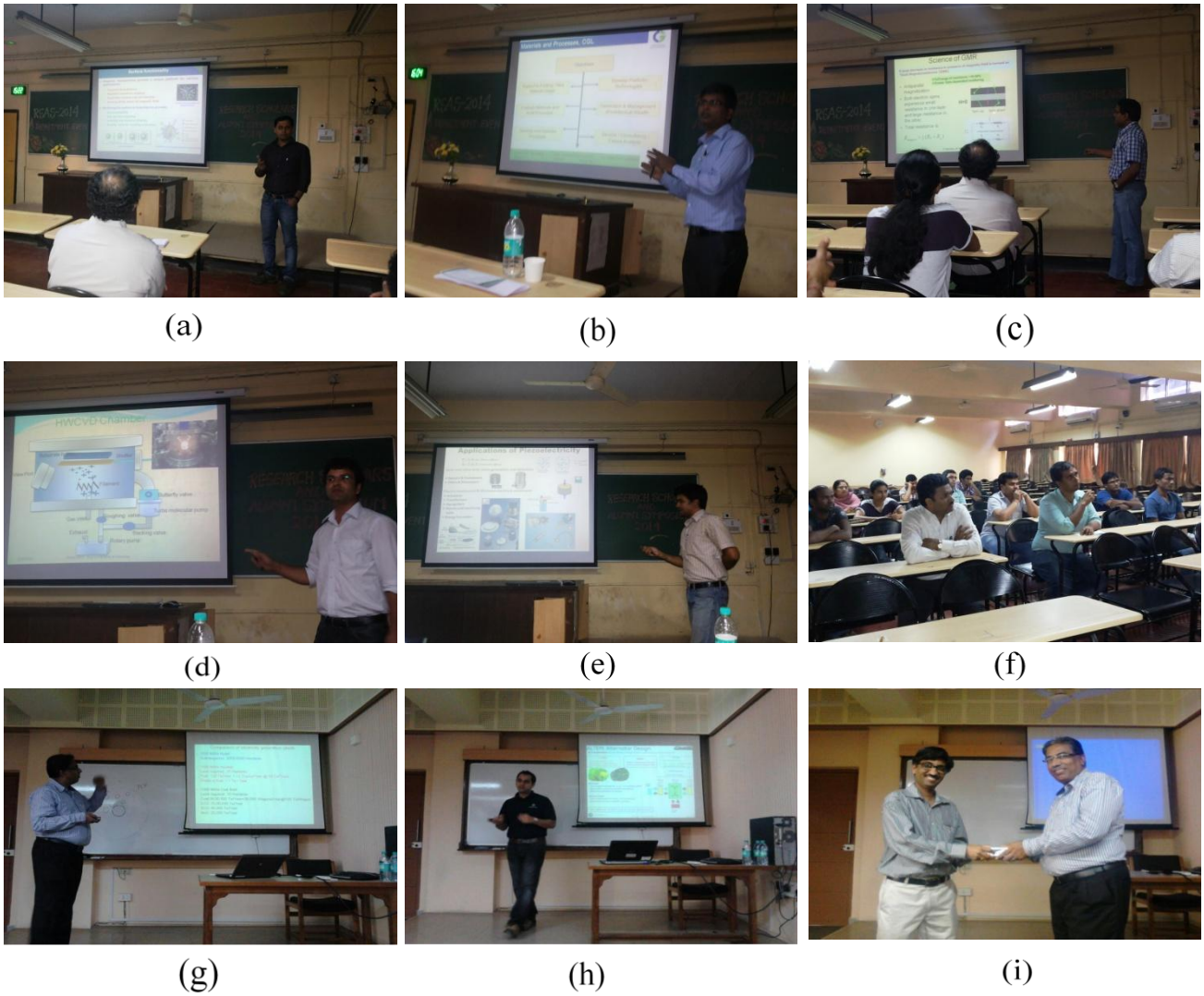
D.2 Oral Session:

25 short listed abstracts were scheduled for the oral session on 8th March 2014 (pre-lunch session). The presentations were grouped in 4 parallel sessions. These sessions had presentations related to metallurgy, material sciences and physics in group one. The second group comprised of submissions from civil engineering and earth sciences. The third group had presentations related to mechanical engineering and electronics. The last group had submissions from different areas like computer sciences, humanities, management, rural technology, and chemical engineering. Different sessions were chaired by faculty members (Prof. Mira Mitra, Prof. E. Chandrasekhar, Prof. S. Parida, and Prof. S. Maheswaran) with research scholars as co-chairs.

Picture 11: Glimpses of the technical sessions

D3. Department Component of RSAS 2014:

The second day of RSAS-2014 had a departmental component wherein arrangements were made for PhD alumni to visit their respective departments. This component was arranged post lunch on the second day. Departmental Coordinators (DCs) took responsibilities of managing the departmental event. Alumni-students interactions were arranged. Different departments had different modes of interaction. Some departments showcased their research by arranging a departmental level poster session whereas in others there were informal interactive sessions.



Picture 12: views of the technical presentations by respective department alumni and research scholars (a) Dr. K.C. Barick, Scientific officer, BARC (b) Dr. Vijay Hiwarkar, Deputy Manager, Crompton Greaves (c) Dr. Subir Kumar Ghosh, Scientific officer, BARC (d-e) presentations by research scholars of Dept. of MEMS (f) view of scholars listening talks at dept. of MEMS (g-h) view of technical presentation by Dr. R.D Kulkarni & Dr. Ravindra Bhide at dept. of EE (i) Head of the dept. presenting a token of appreciation to dept. alumni at the end of the session.

E. Suggestions emerging from various talks/discussions

- ***An official interface for academic institutes with local government agencies is desirable***

  Reason: There is a dearth of technical manpower in public departments while there is a dearth of opportunities/financial resources in academic institutions. So, they can complement each other.

  - Government officials should be able to communicate technical problems faced in public service sectors like Public Works Department, state electricity boards, etc.

  - This will help in bringing more projects to institutes and provide opportunities like internships for students in the public sector to address local socio-technical problems.

  - This can also provide room for public to notify simple but stressing scientific lacunas which might be easily addressed by students. Further, this will enhance understanding of current demands from society and aid budding entrepreneurs to build on ideas.

- ***Research network and database***

  Reason: Lack of information regarding the peers working in similar areas of research.

  - At the institute level, a database of projects and broad PhD titles along with names of supervisors can be made available at a website.

  - A web based portal can be created in institutes to connect research scholars from various institutes.

- ***Common research facilities or Special Research Zones for supporting research infrastructure***

  Reason: While there has been a constant increase in number of PhD students in many institutes, state-of-the-art research facilities have not proportionately increased.

  - Government may select and fund a consortium of colleges to establish common research facilities which can be shared among a group of institutes.

- ❖ Further, Special Research Zones (SRZ) with sophisticated research facilities can be established which can act as centers for collaborative works between industries and research institutions.

- ➢ ***Need to increase awareness about research as early as from school days***

Reason: This would encourage students to aspire for research from the start of academic life in higher education.

- ❖ An introductory course (especially in UG) on the role of science, entrepreneurship and research in industry, society and nation-building is desirable.

- ❖ Opportunities in research can be communicated through seminars and workshops at school/college (10+) level.

- ➢ ***Premier institutes should initiate/enhance their interactions with local institutes***

Reason: This will promote collaborative research and take research activities in local institutes to the next level.

- ❖ Premier institutes like IITs can mentor a few colleges and universities in vicinity. This will give them access to rich knowledge and state-of-the-art research infrastructure.

- ❖ Faculty members can be incentivized to collaborate with their counterparts in local institutes.

- ➢ ***Research output needs to be impactful***

- ❖ Challenging and innovative research works, leading to intellectual property (IP) and meeting societal needs, are required to be supported in large numbers.

- ❖ More than one PhD student can be encouraged to work on bigger research problems.

- ❖ Industries should come forward to sponsor more PhD students.

- ➢ ***Institutes should make their curriculum flexible for an interdisciplinary research***

Reason: Real life and industrial problems always require skills in different areas.

- ❖ Research scholars should be encouraged to opt for courses across departments and allowed to take supervisors from other departments.

- ***Regulation of quality of research journals***

Reason: Dearth of knowledge about journals and their quality due to lack of any authenticated and indigenous web catalogue causes difficulty in identifying reliable research journals.

- *Government* may regulate the number and quality of research journals at the national level by appointing a committee to monitor them.

- Institutes can take initiatives to create such databases at their department level and faculty members should be encouraged to publish in such national journals along with international ones.

- ***New indicators/markers for checking progress and quality of research need to be identified***

Reason: The main marker used for research output is the number of published articles, which may not encourage research scholars to take up problems related to society / rural areas or industry issues having IP potential.

- Therefore, additional markers need to be identified to judge research quality.

- ***Course on research methods and ethics***

Reason: Research scholars in beginning are not aware of research methodologies and importance of ethics in research.

- Courses on research methodology and ethics should be made compulsory for PhD students.

- ***Provision of a mechanism to address research scholars' grievances***

Reason: Issues of a PhD student are generally known to his/her guide and considered as an individual's personal problems.

- Issues and concerns of PhD students can be resolved by conducting Open House in every department at least once in a semester in presence of faculty members of the department.

- ***External/industrial expert in Research Progress Committee (RPC)***

  Reason: Comments and suggestions from experts outside academia would improve/boost quality of research.

  - Wherever essential, one external expert from outside can be a member of RPC.

- ***Educational trips/picnics and short internships will help in facilitating interactions researchers and practicing engineers***

  Reason: The above may lead to impactful research relevant to markets/society.

  - Occasional informal non-academic sessions should be planned by departments/guides.

  - There should be a mechanism in institutes to encourage and support internships for PhD students.

F. Specific actionable items for consideration

- ***National level/government funding***

  - Government may consider funding consortiums of colleges to establish common research facilities which can be shared among the group of colleges.

  - Further, Special Research Zones with sophisticated research facilities may be established, which can act as centers for collaborative works between industries and research institutions.

  - A regulatory mechanism may be established to regulate journals in the country. Proliferation of bad quality journals can thus be kept in check.

Institutes

- An official interface can be set up in academic institutes for interacting with local government agencies.

- Premier institutes like IITs can take responsibility of mentoring a few institutes in vicinity which have postgraduate and PhD programs.

- Undergraduate/postgraduate students should be motivated and incentivized to continue their studies by joining integrated M.Tech/PhD programs. Students should be encouraged and supported to do internships with faculty members from premier institutes within the country.

- A web-based portal can be established in various institutes which can connect research scholars from various institutes.

- A database of research scholars and their broad PhD areas along with names of supervisors can be made available in a website by premier institutes in the country so that PhD students from upcoming/newly established institutes can be interact with their counterparts.

- Special efforts may be made to reach out to industries for sponsoring PhD students so that research output can be practical and impactful.

- Communication skills of many research scholars are not generally up to the mark. Special and directed efforts should be made toward improving the skills, which can also include exposure to other relevant topics such as ethics in academics/research.

- Heads of departments can take initiatives to create a list of good quality journals for their departments.

- The issues and concerns of PhD students can be resolved by conducting Open House in every department at least once every semester in presence of faculty members of the department.

- Markers in addition to the number of publications should be used to gauge PhD research output. Such markers would encourage research scholars to venture into problems that can lead to IP generation and increase research works that contribute to urban as well as rural areas.

- Wherever desirable, an external expert should be inducted as a member of RPC of PhD students so that sizable number of PhD theses can be in the areas relevant to industrial research problems leading to practical and impactful contributions.

- Conscious efforts may be made to promote a few national journals, and faculty members should be encouraged to publish in them.

Industries

- Industries should fund long-term projects having duration of at least four years so that PhD students can be funded to work on them.

- Industries should start funding more fundamental research projects. A set of industries with common interest can fund projects with a proper and mutually agreeable IP sharing mechanism.

- Industries should take more students for projects/internships, and help in building their practical skills and give them exposure to practical research problems.

- Industries should encourage their experts to interact with academic institutes through talks and by becoming a member of RPC of PhD students when such a request is made.

G. RSAS Souvenir:

- The main objective of the souvenir was to share knowledge and perspectives from a variety of alumni, faculty members, and research students. A faculty member (Prof. Prakriti Tayalia) from the advisory committee, Faculty Coordinator (Prof. S.V. Kulkarni), and a few research scholars were part of the editorial board of the souvenir which can be download as separate attachment from this website.

This report has been compiled by Mr. Gulshan Kumar (Institute Doctoral Representative & Overall Coordinator, RSAS-2014), Mr. Siva (Technical Team Manager), Mr. Majid (Technical Team Member) and Mr. Jayakrishnan M. (Logistic Team Manager), under the guidance of Prof. S.V. Kulkarni (Faculty Coordinator, RSAS) on behalf of the organizing committee.