Agenda Papers

for

Project Approval Board (PAB) Meeting

on

19th March, 2014

at

Conference Room
(First Floor),
India International Centre (IIC),
40, Max Mueller Marg,
New Delhi-110003.

File No. NMEICT(MS)/PAB/27
Government of India
Ministry of Human Resource Development
Department of Higher Education

Dated 14th March, 2014

To,

All Members of the Project Approval Board
of National Mission on Education through Information
and Communication Technology.

Sub: Agenda for 27th Meeting of the Project Approval Board (PAB) of National Mission on Education through Information and Communication Technology.

Sir/Madam,

Enclosed please find Agenda papers for the 27th Meeting of the Project Approval Board of National Mission on Education through Information and Communication Technology **scheduled to be held on Wednesday, 19th March, 2014 at 11.00 am** under the Chairmanship of Secretary (HE), Ministry of Human Resource Development, Government of India, New-Delhi at the following venue:

Conference Room-1 (above Library),
First Floor, Main Building,
India International Centre,
40, Max Muellar Marg,
New Delhi -110 003

Kindly make it convenient to attend the meeting.

Yours faithfully,

(A. K. Singh)
Director (ICT) &
Nodal Officer (NMEICT)
Tel: 011-23384276

Copy to:

1. PSO to Secretary (HE)
2. PS to JS (TEL)
3. PS to JS&FA
4. US (TEL)

AGENDA FOR 27th MEETING OF PROJECT APPROVAL BOARD OF NATIONAL MISSION ON EDUCATION THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY TO BE HELD ON 19th MARCH, 2014 AT 11.00 A.M. IN CONFERENCE ROOM (FIRST FLOOR), INDIA INTERNATIONAL CENTRE (IIC), 40, MAX MUELLER MARG, NEW DELHI.

Appendix

Item No. - 1

Confirmation of the Minutes of the 26th Meeting of the Project Approval Board held on 21st November, 2013.

Item No.1

The "**Minutes of the 26th Meeting of the Project Approval Board**" held on 21st November, 2013 is placed for **perusal and confirmation please** (**Appendix-I: Page No. 80 to 91).**

Item No. - 2

Action Taken Report on the Minutes of 26th Meeting of the Project Approval Board held on 21st November, 2013.

Item No.2

The "**Action Taken Report**" on the Minutes of the "26th Meeting of the Project Approval Board" held on 21st November, 2013, is placed at **Appendix-II (Page No. 92 to 102)** and also reproduced below:

<table>
<tr><th>Subject/Agenda item</th><th>Action Taken</th></tr>
<tr><td>Item No.1

Confirmation of the Minutes of the 25th Meeting of Project Approval Board

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB, invited observations from the members on the "Minutes of the 25th Meeting of the PAB." Since all the members agreed and no observations on the same were received, the "Minutes of the 25th Meeting of the Project Approval Board held on 6th November, 2012" were confirmed.</td><td>--</td></tr>
<tr><td>Item No.2

"Action Taken Report" on the Minutes of the 25th Meeting of PAB.

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary reported to PAB that action has been taken and completed as per the PAB's decision in respect of the following 2 items:

<table>
<tr><th>S. No.</th><th>Subject/ Agenda item</th><th>Decision of PAB</th><th>Action Taken</th></tr>
<tr><td>1</td><td>Approval of Project related to e- content generation for 17 subjects in E&C by IIIT Hyderabad.</td><td>PAB approved the project with estimated amount of Rs 119 lakhs.</td><td>The first installment of Rs. 35.7 lakhs has been released to IIIT Hyderabad.</td></tr>
<tr><td>2</td><td>Approval of Project related to developing suitable pedagogical methods of IIT Kharagpur.</td><td>PAB approved the project with estimated budget of Rs 16 Crores.</td><td>The first installment of Rs. 4.63 Crores has been released to IIT Kharagpur.</td></tr>
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<table>
<tr><th>Subject/Agenda item</th><th>Action Taken</th></tr>
<tr><td>
Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB further informed the members that action in respect of following 3 items is under progress and the outcome will be presented in the next PAB meeting:
<table>
<tr><th>S.No</th><th>Subject/ Agenda item</th><th>Decision of PAB</th><th>Action Being Taken</th></tr>
<tr><td>1</td><td>Financial due diligence of "Talk to teachers" Project.</td><td>Create a model which is self sustaining. For this, a meeting with UGC, AICTE, NCTE and other partners to be conducted.</td><td>A Model will be worked out after conducting meeting with UGC, AICTE, NCTE and will be put in next PAB meeting.</td></tr>
<tr><td>2</td><td>Approval of Projects related to development of e-content related to geo informatics by IIT Mumbai.</td><td>PAB advised the along with the cost break up, project may be put for the examination in the next meeting.</td><td>Mission Secretariat will scrutinize the proposal and will put before the next PAB.</td></tr>
<tr><td>3</td><td>Approval of Project related to setting up of teaching ends for creating content for 50 DTH channels at the leading institution of the country.</td><td>i). PAB approved the project in principle, however observed that money may be released only after obtaining the NOC.
ii). SPV may be formed with consultation with UGC and AICTE.</td><td>Actions are being taken to obtain NOC for Ministry of I&B and other related organization and for forming SPV. PAB will be apprised about the outcome in the next meeting.</td></tr>
</table>
</td><td>--</td></tr>
</table>

Subject/Agenda item	Action Taken
Item No.3 **Approval of New Proposals:** **3.1 Virtual Labs (Phase-II) by Mr. Ranjan Bose, IIT Delhi** JS (TEL) and Mission Director NMEICT apprised the members about this project, coordinated by IIT Delhi along with seven IITs and a few other educational institutions as collaborators. In the first phase of the project, 100 virtual labs have been created as against the target of 80 virtual labs. Towards outreach and dissemination, IIT Delhi has conducted workshops and created 65 nodal centers, which are located in various engineering college to ensure that the Virtual labs are being used by these engineering colleges. The PRSG has recommended the continuation of this project for which the Scale-up requires Phase II funds of Rs. 5623.44 lakhs with Maintenance and outreach as the major objectives. There was extensive discussions on the project by members. Some of the observations and issues of concern voiced by PAB members are listed below: 1. PI should concentrate on creation of virtual labs as a replacement option for only high cost lab equipment, say over Rs. 50 lakhs or Rs. 10 lakhs. PI should analyse such data about phase I virtual labs as an input for further consideration. 2. Dissemination and ensuring full use of Virtual Labs is presently lacking. 3. Whether evaluation has been done by external agencies? 4. What is the roadmap for spreading and disseminating the use of Virtual Labs over time? 5. How many experiments actually got 1conducted? 6. What has been the effect of this Project on employability of engineering students? Has any study been done? 7. Exploring the leverage of private sector wide-spread dissemination of the project and user promotion. Present proposal for reaching out to just 236 colleges in 2 years is unacceptable in terms of reach desired. 8. Involving all TEQIP colleges straightaway in phase II to be incorporated.	**Separate Item (Agenda Item No 9 / Page: 42 to 45) is included on Virtual Labs (Phase-II).**

Subject/Agenda item	Action Taken
9. Involving AICTE and UGC for making Virtual Labs as a part of the curriculum for all. PI from IIT Delhi (Prof. Ranjan Bose) responded partially to some of above observations as follows: i) Students are more excited about basic experiments rather than complex high cost equipment labs, because the sample results and reports on basic experiments are easier for them to comprehend. ii) Virtual Labs are of value when used outside normal college lab hours and on holidays. Only about 7-10% labs correspond to equipment over Rs 50 lakhs, but these are used least as per the feedback of over 1 lakh students. iii) 6 lakh feedback forms have been received by students. **After detailed deliberations on observations made by members and PI's response, PAB decided as follows**: **1. Continuation of the Virtual Labs project is agreed in principle. However a small group consisting of JS&FA, JS (TEL), and PI will examine the proposal further in detail.** **2. Among other observations made by PAB, this group will examine deployment of a hub and spoke model and T2T mode - particularly for simpler experiments for much wider overreach. AICTE and UGC may be involved for making Virtual Labs as a part of the curriculum for all. Among the colleges targeted in phase II, all TEQIP colleges are to be included straightaway.** 3. **The recommendations of the Group may be put up in the next PAB meeting for consideration**.	
3.2 E-Yantra Robot Enhanced Teaching in Engineering Colleges - Phase-II by Prof. Kavi Arya, IIT, Bombay Joint Secretary (TEL) and Mission Director NMEICT informed the members that the targets of Phase I of this project have been achieved. 16 labs were set up in Mumbai university colleges, as a part of the first phase.	**30% of Rs 17.09 Crore has been released as first installment to the IIT Bombay for implementation of the Project.**

Subject/Agenda item	Action Taken
Phase II of e-Yantra proposes to reach out to many more students, teachers, and colleges across the country to take the movement created in Phase I, of hands-on training and innovative thinking, to another level - putting our country on the world map of innovative education in embedded systems through project-based learning. PI from IIT Bombay (Dr Kavi Arya) informed that Phase II of the project aims to set up Robotics labs and train teachers in 500 colleges in 20-25 regions in 3 years. While applauding the project conceptualization and approach, PAB members suggested that, out of 500 colleges targeted in Phase II, PI may first include all TEQIP colleges straightaway. The members also suggested that after Phase II, an exit option may be planned by PI for sustainability of the project at college/institution level after the NMEICT provided funds are over. **PAB approved the Phase-II of E-Yantra project with an estimated cost of Rs. 1709.60 Lakhs over 3 years.**	
3.3 National Library and Information Services Infrastructure for Scholarly Content (N-LIST) by Dr. Jagdish Arora, INFLIBNET, Ahmedabad. Joint Secretary (TEL) and Mission Director NMEICT informed the members that N-LIST is a flagship programme of the Mission. Launched in 2010, the project provides access to more than 5,000 electronic journals and 97,000 electronic books to over 3,200 colleges through authentication mechanism set-up it the INFLIBNET Centre. Besides, the project also provides for access to Web of Science to 100 universities and 3,500 electronic journals to 55 CTIs under the cross subscription component of the project. Mission Director, however, informed the members that Rs. 100 crores allocated to the project during XI Plan Period has already been fully exhausted and funds could not allocated to the project for renewal of subscription to e-resources for the year 2013.	**It has been decided that separate Budget Head for e-resources will be created in the TEL Bureau.**

Subject/Agenda item	Action Taken
As such, in the present proposal, the PI has proposed a total budget requirement of Rs. 9102.40 lakhs for continuing the service during the calendar years 2013 and 2014. PAB Members discussed on whether to get this funding by making internal budget adjustments within MHRD as an alternate source of funding or take it to the Cabinet for approval of additional funds during XIIth Plan. It was, however, felt that the latter route will be very time consuming, and so an alternate mechanism for continuation of funding should be tapped for this type on ongoing activity. On this subject, Adviser (Education), Planning Commission pointed out that "Expert Committee Constituted by the MHRD to Survey the Current Scenario of Library Consortia in India and to Explore the Possibilities of Joint Negotiations and Collaborative Services", has recommended that as a first step towards consolidation of consortia, three consortia, namely INDEST-AICTE Consortium, UGC-INFONET Digital Consortium and N-LIST that are funded by the Ministry of HRD are brought under one umbrella through joint negotiation and ministry-level advisory committee. The Committee has also recommended that the N-LIST -- currently running as a project -- should be recognized as a regular scheme of the MHRD and cross-subscription component of e-resources may be merged with the respective consortia, i.e. UGC-Infonet Digital Library Consortium (for universities) and INDEST-AICTE Consortium (for CTIs). **After detailed discussions and deliberations, it was agreed that the benefit of access to e-resources is most critical for teaching and research. Members noted that INDEST Consortium has not been able to cater to the e-resource requirements of new IITs and IISERs because of paucity of funds. As such, it was agreed that Joint Secretary (TEL) will take steps that are necessary for ensuring continuation of all N-LIST components in line with the recommendations made by the Expert Committee on Consortium constituted by the MHRD.**	

Subject/Agenda item	Action Taken
3.4 NMEICT Dissemination & Publicity Campaign by Mr. N. V. Reddy, DAVP. Joint Secretary (TEL) and Mission Director NMEICT apprised PAB members about the need for a systematic publicity and awareness campaign to be launched by the Mission for making its outcomes reach the far nook and corners of the country. For this, DAVP was approached to propose a media plan for popularizing the NMEICT modules available among the primary beneficiaries who are the students of higher educational institutions and their teachers. PI from DAVP (Mr. NV Reddy) then explained the dissemination and publicity campaign proposed by DAVP. To start with, DAVP will engage research agencies for conducting a survey to assess the level of information available with the students about the resources available in the mission, and carry on setting up hoardings (approx. 20'x10' in dimension) for 12 months in 527 connected universities (NMEICT and NKN connected universities) in 2013-14 and 2014-15. In addition, DAVP will also use the popular websites for popularizing the mission as proposed by them. PAB members unanimously agreed for the urgent need for NMEICT Dissemination & Publicity Campaign to be launched by the Mission. There was a suggestion for using social media too for publicity. However Joint Secretary (TEL) & Mission Director opined that a call can be taken on this after the survey exercise is completed by DAVP. It was also suggested that for deciding the contents on display hoardings, JS(TEL) will set-up a committee to recommend the same. **After deliberations, PAB approved sanction of Rs.1324.8 lakhs to DAVP for 3 activities during remaining part of 2013-14 and 2014-15 with break-up as follows:** **i) For the assessment survey : Rs. 30.0 lakh** **ii) For setting up hoardings at 527 Universities for 12 months : Rs. 1264.8 lakh** **iii) For using the website : Rs. 30.0 lakh**	**30% of the project cost has been released as the first installment to DAVP.**

Subject/Agenda item	Action Taken
3.5 NMEICT Dissemination and Awareness Activity through Deployment of Mobile e-learning Terminals (MeLT)-Phase: II by Dr. Vinod Kumar, IIT, Roorkee. JS(TEL) and Mission Director NMEICT explained to PAB that the present proposal from IIT Roorkee relates to Deployment of Mobile e-Learning Terminals (MeLT) for Dissemination and Awareness Activity as Phase II of their earlier completed project. Phase I of the Project was completed by IIT Roorkee along with associated network of Institutes, at a cost of Rs. 3 Crores with the objective of making available to the students in rural areas e-lectures and knowledge e-contents of their interest free-of-cost using Mobile e-Learning Terminals in 12 Vans/Buses. PAB members discussed the pros and cons of continuation of the MeLT project to Phase II. It was felt by some members that though the phase I of the project was well conceived at the time of its initiation, in the changed circumstances and rapid technological developments, putting more money into the project may not be justified. However final decision on the proposal may be based on recommendations of a committee with following members: i) Joint Secretary (TEL) & Mission Director (NMEICT) ii) Representative of Technical Education Bureau iii) Representative of Higher Education Bureau iv) Representative of Central University Bureau **The Committee will look into all aspects including assessment and usability of the present state of equipment and vans, further investment needed vis-à-vis the proposed deployment and the exploring distribution of existing equipment to interested institutions including new IITs. The recommendations of the Committee may be put up before the next PAB meeting for final decision.**	**It is proposed to hand over the vans to IGNOU.**
3.6 Report on Aakash by Prof. D. B. Pathak, IIT, Bombay. PI from IIT Bombay Dr Phatak presented the updated report on Aakash, which was discussed and appreciated. Adviser (Higher Education) Planning Commission suggested that to further enhance the awareness and usage of Aakash tablets, extensive consolidation of Aakash tutorials through an exclusive Portal for community of Aakash users should be done. PI accepted the suggestion and promised that in next PAB meeting, this Portal will be showcased.	**Noted.**

<table>
<tr><th>Subject/Agenda item</th><th>Action Taken</th></tr>
<tr><td>PI also suggested that to popularize and seek feedback on the project, all PAB members and NMEICT Consultants and staff may be given an Aakash tablet by IIT Bombay, for which JS (TEL) was requested to send the list of names to him.

The suggestion was accepted by PAB while accepting PI's report on Aakash.</td><td></td></tr>
<tr><td>Item No. 4

Release of Balance installments.

PAB approved release of balance pending payments as follows:
<table>
<tr><th>Ref. No. to PAB Agenda item</th><th>Project</th><th>Amount approved for release (Rs. lakhs)</th></tr>
<tr><td>4.1</td><td>National Programme on Technology Enhanced Learning (NPTEL)
Co-PI : Prof. Mangal Sunder
Institute: IIT Madras.</td><td>365</td></tr>
<tr><td>4.2</td><td>Virtual Lab (Remote Triggered Labs).
Co-PI: Prof. Rajan Bose.
Institute: IIT Delhi.</td><td>580</td></tr>
<tr><td>4.3</td><td>E-Yantra: Robot Enhanced Teaching of subjects in Engineering Colleges.
PI : Prof. Kavi Arya
Institute: IIT Bombay.</td><td>20.61</td></tr>
<tr><td>4.4</td><td>FOSSEE: Assimilation of Open Source Software in Science and Engineering Education.
PI : Prof. Prabhu Ramachandran
Institute : IIT Bombay.</td><td>63.50</td></tr>
<tr><td>4.5</td><td>e-kalpa: Creating Digital Environment for Design in India.
PI : Prof. Ravi Poovaiah
Institute: IIT Bombay.</td><td>248</td></tr>
</table></td><td>Balance amount has been released to the respective projects.</td></tr>
</table>

<table>
<tr><th>Subject/Agenda item</th><th>Action Taken</th></tr>
<tr><td>
<table>
<tr><td>4.6</td><td>E-content generation and e-skilled test in specialized area of Information Technology.
PI : Sri V. K. Sharma
Institute: C-DAC, NOIDA.</td><td>18</td></tr>
<tr><td>4.7</td><td>Benchmarking of ICT modules in Physics & Chemistry.
PI : Prof. R. K. Thareja,
Prof. G Ramanathan.
Institute : IIT Kanpur.</td><td>101</td></tr>
</table>
</td><td></td></tr>
<tr><td>Item No.5

Budget Estimate for TSG-EdCIL & Mission Secretariat of NMEICT for the Financial Year 2013-14.

On the request of JS&FA, PAB resolved that issue may be examined by IFD on file. Accordingly, TEL Bureau will circulate file to IFD and take necessary approval.</td><td>Noted.</td></tr>
<tr><td>Item No. 6

Amendments to the Budget Estimate of Mission Secretariat of NMEICT for the financial year 2012-13 of NMEICT.

The PAB noted the amendment in the overall value of Budget Estimates for the TSG/Mission Secretariat for financial year 2012-13 as <u>Rs 3.91 Crore</u>, which was typed as <u>Rs 3.19 Crore</u>, erroneously, in the Minutes of 24th meeting of Project Approval Board (PAB) held on 04.10.2012 and also noted the proposal to upload the said amendments to the Budget Estimate in the form of Corrigendum on Sakshat Portal along with the other Minutes of Project Approval Board (PAB).</td><td>Noted.

The amendment as <u>Rs. 3.91 Crore</u> in the overall value of the Budget Estimate for the TSG/Mission Secretariat for financial year 2012-13 has been uploaded in the form of Corrigendum on Sakshat Portal along with the other Minutes of Project Approval Board (PAB), since the overall value of Budget Estimate was erroneously typed as <u>Rs 3.19 Crore</u> in the Minutes of 24th meeting of Project Approval Board (PAB) held on 04.10.2012.</td></tr>
</table>

Subject/Agenda item	Action Taken
Item No.7 **Other items permitted by Chair** Apart from the specific agenda items listed, PAB Chairman and members also deliberated upon some common generic issues pertaining to NMEICT project as a whole, and noted the following for further action by the Mission: 1. Chairmen of AICTE and UGC may be requested to issue an "Advisory" to all engineering colleges under their control to adopt Blending Learning mode (NMEICT e-Content + conventional content existing) to be used by their faculty. Simultaneously, discussions may be held by Mission Director with concerned stakeholders for exploring compulsory usage of NMEICT e-Contents. 2. An integrated Portal for all NMEICT content may be created for students, as presently the Sakshat Portal contains a mix of administrative information as well as e-Content, and it's difficult to navigate the Sakshat Portal by students to access e-Content and Virtual Labs, etc. JS(TEL) informed that a proposal for an Integrated e-Content Portal for NMEICT recently submitted by INFLIBNET will be presented by the PI in the next meeting of the Standing Committee. 3. There is a need for a comprehensive review and updation of NPTEL content which was started 10 years ago, even before NMEICT project commenced.	**1. Both UGC and AICTE have been addressed in this regard.** **2. Separate Item (Agenda Item No. 3/ Page: 13 to 22) is included on Integrated Portal.**

Item No. - 3

Integrated e-Content Portal

Item No: 3

Proposal **: Integrated E-Content Portal**

PI **: Dr. Jagdish Arora – INFLIBNET**

Institute **: INFLIBNET**

Background

1. Union Cabinet approved the NMEICT Mission Document. One of the components of the Mission stated in the Mission Document (Section 3.1 on Page 19) details the Sakshat Portal, wherein it states "The efforts of Ministry of Human Resource Development (MHRD) would be geared towards creating an open house for knowledge".

2. The Mission Document says the portal would be designed in such a way that it sustains the interest of the learner and at the end of every web session, the learner logs out with the satisfaction of having added to his/her knowledge in a way that he / she wanted".

3. In Section 2.3.2, the Document says "Since, running the portal is a continuous, on-going, mammoth task, the Mission may entrust the responsibility for development, maintaining and co-ordination of the portal related activities to a governmental body identified by it. Such a governmental body shall work under the guidance and supervision of the Mission, which shall also provide financial and technical support to this designated agency for development, maintenance and up-keep of the portal".

4. The task of developing and maintaining the Sakshat portal has been handled by a team of IGNOU and Mission personnel thus far. It has now been decided that the portal will be divided into two parts. One part will be the content repository and the other part will be the administration portal.

5. The current proposal relates to the content repository.

Outcomes of the Project:

The outcomes of the proposed project are as follows:

1) Hosting of completed / frozen e-content (projects) on a single web-based platform.

2) Development of a user-friendly single search and browse interface for all e-content (e-modules / reading material), developed under NMEICT;

3) Assignment of metadata to all modules of e-content with links, inter-links and cross-links to relevant e-modules developed under the NMEICT initiative;

4) Mapping of syllabi / model curriculum of UGC / AICTE with the e-modules developed under the Mission;

5) Adoption of digital preservation strategies to ensure long-term availability of e-content developed under the NMEICT;

6) Selection and hosting of other relevant non-NMEICT e-modules available in open access;

7) Make e-content available to students and other life-long learners using different delivery modes to impart formal and informal education for supplementing and complementing the process of teaching and learning in higher education; and

8) Promotion of usage of e-content amongst students and learners.

Methodology

Methodology proposed to be used for putting together on Integrated e-Content Portal would be as follows:

1) The INFLIBNET Centre would acquire e-content with all related material in its generic formats from PIs of the NMEICT projects.
2) After receiving content, the Centre would analyse the content for types, formats, size, etc.
3) Where required, e-content would be re-formatted so that adaptive bitrate streaming techniques can be used for delivery of video content;
4) Once it is in shape, e-content would be uploaded into a development server.

5) The next step would be Metadata creation for each content with the help of subject experts;
6) Parallely, a search and browse interface would be developed to support search and navigation of e-content through single search box.
7) An internal facing interface would also be developed that would provide add-on features such as assigning metadata to each module of e-content with links, inter-links and cross-links to other e-modules, mapping of syllabi / model curriculum of UGC / AICTE with the e-modules etc.
8) After intensive testing the e-content would be transferred onto production server as a beta site of the project;
9) Once all e-content developed under NME-ICT are successfully uploaded with all associated activities, the Centre would select and host other relevant e-modules available in open access and also enrich them with additional quadrants wherever applicable.

Deliverables

Activity	Timeline	Remarks
Acquire data / content from different project's PIs	6 Months	It may vary due to dependency on other Institute
Analysis on received data to shape it	8 Months	
Upload content on development server	8 Months	
Assign metadata to each e-content module	9 Months	
Design and develop interface for search and browse	6 Months	
Creation / Testing of content	4 Months	
Hosting of e-content at production server (Beta version of site)	5 Months	

Project Duration

Time schedule (Year-wise)

It is expected that the initial development and porting will take one year to integrate all content into a single platform and provide search browse interface. Thereafter, as new e-content is developed, it will also be hosted after processing.

		----------Months----------											
Sl. No	**Activity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
01	Acquire data / content from different project's PIs												
02	Analysis on received data and its reformatting												
03.	Upload content on development server												
04	Assign metadata to each e-content module												
05	Design and develop interface for search and browse												
06	Creation / Testing of content												
07	Hosting of e-content at production server (Beta version of site)												

Proposed Budget

Budget Summary	
Financial Year	**Proposed Amount (Rs in Lakhs)**
2014-15	106.76
2015-16	28.23
2016-17	30.55
2017-18	32.10
Total (4 Years)	**197.64**

Year-wise details	
Item	**Amount (Rs. In Lakhs)**
One-time (Hardware)	52.00
Recurring (Manpower)	38.76
Recurring (Others)	16.00
Financial Requirement (2014-15)	**106.76**
Recurring (Manpower)	23.23
Recurring (Others)	05.00
Financial Requirement (2015-16)	**28.23**
Recurring (Manpower)	25.55
Recurring (Others)	05.00
Financial Requirement (2016-17)	**30.55**
Recurring (Manpower)	28.10
Recurring (Others)	04.00
Financial Requirement (2017-18)	**32.10**

Financial Requirement for 2014-15

1. **Financial Requirement (2014-15)**

One-Time hardware				
Item	**No of Item**	**Rate / Unit (Rs in Lakh)**	**Total (Rs in Lakh)**	**Remarks**
Production Server (Blade Server)	--	--	--	To be facilitated by NMEICT
Development Server	2	3.50	7.00	
Non linear editing Machine			5.00	
Redundant Server	--	--	--	At NME-ICT
Workstation / Laptop / Multimedia Desktop /PC / Printer / Scanner			20.00	
Multimedia Software			10.00	License / purchase
Generic format of e-content		10.00	10.00	Enabling content for seamless streaming (adaptive bitrate), webpages for textual materials, etc.
Total One-Time Hardware			**52.00**	

Manpower Requirement (2014-15)		
Position	**No**	**Rs. in Lakhs**
Senior Project Scientist	1	3.00
Project Scientist	4	10.80
Sr Project Associate	6	12.96
Project Associate	6	10.80
Office Attendant	1	1.20
Total (Recurring Manpower) 2014-15		**38.76**

Recurring Costs (Others) 2014-15		
Item	**Total (Rs in Lakhs)**	**Remarks**
Remuneration for meta-data assignment work	5.00	To create meta-data of different subjects
Data Hosting charges including redundant bandwidth	0.00	To be hosted at SAKSHAT
Travel, contingency	5.00	
Consumables and Stationery	2.00	
Printing of Brochures & Pamphlets + Miscellaneous	4.00	
Total (Recurring Others) 2014-15	**16.00**	

Summary (2014-15)	
Item	**Amount (Rs. In Lakhs)**
One-time (Hardware)	52.00
Recurring (Manpower)	38.76
Recurring (Others)	16.00
Financial Requirement (2014-15)	**106.76**

2. Financial Requirement (2015-16)

Manpower Requirement (2015-16)		
Position	**Number**	**Rs. in Lakhs**
Senior Project Scientist	1	3.00
Project Scientist	2	5.04
Sr Project Associate	3	6.48
Project Associate	3	5.40
Office Attendant	1	1.20
10% increment / allowances		2.11
Total Expenditure on Manpower		**23.23**

Recurring Costs (Others) 2015-16	
Item	**Total (Rs in Lakhs)**
Remuneration for assignment of meta-data work	1.00
Travel, conveyance	2.00
Consumables and Stationery	1.00
Printing of Brochures & Publicity Material + miscellaneous	1.00
Total	**5.00**

Summary (2015-16)	
Item	**Amount (Rs. In Lakhs)**
Recurring (Manpower)	23.23
Recurring (Others)	05.00
Financial Requirement (2015-16)	28.23

3. Financial Requirement (2016-17)

Summary (2016-17)	
Item	**Amount (Rs. In Lakhs)**
Recurring (Manpower) (10% increment over previous year, 2015-16)	25.55
Recurring (Others) (Same as year 2015-16)	05.00
Financial Requirement (2016-17)	**30.55**

4. Financial Requirement (2017-18)

Recurring (Others)

Item	**Cost (Rs in Lakhs)**
Remuneration for assignment of meta-data work	1.00
Travel, conveyance	2.00
Consumables and Stationery	0.50
Printing of Brochures & Publicity Material + miscellaneous	0.50
Total	**4.00**

Summary (2017-18)	
Item	**Amount (Rs. In Lakhs)**
Recurring (Manpower) (10% increment over previous year, 2016-17)	28.10
Recurring (Others)	04.00
Financial Requirement (2017-18)	**32.10**

Advantages of the Project:

In the current scenario, the e-contents projects developed under the NME-ICT are distributed on the websites of Institutions of respective PIs in varied types, formats and sizes. Moreover, some completed / frozen e-content projects do not have a web presence. A user can draw maximum advantage from the digital contents if they are available through a single platform that facilitates search and browse of all the content with provision to track usage. Besides, a well-developed platform will enable the user to personalize the learning experience with provisions such as “my account” / “my space” which will facilitate creation of his/her own bouquet of courses across the portal.

As such, it is essential to host all content into one single platform and apply basic tenets of preservation for digital content and implement standard metadata schema of different types for the digital content, so as to ensure their long-term availability. Moreover, in this age of inter-disciplinary research & education e-content developed in a given subject may also be useful to the students of other subjects/disciplines. As such, all e-modules should be interlinked to each other, wherever required, so as to increase the possibility of their discovery by a learner. It is envisaged that the usability of content developed under NME-ICT would increase once all the e-content are available through a single platform with multiple methods to search and browse these contents.

The web-based platform proposed to be developed would provide facility to search and browse all hosted content wherein a learner can easily access the desired material, including audio/video learning material, textual material, multimedia enriched materials etc. through a single interface. Specific functionality that would be supported by the proposed integrated e-content portal would be as follows:

- Support for text, audio, video, animation and graphics.
- Suitable metadata schema and taxonomy with facilities to tag content type, language, level of content (PG / UG), etc.
- Support faceted search mechanism;
- Support role-based log-ins for content creators, users, etc.

- Support multiple end-user platforms like Windows based PC, Linux based, Android based tablets etc.
- Support qualitative assessment of content through rating mechanism by the users and reviewing mechanism by experts.
- Support workflow based mechanism for moderation of uploaded content.
- Analytics and reporting including detailed usage statistics of e-content including number of registered users, number of downloads, content view / downloaded and geographical location of users.
- Asynchronous and synchronous messaging system between learners and experts including email, chat, discussion forum, etc.
- Personalized learning experience with provision for “My Account” / “My Space”.
- Feedback and reporting mechanism
- Collaborative platform for site management, user management, wiki module for users and peer feedback, etc.
- Software application hosting on platform developed under NME-ICT

The Detailed Project Report is placed at Appendix-III (Page: 103 – 114) for the kind perusal and examination by the PAB.

This Proposal has been recommended by the Standing Committee in its meeting held on 3rd March 2014. It is now placed before the Project Approval Board for sanction of Rs. 197.64 Lakh for next four years.

Item No. - 4

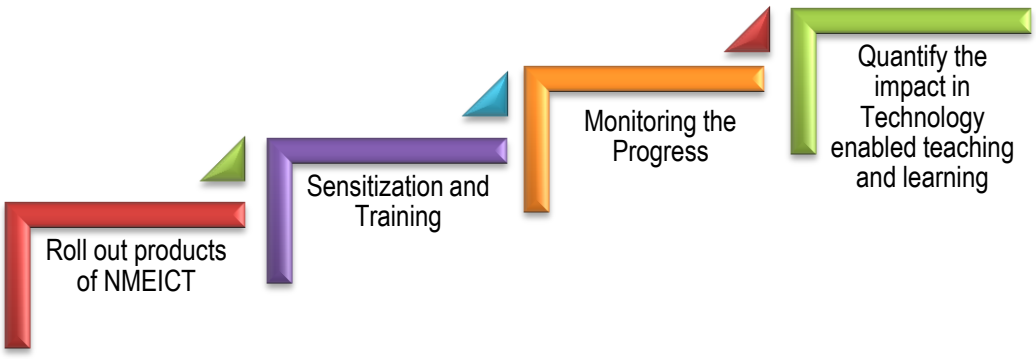
Utilisation of NMEICT Products in State Technical Universities in the Southern Region.

Item No. : 4

Proposal	:	**Utilisation of NMEICT Products in State Technical Universities in the Southern Region**
PI	:	**Dr S. Mohan, Director**
Nodal Institute	:	**NITTTR Chennai in MoU Partnership with STUs**

In continuation of the concerted efforts by NMEICT for dissemination and promotion of e-Content already generated and as part of drive towards rolling out of NMEICT project initiatives, Memoranda of Understanding (MoU) were signed by four regional NITTTRs - as the extended arms of MHRD -and respective State Technical Universities (STU) and Education Boards as partners, on 28th January 2014 in the presence of Hon'ble HRM and ES. Subsequently, NITTTR Chennai had presented their detailed Project Proposal to implement the MoU for dissemination and roll out of NMEICT products in Southern Region on 3rd March 2014 to Standing Committee.

The role of NITTTR in this project is envisaged to be (a) Facilitate Roll out the projects of NMEICT (b) Sensitization and training programs of the NMEICT Products (c) Training programme on educational technology, (d) Monitoring the progress made in the project and (e) quantify the impact made through technology enabled teaching and learning. The components of the project which are rolled out as per the MoU signed between the technical universities and MHRD through the extended arm NITTTR Chennai is shown in figure below.



After presentation of the proposal by NITTTR Chennai before Standing Committee, the PI was requested to revise the proposal extensively incorporating the following observations:

a. The Connectivity component of funding is to be excluded from NITTTR fund requirements because that component has already been taken care of through BSNL. (However for each College, 5 classrooms with access to internet, computers, projection facilities, audio facilities and appropriate seating for the conduct of Virtual classroom using A-view and for the use of all the products and deliverables developed under NMEICT will be set-up).

b. From the remaining funds, NITTTR should separately work out in detail in two parts. First part would be the funds needed by NITTTR for Coordination and Monitoring as an arm of MHRD/NMEICT and the second part would be for direct NITTTR budget components, namely training, and faculty device procurement, etc.

c. The revised proposal should carefully detail the roles of NMEICT Coordinators at various levels.

d. The overall process flow-chart of activities should be revised accordingly.

PI has submitted the DPR after revision- after taking facilitative guidance from Standing Committee for being considered by PAB. The summary of key parameters of DPR and the fund requirement is as given below:

1	**Name of the Institution making the proposal**	**:**	**National Institute of Technical Teachers Training and Research, Chennai**
2	**Name of the Project**	**:**	MHRD Project on "Participation in NMEICT and Utilization of its Products for the Technical Universities"
3	**Reference**	**:**	MoU dated 28.01.2014 signed between NITTTR, Chennai and 8 STUs
4	**Total number of technical universities participating in the project**	**:**	8
5	**Total number of engineering colleges participating in the project**	**:**	483
6	**Total number of teachers in the participating institutions**	**:**	16,231
7	**Total number of teachers to be provided with access device**	**:**	9,528 (Based on maximum 100 per institution)
8	**Total number of teachersto be trained with ICT tools in teaching**	**:**	450 (Master Trainers) and subsequently 9,000 faculty members in three years.
9	**Total number of students in the participating institutions**	**:**	2,43,965
10	**Total cost of the project as proposed by NITTTR, Chennai from NMEICT**	**:**	**Rs. 61,17.1 lakhs**

The break-up of the funds needed by NITTTR Chennai is as follows:

S. No.	Item	Total Cost in Rs.
1	Funding required for the purchase of access device	**952.80**
2	Setting up of 5 e-Classrooms in each of the 483 Institutions	**3622.50**
3	Tendering and procurement process	**150.00**
4	Funding needed for appointing NMEICT Coordinators	**1231.80**
5	Funding needed for the training programme on certificate course	**127.50**
6	Workshop on mapping of NPTEL Content with engineering college curriculum	**32.50**
Gross total amount for rolling out NMEICT products by NITTTR, Chennai		**6117.10**

Out of Rs.61.17 crore, as advised by Standing Committee, the break-up of Rs.61.17 crore in two sub projects is as follows:

i) **For supervision and coordination role – Rs. 12.31 crore (this not only include the additional manpower hired by NITTTR for this purpose, but also it includes 50% of the cost of hiring of manpower for this purpose at engineering college level.**

ii) **For implementing the components of the projects directly, the total cost will be Rs. 48.86 crore**

The Detailed Project Report is placed at Appendix-IV (Page: 115-132) for the kind perusal and examination by the PAB.

PAB may consider approval of the NITTTR Chennai project for 3 years with a total budget of Rs. 6117.1 lakhs. However after starting the project, PI may be advised to do a thorough Gap Analysis for revision and fine-tuning of funds needed for each component and come back to PAB for seeking approval on needed revisions.

Item No. - 5

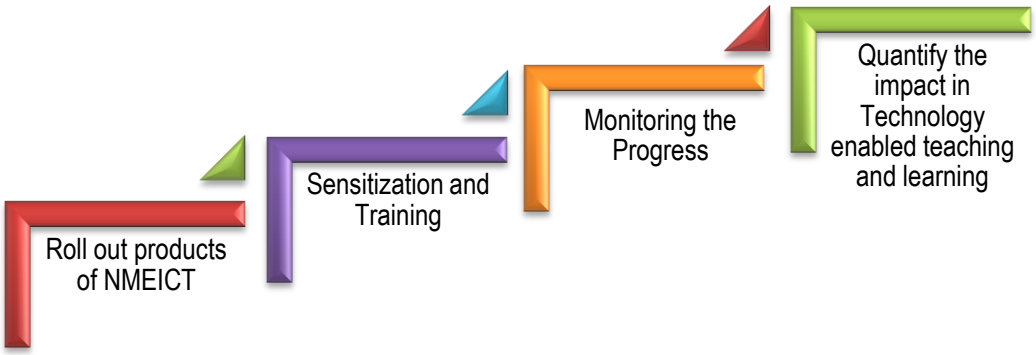
Utilisation of NMEICT Products in State Technical Universities in the Western Region.

Item No. 5

Proposal	**:**	**Utilisation of NMEICT Products in State Technical Universities in the Western Region**
PI	**:**	Prof. Vijay Kumar Agarwal, Director
Nodal Institute	**:**	**NITTTR Bhopal in MoU Partnership with STUs**

In continuation of the concerted efforts by NMEICT for dissemination and promotion of e-Content already generated and as part of drive towards rolling out of NMEICT project initiatives, Memoranda of Understanding (MoU) were signed by four regional NITTTRs- as the extended arms of MHRD - and respective State Technical Universities (STU) and Education Boards as partners, on 28th January 2014 in the presence of Hon'ble HRM and ES. Subsequently, NITTTR Chennai had presented their detailed Project Proposal to implement the MoU for dissemination and roll out of NMEICT products in Southern Region on 3rd March 2014 to Standing Committee as one of the representative NITTTRs.

The role of NITTTRs in this project is envisaged to be (a) Facilitate Roll out the projects of NMEICT (b) Sensitization and training programs of the NMEICT Products (c) Training programme on educational technology, (d) Monitoring the progress made in the project and (e) quantify the impact made through technology enabled teaching and learning. The components of the project which are rolled out as per the MoU signed between the technical universities and MHRD through the extended arm NITTTR Bhopal is shown in figure below.



After presentation of the proposal by NITTTR Chennai before Standing Committee, all the NITTTRs were requested to revise the proposals extensively incorporating the following observations:

a. The Connectivity component of funding is to be excluded from NITTTR fund requirements because that component has already been taken care of through BSNL. (However for each College, 5 classrooms with access to internet, computers, projection facilities, audio facilities and appropriate seating for the conduct of Virtual classroom using A-view and for the use of all the products and deliverables developed under NMEICT will be set-up).

b. From the remaining funds, NITTTR should separately work out in detail in two parts. First part would be the funds needed by NITTTR for Coordination and Monitoring as an arm of MHRD/NMEICT and the second part would be for direct NITTTR budget components, namely training, and faculty device procurement, etc.

c. The revised proposal should carefully detail the roles of NMEICT Coordinators at various levels.

d. The overall process flow-chart of activities should be revised accordingly.

PI has submitted the DPR after revision- after taking facilitative guidance from Standing Committee for being considered by PAB. The summary of key parameters of DPR and the fund requirement is as given below:

1	**Name of the Institution making the proposal**	**:**	**National Institute of Technical Teachers Training and Research, Bhopal**
2	**Name of the Project**	**:**	MHRD Project on "Participation in NMEICT and Utilization of its Products for the Technical Universities"
3	**Reference**	**:**	MoU dated 28.01.2014 signed between NITTTR, Bhopal and 2 STUs
4	**Total number of technical universities participating in the project**	**:**	2
5	**Total number of engineering colleges participating in the project**	**:**	337
6	**Total number of teachers in the participating institutions**	**:**	34180
7	**Total number of teachers to be provided with access device**	**:**	30382 (Based on maximum 100 per institution)
8	**Total number of teachers to be trained with ICT tools in teaching**	**:**	450 (Master Trainers) and subsequently 9000 faculty members in three years.
9	**Total number of students in the participating institutions**	**:**	513968
10	**Total cost of the project as proposed by NITTTR, Bhopal from NMEICT**	**:**	**Rs. 6801.5 lakhs**

The break-up of the funds needed by NITTTR Bhopal is as follows:

1	Funding required for the purchase of access device	**3038.20**
2	Setting up of 5 e-Classrooms in each of the 337 Institutions	**2527.50**
3	Tendering and procurement process	**150.00**
4	Funding needed for appointing NMEICT Coordinators	**925.80**
5	Funding needed for the training programme on certificate course	**127.50**
6	Workshop on mapping of NPTEL Content with engineering college curriculum	**32.50**
Gross total amount for rolling out NMEICT products by NITTTR, Bhopal		**6801.50**

Out of Rs.68.01 crore, as advised by Standing Committee, the break-up of Rs.68.01 crore in two sub projects is as follows:

i) **For supervision and coordination role – Rs. 9.25 crore (this not only include the additional manpower hired by NITTTR for this purpose, but also it includes 50% of the cost of hiring of manpower for this purpose at engineering college level.**

ii) **For implementing the components of the projects directly, the total cost will be Rs. 58.76 crore**

The Detailed Project Report is placed at Appendix-V (Page: 133-151) for the kind perusal and examination by the PAB.

PAB may consider approval of the NITTTR Bhopal project for 3 years with a total budget of Rs. 6801.50 lakhs. However after starting the project, PI may be advised to do a thorough Gap Analysis for revision and fine-tuning of funds needed for each component and come back to PAB for seeking approval on needed revisions.

Item No. - 6

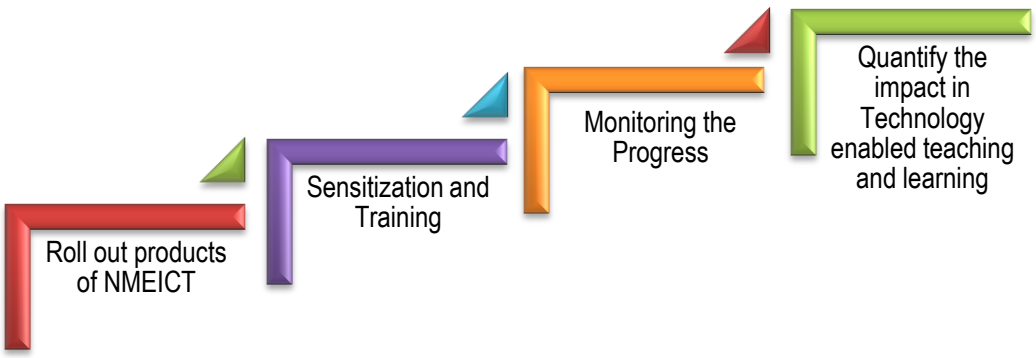
Utilisation of NMEICT Products in State Technical Universities in the Northern Region.

Item No.6

Proposal	**:**	**Utilisation of NMEICT Products in State Technical Universities in the Northern Region**
PI	**:**	**Prof. M. P. Poonia, Director**
Nodal Institute	**:**	**NITTTR Chandigarh in MoU Partnership with STUs**

In continuation of the concerted efforts by NMEICT for dissemination and promotion of e-Content already generated and as part of drive towards rolling out of NMEICT project initiatives, Memoranda of Understanding (MoU) were signed by four regional NITTTRs - as the extended arms of MHRD - and respective State Technical Universities (STU) and Education Boards as partners, on 28th January 2014 in the presence of Hon'ble HRM and ES. Subsequently, NITTTR Chennai had presented their detailed Project Proposal to implement the MoU for dissemination and roll out of NMEICT products in Southern Region on 3rd March 2014 to Standing Committee as one of the representative NITTTRs.

The role of NITTTRs in this project is envisaged to be (a) Facilitate Roll out the projects of NMEICT (b) Sensitization and training programs of the NMEICT Products (c) Training programme on educational technology, (d) Monitoring the progress made in the project and (e) quantify the impact made through technology enabled teaching and learning. The components of the project which are rolled out as per the MoU signed between the technical universities and MHRD through the extended arm NITTTR Chandigarh is shown in figure below.



After presentation of the proposal by NITTTR Chennai before Standing Committee, all the NITTTRs were requested to revise the proposals extensively incorporating the following observations:

a. The Connectivity component of funding is to be excluded from NITTTR fund requirements because that component has already been taken care of through BSNL. (However for each College, 5 classrooms with access to internet, computers, projection facilities, audio facilities and appropriate seating for the conduct of Virtual classroom using A-view and for the use of all the products and deliverables developed under NMEICT will be set-up).

b. From the remaining funds, NITTTR should separately work out in detail in two parts. First part would be the funds needed by NITTTR for Coordination and Monitoring as an arm of MHRD/NMEICT and the second part would be for direct NITTTR budget components, namely training, and faculty device procurement, etc.

c. The revised proposal should carefully detail the roles of NMEICT Coordinators at various levels.

d. The overall process flow-chart of activities should be revised accordingly.

PI has submitted the DPR after revision- after taking facilitative guidance from Standing Committee for being considered by PAB. The summary of key parameters of DPR and the fund requirement is as given below:

1	**Name of the Institution making the proposal**	**:**	**National Institute of Technical Teachers Training and Research, Chandigarh**
2	**Name of the Project**	**:**	MHRD Project on "Participation in NMEICT and Utilization of its Products for the Technical Universities"
3	**Reference**	**:**	MoU dated 28.01.2014 signed between NITTTR, Chandigarh and 4 STUs
4	**Total number of technical universities participating in the project**	**:**	4
5	**Total number of engineering colleges participating in the project**	**:**	587
6	**Total number of teachers in the participating institutions**	**:**	39,700
7	**Total number of teachers to be provided with access device**	**:**	38,700 (Based on maximum 100 per institution)
8	**Total number of teachers to be trained with ICT tools in teaching**	**:**	450 (Master Trainers) and subsequently 9,000 faculty members in three years.
9	**Total number of students in the participating institutions**	**:**	78,7000
10	**Total cost of the project as proposed by NITTTR, Chandigarh from NMEICT**	**:**	**Rs 100,01.56 lakhs**

The break-up of the funds needed by NITTTR Chandigarh is as follows:

S. No.	Item	Total Cost in Rs.
1	Funding required for the purchase of access device	**3870.00**
2	Setting up of 5 e-Classrooms in each of the 587 Institutions	**4402.50**
3	Tendering and procurement process	**150.00**
4	Funding needed for appointing NMEICT Coordinators	**1419.06**
5	Funding needed for the training programme on certificate course	**127.50**
6	Workshop on mapping of NPTEL Content with engineering college curriculum	**32.50**
	Gross total amount for rolling out NMEICT products by NITTTR, Chandigarh	**100,01.56**

Out of Rs.100.01 crore, as advised by Standing Committee, the break-up of Rs.100.01 crore in two sub projects is as follows:

i) **For supervision and coordination role – Rs. 14.19 crore (this not only include the additional manpower hired by NITTTR for this purpose, but also it includes 50% of the cost of hiring of manpower for this purpose at engineering college level.**

ii) **For implementing the components of the projects directly, the total cost will be Rs. 85.82 crore**

The Detailed Project Report is placed at Appendix-VI (Page: 152-170) for the kind perusal and examination by the PAB.

PAB may consider approval of the NITTTR Chandigarh project for 3 years with a total budget of Rs. 100,01.56 lakhs. However after starting the project, PI may be advised to do a thorough Gap Analysis for revision and fine-tuning of funds needed for each component and come back to PAB for seeking approval on needed revisions.

Item No. - 7

Open Licensing Policy Guidelines.

Item No. 7

Subject : Open Licensing Policy Guidelines.

Overall Objective

The National Knowledge Commission (KNC) in 2007 in its recommendations to the Govt. of India recognized the role of Open Educational Resources (OER) in the knowledge economy and to up-grade the quality of education. At that time India was the first country in the world to have recognized the potential of OER and Open Access. Intergovernmental agencies like the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Commonwealth of Learning (COL) have adopted open licensing policy for their materials, and have been advocating the use of open license for public funded resources, while respecting the intellectual property rights.

In fact, the World OER Congress in 2012 organized by UNESCO and COL released the OER Paris Declaration 2012 that urges Governments, educational institutions and teachers to release educational materials as OER. Open licensing will also foster innovations in software development and create an ecosystem for the products delivered through the Mission funding. As the Govt. of India has been providing financial support to develop learning content, software and technology, release of these in open license would enhance their utility, relevance and further development.

The "Draft for Discussions" on Open Licensing Policy Guidelines is placed at Appendix-VII (Page: 171-173) for the kind perusal and examination by the PAB.

Draft Policy on Open Licensing Guidelines is placed before the PAB for consideration and approval.

Item No. - 8

Academic Incentives for Faculties involved in Blended Learning/ Technology-Enabled Learning Initiatives of NMEICT.

Agenda Item No. 8

Project : Academic Incentives for Faculties involved in Blended Learning/ Technology-Enabled Learning Initiatives of NMEICT.

A. Background

1. A special taskforce set up by MHRD on "Faculty Shortage and Design of performance Appraisal System" had submitted its report to the government in August 2011 after two years of fieldwork. As per the findings of the taskforce, India's higher education sector is working with half the teacher strength it actually needs.

2. As per the report, the student ratio in the country is a whopping 1: 20.9 whereas according to the UGC's standards, it should be only 1: 13.5 (1: 12 for postgraduate students and 1: 15 for undergraduate students). Student ratio currently is higher by 7.4 students per teacher for which the additional teacher requirement is 3,83,868, which was the faculty shortage at the time of submission of Report. In percentage terms, the teacher shortage stands at 54 pc, and the additional teacher requirement in India's colleges and universities was estimated at 13, 17,331 by the end of the 12th Plan in 2017. The projection has been made on the basis of average annual growth of 6 per cent in student enrolment in the country. The taskforce had made its projections after meeting all higher education regulators including the UGC, the AICTE, the MCI, the Pharmacy Council of India, Bar Council of India and the Dental Council of India.

3. Given the sheer scale of the crunch, government's goal of attainment of a Gross Enrollment Ratio of 20 per cent by 2015 in the higher education sector looks difficult to be achieved, unless of course more teachers are provided for.

4. Blended learning (or Technology-Enabled Learning) - a teaching approach that combines online and classroom learning activities and resources to reduce in-class sitting time for students in a face-to-face environment - can be a tremendous boon for a university for addressing the faculty shortage. It can help the institution enhance the quality of programs; complete faculty teaching loads, and improves cost effectiveness. However, convincing the institutions and faculty that a blended course or program is a good idea may take some time and efforts.

5. NMEICT had been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in providing high quality personalized and interactive knowledge modules over the internet/intranet for all the learners in Higher Education Institutions in any- time, any-where mode. The Mission has two major components viz., (a) content generation and (b) connectivity along with provision for access devices for institutions and learners. For effective utilization of e-content, the Mission has plans to use appropriate pedagogy for e-learning, providing facility of performing experiments through virtual laboratories, on-line testing and certification, on-line availability of teachers to guide and mentor learners, utilization of Direct to Home (DTH) platforms, training and empowerment of teachers to effectively use the new method of teaching learning etc. Faculties from all the IITs, several NITs and other Institutions are participating in this curriculum development project.

6. Significant progress has been made by NMEICT in getting created e-Content - particularly in core engineering streams. NPTEL provides e-learning through online Web and Video courses in engineering, science and humanities streams

7. However, despite the significant progress made in creating e-Content, the present usage of e-Content by the target beneficiaries is not optimal. The Mission provides an unprecedented opportunity for all Universities and higher technical Institutions to deploy the massive e-Content being generated in higher education system for blended mode of teaching and consequently realizing the intrinsic benefits of using Blended Learning.

8. Min. of HRD has been deliberating upon the issue of underutilization of e-Content generated so far – particularly in engineering discipline. It is felt that to start with, we may motivate and persuade the large populace of engineering colleges faculty to adopt Blending Learning mode (NMEICT e-Content + conventional content existing) so that they can appreciate directly the intrinsic benefits of using Blended Learning. Chairman UGC and Chairman AICTE were requested to issue an appropriate “Advisory” to all Universities and engineering colleges under their control to adopt Blending Learning mode (NMEICT e-Content + conventional content existing) to be used by their faculty.

9. In addition to the Advisory for adopting Blended Learning by their faculty, there is a justification for putting in place some academic Incentives for faculties involved in blended learning/ technology-enabled learning initiatives of NMEICT. In fact, there has been a repeated demand by concerned faculty segments for award of Academic Credit Points (API Score) for various levels of involvement/engagement with technology-enabled learning and teaching activities.

10. During the DTH Committee Meeting held on 9th January 2014, “An issue was raised by one of the members, that Teachers are now required to contribute in a big way and also in large numbers to deliver live lecture, content, offer years of experience and then interact live with students and take their questions, in DTH programme regularly. It was further pointed out that such teachers have also been contributing towards production of e-contents, under NMEICT programme. Therefore we need to encourage and acknowledge talent of such teachers and may equate a number of sessions delivered through DTH etc., as equivalent to paper presented in Nation/international conferences so that the Teacher earns Academic Credit points that may benefit them in API score, etc. It was decided that Pedagogy & Scheduling Committee be also requested to take up this issue and come up with recommendations. Further the recommendations on this shall be taken up with the UGC, AICTE, IIT & NIT Council etc., for a decision on this issue.”

11. Director EMMRC, University of Kashmir has also expressed his concerns about best teachers being not motivated to achieve the objectives of NMEICT for e-Content development and DTH Channels utilization and has suggested some academic and monetary incentives to achieve the objectives of NMEICT.

12. Considering above rationale, discussions were further held with concerned UGC representative, who in turn consulted representatives of some Universities involved actively with NMEICT initiatives. Based on such consultations, following academic incentives are proposed for PAB’s consideration and approval:

B. Proposed Incentives for faculties involved in Blended Learning/ Technology-Enabled Learning Initiatives of NMEICT

1. E-content development work may be linked as an option to the current API Scheme of UGC as follows:

   a) **Content writers** :

      i) For authoring 10 modules for post-graduate level- 15 API to single author, for joint , 10 API to first and 5 to each co-author (Each module means e-content of 40-60 min duration).

      ii) For authoring 10 modules for under-graduate level- 10 API to single author, for joint , 6 API to first and 4 to each co-author.

b) **Paper Coordinator/ Technical Coordinators**:10 API per paper of 40-50 min duration.

i) For coordinating One Paper for post-graduate level- 15 API.

ii) For coordinating One Paper for under-graduate level- 10 API.

c) **Reviewer**: 5 API per set of 10 modules.

d) **Translators**: 2 API per set of 10 modules.

e) **Coordinator for Training/Workshops:** 10 API per week of training to coordinator and 5 API per week to co-coordinator.

f) **Resource Person for Workshop/Training**: 1 API per hour.

g) **PI/Co-PI**: 10 per paper to PI and 5 per paper to Co-PI.

2. **Special Casual Leave / Duty Leave** : A faculty should be entitled for special causal leave/duty leave to encourage and facilitate them for getting involved in any of the purposes NMEICT development work, organizing/ coordinating/ participating in training for e-learning, TEL, video lectures, multimedia creation, national/ international conferences etc. For determining the entitlement the following norms may be adopted for different roles in NMEICT supported National, Regional or State Level bodies and other recognized centres working in the field of TEL.

a) **Content Writers:** 5 duty leaves/ special casual leave per set of 10 modules as single authoring / 3 per set of 10 modules as co-authoring.

b) **Paper Coordinator/ Technical Coordinators:** 5 duty leaves/ special casual leave per paper of 40-60 hour duration.

c) **Reviewer:** 2 duty leaves/ special casual leave per set of 10 modules.

d) **Translators**: 2 duty leaves/ special casual leave per set of 10 modules.

e) **Coordinator for Training**: Same as number of days of training.

f) **PI/Co-PI**: 5 duty leaves/ special casual leave per month till the tenure of project (can be collected and taken together, if taken together for one or more month , ad-hoc faculty may be appointed in lieu).

3. Workshops/Seminars/Conferences, Talks, Lectures, Memberships of Associations, etc.: (API at par with existing)

4. Research paper/books/chapters/articles in the field of e-learning/ education/ teaching-learning should be accepted as equivalent to research in core subject area irrespective of background subject of the faculty to encourage large number of participation across various disciplines. (API at par with conventional research papers).

5. **Administrative work for coordination of e-learning activities**: 5 API per month for administration of e-learning activities involving funding from government bodies of more than Rs 10 Lakhs till the duration of the project.

6. **Delivering Video Lecture/TEL:** 2 API per lecture.

7. **Virtual Teacher/Mentor/ Talk to Teacher programme:** Using virtual platform through online student-teacher groups / support for MOOCs – (online assignments, discussion forum, etc) Per month 5 API per 20 students.

8. e-Learning Course designing/use of participatory and innovative teaching and learning methods, updating subject content, course improvement etc.- 20 API per course for one semester; 10 API per course for three months certification course; 5 API per course for lesser than three months certification course.

9. Orientation Programmes in Blending Learning/Technology Enabled Learning Initiatives of MHRD may be given equivalence to the Orientation/ Refresher Courses organized by the Academic Staff Colleges.

10. **M.Phil/Ph.D**- Two guides, one providing subject specific guidance and Co-guide providing guidance in e-learning/educational technologies/ICT etc (need not be from same parent disciplines), both should to be recognized as main guides with 15 API scores for each for Ph.D and 10 API for M.Phil.

11. **Project work with students to promote/evolve/improve TEL based learning activities** : 15 API for a group of 10 students for 3 months for post-graduate students; 10 API for a group of 10 students for 3 months for under-graduate students.

12. **Study Leave and Deputation** : Study leave should be extended for the faculty involved in NMEICT activities to accomplish work equivalent to 50 API score per semester.

13. **Fellowships/ Awards/ Exchange Programmes/ International and National Seminars/Workshops etc**.: All the existing fellowships MHRD/UGC and other funding agencies should extend Fellowships/ Awards/ Exchange programmes/ International and National seminars/workshops grant to be extended NMEICT related activities.

The above-proposed Incentives for faculties involved in Blended Learning/ Technology-Enabled Learning Initiatives of NMEICT may be considered for PAB's approval.

Item No. - 9

Virtual Labs (Phase II).

Item No: 9

Proposal : Virtual Labs (Phase II)

PI : Prof. Ranjan Bose

Institute : IIT Delhi

1. Union Cabinet while approving the NMEICT Mission Document, made provision of Rs.200 crores for creating Virtual Laboratories for supporting e-learning.

2. Main anchor institution for this component of Mission has been IIT Delhi since the beginning. Three projects "Pilot project" with the estimate cost of Rs.22 crores and phase-I of Virtual Lab with the estimate cost of Rs.80.00 crores and "Remote triggered labs" with the estimate cost of Rs.22.68 crores have been approved under the Mission till now for IIT Delhi.

3. Virtual Labs project was put up before the PAB at its meeting held on 21stNovember, 2013. Detailed discussions were held on this project.

4. **Given below are relevant extracts from the Minutes of the PAB meeting referred:**

   After detailed deliberations on observations made by members and PI's response, PAB decided as follows:

   i) **Continuation of the Virtual Labs project is agreed in principle. However a small group consisting of JS&FA, JS(TEL), and PI will examine the proposal further in detail**.

   ii) Among other observations made by PAB, this group will examine deployment of a hub and spoke model and T2T mode - particularly for simpler experiments for much wider overreach. AICTE and UGC may be involved for making Virtual Labs as a part of the curriculum for all. Among the colleges targeted in Phase II, all TEQIP colleges are to be included straightaway.

   iii) The recommendations of the Group may be put up in the next PAB meeting for consideration.

5. PI and co-PIs of the Virtual Labs project have recast their proposal in light of these discussions. Overall budget is given below. Details are available in the DPR circulated along with this Agenda Note.

S.No.	Items	Budget#			Total (in Lakh)
		First Year (in Lakh)	Second Year (in Lakh)	Third Year (in Lakh)	
1)	**Deployment and Outreach**	264.5	289.03	319.39	872.92
2)	**Integration and Maintenance**	861	944.9	1037.9	2843.8
3)	**Development of new experiments (300expt.x 3 Lakhs/expt.)***	300	300	300	900
4)	**Honoraria**	40	40	40	120
5)	**Central platform Engineering**	546.388	509.8203	560.80233	1617.0106
6)	**Data Centre**	34.515	50.43	98.15	183.095
7)	**Software License**	200	0	0	200
8)	**Reviews / Mid-term evaluations/Internal Workshops**	70.95	78.04	85.84	234.83
Total		**2,317.353**	**2,212.22**	**2,442.082**	**6,971.655**

6. **The primary focus of the Second Phase** of the Virtual Labs project is to maintain the labs already developed and reach out to all potential users of Virtual Labs. The virtual labs will be hosted on a national server for easy access of all students. Selected simulation based labs (discipline wise) shall be collated as a single package for distribution to engineering colleges. These may be more practical for remote areas of the country which still do not have good internet connectivity. Private agencies/ colleges will be roped in for mass scale awareness and usage of the labs. Additional labs/experiments will be developed to fill ups the gap area of typical UG curriculum in each discipline. Labs based on

proprietary software shall be converted to free and open source technologies to maximize the outreach. Labs shall also be made compliant to mobile platform/ Tablets. Effort shall also be made to rope in appropriate agencies for granting certificates to the users.

7. **The main objectives of the second Phase** of this project are listed below:
   a) To maintain/upkeep the existing operational virtual labs.
   b) To port Virtual Labs to a common platform and host it on a national server.
   c) To create a 'single package' of simulation-based Virtual Labs to be distributed to users.
   d) To engage private agencies for outreach of Virtual Labs: (i) awareness about labs and usage of labs.
   e) To identify the gap areas between the typical syllabi of technical universities and the existing labs and to develop additional labs/experiments to fill these gaps.
   f) To convert labs not based on free and open source technologies to open source.
   g) To port the existing labs to mobile platform Tablets.
   h) To identify and work with government, private agencies and professional bodies for granting 'Certificate to users of Virtual Labs'.

8. It may be noted that the current DPR is different from that presented in the PAB meeting held on 21st November 2013 in following respects:

   i) The duration of the project has been increased from two years to three years.
   ii) Following additional objectives have been included in the project:
      a) Enhanced outreach, targeting over 21 Lakh physical usages (over 300 nodal centers for three years) against the previous target of 6.6 Lakh (over 200 nodal centers for two years).
      b) Porting the Virtual Labs to a common platform and hosting on a National Server.

c) Creation of 'Single Package' of simulation-based Virtual Labs for distribution.
d) Converting all labs on Open Source and Free Software
e) Making the labs compliant to Tablet/ Mobile Platforms.

iii) In spite of the additional objectives and scope as above, the cost of the project has only changed from 56.3 crores spread over two years (i.e Rs 28.15 crores per year) to 69.71 crores spread over three years (i.e. 23.24 crores per year).

iv) For the scope mentioned in the last DPR, the approximate cost would be 45 crores.

9. **The Detailed Project Report** is placed at Appendix-VIII (Page: 174-272) for the kind perusal and examination by the PAB.

Item is placed before the PAB for approving Phase-II of Virtual labs Project with estimated cost of Rs. 69,71.655 Lakhs.

Item No. - 10

ICT Mapping in Higher EducationBetween IIT Bombay and the National University of Singapore.

Agenda Item No. : 10

Project	**:**	**ICT Mapping in Higher Education between IIT Bombay and the National University of Singapore.**
PI	**:**	**Dr. Kannan Moudgalya**
Institute	**:**	**Indian Institute of Technology (IIT), Bombay**
Principal Partner(s)	**:**	**National University of Singapore (NUS).**

1.0 Background and Need of the Project

A joint "ICT Mapping Exercise" has been under consideration by the MHRD, India and the National University of Singapore since March 2013. These discussions were initiated by Mr. Pawan Agarwal, Advisor (Higher Education), Planning Commission. In-principle agreement to embark on the joint project was reached in a video-conference between Dr. Ashok Thakur, Secretary (HE), MHRD, and Prof. Tan Chorh Chuan, President, NUS, on 3 June 2013.

They recognized a need to encourage wider usage and adoption of technology in Indian higher-education and were of the view that an ICT Mapping Exercise could identify the gaps that exist in adoption and ways to overcome these gaps by sharing of best practices among institutions.

2.0 Objectives

The purpose of this exercise is to identify and understand successful methods and processes in the use of ICT in higher education, and to recommend methods of absorbing them.

The project will comprise of comparison of practices of ICT in higher education in overseas institutions with Indian Universities and to establish their relevance in Indian context. However, the information extracted from overseas may not be directly applicable to India and suitable changes may have to be made to the key parameters of comparison.

3.0 The Main Deliverable expected

The project help MHRD to play the role of enabler by connecting an institution (public/private) which wants to adopt a new technology and an institution that has already implemented the technology successfully.

3.1 Deliverables broadly identified as follows:

(i) Relevance to the NMEICT on leveraging ICT for the education in India:

The main objective of this project is to compile the best ICT practices followed in some of the leading educational institutions in India and to compare them with those of a few of the leading overseas institutions, such as NUS and CMU. This work will help us find where we stand and recommend future directions. It will also give a qualitative picture of the benefits of ICT adoption and the methods to do it. The results will be of immediate relevance to the National Mission on Education through ICT (NMEICT), a centrally sponsored scheme which focuses on leveraging ICT for the education in India.

3.2 Others:

(i) Identify processes that will be helpful to follow.

(ii) Identify Model Organization in Best Practices:

For example, an organisation that has a good handle on the installation of Moodle may be in a position to establish this service through a cloud for all other institutions. Such an offering may be made available for many components of administrative systems as well, even if an integrated ERP system is not possible.

(iii) Templates, Checklists on the Best Processes

The project could also have templates, checklists on the best processes to follow in technologies involving:

- Lessons on-demand (Anytime anywhere access to content)
- MOOCs (Massive Open Online Courses)/ Distance education solutions
- Hybrid learning and Flip Classrooms
- Clicker based interactions
- Social media
- Learning management systems
- Cloud solutions
- IT security solutions
- Campus networks
- Student learning solutions
- Digital classrooms
- Web-based student services
- Online exam & evaluation systems
- Student record management systems
- Marketing & CRM systems
- ERP systems
- Collaboration systems
- Digital libraries

4.0. Impact and Beneficiaries

This project will

- Help participating institutions identify gaps in adoption of technology.
- Give recognition to the participating institutions that have established excellent ICT practices.
- Create a channel and system for non-participating institutions to learn from the best practices of participating institutions

- Lead to adoption of best practices in technology in 20% (TBD) of Indian institutions.

5.0. Summary of Phases and Key Tasks

Phases	Key tasks
Conceptualization	• Writing of the scope of work • Facilitation of meetings & finalizing scope of work • Defining focus areas • Finalizing the method and framework of data collection • Kick-off meet of all participating institutions and partners in Delhi
Data collection	• Design of online questionnaire • Video interviews • Creation of online platform • Trip to participating institutions
Analysis and Comparative Study	• Defining of the comparative framework • Data Analysis • Capstone Forum Event at NUS of all participating institutions
Dissemination	• Printing • Ongoing maintenance of the website • Production of Video and CD • Meet of all participants in Delhi/Mumbai

6.0. Proposed phases and timelines

Phases	Duration
Conceptualisation (Scope of work, teams, areas of focus, methods)	Feb- April, 2014
Data collection (Online, Video, Questionnaire)	April-June, 2014
Analysis and Comparative Study (Capstone Forum)	June-July, 2014
Dissemination	July-Sept, 2014

7.0. Participating Institutes

The participating institutions will comprise of around 15 institutions of higher learning in India, to be identified by IIT-B, NUS, the MHRD and the Planning Commission of India; and upon mutual agreement, 2 or 3 other institutions beyond India and Singapore.

7.1. Advisory Committee

- Advisor Higher Education, Planning Commission.
- Mission Director, NMEICT.
- Representative, National University of Singapore.
- Representative, IIT Bombay.

7.2. Project Management

A Project Director will be identified to supervise the project. This director will work with the help of two project managers one based in Delhi and another in Mumbai to run the project. This team will in turn be helped by the designated project leaders in participating institutions. The overall Exercise shall be overseen by Secretary (HE), MHRD India, a representative of NUS and a representative of IIT Bombay.

8.0 Observations by Standing Committee (SC) dated March 3rd, 2014

PI was advised to revise the proposal incorporating the following observations by SC Chairman and SC members:

a) **Financial Requirement:** Whether 5 people are really needed for the survey to be carried out in overseas? Accordingly, PI has been advised by the SC Chairman to review and revise the financial requirements of the project thoroughly.

b) **Objective:** Objective of the project needs to be re-worded suitably. Rather than “study”, it can be “comparison” of practices in Overseas with Indian Universities.

c) **Title of the Project:** Title should be changed with proper implications of ICT in Higher Education. It can be suitably fitted with objective by naming as ICT mapping instead of IT mapping.

d) **Relevance with Indian Context:** The comparison with overseas Higher Educational institutes is how far relevant in Indian context, that has to be brought out clearly. The information extracted from overseas may not be directly applicable to India and suitable changes may have to be made to the key parameters of comparison.

e) **Overall budget reduction:** SC recommended to PI to reduce the overall budget.

f) **Specific University:** It is recommended that Gitam University, Vishakhapatnam should be included in the study other than whatever mentioned in the project proposal.

Following the recommendations of SC Chairman and SC members, the objective of the project has been redefined and the reduced budget has been represented in comparison to already presented budget in SC meeting in the following tables.

Table 1: Budget presented in SC Meeting

Works/Resources	Costs in Lakhs (INR)	Comments
Project Director	TBD	
Project Manager (Delhi)	4.0	50 pm for 8 months
Project Manager (Mumbai)	4.0	50 pm for 8 months
Technical Advisor	1.6	20 pm for 8 months
Support staff	1.6	20 pm for 8 months
Data Analyst	0.7	Salary: 35k per month; 2 months;
Online/Website team	2.8	Lump sum for one time set up; Cost of maintenance and updation 10k per month; 8 months
Video production team	4.5	3 videos per institute for 10 institutions; 15k per video
Event organization	3.9	Event Manager 35k per event for 3 events; Average cost of event per person Rs.5000; 40 participants; travel/ stay for 20 participants
Domestic travel and stay	4.5	3 members X 10 institutes X 1 day of stay @ (Rs. 20,000 per person of travel + Rs. 5000 for stay)
International travel and stay	12.7	5 members X 3 days of stay @ (Rs. 50,000 for air ticket to Singapore +Rs. 10,000 per day for stay per person) 5 members X 7 days of stay @ (Rs. 90,000 for air ticket to USA+Rs. 12,000 per day for stay per person)
Production of collateral (report, CD, reference material etc.)	1.0	Rs. 1000 per piece for 50 recipients
Contingency	7.0	
Total	**53.1**	

Table 2: Reduced Budget after incorporating the suggestions of Standing Committee

Draft Budget

Works/Resources	Proposed amount (Rs. Lakh)	Final amount (Rs. Lakh)[0]
Salary[1]	13.9	11.9
Website Development[2]	3.8	2.8
Video production[3]	4.5	4.5
Event organization[4]	3.9	3.9
Domestic TA/DA[5]	4.5	4.5
International TA/DA[6]	13.7	12.7
Documentation	1.0	1.0
Consumables	0.8	0.8
Contingency	7.0	1.5
Total	**53.1**	**43.6**

[0]Breakup for the reduced amounts are given in the footnote.

[1]Calculated on the basis of two managers (one in Mumbai and one in Delhi) working part time, a general/database programmer, a data analyst and a support staff member working for 8 months.

[2]The required website development will be outsourced to an external agency. Lump sum of Rs. 2 lakh for one time set up; Cost of maintenance and updation 10k per month for 8 months.

[3]Three videos per institute for 10 institutions; 15k per video.

[4]Event Manager at 35k per event for 3 events; Average cost of event per person Rs.5000; 40 participants; travel/ stay for 20 participants.

[5]Three (3) members X 10 institutes X 1 day of stay @ (Rs. 20,000 per person of travel + Rs. 5000 for stay).

[6]Five (5) members X 3 days of stay @ (Rs. 50,000 for air ticket to Singapore + Rs. 10,000. per day for stay per person) 5 members X 7 days of stay @ (Rs. 90,000 for Air Ticket to USA+Rs. 12,000 per day for stay per person).

The revised Detailed Project Report is placed at Appendix-IX (Page: 273-281).

PAB may consider the above project with estimate cost of Rs.43.6 Lakhs for approval.

Item No. - 11

FOSSEE: Adoption of Free and Open Source Software in Education (Phase II).

Item No. 11

Proposal **: FOSSEE: Adoption of Free and Open Source Software in Education (Phase II).**

PI **: Profs. Prabhu Ramachandran and 7 others**

Institute **: IIT Bombay**

Control No : me-20021010551

OVERALL PROJECT OBJECTIVE

The aim of the FOSSEE project is to eliminate the use of proprietary/commercial software packages in Science and Engineering Education across India and replace them with Free and Open Source Software (FOSS). The shift to FOSS packages will save the educational institutions huge amounts of money. Students trained to use the state-of-the-art FOSS packages will be able to give their prospective employers a huge benefit: especially for small and medium sized companies. FOSS will immensely help the students who wish to become entrepreneurs.

1. Following are the outcomes of the FOSSEE Phase I

Item	Proposed	Achieved
Contact workshops for teachers	55	70
Remote, SELF, Workshops	-	874
Textbook Companions	100	250
Conferences	6	7
Spoken Tutorials	40	61
Course Conversion	5	5
Lab Migration	-	10

Table 2: Promised vs. Delivered in Phase I

2. In Phase-I, apart from the activities mentioned in Table 2, other activities undertaken by FOSSEE are the following:

a) **Course on SDES**: A semester long course in Software Development Techniques in Engineering and Science (SDES) has been designed by the Python team of FOSSEE to equip students with skills in Python, Bash/Linux, Latex, Version Control and Test Driven Development. The course and all its course material is now included in the curriculum of IIT Bombay and BHU, Varanasi. Furthermore, through the Thousand Teacher Training programme, the Python resource team in FOSSEE trained a total of 725 teachers across India on SDES.

Hardware Interface: The FOSSEE team has come up with Scilab based data acquisition systems using COMEDI (Control and Measurement Device Interface with drivers for more than 400 A/D cards and digital I/O cards, a Linux project), Xcos (block oriented simulation tool) and HART (hardware access real time toolbox). Various combinations of the above have been validated for data acquisition and control. The FOSSEE team also helped the SBHS (single board heater system of the virtual labs project funded by NMEICT) to be controlled remotely using the above mentioned hardware access software, along with Python for connectivity and Scilab for control algorithm design. Hardware access has been provided in Windows through a serial interface.

b) **Electronic Circuit Simulation**: The FOSSEE team has developed an electronic circuit simulator based on FOSS components, such as KiCAD and NGSpice. Scilab is used in this simulator to explain the results. This software has the potential to be used as an alternative to OrCAD, at least in the academic institutions. This software is named as Oscad. FOSSEE also published a book on Oscad. This software was introduced and used in the 10,000 Teacher Training Programme on Analog Electronics, conducted by IIT Kharagpur. This software requires further improvement, so as to be useful to teachers and students of engineering colleges. The team also need to help conduct SELF workshops, to create TBCs and to migrate labs using Oscad.

c) **FOSS on Aakash**: The FOSSEE team helped port C, C++, Python, Scilab and Oscad onto the Aakash tablet.

d) **Postal Campaign**: In order to publicise FOSSEE activities and to meet the shortfall in the lab migration project, postal campaigns were initiated by FOSSEE in phase I. About 4,150 Heads of various Departments in about 700 AICTE recognised colleges were contacted. The response FOSSEE is much more than what was obtained for magazine advertisements. For example, FOSSEE received only one email for an advertisement of LibreOffice free workshop advertisement placed in the back cover of Linux for You, placed at a cost of Rs. 50,000. The team also plans to follow such a postal campaign for other activities also in the near future.

3. Keeping the AICTE syllabus in mind, the team has mapped the completed and under progress books in the Textbook Companion (TBC) Activity with the AICTE approved standard Engineering textbooks.

Name of the FOSS	Number of completed TBC	Number of Under Progress TBC
http://vlab.co.in/ba_labs_all.php?id=2Scilab	48	28`
Python	7	9
Oscad	2	-

Table 3: Mapping of TBCs with AICTE approved texbooks

4. In the last two PRSG meetings held in September 2012 and March 2013, following were recommended by the committee:

a) PRSG observed that FOSSEE has offered its work to a large number of college students through Textbook companions.

b) The ecosystem created by the FOSSEE team in co-opting students from various colleges around the country in creating textbook companions is appreciated by the PRSG.

c) PRSG noted that FOSSEE has been concentration only on two FOSS namely: Scilab and Python. Hence, recommended that the team explores more FOSS alternatives.

d) PRSG was concerned that the FOSS activity is too important to be done by a single institution - namely IIT Bombay. Hence, it urges to identify and train collaborator institutions to carry on with the FOSS activity.

e) The PRSG strongly feels that the important work carried out by the FOSSEE project should not be stopped after Phase 1, but that it should be continued as Phase II as well.

Extracts from Draft Minutes of Standing Committee held on 19th Sept 2013:

The SC appreciates the extension proposed by the PI in the Phase II and recommends that as many open software and hardware designs on educational tools be popularised.

5. Therefore, to address the above-mentioned PRSG recommendations and the recommendations of the Standing Committee, the FOSSEE team has proposed Phase II.

Main Deliverables: Phase II:

i) One thousand additional textbook companions and lab migrations in three years, in all FOSS systems together.

ii) Support for 1,000 SELF workshops to be organised by the Spoken Tutorial Team. Support also for Online tests.

iii) Publicising the FOSS activity at colleges through postal campaigns and other methods. Nurturing and training partner institutions across the country for spreading the FOSS culture. FOSSEE has identified two institutions for the first year.

iv) IIT Kharagpur, Prof. Rajib Mall, Head of the Dept. of Computer Science and Engineering.

v) Thiagarajar College of Engineering, Madurai, Dr. Mercy Shalinie, HoD, Dept of Computer Science.

vi) Working with government agencies and curriculum boards of universities to adopt FOSS in their curricula.

vii) Strengthening the chosen FOSS system's capabilities, where applicable.

viii) Working with the Aakash Team and helping them with domain support.

ix) Focus FOSS systems: Scilab, Python, OpenFOAM, Oscad, SimPy and COIN-OR, at present. FOSSEE may extend the support to other FOSS systems, such as R and OpenModelica and also open hardware initiatives as well, depending on the interest of the PIs and the collaborating institutions of the FOSSEE project.

6. Following is the detail of the financial expenditure of FOSSEE Phase I

Total amount sanctioned	**:**	**Rs. 3,18,50,000**
Amount of funds spent	:	Rs. 2,83,96,437
Balance amount	:	Rs. 34,58,563

Schedule of Release of Funds

S. No.	Date	Amount released (in Rupees)
1	16/03/11	95,00,000
2	27/03/12	50,00,000
3	09/09/13	1,10,00,000
4	26/12/13	63,50,000

Table 1: Schedule of release of funds in Phase I and current status

7. Budget for Phase II

Head	I Year (Rs. Cr)	II Year (Rs. Cr)	III Year (Rs. Cr)	Total (Rs. Cr)
Salaries[0]	1.05	1.40	1.80	4.25
Honorarium for textbook companion creators[1]	0.69	0.88	0.95	2.52
Collaborating partner institutions[2]	0.50	1.00	1.50	3.00
Travel[3]	0.20	0.25	0.30	0.75
Postal Campaign Expenses[4]	0.10	0.15	0.20	0.45
Other promotional expenses (stalls, media)	0.15	0.20	0.25	0.60
Conferences and workshops[5]	0.20	0.25	0.30	0.75
Equipment	0.15	0.20	0.25	0.60
Web hosting expenses	0.05	0.10	0.15	0.30
Consumables	0.13	016	0.20	0.49
Other FOSS systems to be taken up for promotion[6]	0.00	0.50	1.00	1.50
Contingency	0.10	0.15	0.20	0.45
Coordinator's honorarium	0.08	0.10	0.15	0.33
Total	3.40	5.34	7.25	15.99

Table 4: Budget for three years and the total (Rs. crore)

Notes for the costing :

[0] Calculated on the basis of 30, 35, 40 people working on the project, with average annual salaries of Rs. 3.5 lakh, 4.0 lakh and 4.5 lakh, in the three years, respectively.

[1] More than 95% of the textbook companion creators and lab migrators are students and faculty members from institutions other than IITs. Basis: 300, 350, 350 units (textbook companion and lab migration together), at an average honorarium of Rs. 23,000, 25,000 and 27,000, in the three years, respectively. The reason to increase the first year honorarium to Rs. 23,000 from 15,000 is explained in the previous page: (a) higher cost of living (b) books becoming more difficult and (c) more than one software required to complete a textbook companion. In all, IIT Bombay will create 1,000 units (300+350+350) in the three years.

[2] Based on average institutional support of Rs. 10 lakhs per year. It is proposed to support 5 institutions for three years, 5 institutions for two years and 5 institutions for one year. A detailed justification for this amount is given in Table 3. It is to be noted that the deliverables mentioned in this Table are additional, i.e., these are over and above what is to be delivered by IIT Bombay.

[3] An average of four air travels by five PIs per year by economy class and an average of two air travels by 15 staff members every year. About a fourth of the expenses are for travel by rail/road. These travels are giving talks in important meetings, meeting collaborators, and advocacy.
[4] Based on average docket price of Rs. 25 to 50 (depends on the print volume of brochures) for 4,000 and 1,000 colleges per mailing in the first year and increasing progressively.
[5] A total of Rs.5 lakhs is budgeted for these conferences/workshops. A large number of experts are expected to attend. At the assumed cost, the team expects to conduct 4, 5 and 5 units of these, with a provision for cost escalation.
[6] Provision for other FOSS systems to be taken up for support. Some examples are R, OpenModelica and OpenCL. FOSSEE may also work on open source hardware. The additional systems will depend on the new faculty members who may participate in the future.

The **"Proposal"** and **"Additional information"** for FOSSEE is placed at Appendix-X (Page: 282-301) & Appendix-XI (Page: 302-307) respectively for the kind perusal and examination by the PAB.

Item is placed before the PAB for approving Phase-II of FOSSEE with estimated cost of Rs. 15.99 Crores for a period of 3 years.

Item No. - 12

Creation of Courseware e-content Development for remaining 58 UG Subjects at an enhanced rate of Rs.34,000 per Module.

Item No. 12

Proposal	**:**	**Creation of Courseware e-content Development for remaining 58 UG Subjects at an enhanced rate of Rs.34, 000 per Module.**
PI	**:**	**Prof. Rajbir Singh & EMMECs**
Institute	**:**	**CEC & EMMRC's**
Control No	**:**	**DE-19111011541**

The Consortium for Educational Communication (CEC), New Delhi, submitted a project proposal to MHRD on 27th February 2009 titled "Creation of Courseware e-content Development" for 87 Subjects. Each subject on an average is having 355 Modules and each Module carries about 30 minutes of Video and more than 30 minutes of text etc., and for development of it were paid @ Rs.17500 per module. The 3rd PAB and 18th PAB meeting approved the CEC project with a budget of Rs.18.50 Crores.

The SC in its meeting held on 6th December 2013 reviewed the progress of the project and out of the budget of Rs.18.5 Crores approved by the 18th PAB meeting held on 24th January 2011, noticed Rs.12.00 Crores have been released so far, the SC therefore recommend release of the remaining funds of Rs.4.65 Crores (for completion of e-content in 29 UG Subjects on an average contains 355 Modules, besides conduct of 10 workshops).

CEC e-Content Dedicated to the Nation:

Dr. Pallam Raju, the Honorable HRD Minister has on September 23rd 2013 at Bundelkhand University, Jhansi, Uttar Pradesh followed on 28th January 2014 at CEC, New Delhi, dedicated to the nation, the e-Content produced in 'Botany History, English Language, Environmental Science, Anthropology, Mathematics, Hindi Language and Photography' UG Subjects, produced by EMMRCs, as Co-PI of the Project and the production of the e-content was appreciated by all.

CEC Request to enhance the budget for development e-Content:

CEC has over past two years has been requesting that they are not in a position to produce high quality e-contents in Rs.17,500/- Lakhs/ module and it may be increased to Rs.35,000 per module.

The reason cited by the PI on increase in development cost of e-Content to Rs.35,000/- per Module is on account of:

i) Maintaining highest quality,

ii) Production of e-content in complete 4 Quadrants,

iii) e-content certification and validation, undergoing rigorous quality control during production of e-content development, expert preview and incorporating corrections in the e-content thereafter

iv) Creating Transcription (Text) out of the video spoken by the Teacher and making the text available to the students in e-content modules and

v) Creating e-book out of each e-content module is developed & incorporated in Template under Downloads & Academic Script, besides introducing Glossary, Frequently Asked Questions and their replies, Quits, Assignment, case studies, Tutorials etc.

Pricing Committee: Joint Secretary (TEL) & Mission Director (NMEICT) vide communication dated November 6, 2013 has constituted a Committee under the Chairmanship of Prof Mangal Sunder, IIT Madras as under:

i)	Prof. K. Mangala Sunder	:	Chairman
ii)	Prof. Dr. Jagdish Arora, Director, INFLIBNET	:	Member
iii)	Prof. Rajbir Singh, Director CEC or his representative	:	Member
iv)	Prof. Uma Kanjilal	:	Member
v)	Shri. Pradeep Kaul	:	Convener

The Committee has been requested to (i) preparation of a generic guideline for e-content under NMEICT that should include (ii) how much should be paid for each of the suggested quadrants, (iii) the generic permissible rates for all activities which have to be undertaken to complete the e-content course of 40 lectures (each one approximately 1 hr), (iv) How much should be paid to regular employees of college/ university should come out clearly and (v) After preparation of the content, where should it be uploaded/ delivery mechanism.

The Committee met on 30th November 2013 at 12:00 noon at MHRD, New Delhi. After detailed discussion on various items in production of e-content module the committee has recommended that per content module cost may be increased from present Rs. 17,500/- to Rs. 34,000/- modules. Calculation & Comparison on this, the old rate and proposed new rate for production of e-content in four quadrant including all attributes, elements and certification and validation of content proposed to be followed by CEC is as under.

A Comparison of Present and Proposed Expenditure per e-content module

S. No.	Description of items for payment	Present Amount for Module cost is Rs. 17,500/-	Proposed Amount for Module cost Rs. 34,000/-	Reference rates based on which payments are being made in column 2 & 3
	1	2	3	4
1	Subject Coordinator	Rs. 1000/-	Rs. 1000/-	As per e-content DPR
2	Subject expert/ Resource person			
	a. For Research (Background work for reference material field visits etc.)	Rs. 2000/-	Rs. 2000/-	Rs. 2000 - 5000/- *
	b. For providing objectives, summary, Downloadable (PDF) text, Transcript, case studies, FAQ`s, Assignments, Quiz, tutorial References, Glossary, Web References, etc.	Rs. 4500/-	Rs. 4500/-	Rs. 2000 - 8000/- *
	c. Onscreen presentation by the subject expert	Rs. 2000/-	Rs. 2000/-	Rs. 1000 - 2000/- *

S. No.	Description of items for payment	Present Amount for Module cost is Rs. 17,500/-	Proposed Amount for Module cost Rs. 34,000/-	Reference rates based on which payments are being made in column 2 & 3
3.	For production of ETV programme/Video modules a. Hiring /purchase of Equipment, facilities. b. Hiring/engagement of Human resources on contract basis as permissible under project for timely and successful completion of the project. c. Preproduction, Studio Recording, Music composition, Post production, etc. **(Presently CEC and Media Centre production facilities are being used at optimum and the expenditure is borne by Debit to UGC grants which is available only for limited no. of Video programmes. However as per DPR in Phase – II the production is proposed to be outsourced.)**	CEC e-content module has four quadrants where Audio/Video is the major quadrant. At present there are no funds available for Video production under NME-ICT.	Rs. 5000/- Rs. 5000/-	As per UGC funding for production of ETV programme.
4.	Freelance/hired Editors payment per e-content/ ETV programme for 4 shifts @ Rs.1000/- per shift **(Presently Rs. 2,000/- is borne by Debit to UGC grants which is available only for limited no. of Video programmes. However as per DPR in Phase – II the production is proposed to be outsourced.)**	Rs. 2,000/- which is not sufficient for Assembling, Editing, Down Converting and Chucking for Video Programmes.	Rs. 4000/-	Rs. 500 – 1000/- * Per shift
5.	Freelance/hired Graphics Artist/Animator/Module Integrator per e-content for 4 shifts @ Rs.1000/- per shift.	Rs. 4000/-	Rs. 4000/-	Rs. 1500 – 2000/- * Per shift
6.	Honorarium to PI, Co-PI and staff as permissible under project for timely and successful completion of the project as permissible under project.	Rs. 500/-	Rs. 1500/-	Approx. 5% of Module cost

S. No.	Description of items for payment	Present Amount for Module cost is Rs. 17,500/-	Proposed Amount for Module cost Rs. 34,000/-	Reference rates based on which payments are being made in column 2 & 3
7.	E-content certification and validation **(Presently borne by Debit to UGC grants which is available only for limited no. of Video Programmes)** (a) 1st stage at Media Centres by subject experts and production team (b) 2nd stage at CEC by Peer group	At present there are no funds available for quality certification and validation under NMEICT.	Rs. 1000/- Rs. 1000/-	The Honorarium being paid to experts for preview of programmes at CEC and Media Centres Rs. 1000/- Rs. 1000/-
8.	**Sub Total**		**Rs. 31,000/-**	
9.	Contingency including transport, consumables, Integration activities, PRSG meeting, dissemination and outreach activities etc.	Rs. 1500/-	Rs. 3000/-	Approx. 10% of the Module cost
	Total (8+9)	**Rs. 17,500/-**	**Rs. 34,000/-**	

Note: Per module new cost is Rs.34,000/-.

However, the Pricing Committee recommended the above e-content production costing subject to the following parameters:

i) Producing e-content in four quadrants approach.

ii) Maintaining highest Audio/Video quality, camera resolution 1000TV Lines or above, Video S/N 60 db & high.

iii) Creation of Transcription (Text) out of the video spoken by the Teacher and making the text available to the students in e-content modules.

iv) Creating e-book out of each e-content module containing 12 pages or more.

v) Providing Academic Script, Glossary, Frequently Asked Questions and their replies, Quiz, Assignment, case studies, Tutorials etc.

vi) Rigorous E-content certification and validation at two stages. Final & full Certification and, suggestion for correction in modifications and accepting only the certified e-content modules.

The Pricing Committee noted that NPTEL, in the year 2009, was provided with a funding of nearly Rs. 70 Crores by the MHRD for development e-content for 600 plus courses. It was reported by the Coordinator that NPTEL has an operating cost of Rs.29,000/- per Module with text, and problems and assignments as additional material. The Committee therefore felt that budget for e-content development @ Rs.34,000/- per module and as per the parameters specified as above is justified.

Agenda before recent SC meeting

An Agenda item on above was placed before the Standing Committee meeting held on 6th December 2013, regarding proposal by CEC for making e-content for left over 58 subjects with the revised cost of Rs.34,000/- per Module and for conduction of 62 workshops @ Rs.2 Lakhs. Total funds therefore were requested was to the order of Rs.70.69 Crores.

The SC in its meeting held on 6th December 2013 deliberated and made the following recommendations on this issue:

1) The decision to increase the cost of producing one hour of video lecture has to be done carefully, as it will affect several other projects also.
2) Cost audit by competent authorities may also be useful.

Due Diligence by an independent Agency:

The CEC proposal was accordingly placed for 'due diligence' before an independent Cost & Audit agency, M/s "KPMG" and their observation on Cost per Module is as under:

A dedicated committee in Dec 2013 after detailed review recommended a per module budget of INR 34,000 for a 1 hour module including, video lecture, transcript, e-book, assignment, certification. Based on Committee report's review, Phase 1 vs. Phase 2 cost breakup comparison and the understanding that significant part of content development cost in Phase I was allocated to UGC funds, KPMG doesn't find the recommended cost of INR 34,000 per module to be over-estimated.

The **Financial Due Diligence** for **"Creation of Courseware e-content Development for remaining 58 UG Subjects at an enhanced rate of Rs.34,000/- per Module**" is placed at Appendix-XII (Page: 308-311) for the kind perusal and examination by the PAB.

Further, their observation on Average modules per subject is as under:

An average of 355 modules per subject (actual output list not available with the PI) has been taken to arrive at the total project cost. However, based on the review of total modules completed in Phase 1 for 8 subjects (1577 modules), the average number of modules developed is 197. Hence, the 'projected' average of 355 modules per subject is on the higher side leading to significantly higher budget request. As the PI at this time doesn't have the full list of modules for Phase 2 subjects, the average modules per subject for the purpose of budget calculation should be revisited (can be approx. same at Phase 1 average ~200) followed by formal milestone based output review during the course of the project.

Recommendations of the PAB Sought:

Based on the request made by the Director, CEC, the recommendations of the SC in its meeting held on 6th December 2013, the due diligence conducted by the KPMG, the issue is therefore placed before the PAB for kind approval, for development of e-content by CEC for left over 58 UG subjects (out of 87 Subjects allotted) with revised cost of Rs.34,000 per Module and as per the quality parameters set by the Pricing Committee and further conduct of 62 workshops @ Rs.2 Lakhs each. Total funds therefore requested for kind approval on these are Rs.71.24 Crores.

The estimated additional implication on account of enhancement of production cost from Rs.17,500/- to Rs.34,000/- for production of e-content in remaining 58 UG Subjects (each having 355 Module) is around Rs33.97 Crores.

Item No. - 13

Creating Accessible Study Material for Print Impaired Student- IIT, Kharagpur.

Agenda Item No. : 13

Proposal	**:**	**Creating Accessible Study Material for Print Impaired Student (Main Phase).**
PI	**:**	**Prof. Partha Pratim Chakrabarti,**
Co-PI	**:**	**Prof.Anupam Basu & Prof. Sudeshna Sarkar,**
Institute	**:**	**Indian Institute of Technology, Kharagpur**

Background, Objective, Need, Scope and Impact of the Project.

1. Background of the Project

The original proposal was submitted by the Centre for Internet and Society to MHRD-NMEICT for approval. A pilot phase was approved to IIT Kharagpur and a grant-in-aid of Rs. 53 lakhs was sanctioned. Under this Plot phase a total of 183 books have been converted and made available at http://www.cel.iitkgp.ernet.in/asm/. Training was imparted to several agencies for conversion of books in different languages and a pool of resource persons and agencies have been generated in this phase.

1.1. Objective

This project aims to solve the problem of non-availability of reading materials for print impaired students pursuing higher education courses in universities across the country. This will be achieved by converting and distributing course books and recommended reference books into an accessible e-text DAISY format. The material shall include books in English and regional medium languages. The e-text content can also be used to generate textbooks in Braille, large print and audio formats. Through this project a large number of agencies and people including students will be involved in the book conversion process. Thus a larger pool of resources will be developed for future requirements as well as more people will be sensitized about the problems of the print impaired.

1.2. Need for Project

Provide technology enabled free access of Higher Education courses and related content to print Impaired Students in Universities across the country.

1.3. Project Scope

Conversion of 5,000 course books (both text and reference) targeted to both UG and PG levels of mostly Arts and Commerce streams (visually impaired people generally avoid Science stream, and conversion cost is also much higher). Additionally research in development of a few new technologies in this field.

Books will be converted to an accessible e-text DAISY format. The material shall include books in English and regional medium languages. The e-text content could also be used to generate textbooks in Braille, large print and audio formats.

1.4. Proposed Impact

Studies suggest that in India about 20,000 to 25,000 print impaired students are pursuing higher education but are hindered by the lack of availability of course material in accessible format. As soon as DAISY books become available free of cost, such students would (and the institutes offer the use of such books) be more empowered to pursue and complete their higher education

1.5 Duration of the Project

Three years.

1.6. Amount of Grant Requested

Rs. 11.077 crores

2. Main Phase Proposal based on Recommendations of the Project Review and Supervisory Group (PRSG) and the Standing Committee (SC).

On the basis of the experience gained from the Pilot Phase of the project and as per the recommendations of the Project Review and Supervisory Group (PRSG) and the Standing Committee(SC) IIT Kharagpur is bringing a proposal for the Main phase of the project “Creating Accessible Study Material for Print Impaired Students”. About 5000 books in English, Hindi and other regional languages shall be taken up for conversion in this phase along with research for development of a few new technologies in this field.

2.1. Recommendations by the Standing Committee

- Indian language TTS should be explored, IIT Kharagpur to look into technology development for this.
- The members felt that since the PI has completed the Pilot Project, looking into the importance and the uniqueness of the project to produce Accessible Study Material for Print Impaired Students, the PI should be encouraged to now take up the Main Project and re-plan the approach keeping in view the experience gained out of the Pilot Project.

3. Pilot Phase Vs Main Phase Deliverables

3.1. Pilot Phase Deliverable

Pilot Phase

Pilot phase was led by IIT Kharagpur and involved creation and dissemination of 183 DAISY books (including 115 with audio) with over 1000 students benefited from this. Pilot was executed with a budget of INR 53 lakhs. Several agencies were trained in the conversion of books in different languages, resulting in the creation of strong resource pool.

Conversion of Books in Pilot Phase:

Language	Initial Target		Actual Conversion	
	Text only DAISY	**Full Text Full Audio DAISY**	**Text only DAISY**	**Full Text Full Audio DAISY**
English	50 books	50 books	52 books	52 books
Hindi	50 books	50 books	56 books	56 books
Bengali	25 books	5 books	25 books	1 book
Tamil	25 books	5 books	25 books	5 books
Assamese	25 books	5 books	11 books	NIL
Marathi	25 books	5 books	14 books	1 book
Mathematical books	NIL	NIL	Sample	Sample
Total	200 books	120 books	183 books	115 books

3.2. Fund Utilisation in Pilot Phase (approximate figures):

Direct cost of conversion

(Paid to conversion centres) **:** INR 22 lakhs

Indirect cost of conversion
(Training, quality control, co-ordination, dissemination etc.): INR 10 lakhs

Travel
(SC, PRSG & Co-ordination meetings, Trainings): INR 8 lakhs

Website
(Development & Maintenance) **:** INR 2 lakhs

Equipment, Accessories & Consumables **:** INR 4 lakhs

Miscellaneous & Contingency **:** INR 2 lakhs

Overhead **:** INR 5 lakhs

3.3. Main Phase Deliverables:

1. Content Generation and Dissemination: About 5000 books (2500 in English and 2500 in Indian languages).
2. Technology Development
    a) Automatic XML tagging of already digitised material.
    b) Method(s) for making maps and figures accessible.
    c) Simulation of science experiments through computer/web for understanding by print impaired students.
    d) Dissemination/delivery through web/computer with on the fly audio conversion.

4.1 Estimated Budget: Rupees eleven crores seven lakh seventy thousand only.

(All figures are in lakhs of Rupees only)

Sl.	Particulars		Cost
1.	**Cost of Conversion of 5000 Books**		637.5
	(To be paid to Conversion Centres as per progress of work)	637.5	
2.	**Manpower**		174.0
	Consultant (Part time) – IIT Kharagpur	15	
	Research Personnel (4) – IIT Kharagpur	60	
	Administrative Personnel (1) – IIT Kharagpur	9	
	Technical Personnel (5) – One at each Coordinating Centres	45	
	Administrative Personnel (5) – One at each Coordinating Centres	45	
3.	**Equipment and Accessories**		46.5
	Dedicated Server – IIT Kharagpur	5	
	Desktop PC's (4 nos.) – IIT Kharagpur	2	
	Laptop (5 nos.) – IIT Kharagpur	2.5	
	Printer (2 nos.) – IIT Kharagpur	1	
	Braille Printer, Display, Image Enhancer – IIT Kharagpur	7.5	
	Handheld devices like Akash – IIT Kharagpur	1	
	Tactile components – IIT Kharagpur	10	
	Software and Conversion Tools – IIT Kharagpur	10	
	Desktop PC's (10 nos.) – Two at each Coordinating Centres	5	
	Printers (5) – One at each Coordinating Centres	2.5	
4.	**Consumables and Contingency**		67.0
	IIT Kharagpur – Rs. 4 lakhs per year	12	
	5 Coordinating agencies – Rs. 2 lakh each per year	30	
	Books	25	
5.	**Travel**		57.0
	IIT Kharagpur – Rs. 5 lakhs per year	15	
	5 Coordinating agencies – Rs. 2 lakhs each per year	30	
	Training – Rs. 1 lakh per training (12 times)	12	
6.	**Miscellaneous**		25.0
	Accessible Website Development – IIT Kharagpur	10	
	Workshops – IIT Kharagpur	6	
	User Trials for technologies being developed – IIT Kharagpur	4	
	Training for New Technologies – IIT Kharagpur	5	
	Sub-Total		1007.0
7.	**Overhead** @ 10% of sub-total		100.7
	Total		1107.7

4.2 Budget Break-up

S.No.	Component	Old Budget	Revised Budget	Comments
1.	Cost of Conversion of 5000 Books	**637.5**	**637.5**	**Cost of conversion of 5,000 books in the daisy format seems to be in line with industry standards**
2.	Manpower	**174**	**174**	**Manpower consists of 16 employees Manpower costs seemed to be in line with project objectives, industry standards and ministry regulations**
3.	Equipment and Accessories	**46.5**	**45.3**	**Manpower consists of 16 employees Manpower costs seemed to be in line with project objectives, industry standards and ministry regulations**
4.	Consumables and Contingency	**67**	**59.4**	**Cost of books was removed from consumables Other consumables - medical facilities and housing were added**
5.	Travel	**57**	**57**	**Travel cost seemed justified in terms of the spread of the project and requirements for travel**
6.	Miscellaneous	**25**	**55**	**Reduction in Website development costs Cost of books was re-allocated from Consumables Lab development and Internet charges were also added to these costs**
7.	Overhead @ 10 % of sub-total	**100. 7**	**0**	**Overheads were removed as a separate component of the budget as mission projects are advised not to have an overhead component**
Total		**1,107.7**	**1,028.2**	**Total savings of ~INR 80 Lakhs**

5. Key Observations by an independent agency (KPMG)

Parameters	DPR Components	KPMG Comments
Book Conversion	5000 books are envisaged to be converted into DAISY format in house with the assistance of 5 coordinating centers	.Opportunity to consider outsourcing books conversion (lower costs, repetitive effort and requires no technology development/ expertise)
Availability of books in Soft Copy	At present, it is not possible to obtain softcopies of books in the required Unicode format as this format is generally not used by the publishers. Some books may be available in the PDF format, but would require similar amount of processing and hence, cost. Softcopies in the available format would require more effort for conversion and publishers would not be willing to share these, fearing piracy.	This is a worst case scenario assuming that 100% of the books will not be available in relevant soft copy format. As and when the soft copies become available, need to revalidate the cost
Technology Development	The nodal agency plans to undertake R&D work in order to provide the print impaired students with tools and means of accessing textual and other contents. The nodal agency plans to undertake R&D work in order to provide the print impaired students with tools and means of accessing textual and other contents These include : Automatic XML tagging, Making maps and figures accessible, Simulation of science experiments Delivery through web/computer with on the fly audio conversion.	Opportunity to migrate the content to a cloud in future – perhaps the NMEICT cloud, to ensure scalability and cost savings

Parameters	DPR Components	KPMG Comments
Delivery, Dissemination	All the content developed will be uploaded in a dedicated server kept at IIT Kharagpur. The users (either print impaired individuals or Universities /colleges /organizations where such people are enrolled/ attached) can register themselves and then download as per their requirement.	Opportunity to migrate the content to a cloud in future – perhaps the NMEICT cloud, to ensure scalability and cost savings

The **"Proposal"** and **"Financial Due Diligence"** for Creating Accessible Study Material is placed at Appendix-XIII (Page: 312-326) & Appendix-XIV (Page: 327-330) respectively for the kind perusal and examination by the PAB.

PI requested for INR 11.07 Crores of funding and PAB may approve the revised reduced funding of INR 10.28 Crores based on KPMG observations.

Item No. - 14

Creation of an Expert Database (VIDWAN).

Item No. 14

Project	**:**	**Creation of an Expert Database (VIDWAN)**
PI	**:**	**Shri P. Kannan**
Control No	**:**	**KOT1411201313071**
Institute	**:**	**INFLIBNET Centre, Gandhinagar**

There is no good database of experts. NIC has a database, but it has no interactive features, no facility to receive publications. UGC's database has personal details, but no publications. A few more databases, domain specific, are however available.

The INFLIBNET Centre was asked to make a presentation on Expert database to Dr. M. Pallam Raju, Hon'ble Minister, HRD where-in the was asked to propose development a full-fledged database incorporating features such as hyperlink to other databases (IndCat, Shodhganga) and integration with ORCID ID, Researcher ID, SCOPUS ID, Google Scholar ID, etc.

As per the suggestion of MHRD, INFLIBNET Centre, Gandhinagar had prepared the project proposal for creation of "VIDWAN: Expert Database". The database would comprise information on experts available in India in different disciplines as well as experts and academicians of Indian origin working abroad. The country has more than 700 degree awarding institutions; 35,000 colleges and more than 4,000 research institutions. It does not have reliable source of information for experts available and country in various disciplines of teaching and researcher. The database proposes to be a comprehensive source of information for experts wherein the database would be populated by invitation, nomination as well as through voluntary submission of research profiles by experts. The database will store the data in RDF/XML, network of co-authors and networks of subject disciplines would be created automatically using semantic platforms like VIVO. The proposed project would be a trusted source of information for scientists and researchers to network with each other, for researcher and students to seek guidance in their research area for funding agencies and policy makers to find expert for evaluation and assessment.

Open source software VIVO is proposed to be used. Advanced searches, browse, links with a lot of databases will be available. RDF XML database will be used. As it is a semantic database, some of the updating of records will be done automatically.

The PI had initially asked for a budget amount of Rs. 37.20 lakhs for spending and completing the project in 12 months, as follows:

S No.	Item	Amount (Rs in Lakhs)
One Time Charge		
01	Non-recurring (Production Server including storage, Development Server, Workstations,etc)	12.00
Annual Recurring Charges		
01	Recurring + Manpower	25.20
Total		**37.20**

However, subsequent to initial consultations with Mission Directorate, the PI had revised and reduced the budget projections considering the assumption that NMEICT would make its central server available for hosting the database. Revised budget for the project proposal, after reducing the cost for production server was Rs. 31.70 lakhs as per the details given below:

S. No	Item	Amount (Rs in Lakhs)
One Time Charge		
01	Non-recurring (Development Server, Workstations, etc)	7.00
Annual Recurring Charges		
01	Recurring + Manpower	24.70
Total		**31.70**

PI was invited to give a presentation to SC on 6th December 2013 for giving further details and clarifications to the members. As the PI had given only the first year cost, the SC members asked for recurring cost, as this database has to be sustained at least during the life of NMEICT. PI gave this information that the recurring costs for the second and third years will be Rs. 10 lakh and Rs. 11 lakh, respectively.

After detailed discussions on the proposal, Standing Committee made the following recommendations:

The Standing Committee *recommends this project, with a total cost of Rs. 31.70+10+11 = Rs. 52.70 lakh, for a period of three years.*

PI was asked to revise the DPR accordingly. In their revised DPR however PI marginally revised the cost estimates upwards to Rs. 55.38 lakh with yearwise break-up as follows:

Financial Requirement (2014–2015)	:	Rs 31.00 Lakhs
Financial Requirement (2015–2016)	:	Rs 11.61 Lakhs
Financial Requirement (2016–2017)	:	Rs 12.77 Lakhs
Total Amount Required	:	Rs 55.38 Lakhs

Subsequently, NMEICT decided to get this project proposal reviewed for financial due-diligence by independent expert agency KPMG. In their report attached at Appendix XV (Page: 331-334), KPMG reviewed with PI the Project need, benefits, scope, duration, budget and other parameters, etc., and after their review they recommended reduction of cost by Rs. 2.7 lakhs. The final cost for the project for 3 years recommended by them comes out to Rs. 52.70 lakhs.

PAB may consider approval of the project for 3 years with a total budget of Rs. 52.70 lakhs as recommended by KPMG after Financial Due Diligence.

Appendix

Appendix-I

Minutes of the 26th Meeting of the Project Approval Board (PAB) held on 21st November, 2013.

MINUTES OF THE 26th MEETING OF PROJECT APPROVAL BOARD OF NATIONAL MISSION ON EDUCATION THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY (NMEICT) HELD ON 21st NOVEMBER 2013 AT 11.00 A.M. IN CONFERENCE ROOM (FIRST FLOOR), SHASTRI BHAWAN, NEW DELHI

The 26th Meeting of the Empowered Committee of Experts (Project Approval Board) of National Mission on Education through Information and Communication Technology (NMEICT) was held on 21st November, 2013 at 11.00 a.m. in Conference Room, (First Floor), Shastri Bhawan, New Delhi under the Chairmanship of Secretary, Department of Higher Education, Ministry of HRD. The list of participants is at **Annexure.**

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB welcomed all the participants. Thereafter agenda items were discussed and following decisions were reached:

Item No.1

Confirmation of the Minutes of the 25th Meeting of Project Approval Board

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB, invited observations from the members on the "Minutes of the 25th Meeting of the PAB." Since all the members agreed and no observations on the same were received, the "Minutes of the 25th Meeting of the Project Approval Board held on 6th November, 2012" were confirmed.

Item No.2

"Action Taken Report" on the Minutes of the 25th Meeting of PAB

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary reported to PAB that action has been taken and completed as per the PAB's decision in respect of the following 2 items:

Sl. No.	Subject/Agenda item	Decision of PAB	Action Taken
1	Approval of Project related to e- content generation for 17 subjects in E&C by IIIT Hyderabad.	PAB approved the project with estimated amount of Rs 119 lakhs.	The first installment of Rs. 35.7 lakhs has been released to IIIT Hyderabad.
2	Approval of Project related to developing suitable pedagogical methods of IIT Kharagpur.	PAB approved the project with estimated budget of Rs 16 Crores.	The first installment of Rs. 4.63 Crores has been released to IIT Kharagpur.

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB further informed the members that action in respect of following 3 items is under progress and the outcome will be presented in the next PAB meeting:

S.No	Subject/Agenda item	Decision of PAB	Action Being Taken
1	Financial due diligence of "Talk to teachers" Project.	Create a model which is self sustaining. For this, a meeting with UGC, AICTE, NCTE and other partners to be conducted.	A Model will be worked out after conducting meeting with UGC, AICTE, NCTE and will be put in next PAB meeting.
2	Approval of Projects related to development of e-content related to geo informatics by IIT Mumbai.	PAB advised the along with the cost break up, project may be put for the examination in the next meeting.	Mission Secretariat will scrutinize the proposal and will put before the next PAB.
3	Approval of Project related to setting up of teaching ends for creating content for 50 DTH channels at the leading institution of the country.	i). PAB approved the project in principle, however observed that money may be released only after obtaining the NOC. ii). SPV may be formed with consultation with UGC and AICTE.	Actions are being taken to obtain NOC for Ministry of I&B and other related organization and for forming SPV. PAB will be apprised about the outcome in the next meeting.

Thereafter, the said "Action Taken Report" was noted by PAB.

Item No.3

Approval of New Proposals:

3.1 Project : Virtual Labs (Phase-II)
***PI* : Ranjan Bose**
***Institute* : IIT Delhi**

JS(TEL) and Mission Director NMEICT apprised the members about this project, coordinated by IIT Delhi along with seven IITs and a few other educational institutions as collaborators. In the first phase of the project, 100 virtual labs have been created as against the target of 80 virtual labs. Towards outreach and dissemination, IIT Delhi has conducted workshops and created 65 nodal centers, which are located in various engineering college to ensure that the Virtual labs are being used by these engineering colleges. The PRSG has recommended the continuation of this project for which the Scale-up requires Phase II funds of Rs. 5623.44 lakhs with Maintenance and outreach as the major objectives.

There was extensive discussions on the project by members. Some of the observations and issues of concern voiced by PAB members are listed below:

1. PI should concentrate on creation of virtual labs as a replacement option for only high cost lab equipment, say over Rs. 50 lakhs or Rs. 10 lakhs. PI should analyse such data about phase I virtual labs as an input for further consideration.
2. Dissemination and ensuring full use of Virtual Labs is presently lacking.
3. Whether evaluation has been done by external agencies?
4. What is the roadmap for spreading and disseminating the use of Virtual Labs over time?
5. How many experiments actually got conducted?
6. What has been the effect of this Project on employability of engineering students? Has any study been done?
7. Exploring the leverage of private sector wide-spread dissemination of the project and user promotion. Present proposal for reaching out to just 236 colleges in 2 years is unacceptable in terms of reach desired.
8. Involving all TEQIP colleges straightaway in phase II to be incorporated.
9. Involving AICTE and UGC for making Virtual Labs as a part of the curriculum for all.

PI from IIT Delhi (Prof Ranjan Bose) responded partially to some of above observations as follows:

i) Students are more excited about basic experiments rather than complex high cost equipment labs, because the sample results and reports on basic experiments are easier for them to comprehend.

ii) Virtual Labs are of value when used outside normal college lab hours and on holidays. Only about 7-10% labs correspond to equipment over Rs 50 lakhs, but these are used least as per the feedback of over 1 lakh students.

iii) 6 lakh feedback forms have been received by students.

After detailed deliberations on observations made by members and PI's response, PAB decided as follows:

1. **Continuation of the Virtual Labs project is agreed in principle. However a small group consisting of JS&FA,JS(TEL), and PI will examine the proposal further in detail.**
2. **Among other observations made by PAB, this group will examine deployment of a hub and spoke model and T2T mode - particularly for simpler experiments for much wider overreach. AICTE and UGC may be involved for making Virtual Labs as a part of the curriculum for all. Among the colleges targeted in phase II, all TEQIP colleges are to be included straightaway.**
3. **The recommendations of the Group may be put up in the next PAB meeting for consideration**.

3.2 Project : E-Yantra Robot Enhanced Teaching in Engineering Colleges - Phase-II.
***PI* : Prof.Kavi Arya**
Control No. : KR 13200 99887
Institute IIT, Bombay

Joint Secretary (TEL) and Mission Director NMEICT informed the members that the targets of Phase I of this project have been achieved. 16 labs were set up in Mumbai university colleges, as a part of the first phase.

Phase II of e-Yantra proposes to reach out to many more students, teachers, and colleges across the country to take the movement created in Phase I, of hands-on training and innovative thinking, to another level - putting our country on the world map of innovative education in embedded systems through project-based learning. PI from IIT Bombay (Dr Kavi Arya) informed that Phase II of the project aims to set up Robotics labs and train teachers in 500 colleges in 20-25 regions in 3 years.

While applauding the project conceptualization and approach, PAB members suggested that, out of 500 colleges targeted in Phase II, PI may first include all TEQIP colleges straightaway. The members also suggested that after Phase II, an exit option may be planned by PI for sustainability of the project at college/institution level after the NMEICT provided funds are over.

PAB approved the Phase-II of E-Yantra project with an estimated cost of Rs. 1709.60 Lakhs over 3 years.

3.3 Project : National Library and Information Services Infrastructure for Scholarly Content (N-LIST)
***PI* : Dr. Jagdish Arora,**
***Institute* : INFLIBNET, Ahmedabad**

Joint Secretary (TEL) and Mission Director NMEICT informed the members that N-LIST is a flagship programme of the Mission. Launched in 2010, the project provides access to more than 5,000 electronic journals and 97,000 electronic books to over 3,200 colleges through authentication mechanism set-up it the INFLIBNET Centre. Besides, the project also provides for access to Web of Science to 100 universities and 3,500 electronic journals to 55 CTIs under the cross subscription component of the project. Mission Director, however, informed the members that Rs. 100 crores allocated to the project during XI Plan Period has already been fully exhausted and funds could not allocated to the project for renewal of subscription to e-resources for the year 2013.

As such, in the present proposal, the PI has proposed a total budget requirement of Rs. 9102.40 lakhs for continuing the service during the calendar years 2013 and 2014. PAB Members discussed on whether to get this funding by making internal budget adjustments within MHRD as an alternate source of funding or take it to the Cabinet for approval of additional funds during XIIth Plan. It was, however, felt that the latter route will be very time consuming, and so an alternate mechanism for continuation of funding should be tapped for this type on ongoing activity.

On this subject, Adviser (Education), Planning Commission pointed out that "Expert Committee Constituted by the MHRD to Survey the Current Scenario of Library Consortia in India and to Explore the Possibilities of Joint Negotiations and Collaborative Services", has recommended that as a first step towards consolidation of consortia, three consortia, namely INDEST-AICT Consortium, UGC-INFONET Digital Consortium and N-LIST that are funded by the Ministry of HRD are brought under one umbrella through joint negotiation and ministry-level advisory committee. The Committee has also recommended that the N-LIST - currently running as a project -- should be recognized as a regular scheme of the MHRD and cross-subscription component of e-resources may be merged with the respective consortia, i.e. UGC-Infonet Digital Library Consortium (for universities) and INDEST-AICTE Consortium (for CTIs).

After detailed discussions and deliberations, it was agreed that the benefit of access to e-resources is most critical for teaching and research. Members noted that INDEST Consortium has not been able to cater to the e-resource requirements of new IITs and IISERs because of paucity of funds. As such, it was agreed that Joint Secretary (TEL) will take steps that are necessary for ensuring continuation of all N-LIST components in line with the recommendations made by the Expert Committee on Consortium constituted by the MHRD.

3.4 Project : NMEICT Dissemination & Publicity Campaign
***PI* : Mr. N. V. Reddy**
***Institute* : DAVP**

Joint Secretary (TEL) and Mission Director NMEICT apprised PAB members about the need for a systematic publicity and awareness campaign to be launched by the Mission for making its outcomes reach the far nook and corners of the country. For this, DAVP was approached to propose a media plan for popularizing the NMEICT modules available among the primary beneficiaries who are the students of higher educational institutions and their teachers. PI from DAVP (Mr. NV Reddy) then explained the dissemination and publicity campaign proposed by DAVP. To start with, DAVP will engage research

agencies for conducting a survey to assess the level of information available with the students about the resources available in the mission, and carry on setting up hoardings (approx. 20'x10' in dimension) for 12 months in 527 connected universities (NMEICT and NKN connected universities) in 2013-14 and 2014-15. In addition, DAVP will also use the popular websites for popularizing the mission as proposed by them.

PAB members unanimously agreed for the urgent need for NMEICT Dissemination & Publicity Campaign to be launched by the Mission. There was a suggestion for using social media too for publicity. However Joint Secretary (TEL) & Mission Director opined that a call can be taken on this after the survey exercise is completed by DAVP. It was also suggested that for deciding the contents on display hoardings, JS(TEL) will set-up a committee to recommend the same.

After deliberations, PAB approved sanction of Rs.1324.8 lakhs to DAVP for 3 activities during remaining part of 2013-14 and 2014-15 with break-up as follows:

i)	**For the assessment survey**	**Rs. 30.0 lakh**
ii)	**For setting up hoardings at 527 Universities for 12 months**	**Rs. 1264.8 lakh**
iii)	**For using the website**	**Rs. 30.0 lakh**

3.5 Project : NMEICT Dissemination and Awareness Activity through Deployment of Mobile e-learning Terminals (MeLT)-Phase: II.
***PI* : Dr. Vinod Kumar**
***Institute* : IIT, Roorkee**

JS(TEL) and Mission Director NMEICT explained to PAB that the present proposal from IIT Roorkee relates to Deployment of Mobile e-Learning Terminals (MeLT) for Dissemination and Awareness Activity as Phase II of their earlier completed project. Phase I of the Project was completed by IIT Roorkee along with associated network of Institutes, at a cost of Rs. 3 Crores with the objective of making available to the students in rural areas e-lectures and knowledge e-contents of their interest free-of-cost using Mobile e-Learning Terminals in 12 Vans/Buses.

PAB members discussed the pros and cons of continuation of the MeLT project to phase II. It was felt by some members that though the phase I of the project was well conceived at the time of its initiation, in the changed circumstances and rapid technological developments, putting more money into the project may not be justified. However final decision on the proposal may be based on recommendations of a committee with following members:

i) Joint Secretary (TEL) & Mission Director (NMEICT)
ii) Representative of Technical Education Bureau
iii) Representative of Higher Education Bureau
iv) Representative of Central University Bureau

The Committee will look into all aspects including assessment and usability of the present state of equipment and vans, further investment needed vis-à-vis the proposed deployment and the exploring distribution of existing equipment to interested institutions including new IITs. The recommendations of the Committee may be put up before the next PAB meeting for final decision.

3.6 Project : Report on Aakash
***PI* : Prof. D. B. Pathak**
***Institute* : IIT, Bombay**

PI from IIT Bombay Dr Phatak presented the updated report on Aakash, which was discussed and appreciated. Adviser (Higher Education) Planning Commission suggested that to further enhance the awareness and usage of Aakash tablets, extensive consolidation of Aakash tutorials through an exclusive Portal for community of Aakash users should be done. PI accepted the suggestion and promised that in next PAB meeting, this Portal will be showcased.

PI also suggested that to popularize and seek feedback on the project, all PAB members and NMEICT Consultants and staff may be given an Aakash tablet by IIT Bombay, for which JS(TEL) was requested to send the list of names to him.

The suggestion was accepted by PAB while accepting PI's report on Aakash.

Item No. 4

Release of Balance installments

PAB approved release of balance pending payments as follows:

Ref. No. to PAB Agenda item	Project	Amount approved for release (Rs. lakhs)
4.1	National Programme on Technology Enhanced Learning (NPTEL) Co-PI : Prof. Mangal Sunder, Institute Institute : IIT Madras	365.00
4.2	Virtual Lab (Remote Triggered Labs). Co-PI : Prof. Rajan Bose. Institute : IIT Delhi.	580.00
4.3	E-Yantra: Robot Enhanced Teaching of subjects in Engineering Colleges. PI : Prof. Kavi Arya Institute : IIT Bombay.	20.61
4.4	FOSSEE: Assimilation of Open Source Software in Science and Engineering Education. PI : Prof. Prabhu Ramachandran Institute : IIT Bombay	63.50
4.5	e-kalpa: Creating Digital Environment for Design in India. PI : Prof. Ravi Poovaiah Institute : IIT Bombay.	248.00
4.6	E-content generation and e-skilled test in specialized area of Information Technology. PI : Sri V. K. Sharma Institute : C-DAC, NOIDA.	18.00
4.7	Benchmarking of ICT modules in Physics & Chemistry. PI : Prof. R. K. Thareja, Prof. G Ramanathan. Institute : IIT Kanpur	101.00

Item No.5

Budget Estimate for TSG-EdCIL & Mission Secretariat of NMEICT for the Financial Year 2013-14

On the request of JS&FA, PAB resolved that issue may be examined by IFD on file. Accordingly, TEL Bureau will circulate file to IFD and take necessary approval.

Item No. 6

Amendments to the Budget Estimate of Mission Secretariat of NMEICT for the financial year 2012-13 of NMEICT.

The PAB noted the amendment in the overall value of Budget Estimates for the TSG/Mission Secretariat for financial year 2012-13 as **Rs 3.91 Crore**, which was typed as **Rs 3.19 Crore**, erroneously, in the Minutes of 24th meeting of Project Approval Board (PAB) held on 04.10.2012 and also noted the proposal to upload the said amendments to the Budget Estimate in the form of Corrigendum on Sakshat Portal along with the other Minutes of Project Approval Board (PAB).

Item No.7

Other items permitted by Chair

Apart from the specific agenda items listed, PAB Chairman and members also deliberated upon some common generic issues pertaining to NMEICT project as a whole, and noted the following for further action by the Mission:

1. Chairmen of AICTE and UGC may be requested to issue an "Advisory" to all engineering colleges under their control to adopt Blending Learning mode (NMEICT e-Content + conventional content existing) to be used by their faculty. Simultaneously, discussions may be held by Mission Director with concerned stakeholders for exploring compulsory usage of NMEICT e-Contents.

2. An integrated Portal for all NMEICT content may be created for students, as presently the Sakshat Portal contains a mix of administrative information as well as e-Content, and it's difficult to navigate the Sakshat Portal by students to access e-Content and Virtual Labs, etc. JS(TEL) informed that a proposal for an Integrated e-Content Portal for NMEICT recently submitted by INFLIBNET will be presented by the PI in the next meeting of the Standing Committee.

3. There is a need for a comprehensive review and updation of NPTEL content which was started 10 years ago, even before NMEICT project commenced.

The meeting ended with a Vote of Thanks to the Chair.

Annexure

Attendance of "Project Approval Board (PAB)" held on 21st November, 2013 at 11.00 a.m. Under National Mission on Education through Information & Communication Technology (NMEICT), Ministry of Human Resource Development at Conference Room No.112-C Wing (First Floor), Ministry of Human Resource Development, Shastri Bhawan, New Delhi.

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6.	Prof. Santosh Kumar, Director, Inter-University Consortium, IGNOU, New Dehli-1100068	Mob.No. :+91 9810012828 Email : spanda@ignou.ac.in
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S. No.	Name, Designation & Address	Phone No., Fax & Email
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18.	Dr. Saraswathi Krithivasan Programme Manager, e-yantra, Department of CSE, IIT, Bombay	Ph. : 80970-24114 Email : saraswathi@e-yantra.org
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20.	Dr. Jagdish Arora, INFLIBET Centre, Gandhinagar – 302007	Ph. : 079-23268201 Mob.No. : 09725051200 Email : jarora@inflibnet.ac.in Fax : 079- 23268111
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24.	Sh. Bibhuti Bhusan Sahoo Assistant Librarian IIT, Delhi	Ph. : 011-26531449 Mob.No. : +91 9818689555 Email : bibhuti@library.iitd.nic.in
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Appendix-II

Action Taken Report on the "Minutes of 26th Meeting of the Project Approval Board (PAB)" held on 21st November, 2013.

Appendix-II

ACTION TAKEN REPORT

ON THE MINUTES OF 26th MEETING OF PROJECT APPROVAL BOARD (PAB) OF NATIONAL MISSION ON EDUCATION THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY (NMEICT) HELD ON 21st NOVEMBER, 2013.

<table>
<tr><th>Item</th><th>Action Taken</th></tr>
<tr><td>Item No.1

Confirmation of the Minutes of the 25th Meeting of Project Approval Board

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB, invited observations from the members on the “Minutes of the 25th Meeting of the PAB.” Since all the members agreed and no observations on the same were received, the “Minutes of the 25th Meeting of the Project Approval Board held on 6th November, 2012” were confirmed.</td><td>--</td></tr>
<tr><td>Item No.2

“Action Taken Report” on the Minutes of the 25th Meeting of PAB.

Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary reported to PAB that action has been taken and completed as per the PAB’s decision in respect of the following 2 items:

<table>
<tr><th>S. No.</th><th>Subject/ Agenda item</th><th>Decision of PAB</th><th>Action Taken</th></tr>
<tr><td>1</td><td>Approval of Project related to e- content generation for 17 subjects in E&C by IIIT Hyderabad.</td><td>PAB approved the project with estimated amount of Rs 119 lakhs.</td><td>The first installment of Rs. 35.7 lakhs has been released to IIIT Hyderabad.</td></tr>
<tr><td>2</td><td>Approval of Project related to developing suitable pedagogical methods of IIT Kharagpur.</td><td>PAB approved the project with estimated budget of Rs 16 Crores.</td><td>The first installment of Rs. 4.63 Crores has been released to IIT Kharagpur.</td></tr>
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<table>
<tr><th>Item</th><th>Action Taken</th></tr>
<tr><td>
Joint Secretary (TEL) and Mission Director (NMEICT) & Member Secretary, PAB further informed the members that action in respect of following 3 items is under progress and the outcome will be presented in the next PAB meeting:
<table>
<tr><th>S.No</th><th>Subject/ Agenda item</th><th>Decision of PAB</th><th>Action Being Taken</th></tr>
<tr><td>1</td><td>Financial due diligence of "Talk to teachers" Project.</td><td>Create a model which is self sustaining. For this, a meeting with UGC, AICTE, NCTE and other partners to be conducted.</td><td>A Model will be worked out after conducting meeting with UGC, AICTE, NCTE and will be put in next PAB meeting.</td></tr>
<tr><td>2</td><td>Approval of Projects related to development of e-content related to geo informatics by IIT Mumbai.</td><td>PAB advised the along with the cost break up, project may be put for the examination in the next meeting.</td><td>Mission Secretariat will scrutinize the proposal and will put before the next PAB.</td></tr>
<tr><td>3</td><td>Approval of Project related to setting up of teaching ends for creating content for 50 DTH channels at the leading institution of the country.</td><td>i). PAB approved the project in principle, however observed that money may be released only after obtaining the NOC.
ii). SPV may be formed with consultation with UGC and AICTE.</td><td>Actions are being taken to obtain NOC for Ministry of I&B and other related organization and for forming SPV. PAB will be apprised about the outcome in the next meeting.</td></tr>
</table>
</td><td>--</td></tr>
</table>

Item	Action Taken
Item No.3 **Approval of New Proposals:** **3.1 Virtual Labs (Phase-II) by Mr. Ranjan Bose, IIT Delhi** JS (TEL) and Mission Director NMEICT apprised the members about this project, coordinated by IIT Delhi along with seven IITs and a few other educational institutions as collaborators. In the first phase of the project, 100 virtual labs have been created as against the target of 80 virtual labs. Towards outreach and dissemination, IIT Delhi has conducted workshops and created 65 nodal centers, which are located in various engineering college to ensure that the Virtual labs are being used by these engineering colleges. The PRSG has recommended the continuation of this project for which the Scale-up requires Phase II funds of Rs. 5623.44 lakhs with Maintenance and outreach as the major objectives. There was extensive discussions on the project by members. Some of the observations and issues of concern voiced by PAB members are listed below: 1. PI should concentrate on creation of virtual labs as a replacement option for only high cost lab equipment, say over Rs. 50 lakhs or Rs. 10 lakhs. PI should analyse such data about phase I virtual labs as an input for further consideration. 2. Dissemination and ensuring full use of Virtual Labs is presently lacking. 3. Whether evaluation has been done by external agencies? 4. What is the roadmap for spreading and disseminating the use of Virtual Labs over time? 5. How many experiments actually got 1conducted? 6. What has been the effect of this Project on employability of engineering students? Has any study been done? 7. Exploring the leverage of private sector wide-spread dissemination of the project and user promotion. Present proposal for reaching out to just 236 colleges in 2 years is unacceptable in terms of reach desired. 8. Involving all TEQIP colleges straightaway in phase II to be incorporated.	**Separate Item (Agenda Item No. 9 / Page: 42 to 45) is included on Virtual Labs (Phase-II).**

Item	Action Taken
9. Involving AICTE and UGC for making Virtual Labs as a part of the curriculum for all. PI from IIT Delhi (Prof Ranjan Bose) responded partially to some of above observations as follows: i) Students are more excited about basic experiments rather than complex high cost equipment labs, because the sample results and reports on basic experiments are easier for them to comprehend. ii) Virtual Labs are of value when used outside normal college lab hours and on holidays. Only about 7-10% labs correspond to equipment over Rs 50 lakhs, but these are used least as per the feedback of over 1 lakh students. iii) 6 lakh feedback forms have been received by students. **After detailed deliberations on observations made by members and PI's response, PAB decided as follows**: **1. Continuation of the Virtual Labs project is agreed in principle. However a small group consisting of JS&FA, JS(TEL), and PI will examine the proposal further in detail.** **2. Among other observations made by PAB, this group will examine deployment of a hub and spoke model and T2T mode - particularly for simpler experiments for much wider overreach. AICTE and UGC may be involved for making Virtual Labs as a part of the curriculum for all. Among the colleges targeted in phase II, all TEQIP colleges are to be included straightaway.** 3. **The recommendations of the Group may be put up in the next PAB meeting for consideration**.	
3.2 E-Yantra Robot Enhanced Teaching in Engineering Colleges - Phase-II by Prof. Kavi Arya, IIT, Bombay Joint Secretary (TEL) and Mission Director NMEICT informed the members that the targets of Phase I of this project have been achieved. 16 labs were set up in Mumbai university colleges, as a part of the first phase. Phase II of e-Yantra proposes to reach out to many more students, teachers, and colleges across the country to take the movement created in Phase I, of hands-on training and innovative thinking, to another level - putting our country on the world map of innovative education in embedded systems through project-based learning. PI from IIT Bombay (Dr Kavi Arya) informed that Phase II	**30% of Rs 17.09 Crore has been released as first installment to the IIT Bombay for implementation of the Project.**

Item	Action Taken
of the project aims to set up Robotics labs and train teachers in 500 colleges in 20-25 regions in 3 years. While applauding the project conceptualization and approach, PAB members suggested that, out of 500 colleges targeted in Phase II, PI may first include all TEQIP colleges straightaway. The members also suggested that after Phase II, an exit option may be planned by PI for sustainability of the project at college/institution level after the NMEICT provided funds are over. **PAB approved the Phase-II of E-Yantra project with an estimated cost of Rs. 1709.60 Lakhs over 3 years.**	
3.3 National Library and Information Services Infrastructure for Scholarly Content (N-LIST) by Dr. Jagdish Arora, INFLIBNET, Ahmedabad. Joint Secretary (TEL) and Mission Director NMEICT informed the members that N-LIST is a flagship programme of the Mission. Launched in 2010, the project provides access to more than 5,000 electronic journals and 97,000 electronic books to over 3,200 colleges through authentication mechanism set-up it the INFLIBNET Centre. Besides, the project also provides for access to Web of Science to 100 universities and 3,500 electronic journals to 55 CTIs under the cross subscription component of the project. Mission Director, however, informed the members that Rs. 100 crores allocated to the project during XI Plan Period has already been fully exhausted and funds could not allocated to the project for renewal of subscription to e-resources for the year 2013. As such, in the present proposal, the PI has proposed a total budget requirement of Rs. 9102.40 lakhs for continuing the service during the calendar years 2013 and 2014. PAB Members discussed on whether to get this funding by making internal budget adjustments within MHRD as an alternate source of funding or take it to the Cabinet for approval of additional funds during XIIth Plan. It was, however, felt that the latter route will be very time consuming, and so an alternate mechanism for continuation of funding should be tapped for this type on ongoing activity.	**It has been decided that separate Budget Head for e-resources will be created in the TEL Bureau.**

Item	Action Taken
On this subject, Adviser (Education), Planning Commission pointed out that "Expert Committee Constituted by the MHRD to Survey the Current Scenario of Library Consortia in India and to Explore the Possibilities of Joint Negotiations and Collaborative Services", has recommended that as a first step towards consolidation of consortia, three consortia, namely INDEST-AICT Consortium, UGC-INFONET Digital Consortium and N-LIST that are funded by the Ministry of HRD are brought under one umbrella through joint negotiation and ministry-level advisory committee. The Committee has also recommended that the N-LIST -- currently running as a project -- should be recognized as a regular scheme of the MHRD and cross-subscription component of e-resources may be merged with the respective consortia, i.e. UGC-Infonet Digital Library Consortium (for universities) and INDEST-AICTE Consortium (for CTIs). **After detailed discussions and deliberations, it was agreed that the benefit of access to e-resources is most critical for teaching and research. Members noted that INDEST Consortium has not been able to cater to the e-resource requirements of new IITs and IISERs because of paucity of funds. As such, it was agreed that Joint Secretary (TEL) will take steps that are necessary for ensuring continuation of all N-LIST components in line with the recommendations made by the Expert Committee on Consortium constituted by the MHRD.**	
3.4 NMEICT Dissemination & Publicity Campaign by Mr. N. V. Reddy, DAVP. Joint Secretary (TEL) and Mission Director NMEICT apprised PAB members about the need for a systematic publicity and awareness campaign to be launched by the Mission for making its outcomes reach the far nook and corners of the country. For this, DAVP was approached to propose a media plan for popularizing the NMEICT modules available among the primary beneficiaries who are the students of higher educational institutions and their teachers. PI from DAVP (Mr. NV Reddy) then explained the dissemination and publicity campaign proposed by DAVP. To start with, DAVP will engage research agencies for conducting a survey to assess the level of information available with the students about the resources available in the mission, and carry on setting up hoardings (approx. 20'x10' in dimension) for 12 months in 527 connected	**30% of the project cost has been released as the first installment to DAVP.**

Item	Action Taken
universities (NMEICT and NKN connected universities) in 2013-14 and 2014-15. In addition, DAVP will also use the popular websites for popularizing the mission as proposed by them. PAB members unanimously agreed for the urgent need for NMEICT Dissemination & Publicity Campaign to be launched by the Mission. There was a suggestion for using social media too for publicity. However Joint Secretary (TEL) & Mission Director opined that a call can be taken on this after the survey exercise is completed by DAVP. It was also suggested that for deciding the contents on display hoardings, JS(TEL) will set-up a committee to recommend the same. **After deliberations, PAB approved sanction of Rs.1324.8 lakhs to DAVP for 3 activities during remaining part of 2013-14 and 2014-15 with break-up as follows:** **i). For the assessment survey : Rs. 30.0 lakh** **ii). For setting up hoardings at 527 Universities for 12 months : Rs. 1264.8 lakh** **iii). For using the website : Rs. 30.0 lakh**	
3.5 NMEICT Dissemination and Awareness Activity through Deployment of Mobile e-learning Terminals (MeLT)-Phase: II by Dr. Vinod Kumar, IIT, Roorkee. JS(TEL) and Mission Director NMEICT explained to PAB that the present proposal from IIT Roorkee relates to Deployment of Mobile e-Learning Terminals (MeLT) for Dissemination and Awareness Activity as Phase II of their earlier completed project. Phase I of the Project was completed by IIT Roorkee along with associated network of Institutes, at a cost of Rs. 3 Crores with the objective of making available to the students in rural areas e-lectures and knowledge e-contents of their interest free-of-cost using Mobile e-Learning Terminals in 12 Vans/Buses.	**It is proposed to hand over the vans to IGNOU.**

Item	Action Taken
PAB members discussed the pros and cons of continuation of the MeLT project to Phase II. It was felt by some members that though the phase I of the project was well conceived at the time of its initiation, in the changed circumstances and rapid technological developments, putting more money into the project may not be justified. However final decision on the proposal may be based on recommendations of a committee with following members: i) Joint Secretary (TEL) & Mission Director (NMEICT) ii) Representative of Technical Education Bureau iii) Representative of Higher Education Bureau iv) Representative of Central University Bureau **The Committee will look into all aspects including assessment and usability of the present state of equipment and vans, further investment needed vis-à-vis the proposed deployment and the exploring distribution of existing equipment to interested institutions including new IITs. The recommendations of the Committee may be put up before the next PAB meeting for final decision.**	
3.6 Report on Aakash by Prof. D. B. Pathak, IIT, Bombay. PI from IIT Bombay Dr Phatak presented the updated report on Aakash, which was discussed and appreciated. Adviser (Higher Education) Planning Commission suggested that to further enhance the awareness and usage of Aakash tablets, extensive consolidation of Aakash tutorials through an exclusive Portal for community of Aakash users should be done. PI accepted the suggestion and promised that in next PAB meeting, this Portal will be showcased. PI also suggested that to popularize and seek feedback on the project, all PAB members and NMEICT Consultants and staff may be given an Aakash tablet by IIT Bombay, for which JS(TEL) was requested to send the list of names to him. **The suggestion was accepted by PAB while accepting PI's report on Aakash.**	**Noted.**

Item	Action Taken
Item No. 4 **Release of Balance installments.** **PAB approved release of balance pending payments as follows:**	**Balance amount has been released to the respective projects.**

Ref. No. to PAB Agenda item	Project	Amount approved for release (Rs. lakhs)
4.1	National Programme on Technology Enhanced Learning (NPTEL) Co-PI : Prof. Mangal Sunder, Institute Institute : IIT Madras.	365
4.2	Virtual Lab (Remote Triggered Labs). Co-PI: Prof. Rajan Bose. Institute: IIT Delhi.	580
4.3	E-Yantra: Robot Enhanced Teaching of subjects in Engineering Colleges. PI : Prof. Kavi Arya Institute: IIT Bombay.	20.61
4.4	FOSSEE: Assimilation of Open Source Software in Science and Engineering Education. PI : Prof. Prabhu Ramachandran Institute : IIT Bombay.	63.50
4.5	e-kalpa: Creating Digital Environment for Design in India. PI : Prof. Ravi Poovaiah Institute: IIT Bombay.	248
4.6	E-content generation and e-skilled test in specialized area of Information Technology. PI : Sri V. K. Sharma Institute: C-DAC, NOIDA.	18
4.7	Benchmarking of ICT modules in Physics & Chemistry. PI : Prof. R. K. Thareja, Prof. G Ramanathan. Institute : IIT Kanpur.	101

Item	Action Taken
Item No.5 **Budget Estimate for TSG-EdCIL & Mission Secretariat of NMEICT for the Financial Year 2013-14.** On the request of JS&FA, PAB resolved that issue may be examined by IFD on file. Accordingly, TEL Bureau will circulate file to IFD and take necessary approval.	**Noted.**
Item No. 6 **Amendments to the Budget Estimate of Mission Secretariat of NMEICT for the financial year 2012-13 of NMEICT.** The PAB noted the amendment in the overall value of Budget Estimates for the TSG/Mission Secretariat for financial year 2012-13 as **Rs 3.91 Crore**, which was typed as **Rs 3.19 Crore**, erroneously, in the Minutes of 24th meeting of Project Approval Board (PAB) held on 04.10.2012 and also noted the proposal to upload the said amendments to the Budget Estimate in the form of Corrigendum on Sakshat Portal along with the other Minutes of Project Approval Board (PAB).	**Noted.** The amendment as Rs. 3.91 Crore in the overall value of the Budget Estimate for the TSG/Mission Secretariat for financial year 2012-13 has been uploaded in the form of Corrigendum on Sakshat Portal along with the other Minutes of Project Approval Board (PAB), since the overall value of Budget Estimate was erroneously typed as Rs 3.19 Crore in the Minutes of 24th meeting of Project Approval Board (PAB) held on 04.10.2012.

Item	Action Taken
Item No.7 **Other items permitted by Chair** Apart from the specific agenda items listed, PAB Chairman and members also deliberated upon some common generic issues pertaining to NMEICT project as a whole, and noted the following for further action by the Mission: 1. Chairmen of AICTE and UGC may be requested to issue an "Advisory" to all engineering colleges under their control to adopt Blending Learning mode (NMEICT e-Content + conventional content existing) to be used by their faculty. Simultaneously, discussions may be held by Mission Director with concerned stakeholders for exploring compulsory usage of NMEICT e-Contents. 2. An integrated Portal for all NMEICT content may be created for students, as presently the Sakshat Portal contains a mix of administrative information as well as e-Content, and it's difficult to navigate the Sakshat Portal by students to access e-Content and Virtual Labs, etc. JS(TEL) informed that a proposal for an Integrated e-Content Portal for NMEICT recently submitted by INFLIBNET will be presented by the PI in the next meeting of the Standing Committee. 3. There is a need for a comprehensive review and updation of NPTEL content which was started 10 years ago, even before NMEICT project commenced.	**1. Both UGC and AICTE have been addressed in this regard.** **2. Separate Item (Agenda Item No. 3/ Page: 13 to 22) is included on Integrated Portal.**

Appendix-III

Detailed Project Report (DPR) on “Integrated e-Content Portal”.

Integrated e-Content Portal
Project Proposal Submitted to the Ministry of Human Resource Development under the National Mission on Education through ICT
(Control No.: AEC1411201313068)

PI: Dr. Jagdish Arora
Director, INFLIBNET Centre
Infocity, Gandhinagar, Gujarat

Detail Project Report

1. Objectives

The objectives of the proposed project are as follows:

- Completed / frozen e-content (projects) so as to host them into single search web-based platform;
- Assign metadata to all modules of e-content with links, inter-links and cross-links to relevant e-modules developed under the NME-ICT initiative;
- Map syllabi / model curriculum of UGC / AICTE with the e-modules developed under the Mission;
- Develop user friendly single search and browse interface for all e-content (e-modules / reading material), developed under NME-ICT, MHRD;
- Adopt digital preservation strategies to ensure long-term availability of e-content developed under the NME-ICT;
- Select and host other relevant e-modules available in open access;
- Make e-content available to students and peers using different delivery modes to impart formal and informal education for supplementing and complementing the process of teaching and learning in higher education; and
- Promote usage of e-content amongst students and peer.

2. Methodology

Methodology proposed to be used for putting together on Integrated e-Content Portal would be as follows:

i) The INFLIBNET Centre would acquire e-content with all accompanied material in its generic formats from PIs of the NME-ICT projects.
ii) After receiving content, the Centre would analyse the content for their types, formats, volume, etc.
iii) These e-content would be shaped so that adaptive bitrate streaming technique can be used for delivery of video content;
iv) Upload content into a development server.

v) Metadata creation for each content with the help of subject experts;

vi) A search and browse interface will be develop to support search and navigation of e-content through single search box. The interface would provide add-on features such as assign metadata to each module of e-content with links, inter-links and cross-links to other e-modules, map syllabi / model curriculum of UGC / AICTE with the e-modules.

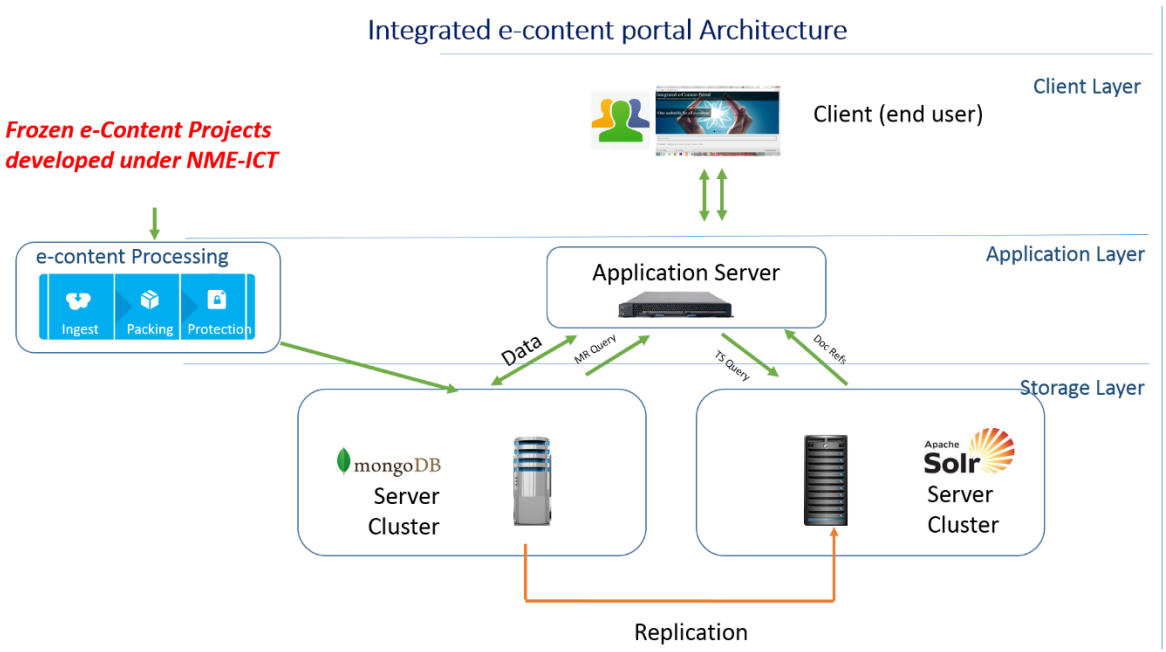
vii) The intensive testing of interface and transfer of e-content onto production server as a beta site of the project;

viii) Once all e-content developed under NME-ICT are successfully uploaded with all associated activities, the Centre would select and host other relevant e-modules available in open access and also enrich them with additional quadrants wherever applicable.

Note: Designing of portal and appropriate meta-data schema shall involve PRSG including Prof Uma Kanjilal, Mr. Pradeep Varma and some of the members from list of reviewer / experts provided by PI in proposal.

2.1 Infrastructural Solution

It is proposed to use three layered / tier architecture given in below figure



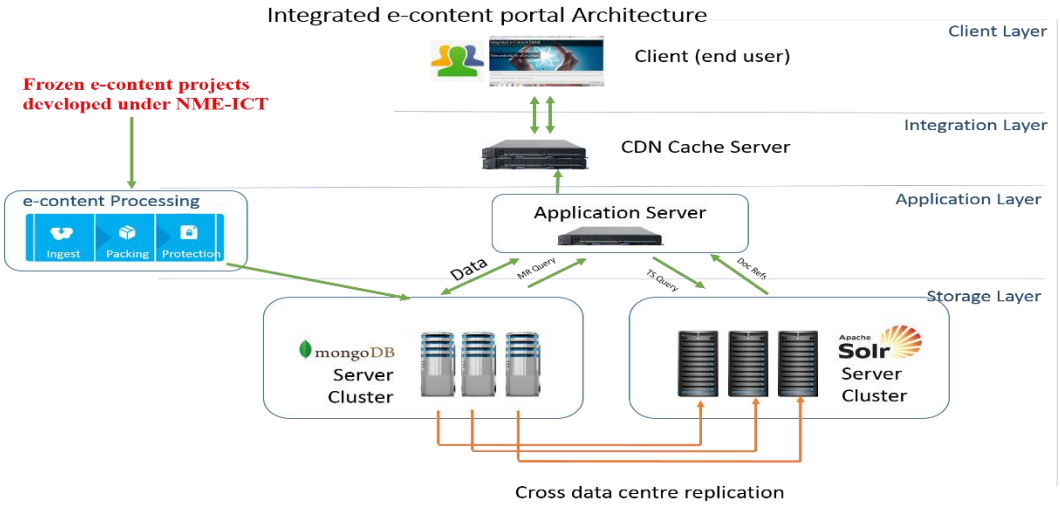
Client Layer (Presentation tier): This layer will be accessible directly by users such as search and browse interface.

Application Layer (Middle tier / business logic): The logical tier controls an application's functionality by performing detailed processing.

Storage Layer (Data tier): This tier will consist of database servers to store the content as well as indexed data.

2.2 Future Infrastructural Solution

When volume of content as well as no of users will become more then it is propose to use n-tier architecture given below:



3. Deliverables year wise and its possible contribution to major objectives of mission

Activity	Timeline	Remarks
Acquire data / content from different project's PIs	6 Months	It may vary due to dependency on other Institute
Analysis on received data to shape it	8 Months	
Upload content on development server	8 Months	
Assign metadata to each e-content module	9 Months	
Design and develop interface for search and browse	6 Months	
Creation / Testing of content	4 Months	
Hosting of e-content at production server (Beta version of site)	5 Months	

4. Time schedule (Year-wise)

The project is proposed for one year to integrate all content into a single platform and provide search browse interface. It is ongoing task because many e-content projects being developed.

		----------Months----------											
Sl. No	**Activity**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
01	Acquire data / content from different project's PIs												
02	Analysis on received data and its reformatting												
03.	Upload content on development server												
04	Assign metadata to each e-content module												
05	Design and develop interface for search and browse												
06	Creation / Testing of content												
07	Hosting of e-content at production server (Beta version of site)												

5. Details of Permanent Assets to be Procured from the Project with Estimated Cost

Item	**No of Item**	**Rate / Unit (Rs in Lakh)**	**Total (Rs in Lakh)**	**Remarks**
Development Server	2	3.50	7.00	
Non linear editing Machine			5.00	
Workstation / Laptop / Multimedia Desktop /PC / Printer / Scanner			20.00	
		Total	**32.00**	

6. Details of Financial Outlay in Year for Recurring and Non-recurring Funds

Budget Summary	
Financial Year	**Proposed Amount (Rs in Lakhs)**
2014-15	106.76
2015-16	28.23
2016-17	30.55
2017-18	32.10

Sl No	Item	Amount (Rs in Lakhs)
One Time Charge		
01	Non-recurring	52.00
Annual Recurring Charges		
01	Recurring + manpower	54.76
		Total:- 106.76

7. Management of Deliverables & IPR etc.

It is expected that besides e-content few software tools may be developed during the process of execution of this project. Software tools and e-content thus developed will be made available as open source software for the benefit of academic community at large.

8. Justification of the Projection and its Contribution towards Mission Objectives

In the current scenario, the e-contents projects developed under the NME-ICT are distributed on the websites of Institutions of respective PIs in varied types, formats and size. Moreover, some completed / frozen e-content projects do not have the web presence. Content creation and its delivery could be done using a robust web-based platform accompanied with a back-end database to facilitate effective content development and deployment. A user can draw maximum advantage from the digital contents if they are available through a single platform that facilitate search and browse of all the content with provision to track usages. Besides, user will also able to personalized learning experience with provision for "my account" / "my space" which will facilitate creation of his/her own bouquet of courses across the portal.

As such, it is essential to host all content into one single platform and apply basic tenets of preservation for digital content and implement standard metadata schema of different types for the digital content, so as to ensure their long-term availability. Moreover, in this age of inter-disciplinary research & education e-contents developed in a given subject may also be useful to the students of other subjects/disciplines. As such, all e-modules should be interlinked to each other, wherever required, so as to increase the possibility of their discovery to a learner. It is envisaged that the usability of content developed under NME-ICT would increase once all the e-contents are available through a single platform with multiple methods to search and browse these contents.

The web-based platform proposed to be developed would provide facility to search and browse all hosted content wherein a learner can easily access the desired material including audio/video learning material, textual material, multimedia enriched materials etc. through a single interface. Specific functionality that would be supported by integrated e-content portal would be as follows:

- Support for text, audio, video, animation and graphics.
- Suitable metadata schema and taxonomy with facilities to tag content type, language, level of content (PG / UG), etc.
- Support faceted search mechanism;
- Support role-based log-ins for content creators, users, etc.
- Support multiple end user platforms like Windows based PC, Linux based, Android based tablets etc.
- Support qualitative assessment of content through rating mechanism by the users and reviewing mechanism by experts.
- Support workflow based mechanism for moderation of uploaded content.
- Analytics and reporting including detailed usage statistics of e-content including number of registered users, no. of download, content view / downloaded and geographical location of users.
- Asynchronous and synchronous messaging system between learners and experts including email, chat, discussion forum, etc.
- Personalized learning experience with provision for "my account" / "my space".
- Feedback and reporting mechanism
- Collaborative platform for site management, user management, wiki module for users and peer's feedback, etc.
- Software application hosting on platform developed under NME-ICT

Summary of DPR - with Suggested Strategies

Name of the Project: Integrated e-Content Portal
Control No.:
Name of PI(s): Dr. Jagdish Arora, Director, INFLINET Centre, Gandhinagar
Co-PI: Mr Yatrik Patel, Scientist-D, INFLIBNET Centre
Mr Abhishek Kumar, Scientist-C, INFLIBNET Centre

Name of the Institute(s): INFLINET Centre, Gandhinagar

1. Objectives

The objectives of the proposed project are as follows:

- Completed / frozen e-content (projects) so as to host them into single search web-based platform;
- Assign metadata to each module of e-content with links, inter-links and cross-links to other e-modules developed under the NME-ICT initiative;
- Map syllabi / model curriculum of UGC / AICTE with the e-modules developed under the Mission;
- Develop user friendly single search and browse interface for all e-content (e-modules / reading material), developed under NME-ICT, MHRD;

- Adopt digital preservation strategies to ensure long-term availability of e-content developed under the NME-ICT;
- Select and host other relevant e-modules available in open access;
- Make e-content available to students and peers using different delivery modes to impart formal and informal education and for supplementing and complementing the process of teaching and learning in higher education; and
- Promote usage of e-content amongst students and peer.

2. Deliverables year wise and its possible contribution to major objectives of mission

Activity	Timeline	Remarks
Acquire data / content from different project's PIs	6 Months	It may vary due to dependency on other Institute
Analysis on received data and its reformatting	8 Months	
Upload content on development server	8 Months	
Assign metadata to each e-content module	9 Months	
Design and develop interface for search and browse	6 Months	
Creation / Testing of content	4 Months	
Hosting of e-content at production server (Beta version of site)	5 Months	

3 (i). Arrangements for Quality Control

It is proposed to involved subject experts to create metadata for each e-module to ensure quality control. A platform would be developed to ensure its robustness and long term support from user community.

The platform itself would be user-friendly which incorporate the features of user management, site management, module management. Different kind of graphs representation which would show user statistics, access of content in terms of geographical location, download, view, etc

3(ii). Accuracy

All content are developed by experts in their respective discipline that are duly reviewed by the peers. Moreover, discrepancies, if any, could be pointed out by the users and would be promptly attended to.

3(iii). Coverage

The project proposes to host all e-content, developed under NME-ICT, into a single web-based platform.

3(iv). Updation Mechanism

It is proposed to set up a panel of experts to identify e-content, available under common creative license. These identified e-content would be incorporated / uploaded into server. The feedback from users and subject experts would also act as a mechanism to update the content as and when required. Requisite Wiki-like interfaces can be built into portal for this purpose.

3(v). Testing by Users

As mentioned above, e-content would be made available in open access through the proposed integrated portal for testing by the end users. The feedback obtained from users would be duly incorporated. The platform would also provide the survey features where learner can participate in survey.

3 (vi). Testing by Peer Group

The integrated portal once launched would be open up for use and testing to be entire academic community for testing and review. Specific request would also be sent to members of Standing Committee, Project Approval Board of NME-ICT to visit the site and use it extensively and provide their feedback.

4. Scaling-up

4 (a). Plan: It is proposed to develop web-based, database driven platform for integrated e-content portal. Addition of e-content available on open access would be incorporate in 2nd phase of development.

4 (b) i) **Strategy (in-house)**: There would be two team comprises of technical persons. One team will be involved in development of web-based platform including configuration of video streaming server and another team will work of acquiring of data and creation of metadata with the help of subject experts.

ii) **Outsourcing**: In 2nd phase of development, the Centre may involve multimedia teams to outsource to enrichment of content with animation / graphics /multimedia.

5. Popularisation and Extension Activities and Plan

The project provides for organization of workshops / conferences at local / regional / national level. Such workshops would be organized by INFIBNET in universities and colleges along with its regular e-resource awareness programme. Advertisement in INFLIBNET newsletter, Newspapers and in University News would also be given to popularize use of e-content platform through this project.

5(a). Strategy for popularisation

Use of e-content will be encouraged through refresher's course offered in Academic Staff Colleges. Faculty in colleges and universities would be instructed to ask questions based on e-content available for a given course / paper.

5(b). Extension of Activities and Plan

Enriched additional reading material, available in open access, for each subjects.

5(b)-i. Maintenance

The interface would be maintained and updated through feedback mechanism.

5(b)-ii. User Feedback Mechanism

The feedback from the users would be invited through Web-based interface made available through the content website. Moreover, asynchronous and synchronous messaging system between learners and experts including email, chat, discussion forum, etc would be created to enable end-users to interact with course coordinators.

6. Review Mechanism

6(a). Frequency of Review

Content hosting activities will be reviewed as frequently as required. However, quarterly review will be ensured.

6(b). List of at least 10 Reviewers

i) Prof. Uma Kanjilal, School of Library and Information Science, IGNOU, New Delhi
ii) Prof. Karmeshu, School of Computer and System Science, Jawaharlal Nehru University, New Delhi
iii) Prof. Mangala Sundar Krishnan, Deptt. of Chemistry, IIT Madras, Chennai
iv) Prof. Huzur Saran, Deptt. of Computer Science and Engineering, IIT Delhi
v) Prof. J.P. Gupta, Vice Chancellor, Sharada University, Greater Noida
vi) Prof. Savita Gandhi, Deptt of Computer Science, Gujarat University, Ahmedabad

vii) Shri R.K. Chauhan, Principal Scientific Officer, Computer Science, IIT Delhi
viii) Shri R.S. Mani, National Informatics Centre, New Delhi
ix) Shri H. Anil Kumar, Chief Librarian, IIM Ahmedabad
x) Shri T.S. Kumbar, Chief Librarian, IIT Gandhinagar

7. Budget

Budget Summary	
Financial Year	**Proposed Amount (Rs in Lakhs)**
2014-15	106.76
2015-16	28.23
2016-17	30.55
2017-18	32.10

7(a). Capital Expenditure: Rs. 52.00 lakhs

7(a-i). Item-wise Details

Item	No of Item	Rate / Unit (Rs in Lakh)	Total (Rs in Lakh)	Remarks
Production Server (Blade Server)	--	--	--	To be facilitated by NME-ICT (Centralize server)
Development Server	2	3.50	7.00	
Non linear editing Machine			5.00	
Redundant Server	--	--	--	At NME-ICT Centralized server
Workstation / Laptop / Multimedia Desktop /PC / Printer / Scanner			20.00	
Multimedia Software			10.00	License / purchase
Generic format of e-content		10.00	10.00	Enabling content for seamless streaming (adaptive bitrate),webpages for textual materials, etc
		Total	**52.00**	

7(a-ii) Focused Comments on High-cost Equipment

It is proposed to purchase development servers with high storage capacity and built-in redundancy for storing storage-intensive, video based, multimedia e-content.

7(b). Revenue Expenditure: Rs. 54.76 lakhs

7(b-i). Item-wise Details

a) Recurring Expenses

Item	Total (Rs in Lakh)	Remarks
Remuneration for meta-data assignment work	5.00	To create meta-data of different subjects
Data Hosting charges including redundant bandwidth	00.00	To be hosted at SAKSHAT
Travel, contingency	5.00	
Consumables and Stationery	2.00	
Printing of Brochures & Pamphlets + Miscellaneous	4.00	
Total	**16.00**	

b) Manpower

Manpower Requirement		
Position	**No**	**Rupees in Lakhs**
Senior Project Scientist	1	3.00
Project Scientist	4	10.80
Sr Project Associate	6	12.96
Project Associate	6	10.80
Office Attendant	1	1.20
Total Expenditure on Manpower		**38.76**

7(b-ii) Focused Comments on:

Total Honorarium to be Paid in the Project: As per NME-ICT guidelines
Total Consultancy Fee to be Paid during the Project: As per NME-ICT guidelines

7(c). Anchor Institution for Disbursement of Funds

INFLIBNET Centre, Gandhinagar, Gujarat

8. Cost Benefit Analysis

The content uploaded with graphical user search and browse interface would be available to all universities and colleges in India as well all over the world at a total proposed cost of Rs. 107.00 lakhs. This will have a great impact of quality of education and teaching, learning process.

9. Social Impact

The project would essentially enable every college and university students to access scholarly content free-of-cost. The project would provide access to e-content, developed under the NME-ICT projects in different subject disciplines. Easy access to qualitative and scholarly content would bring in a new cultural of referencing and consultation in the learning process. Access to qualitative e-resources to college students would improve the learning and teaching process. As such, there would be a remarkable improvement in the quality of students coming out of colleges and universities, which, in turn, will increase their employability and over all personality.

10. Outcome: Extent to which the Project will Realize the Objectives of the Mission

The project would contribute in the process of development of information enriched society. Continuation of project would result in development of additional course content. The project would successful bridge the digital divide and would help in the nation move towards information-rich society.

Part-VI Document Uploaded

i) DPR

Appendix-IV

Detailed Project Report (DPR) on "Utilisation of NMEICT Products in State Technical Universities in the Southern Region".

Participation in NMEICT and Utilisation of its Products by the Technical Universitiesin the Southern Region

Sub-Project

Products and Services directly implemented by NITTTR, Chennai

सत्यमेव जयते
NMEICT

A Proposal submitted to
Ministry of Human Resource Development,
Government of India

By

National Institute of Technical Teachers Training and Research,
Taramani, Chennai – 600 113

March 2014

CONTENTS

SUMMARY AND APPROVAL REQUEST

1	**Name of the Institution making the proposal**	:	**National Institute of Technical Teachers Training and Research, Chennai**
2	**Name of the Project**	:	MHRD Project on "Participation in NMEICT and Utilization of its Products for the Technical Universities"
3	**Reference**	:	MoU dated 28.01.2014 signed between NITTTR, Chennaiand 8 STUs
4	**Total number of technical universities participating in the project**	:	8
5	**Total number of engineering colleges participating in the project**	:	483
6	**Total number of teachers in the participating institutions**	:	16231
7	**Total number of teachers to be provided with access device**	:	9528 (Based on maximum 100 per institution)
8	**Total number of teachers to be trained with ICT tools in teaching**	:	450 (Master Trainers) and subsequently 9000 faculty members in three years.
9	**Total number of students in the participating institutions**	:	243965
10	**Total cost of the project as proposed by NITTTR, Chennai from NMEICT**	:	**Rs. 6117.1 lakhs**

Date:

Director
National Institute of Technical Teachers
Training and Research, Chennai

BACKGROUND INFORMATION:

1.1 Rationale:

The National Mission on Education through Information and Communication Technology (NMEICT) is an initiative of the MHRD, Govt. of India, which aims at providing a wide range of educational services to higher education particularly technical education. The project aims at providing and meeting the challenge for our higher education system in leveraging the learning sciences and modern technology that mirror learners reality of their future. A core set of standard based concepts and competencies form the basis of what students learn and in turn what teachers should teach. The pivotal point is any-time availability of desired knowledge at appropriate levels of comprehension at the door step of the learners. The components of the NMEICT is to place the learners at the center and empower them to take control of their own learning by providing flexibility on several dimensions. The various products of NMEICT have been developed by experts from IITs and IISc who have expertise in the respective content. NITTTR Chennai with its established rapport and reach with the Technical Education System in the Southern Region has the unique strength of providing the needed outreach for the NMEICT products developed by various experts. The Faculty of NITTTR Chennai will play needed facilitators' role for making the Teachers ICT enabled and make effective use of NMEICT products for their classroom Teaching and Assessment.

The important role of NITTTR in this project is envisaged to (a) Roll out the projects of NMEICT (b) Sensitization and training programs of the NMEICT Products (c) Training programme on educational technology, (d) Monitoring the progress made in the project and (e) quantify the impact made through technology enabled teaching and learning. The components of the project is shown in figure 1 which is rolled out in the MoU signed between the technical universities and MHRD through the extended arm NITTTR Chennai.

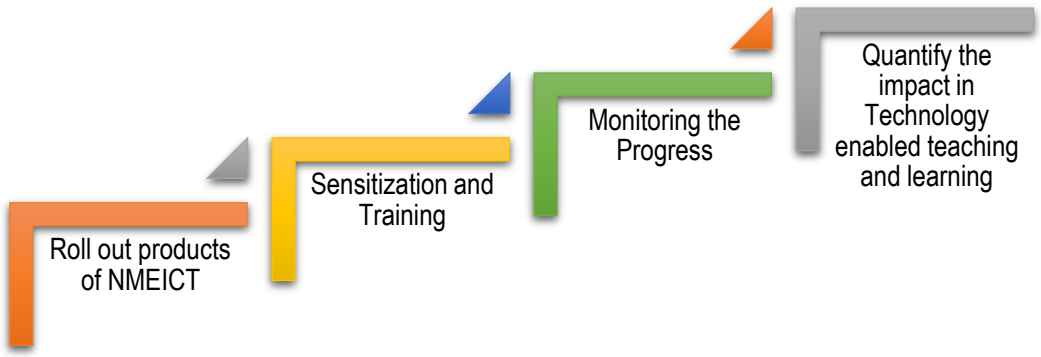


Figure 1: NITTTR in Roll out of NMEICT Products

The rollout of NMEICT products in the technical institutions need to be implemented with utmost care, since it is going to provide paradigm shift and redefine the teaching learning process. NMEICT project already created great impact in the higher education arena through their unique products, which ensure learning take place in

any place. To its credit well established connectivity to reach the mass, and inculcate the culture of ICT is well in place. In order to ensure the optimal value and reach the entire society this MoU and subsequent project proposal will derive the required funding from NMEICT. This project investment focusses towards distribution and dissemination of the NMEICT project. Without this, the large amount of investment made towards the project will go waste, without any major benefit to the education system in the country. The concept of MoU and rolling out is placed in right time to improve the knowledge economy through enhanced connectivity. This reinvented role will ensure the effectiveness. NITTTR will spearhead the rolling out activities to ensure proper development of knowledge society. The components of the NMEICT are given in Table 1.

Table - 1: Components of the NMEICT

S. No.	Component	Description	Category
1.	Internet Access to institutions	Provides internet access to technical institutions at speeds ranging from 10 Mbps to 1 Gbps	Augmenting Infrastructure
2.	Affordable Access device / Computers	Provides Tablets / Laptops for working in a Wi-Fi environment for ready access of NMEICT resources	Augmenting Infrastructure
3.	Setting up of e-Classroom	A classroom with access to internet, computers, projection facilities, audio facilities and appropriate seating for the conduct of Virtual classroom using A-view and for the use of all the products and deliverables developed under NMEICT	Augmenting Infrastructure
4.	NPTEL	Consists of large number of Web and Video resources on topics in science, engineering and technology delivered by experts, suitable for undergraduate curriculum	e-Learning resource
5.	Virtual Lab	Provides remote access to labs in various disciplines of science and engineering to learn basic and advanced concepts through remote experimentation	e-Learning resource
6.	Spoken Tutorial	A collection of video tutorials of 10 minutes duration with audio in several languages covering topics on computer science and open source software	e-Learning resource
7.	e-Yantra	A platform for building robotics based solutions with a specially built robot and corresponding open source code; trains next generation of embedded system engineers	Robotics Solution Development Tool
8.	A-VIEW	A versatile e-learning tool for distance education (video conferencing) designed especially for multi-location classroom management	Virtual classroom management tool
9.	Talk to Teacher	Training programme for engineering college teachers to enhance their teaching skills in core engineering and science areas	Faculty training

With the availability of such extensive resources developed by experts, it is required to disseminate them to a wider teacher and student community in universities, engineering colleges. It is also required to plan and schedule various learning activities through NMEICT by teachers and students and integrate them into curriculum.

1.2 Objectives:

The objectives of the proposed project are to:

(i) Make available the NMEICT e-Content to teachers and students of technical universities, engineering colleges

(ii) Extend the reach of NMEICT through providing awareness about the cost sharing internet access and access devices to institutions

(iii) Build capacity for e-content generation and establish logical linkage between different activities

(iv) Sensitize teachers in using ICT as a solution for quality improvement and train the teachers in using, creating e-content.

(v) Provide any time availability of desired knowledge at appropriate levels of comprehension for the students

(vi) Provide content in different pedagogical format to provide a variety of learning experiences to the students

(vii) Integrate use of NMEICT resources in the technical curriculum

1.3 Signing of MoU:

In order to achieve the objectives, NITTTR, Chennai made extensive discussions with Authorities of Technical Universities and State Boards of Technical Education resulting in signing of the MoU between MHRD through NITTTR, Chennai and several institutions. The list of institutions which has signed MoU with NITTTR, Chennai along with the estimated beneficiaries is given in Table 2 and Table 3.

The universities, engineering colleges broadly come under the following categories (i) Government, (ii) Government aided and (iii) Private self-financing. As such they exhibit quite reasonable variation in the available infrastructure, location, faculty expertise, academic performance and other indicators. Any initiative such as NMEICT for augmenting academic resources, therefore would need to address both extremes; sustaining the excellence and providing challenging experiences to well performing learners as well as providing quality and basic inputs to others. After a careful consideration of the needs of the universities, engineering colleges for augmentation of academic resources, the authorities in the universities who have signed the MoU have identified a number of institutions to participate in the activities stated specifically in the

MoU, as well as any other component of NMEICT, as the need arises. In the MoU it is mutually agreed to empower the faculty members of the university/institution with technology enabled teaching and learning. In this connection, specially designed training programme in educational technology, providing training through outreach programme as part of NMEICT projects, providing access device and financial support to obtain internet connectivity.

Table – 2: Details of Universities signed MoU with NITTTR, Chennai

S. No.	State	Name of Organisation / University	No. of Engg. Colleges	No. of Teachers	No. of Students*
1	Tamil Nadu	Anna University, Chennai	28	2800	53265
		SRM University, Chennai	10	251	
		VIT University, Vellore	2	500	
2	Kerala	CUSAT, Cochin	24	3120	46800
3	Karnataka	Visvesvaraya Technological University, Belgaum	210	1680	25200
4	Andhra Pradesh	Kakatiya University, Warangal	9	7680	115200
		Jawaharlal Nehru Technological University, Ananthapur	198		
5	Puducherry	Directorate of Higher and Technical Education, Puducherry	2	200	3500
		Total	**483**	**16231**	**243965**

**approximate number reported by the universities and calculated on the basis 1:15 (AICTE norms)*

1.4 Outcome of the Project

The project aims at institutionalizing the participation of State Technical Universities (STUs) and associated engineering colleges in the NMEICT project and utilization of its resources. The project plans to achieve this through commitment from the STUs along with the monitoring and control through NITTTRs on the one hand and roll out of NMEICT products and provision of appropriate funding by NMEICT project and participating institutions/ STUs/ State Governments on the other. Through the implementation of the project the reach of the products to the students and teachers is ensured. The teachers are sensitized in using ICT as a solution for quality technical education and are encouraged to contribute to the body of e-content. The thrust areas proposed under the project will enable integrating the NMEICT products into the curriculum of a range of STUs and associated engineering colleges.

The expected outcome of the project are:

- Integration of NMEICT resources into the curriculum of Degree level institutions through
    - Ready use of NPTEL and Spoken Tutorial resources in every day classroom teaching.

- Use of Virtual Lab resources for remote experimentation to learn basic and advanced concepts.
- Use e-yantra for solution development in robotics
- Providing challenging learning experiences to well performing learners as well as providing quality and basic inputs to others

- Sensitizing teachers to the effective use of NMEICT e-resources and providing them knowledge and resources to contribute to the body of e-resources by their own developmental efforts.
- Effective coordinating, monitoring and review mechanisms at the MHRD,STU, State and NITTTRs for implementation of the thrust areas by the participating institutions.
- Achieving benefits to the quantum of teachers and students as identified in the DPR
- Increase the quality of learning in private and new generation institutions
- Sustain the growth of established institutions
- Increased acceptance of students by the industry

2 THRUST AREAS AND FINANCIAL REQUIREMENTS:

In this proposal the funding component required for NITTTR to implement, roll out and monitor is provided in detail (Figure 2). Thecost sharing component expressed in the MoU between the University and MHRD with respect to internet connectivity is directly dealt by the concerned institute with the BSNL and NITTTR will facilitate in getting it implemented as per MoU. Training programme to sensitize the various products of NMEICT is clearly brought through the outreach programme of the concerned NMEICT Project. **Hence in this proposal only the funding required for NITTTR to roll out NMEICT products, monitoring, providing access device and map them with the state engineering curricula is dealt in detail.**

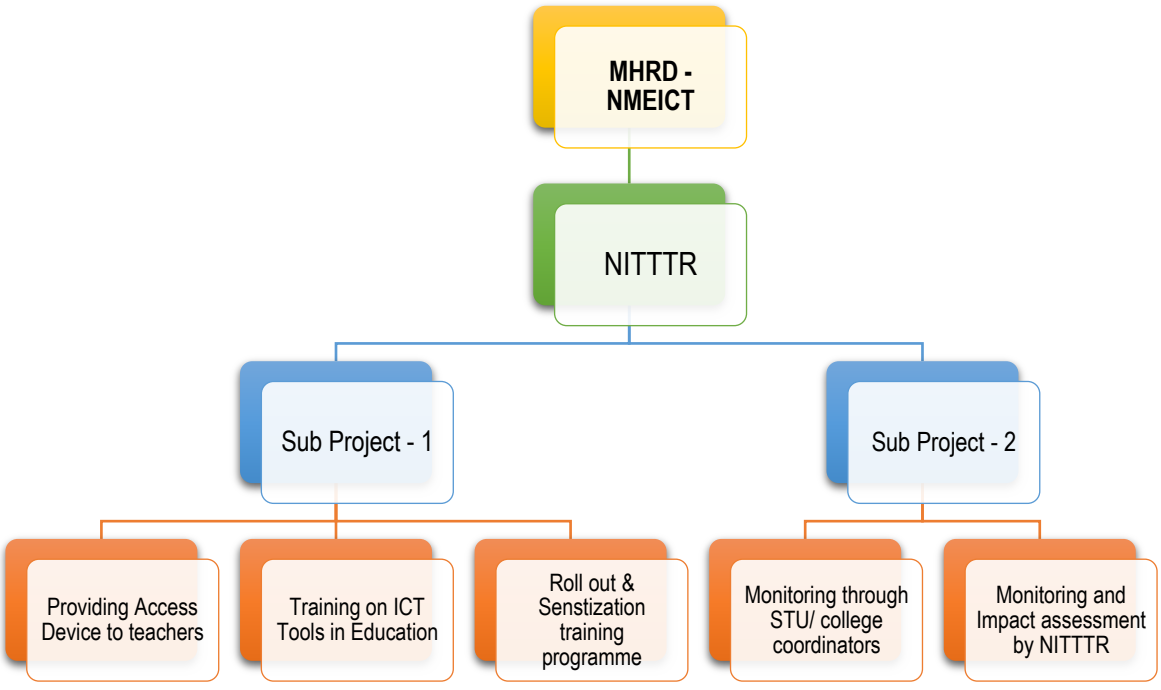


Figure 2: Implementation of NMEICT rolling out through NITTTR

2.1 Thrust Area 1: Providing Access Device / Computers and Accessories to Teachers

As the project aims at providing any-time availability of desired knowledge at the door step of the learners, an appropriate device to access the Internet is very critical. With the availability of Wi-Fi campus, a portable access device allows a lot of flexibility. After extensive review, the numbers of teachers to be provided with an access device / computer with accessories have been estimated by the authorities who have signed the MoU. The number of teachers to be provided with Access Devices calculated on the basis of maximum of 100 per Institution is given in Table 3.

Table 3: Number of Teachers to be provided Access Devices in the Southern Region

Item	Tamil Nadu	Kerala	Karna-taka	Andhra Pradesh	Pudu cherry	Total	Remarks
Teachers from Universities/ Engg. Colleges	3000	3120	1680	1528	200	**9528**	*Access device will be provided to actual number of faculty members if it is less than 100; and if faculty strength is more than 100 it is restricted to 100*

The funding required for providing access device is given in Table 4 which is calculated on the basis of Rs.20,000/- at a cost of the device with a ratio 50:50 for the Govt. of India, the State Govt. and corresponding private funded university/college respectively.

Table 4: Funding required for the purchase of access device

S. No.	Item	Total No. of faculty members to be provided	Total cost for the item Rs. (in Lakhs)	Remarks
1.	Providing Access device / Computer with accessories for teachers (*limited to 100 devices per institutions @ Rs.20,000/- per device (Rs.10000 from NMEICT Project*)	9528	**952.8**	*Cost sharing basis 50:50 as per MoU; remaining Rs.952.8 lakhs need to borne by participating institution*

2.2 Thrust Area 2: Setting up of e-Classroom in the colleges.

Rolling out of NMEICT products to technical institutions is possible only if the infrastructure is augmented with e-classroom. Hence, it is proposed to establish e-classrooms with 50:50 contributions both from MHRD and academic institution through NITTTR Chennai. It is proposed to develop five e-classrooms in each institution. However, NITTTR Chennai will access the existing infrastructure and submit the actuals that need to be developed in each institution. All the products of NMEICT viz., NPTEL, Spoken Tutorial, Virtual Lab, FOSSEE will be loaded on the server established in the e-classroom. The Classrooms will have a server, LCD Projector and Audio systems.The total cost of each e-Classroom is estimated to be Rs.3.0 lakhs. The cost will

be shared on 50:50 basis. The NMEICT Component of Rs. 1.5 lakhs will be met out of the "Communication and bulk storage server" Component of the NMEICT Mission.

The tendering and procurement of the equipment for the e-Classroom will be carried out by NITTTR Chennai. NITTTR Chennai will ensure to receive the 50% component of Rs.1.5 lakhs from each college/Institution and after receiving will claim the remaining 50% from NMEICT. The cost for the tendering and procurement process will be included by NITTTR Chennai in the project proposal.

Table 5a: Funding required for the setting up e-Classroom

S. No	Item	Total No. of Institutions getting e-Classrooms	Total cost for the item Rs. (in Lakhs)	Remarks
1.	**Setting up of 5 e-Classrooms in each Institution for accessing NMEICT resources (spoken tutorial etc.,).The cost of each classroom is Rs.3.0 lakhs.**	**483 (each Institution will get 5 Classrooms)**	**3622.5**	***Cost sharing basis 50:50 as per MoU; remaining Rs.3622.5 lakhs need to borne by participating institutions***

Table 5b: Funding required by NITTTR, Chennai for the tendering and procurement process for setting up e-Classroom

S. No.	Item	Cost Rs. In lakhs	Remarks
1	Advertisement, conduct of committee meetings and expert remuneration	50.0	
2	Travel cost (for four states) consisting of 125 trips to each state with each visit costing Rs.20,000/-	100.0	*Faculty members and project consultant will travel to different institutions to ascertain the supply and installation of items.*
	Sub Total	**150.0**	

2.3 Thrust Area 3: Appointing NMEICT Coordinators

2.3.1 NMEICT Coordinator at STU:

It is required to appoint one NMEICT Coordinator at STU on full time basis in the project to popularize the products of the NMEICT, monitor the NMEICT activities and implement the mandate of the NMEICT MoU in institutions under the control of STU. The funding requirement is given in Table 6. The remuneration for the Coordinator is Rs.40, 000/- per month equally shared between the Govt. of India and the State, appointed full time during the project period.

2.3.2 NMEICT Coordinator at Institutions:

It is required to appoint a person from the existing staff of the college as NMEICT -Coordinator to coordinate the activities of the NMEICT in the College. The funding required for this is given in Table 6. The remuneration for the Coordinator is Rs.10,000/- per month for Engineering college, equally shared between the Govt. of India and the State Govt.

2.3.3 NMEICT Coordinator at NITTTR

The MoU is valid for a period of threeyears and NITTTR, Chennai need to monitor and report progress on a continuous basis. NITTTR, Chennai is responsible for five states covering a large number of institutions.

Personnel for monitoring: It is proposed to employ, the following personnel for the monitoring of the project.

i) Consultant – two nos. full time or contract basis at a remuneration of Rs. 50,000/ month

ii) Coordinators- four nos. – part time selected from the NITTTR faculty at a remuneration of Rs.20, 000/ month / each.

Travel expenses: The Consultant, Coordinators and other faculty need to visit the project institutions often for conduct of programs, discussions and review. A budget covering the travel cost as per norms need to be provided to NITTTR, Chennai. Table 6 summarizes the funding needed for appointing coordinators by NITTTR, Chennai

Table 6: Funding needed for appointingNMEICT Coordinators:

S. No.	Item	Cost per year Rs. In lakhs	Cost for three years Rs. In lakhs	Remarks
1	Payment to Coordinators at STU (Eight Nos) (Fulltime appointment in the project)	19.2	57.6	*Eight Numbers at Rs.40000 per month; on 50:50 basis as per MoU; Rs.20000 per month need to be provided from NMEICT Project*
2	Payment to Coordinators at Engineering Colleges (Honorarium to existing faculty member)	289.8	869.4	*483 Numbers at Rs.10000 per month; on 50:50 basis as per MoU; Rs.5000 per month need to be provided from NMEICT Project*
3	Remuneration for two Consultants at NITTTR	12.0	36.0	*Rs.50000 per month need to be provided from NMEICT Project*
4	Remuneration for four Coordinators at NITTTR	9.6	28.8	*Rs.20000 per month need to be provided from NMEICT Project*
5	Travel cost (for four states) consisting of 100 trips to each state with each visit costing Rs.20,000/-	80.0	240.0	*Faculty member and project consultant will travel to different institutions to ascertain, monitor and quantify the impact due to technology enabled teaching and learning;*
	Sub Total	410.6	**1231.8**	

2.4 Thrust Area 4: Rollout and Sensitization of NMEICT Products & Certificate course

In order to get full benefit from the potential of NMEICT and its products, the teachers in the technical institutions need orientation particularly in the following:

(i) adopting and integrating the NMEICT resources in the teaching learning process

(ii) ability to utilize the Direct to Student initiative of NMEICT

(iii) empowerment through Digital Literacy Initiative for creating e-content and running e-classes

In order to provide the necessary orientation for the above, it is proposed to conduct the outreach programme as part of the MoU on various products of NMEICT. It is already decided to provide the training, where concerned institution will bear the TA and DA and the training cost (TA/DA of resource persons, course materialand instructional overheads) will be borne by respective NMEICT Projects. In addition to the above sensitization programme, it is also proposed to conduct the training programme"ICT tools for teaching" for the faculty members.

Certificate Programme in ICT Tools for Teaching:

This training will give them the motivation to adopt ICT driven pedagogy and will cover pedagogical practices for integrating ICT initiatives into the Curriculum and familiarization of NMEICT Products.The programme will be offered through a blended mode with face to face and online instructions and enable the teachers to use the open source packages available for creation of e-content and running e-classes. The teachers will be able to create their own e-content by utilizing NMEICT products as well as open source software.

The number of technical teachers taking up these training programme will be identified on the basis of the requirement, and it is decided to train (master trainers) with minimum of ten faculty members from each participating institution. The schedule for the training programme will be five days contact for the phase I followed by the two months of self-learning in their parent institution with project and assignment. Phase II will be for another five days of contact programme followed by one month of development and consolidation of projects in their parent institution. Final phase will be for two days to review and assess their learning through project. This will allow the learners to access course materials, undertake additional further reading, submit assignments, receive feedback and keep up to date with course announcements. All users will be supplied login details ahead of the course and training on the use of LMS is included in the phase I.To leverage the potential of online learning, it is decided to conduct the course through A-View to outreach maximum number of participants.

The Cost is estimated for this programme conducted in three spells. The TA will be Rs. 6,000/- for the three phase per participant and DA would be Rs.6,000/- per participant respectively, for each spell. Training cost would be Rs.50,000/- per programme covering instructional resources, resource persons and institutional overheads.The funding required for this training cum workshop is included in Table 7.

Table 7:Funding needed forthe training programme on certificate course

S.No	Item	Cost	Total No. of faculty member in the training programme	Total Amount in Rs. In Lakhs	Remarks
Master Trainers(Remote Centre Coordinators) Programmes					
1	Travel allowance for the participants	Rs.6000 (Rs.2000 per phase)	**150**	**9.0**	*(30 participants per programme – Remote Centre Coordinators programme)*
2	DA for the participants	R s.6000 (@ Rs.500 per day)	**150**	**9.0**	
3	Cost of training including remuneration and travel of resource persons and course material	50000	**5** *Programmes /year*	**2.5**	
			Sub Total (A)	**20.5**	
Through A-View					
4	Cost of training including remuneration and travel of resource persons and course material	Rs 4.5 Lakhs per programme	**5** (programmes / year)	**22.5**	*(Total number of remote centre is 10 per phase; A total of 60 participants per center is enrolled for training; and totally 600 participants are trained during one programme. In a year on an average 3000 participants will be trained. Totally 9000 faculty members will be trained in three years)*
			Sub Total (B)	**22.5**	
			Total (for one year)	**42.5**	

2.5 Thrust Area 5: Mapping of NMEICT Resources with Undergraduate Curriculum

A large body of e-content is available through the various components of NMEICT. The undergraduate engineering curricula of the various technical universities show some variation in courses, weightages and student assessment processes. It is required to identify and map the available e-content with the curricula of the various universities.

Mapping the available e-content with the university curricula will aid the following:

1. optimal utilization of NMEICT resources for the requirements of engineering colleges
2. planning and scheduling of various learning activities by teachers and students
3. deciding student assessment schemes

The printed curriculum documents for all the Degree in Engineering programmes will be collected from all institutions which have signed MoU. The institutions will depute teachers of discipline concerned to the

workshops organized by the NITTTR, Chennai. The workshops will identify and map the appropriate Spoken Tutorial resources matching the Degree Curricula. The timing and venue of the workshops will be decided by NITTTR, Chennai in consultation with the STU. The relevant findings of the workshop will be brought out as a document which will act as the reference for all further planning of NMEICT related activities.The funding required for conducting Workshop for Mapping Spoken Tutorial, Virtual Laband NPTEL content With Undergraduate Curricula in Table8.The Cost is estimated for a one week programme with Rs.2,000/- towards TA and Rs.2,500/- towards DA for one participant. The training cost could be calculated on the basis of Rs.2,000/- per participant covering instructional resources, resource persons and institutional overheads.

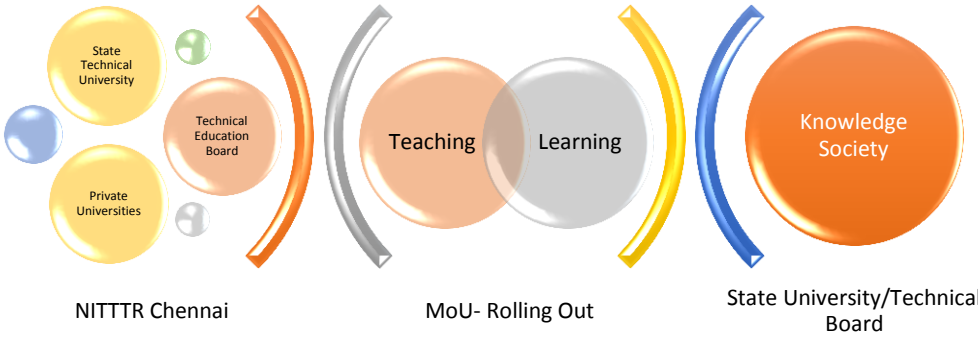
Table 8: Workshop on mapping of NMEICT resources with engineering college curriculum

S.No	Item	Total Amount in Rs. In Lakhs	Remarks
1	Travel allowance for the participants (500 participants – 20 programmes ; TA @ Rs.2000 per participant)	**10.0**	*Spoken Tutorial material developed under NMEICTwill be mapped with undergraduate curriculum*
2	DA for the participants (for one-week programme)	**12.5**	
3	Institutional Overhead on Electricity, Maintenance and Water and course material	**10.0**	
		32.5	

2.6 Monitoring and assessing the impact in Technology enabled teaching learning

2.6.1 Assessment of the NMEICT impact in TELT:

To gauge the efficiency of the NMEICT products in the education, it is decided to quantify through scientifically designed pre and post questionnaire. It provides a greater insight about the creation of knowledge society.



In order to achieve the objectives of the project, the technical institutions need to continuously try integrating NMEICT products into the curriculum. A number of Key Performance Indicators for the institutions are identified which need to be monitored.

The Key Performance Indicators are:

- No. of teachers trained under Pedagogy Training, Talk to Teachers and Certificate Course in Educational Technology
- No. of students using the various components of NMEICT
- Timing provided in the schedule for access of NMEICT products
- Proportion of usage NPTEL content
- Improvement in student performance
- E-content generation by teachers

Profurn for reporting the data on periodic basis will be developed for use by the institutions.

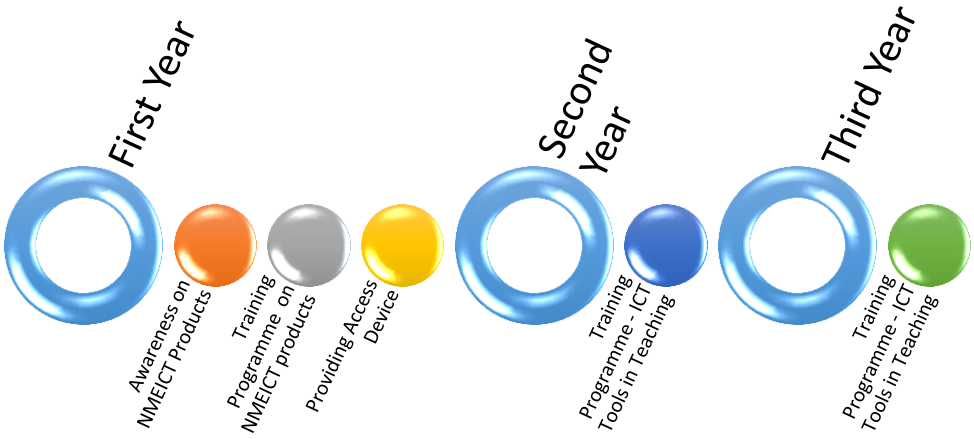
3.0 TOTAL FUNDING REQUIREMENT FOR COORDINATION AND MONITORING BY NITTTR, CHENNAI

The Table No. 9 summarises the total funding needed for coordination of NMEICT related activities in the Southern Region and monitoring by NITTTR, Chennai.

Table 9: Total funding required for Coordination of NMEICT activities by NITTTR, Chennai

S. No.	Item	Total Cost in Rs.	Remarks
1	Funding required for the purchase of access device	952.8	*Ref: Table No: 4*
2	Setting up of 5 e-Classrooms in each of the 483 Institutions	3622.5	*Ref: Table No:5a*
3	Tendering and procurement process	150.0	*Ref: Table No:5b*
4	Funding needed for appointing NMEICT Coordinators	1231.8	*Ref: Table No: 6*
5	Funding needed for the training programme on certificate course	127.5	*Ref: Table No: 7*
6	Workshop on mapping of NPTEL Content with engineering college curriculum	32.5	*Ref: Table No: 8*
Gross total amount for Coordination for rolling out NMEICT products by NITTTR, Chennai		**6117.1**	

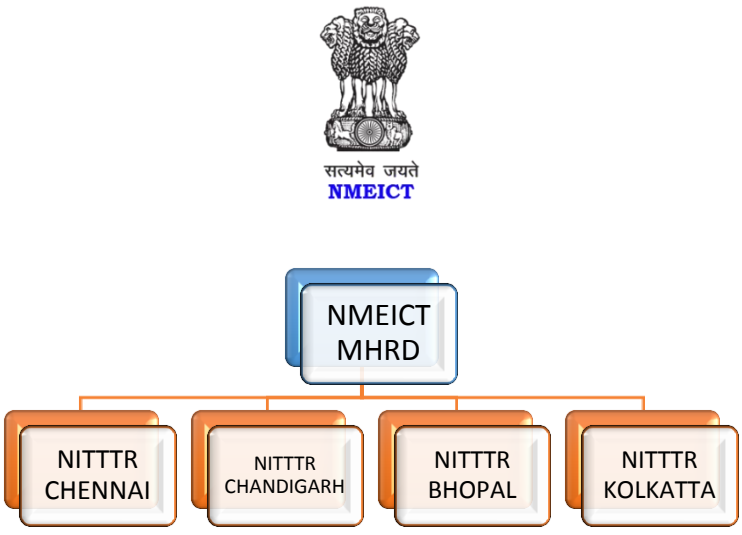
The Gross total amount required for Rolling out MHRD / NMEICT Products in Universities, Engineering Colleges covered under the MoU signed by NITTTR, Chennai, is Rs. 6117.1 lakhs.



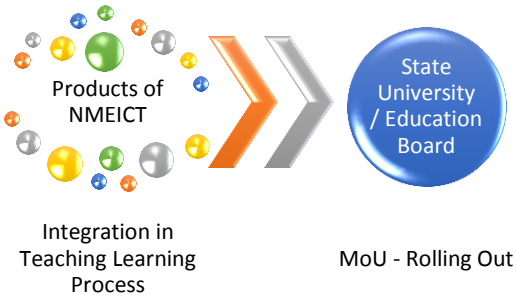
Roadmap of the Implementation

4.0ADMINISTRATION SETUP TO ROLLOUT THE PROJECT:

Memorandum of Understanding to rollout the products of National Mission on Education through ICT, to state technical universities and technical education board through MHRD extending arm NITTTR was successfully launched on 28th January 2014.It provides a momentous opportunity for all the technical teachers and experts in the country to pool their collective wisdom for the benefit of every Indian learner and, thereby, reducing the digital divide. Under this Mission, a proper balance between content generations, research in critical areas relating to imparting of education and connectivity for integrating our knowledge with the advancements in other countries is to be attempted. NITTTR Chennai, as a facilitator, is engaged in rolling out of NMEICT under the plan project of NME-ICT of MHRD.



Outcome of NMEICT Products Roll Out



NationalAdvisory Committee (NAC) to rollout NMEICT Products in technical institution willbe chaired by JS (TEL), HRD and its composition of members is indicated in the table below.

NATIONAL ADVISORY COMMITTEE TO ROLL OUT NMEICT PRODUCTS	
Chair	The Director, NITTTR, Chennai
Members	Dr. C.S. Arora, Senior consultant NMEICT and any other members to be nominated by JS (TEL)
	The Directors, NITTTR, Chandigarh, Bhopal and Kolkatta
Member Secretary	

Responsibilities of NAC to rollout NMEICT Products includes:

- ✓ Broad policy framework to integrate the products of NMEICT into the curricula of the technical education.
- ✓ Developing curriculum for Pedagogy and Educational Technology courses.
- ✓ Empowering technical teachers in various facets of educational technology.
- ✓ Create suitable governance and operational mechanism in all activities of roll out.
- ✓ Developing framework for gauging the effectiveness of NMEICT through scientifically developed pre and post questionnaire.
- ✓ Monitoring of activities and progress of the rollout.
- ✓ Budget approval and allocations as recommended.

The NAC will meet at least two times in a year to ascertain the progress and provide suggestions to accelerate the entire process.

In addition to the National Advisory Council as an apex body, there will be Programme Implementation and Monitoring Group (PIMG) committee region wise (Four) for each NITTTR. The composition of PIMG will include five to ten members from participating university and directorate of technical education, chaired by corresponding region, NITTTR Director and Principal Investigator of corresponding region as member secretary. The composition of PIMG is shown below.

PROGRAMME IMPLEMENTATION AND MONITORING GROUP (PIMG) - REGIONAL	
Chair	The Director, NITTTR – Corresponding Region
Members	Five to Ten experts to be nominated in consultation and direction from JS (TEL)
Member Secretary	Principal Investigator, NITTTR, – Corresponding Region

Responsibilities of PIMG to rollout NMEICT Products includes:

- ✓ Integration of NMEICT products in the curricula of technical universities.
- ✓ Implementation of sensitization of workshop.
- ✓ Prepare the blueprint for processing and reviewing the effectiveness of the project.
- ✓ Design and finalization of training programmes dates to the convenience of all institutes.
- ✓ Designing common framework for utilization of the fund released from the project.
- ✓ Monitoring of activities and progress of the rollout in the respective region.

The PIMG will meet at least two times in a year to ascertain the progress and provide suggestions to accelerate the entire process. Recommendations and action taken is presented before NAC for approval.

In addition to the National Advisory Council and Programme Implementation and Monitoring Group (PIMG), exclusive Project Management Group (PMG) is established state wise to ascertain the progress at grass root level. The composition of PMG is shown below.

PROJECTMANAGEMENT GROUP (PMG) – STATE WISE	
Chair	The Director, NITTTR – Corresponding Region
Members	Five independent domain experts to be nominated in consultation and direction from JS (TEL)
Member Secretary	Principal Investigator, NITTTR, – Corresponding Region Co- Principal Investigator, NITTTR, – Corresponding Region

Responsibilities of PMG includes:

- ✓ Monitor the effectiveness of various projects/products in NMEICT in the state.
- ✓ Developing and ensuring guidelines to ensure the transfer of technical teachers training to the student community.
- ✓ All recommendations of PMG should be submitted to PIMG for approval.
- ✓ Integrating and promoting technology enabled teaching learning to the mainstream of education.
- ✓ Monitoring of activities and progress of the rollout in the respective state.
- ✓ PMG shall be responsible for review including on-site assessment.

The PMG will meet at least four times in a year to ascertain the progress and provide suggestions to accelerate the entire process. Recommendations and action taken is presented before PIMG for approval.

Appendix-V

Detailed Project Report (DPR) of “Utilisation of NMEICT Products in State Technical Universities in the Western Region”.

Participation in NMEICT and Utilisation of its Products by the Technical Universities in the Western Region

Sub-Project

Products and Services directly implemented by NITTTR, Bhopal

सत्यमेव जयते
NMEICT

A Proposal submitted to
Ministry of Human Resource Development,
Government of India

By

National Institute of Technical Teachers Training and Research,
Shamla Hills, Bhopal - 462 002 (M.P.)

March 2014

CONTENTS

SUMMARY AND APPROVAL REQUEST

1	**Name of the Institution making the proposal**	:	**National Institute of Technical Teachers Training and Research, Bhopal**
2	**Name of the Project**	:	MHRD Project on "Participation in NMEICT and Utilization of its Products for the Technical Universities"
3	**Reference**	:	MoU dated 28.01.2014 signed between NITTTR, Bhopal and 2 STUs
4	**Total number of technical universities participating in the project**	:	2
5	**Total number of engineering colleges participating in the project**	:	337
6	**Total number of teachers in the participating institutions**	:	34180
7	**Total number of teachers to be provided with access device**	:	30382 (Based on maximum 100 per institution)
8	**Total number of teachers to be trained with ICT tools in teaching**	:	450 (Master Trainers) and subsequently 9000 faculty members in three years.
9	**Total number of students in the participating institutions**	:	513968
10	**Total cost of the project as proposed by NITTTR, Bhopal from NMEICT**	:	**Rs.6801.5 lakhs**

Date:

Director
National Institute of Technical Teachers
Training and Research, Bhopal

BACKGROUND INFORMATION:

1.1 Rationale:

The National Mission on Education through Information and Communication Technology (NMEICT) is an initiative of the MHRD, Govt. of India, which aims at providing a wide range of educational services to higher education particularly technical education. The project aims at providing and meeting the challenge for our higher education system in leveraging the learning sciences and modern technology that mirror learners reality of their future. A core set of standard based concepts and competencies form the basis of what students learn and in turn what teachers should teach. The pivotal point is any-time availability of desired knowledge at appropriate levels of comprehension at the door step of the learners. The component of the NMEICT is to place the learners at the center and empower them to take control of their own learning by providing flexibility on several dimensions. The various products of NMEICT have been developed by experts from IITs and IISc who have expertise in the respective content. NITTTR Bhopal with its established rapport and reach with the Technical Education System in the Western Region has the unique strength of providing the needed outreach for the NMEICT products developed by various experts. The Faculty of NITTTR Bhopal will play needed facilitators' role for making the Teachers ICT enabled and make effective use of NMEICT products for their classroom Teaching and Assessment.

The important role of NITTTR in this project is envisaged to (a) Roll out the projects of NMEICT (b) Sensitization and training programs of the NMEICT Products (c) Training programme on educational technology, (d) Monitoring the progress made in the project and (e) quantify the impact made through technology enabled teaching and learning. The components of the project is shown in figure 1 which is rolled out in the MoU signed between the technical universities and MHRD through the extended arm NITTTR Bhopal.

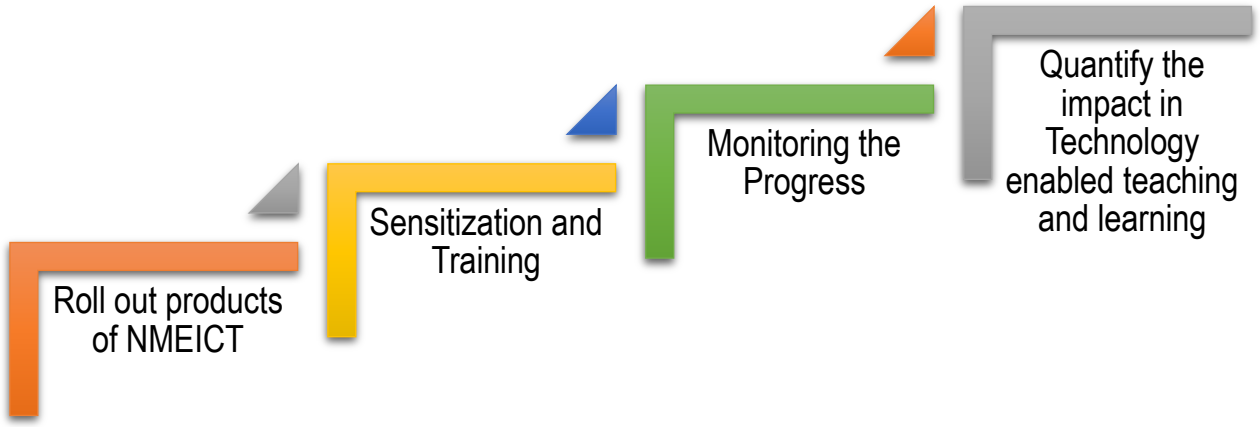


Figure 1: NITTTR in Roll out of NMEICT Products

The rollout of NMEICT products in the technical institutions need to be implemented with utmost care, since it is going to provide paradigm shift and redefine the teaching learning process. NMEICT project already created great impact in the higher education arena through their unique products, which ensure learning take place in

any place. To its credit well established connectivity to reach the mass, and inculcate the culture of ICT is well in place. In order to ensure the optimal value and reach the entire society this MoU and subsequent project proposal will derive the required funding from NMEICT. This project investment focusses towards distribution and dissemination of the NMEICT project. Without this, the large amount of investment made towards the project will go waste, without any major benefit to the education system in the country. The concept of MoU and rolling out is placed in right time to improve the knowledge economy through enhanced connectivity. This reinvented role will ensure the effectiveness. NITTTR will spearhead the rolling out activities to ensure proper development of knowledge society. The components of the NMEICT are given in Table 1.

Table - 1: Components of the NMEICT

S. No.	Component	Description	Category
1.	Internet Access to institutions	Provides internet access to technical institutions at speeds ranging from 10 Mbps to 1 Gbps	Augmenting Infrastructure
2.	Affordable Access device / Computers	Provides Tablets / Laptops for working in a Wi-Fi environment for ready access of NMEICT resources	Augmenting Infrastructure
3.	Setting up of e-Classroom	A classroom with access to internet, computers, projection facilities, audio facilities and appropriate seating for the conduct of Virtual classroom using A-view and for the use of all the products and deliverables developed under NMEICT	Augmenting Infrastructure
4.	NPTEL	Consists of large number of Web and Video resources on topics in science, engineering and technology delivered by experts, suitable for undergraduate curriculum	e-Learning resource
5.	Virtual Lab	Provides remote access to labs in various disciplines of science and engineering to learn basic and advanced concepts through remote experimentation	e-Learning resource
6.	Spoken Tutorial	A collection of video tutorials of 10 minutes duration with audio in several languages covering topics on computer science and open source software	e-Learning resource
7.	e-Yantra	A platform for building robotics based solutions with a specially built robot and corresponding open source code; trains next generation of embedded system engineers	Robotics Solution Development Tool

S. No.	Component	Description	Category
8.	A-VIEW	A versatile e-learning tool for distance education (video conferencing) designed especially for multi-location classroom management	Virtual classroom management tool
9.	Talk to Teacher	Training programme for engineering college teachers to enhance their teaching skills in core engineering and science areas	Faculty training

With the availability of such extensive resources developed by experts, it is required to disseminate them to a wider teacher and student community in universities, engineering colleges. It is also required to plan and schedule various learning activities through NMEICT by teachers and students and integrate them into curriculum.

1.2 Objectives:

The objectives of the proposed project are to:

(i) Make available the NMEICT e-Content to teachers and students of technical universities, engineering colleges

(ii) Extend the reach of NMEICT through providing awareness about the cost sharing internet access and access devices to institutions

(iii) Build capacity for e-content generation and establish logical linkage between different activities

(iv) Sensitize teachers in using ICT as a solution for quality improvement and train the teachers in using, creating e-content.

(v) Provide any time availability of desired knowledge at appropriate levels of comprehension for the students

(vi) Provide content in different pedagogical format to provide a variety of learning experiences to the students

(vii) Integrate use of NMEICT resources in the technical curriculum

1.3 Signing of MoU:

In order to achieve the objectives, NITTTR, Bhopal made extensive discussions with Authorities of Technical Universities and State Boards of Technical Education resulting in signing of the MoU between MHRD through NITTTR, Bhopal and several institutions. The list of institutions which has signed MoU with NITTTR, Bhopal along with the estimated beneficiaries is given in Table 2 and Table 3.

The universities, engineering colleges broadly come under the following categories (i) Government, (ii) Government aided and (iii) Private self-financing. As such they exhibit quite reasonable variation in the available infrastructure, location, faculty expertise, academic performance and other indicators. Any initiative such as NMEICT for augmenting academic resources, therefore would need to address both extremes; sustaining the excellence and providing challenging experiences to well performing learners as well as providing quality and basic inputs to others. After a careful consideration of the needs of the universities, engineering colleges for augmentation of academic resources, the authorities in the universities who have signed the MoU have identified a number of institutions to participate in the activities stated specifically in the MoU, as well as any other component of NMEICT, as the need arises. In the MoU it is mutually agreed to empower the faculty members of the university/institution with technology enabled teaching and learning. In this connection, specially designed training programme in educational technology, providing training through outreach programme as part of NMEICT projects, providing access device and financial support to obtain internet connectivity.

Table – 2: Details of Universities signed MoU with NITTTR, Bhopal

S. No.	State	Name of Organisation / University	No. of Engg. Colleges	No. of Teachers	No. of Students*
1	Madhya Pradesh	Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal	219	18582	280000
2	Gujarat	Gujarat Technical University	118	15598	233968
		Total	**337**	**34180**	**513968**

**approximate number reported by the universities and calculated on the basis 1:15 (AICTE norms)*

1.4 Outcome of the Project

The project aims at institutionalizing the participation of State Technical Universities (STUs) and associated engineering colleges in the NMEICT project and utilization of its resources. The project plans to achieve this through commitment from the STUs along with the monitoring and control through NITTTRs on the one hand and roll out of NMEICT products and provision of appropriate funding by NMEICT project and participating institutions/ STUs/ State Governments on the other. Through the implementation of the project the reach of the products to the students and teachers is ensured. The teachers are sensitized in using ICT as a solution for quality technical education and are encouraged to contribute to the body of e-content. The thrust areas proposed under the project will enable integrating the NMEICT products into the curriculum of a range of STUs and associated engineering colleges.

The expected outcome of the project are:

- Integration of NMEICT resources into the curriculum of Degree level institutions through
    - Ready use of NPTEL and Spoken Tutorial resources in every day classroom teaching.
    - Use of Virtual Lab resources for remote experimentation to learn basic and advanced concepts.
    - Use e-yantra for solution development in robotics
    - Providing challenging learning experiences to well performing learners as well as providing quality and basic inputs to others
- Sensitizing teachers to the effective use of NMEICT e-resources and providing them knowledge and resources to contribute to the body of e-resources by their own developmental efforts.
- Effective coordinating, monitoring and review mechanisms at the MHRD,STU, State and NITTTRs for implementation of the thrust areas by the participating institutions.
- Achieving benefits to the quantum of teachers and students as identified in the DPR
- Increase the quality of learning in private and new generation institutions
- Sustain the growth of established institutions
- Increased acceptance of students by the industry

2 THRUST AREAS AND FINANCIAL REQUIREMENTS:

In this proposal the funding component required for NITTTR to implement, roll out and monitor is provided in detail (Figure 2). The cost sharing component expressed in the MoU between the University and MHRD with respect to internet connectivity is directly dealt by the concerned institute with the BSNL and NITTTR will facilitate in getting it implemented as per MoU. Training programme to sensitize the various products of NMEICT is clearly brought through the outreach programme of the concerned NMEICT Project. **Hence in this proposal only the funding required for NITTTR to roll out NMEICT products, monitoring, providing access device and map them with the state engineering curricula is dealt in detail.**

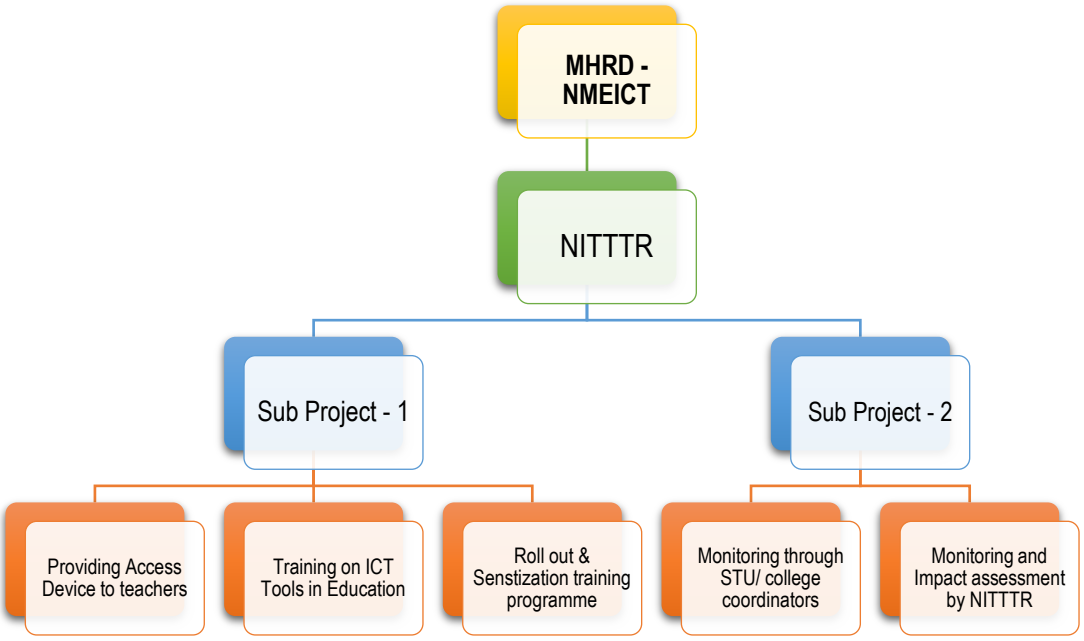


Figure 2: Implementation of NMEICT rolling out through NITTTR

2.1 Thrust Area 1: Providing Access Device / Computers and Accessories to Teachers

As the project aims at providing any-time availability of desired knowledge at the door step of the learners, an appropriate device to access the Internet is very critical. With the availability of Wi-Fi campus, a portable access device allows a lot of flexibility. After extensive review, the numbers of teachers to be provided with an access device / computer with accessories have been estimated by the authorities who have signed the MoU. The number of teachers to be provided with Access Devices calculated on the basis of maximum of 100 per Institution is given in Table 3.

Table 3: Number of Teachers to be provided Access Devices in the Western Region

Item	Madhya Pradesh	Gujarat	Total	Remarks
Teachers from Universities/ Engg. Colleges	18582	11800	**30382**	*Access device will be provided to actual number of faculty members if it is less than 100; and if faculty strength is more than 100 it is restricted to 100*

The funding required for providing access device is given in Table 4 which is calculated on the basis of Rs.20,000/- at a cost of the device with a ratio 50:50 for the Govt. of India, the State Govt. and corresponding private funded university/college respectively.

Table 4: Funding required for the purchase of access device

S. No.	Item	Total No. of faculty members to be provided	Total cost for the item Rs. (in Lakhs)	Remarks
1.	Providing Access device / Computer with accessories for teachers (*limited to 100 devices per institutions @ Rs.20,000/- per device (Rs.10000 from NMEICT Project*)	30382	**3038.2**	*Cost sharing basis 50:50 as per MoU; remaining Rs.3038.2 lakhs need to borne by participating institution*

2.2 Thrust Area 2: Setting up of e-Classroom in the colleges.

Rolling out of NMEICT products to technical institutions, is possible only if the infrastructure is augmented with e-classroom. Hence, it is proposed to establish e-classrooms with 50:50 contributions both from MHRD and academic institution through NITTTR Bhopal. It is proposed to develop five e-classrooms in each institution. However, NITTTR Bhopal will access the existing infrastructure and submit the actual that need to be developed in each institution. All the products of NMEICT viz., NPTEL, Spoken Tutorial, Virtual Lab, FOSSEE will be loaded on the server established in the e-classroom. The Classrooms will have a server, LCD Projector and Audio systems..The total cost of each e-Classroom is estimated to be Rs.3.0 lakhs. The cost will be shared on 50:50 basis. The NMEICT Component of Rs. 1.5 lakhs will be met out of the "Communication and bulk storage server" Component of the NMEICT Mission.

The tendering and procurement of the equipment for the e-Classroom will be carried out by NITTTR Bhopal. NITTTR Bhopal will ensure to receive the 50% component of Rs.1.5 lakhs from each college/Institution and after receiving will claim the remaining 50% from NMEICT. The cost for the tendering and procurement process will be included by NITTTR Bhopal in the project proposal.

Table 5a: Funding required for the setting up e-Classroom

S. No	Item	Total No. of Institutions getting e-Classrooms	Total cost For the item Rs. (in Lakhs)	Remarks
1.	**Setting up of 5 e-Classrooms in each Institution for accessing NMEICT resources (spoken tutorial etc.,).The cost of each classroom is Rs.3.0 lakhs.**	**337** **(each Institution will get 5 Classrooms)**	**2527.5**	***Cost sharing basis 50:50 as per MoU; remaining Rs.2527.5 lakhs need to borne by participating institutions***

Table 5b : Funding required by NITTTR, Bhopal for the tendering and procurement process for setting up e-Classroom

S. No.	Item	Cost Rs. In lakhs	Remarks
1	Advertisement, conduct of committee meetings and expert remuneration	50.0	
5	Travel cost (for four states) consisting of 125 trips to each state with each visit costing Rs.20,000/-	100.0	*Faculty members and project consultant will travel to different institutions to ascertain the supply and installation of items.*
	Sub Total	**150.0**	

2.3 Thrust Area 3: Appointing NMEICT Coordinators

2.3.1 NMEICT Coordinator at STU:

It is required to appoint one NMEICT Coordinator at STU on full time basis in the project to popularize the products of the NMEICT, monitor the NMEICT activities and implement the mandate of the NMEICT MoU in institutions under the control of STU. The funding requirement is given in Table 6. The remuneration for the Coordinator is Rs.40, 000/- per month equally shared between the Govt. of India and the State, appointed full time during the project period.

2.3.2 NMEICT Coordinator at Institutions:

It is required to appoint a person from the existing staff of the college as NMEICT -Coordinator to coordinate the activities of the NMEICT in the College. The funding required for this is given in Table 6. The remuneration for the Coordinator is Rs.10,000/- per month for Engineering college, equally shared between the Govt. of India and the State Govt.

2.3.3 NMEICT Coordinator at NITTTR

The MoU is valid for a period of three years and NITTTR, Bhopal need to monitor and report progress on a continuous basis. NITTTR, Bhopal is responsible for five states covering a large number of institutions.

Personnel for monitoring:It is proposed to employ, the following personnel for the monitoring of the project.

i) Consultant – two nos. full time or contract basis at a remuneration of Rs. 50,000/ month

ii) Coordinators- four nos. – part time selected from the NITTTR faculty at a remuneration of Rs.20, 000/ month / each.

Travel expenses: The Consultant, Coordinators and other faculty need to visit the project institutions often for conduct of programs, discussions and review. A budget covering the travel cost as per norms need to be provided to NITTTR, Bhopal. Table 5summarizes the funding needed for appointing coordinators by NITTTR, Bhopal

Table 6: Funding needed for appointing NMEICT Coordinators:

S. No.	Item	Cost per year Rs. In lakhs	Cost for three years Rs. In lakhs	Remarks
1	Payment to Coordinators at STU (Two Nos) (Fulltime appointment in the project)	4.8	14.4	*Two Numbers at Rs.40000 per month; on 50:50 basis as per MoU; Rs.20000 per month need to be provided from NMEICT Project*
2	Payment to Coordinators at Engineering Colleges (Honorarium to existing faculty member)	202.2	606.6	*337 Numbers at Rs.10000 per month; on 50:50 basis as per MoU; Rs.5000 per month need to be provided from NMEICT Project*
3	Remuneration for two Consultants at NITTTR	12.0	36.0	*Rs.50000 per month need to be provided from NMEICT Project*
4	Remuneration for four Coordinators at NITTTR	9.6	28.8	*Rs.20000 per month need to be provided from NMEICT Project*
5	Travel cost (for four states) consisting of 100 trips for person to each state with each visit costing Rs.20,000/-	80.0	240.0	*Faculty member and project consultant will travel to different institutions to ascertain, monitor and quantify the impact due to technology enabled teaching and learning;*
	Sub Total	308.6	**925.8**	

2.4 Thrust Area 4: Rollout and Sensitization of NMEICT Products & Certificate course

In order to get full benefit from the potential of NMEICT and its products, the teachers in the technical institutions need orientation particularly in the following:

(i) adopting and integrating the NMEICT resources in the teaching learning process

(ii) ability to utilize the Direct to Student initiative of NMEICT

(iii) empowerment through Digital Literacy Initiative for creating e-content and running e-classes

In order to provide the necessary orientation for the above, it is proposed to conduct the outreach programme as part of the MoU on various products of NMEICT. It is already decided to provide the training, where concerned institution will bear the TA and DA and the training cost (TA/DA of resource persons, course material and instructional overheads) will be borne by respective NMEICT Projects. In addition to the above sensitization programme, it is also proposed to conduct the training programme "ICT tools for teaching" for the faculty members.

Certificate Programme in ICT Tools for Teaching:

This training will give them the motivation to adopt ICT driven pedagogy and will cover pedagogical practices for integrating ICT initiatives into the Curriculum and familiarization of NMEICT Products. The programme will be offered through a blended mode with face to face and online instructions and enable the teachers to use the open source packages available for creation of e-content and running e-classes. The teachers will be able to create their own e-content by utilizing NMEICT products as well as open source software.

The number of technical teachers taking up these training programme will be identified on the basis of the requirement, and it is decided to train (master trainers) with minimum of ten faculty members from each participating institution. The schedule for the training programme will be five days contact for the phase I followed by the two months of self-learning in their parent institution with project and assignment. Phase II will be for another five days of contact programme followed by one month of development and consolidation of projects in their parent institution. Final phase will be for two days to review and assess their learning through project. This will allow the learners to access course materials, undertake additional further reading, submit assignments, receive feedback and keep up to date with course announcements. All users will be supplied login details ahead of the course and training on the use of LMS is included in the phase I. To leverage the potential of online learning, it is decided to conduct the course through A-View to outreach maximum number of participants.

The Cost is estimated for this programme conducted in three spells. The TA will be Rs. 6,000/- for the three phase per participant and DA would be Rs.6,000/- per participant respectively, for each spell. Training cost would be Rs.50,000/- per programme covering instructional resources, resource persons and institutional overheads. In the case of remote centre, the participants from near by institution will be called for training and the cost for TA will be Rs. 3,000/- for the three phase per participant and DA would be Rs.1,200/- per participant respectively, for each spell. Training cost would be Rs.20,000/- per programme covering instructional resources, resource persons and institutional overheads. The funding required for this training cum workshop is included in Table 7.

Table 7: Funding needed for the training programme on certificate course

S.No	Item	Cost	Total No. of faculty member in the training programme	Total Amount in Rs. In Lakhs	Remarks
Master Trainers(Remote Centre Coordinators) Programmes					
1	Travel allowance for the participants	Rs.6000 (Rs.2000 per phase)	**150**	**9.0**	*(30 participants per programme – Remote Centre Coordinators programme)*
2	DA for the participants	R s.6000 (@ Rs.500 per day)	**150**	**9.0**	
3	Cost of training including remuneration and travel of resource persons and course material	50000	**5** *Programmes /year*	**2.5**	
			Sub Total (A)	**20.5**	

Through A-View					
4	Cost of training including remuneration and travel of resource persons and course material	Rs 4.5 Lakhs per programme	**5** (programmes / year)	**22.5**	*(Total number of remote centre is 10 per phase; A total of 60 participants per center is enrolled for training; and totally 600 participants are trained during one programme. In a year on an average 3000 participants will be trained. Totally 9000 faculty members will be trained in three years)*
			Sub Total (B)	**22.5**	
			Total (for one year)	**42.5**	

2.5 Thrust Area 5: Mapping of NMEICT Resources with Undergraduate Curriculum

A large body of e-content is available through the various components of NMEICT. The undergraduate engineering curricula of the various technical universities show some variation in courses, weightages and student assessment processes. It is required to identify and map the available e-content with the curricula of the various universities.

Mapping the available e-content with the university curricula will aid the following:

1. optimal utilization of NMEICT resources for the requirements of engineering colleges
2. planning and scheduling of various learning activities by teachers and students
3. deciding student assessment schemes

The printed curriculum documents for all the Degree in Engineering programmes will be collected from all institutions which have signed MoU. The institutions will depute teachers of discipline concerned to the workshops organized by the NITTTR, Bhopal. The workshops will identify and map the appropriate Spoken Tutorial resources matching the Degree Curricula. The timing and venue of the workshops will be decided by NITTTR, Bhopal in consultation with the STU. The relevant findings of the workshop will be brought out as a document which will act as the reference for all further planning of NMEICT related activities.The funding required for conducting Workshop for Mapping Spoken Tutorial, Virtual Lab and NPTEL content With Undergraduate Curricula in Table8. The Cost is estimated for a one week programme with Rs.2,000/- towards TA and Rs.2,500/- towards DA for one participant. The training cost could be calculated on the basis of Rs.2,000/- per participant covering instructional resources, resource persons and institutional overheads.

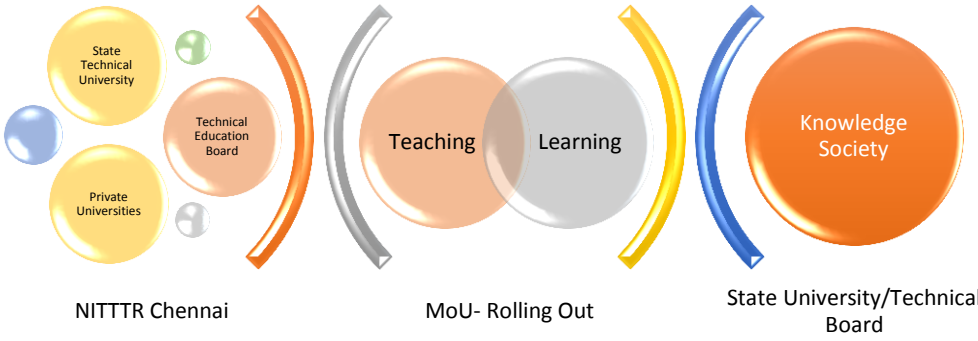
Table 8: Workshop on mapping of NMEICT resources with engineering college curriculum

S.No	Item	Total Amount in Rs. In Lakhs	Remarks
1	Travel allowance for the participants (500 participants – 20 programmes ; TA @ Rs.2000 per participant)	**10.0**	*Spoken Tutorial material developed under NMEICTwill be mapped with undergraduate curriculum*
2	DA for the participants (for one-week programme)	**12.5**	
3	Institutional Overhead on Electricity, Maintenance and Water and course material	**10.0**	
		32.5	

2.5 Monitoring and assessing the impact in Technology enabled teaching learning

2.5.1 Assessment of the NMEICT impact in TELT:

To gauge the efficiency of the NMEICT products in the education, it is decided to quantify through scientifically designed pre and post questionnaire. It provides a greater insight about the creation of knowledge society.



In order to achieve the objectives of the project, the technical institutions need to continuously try integrating NMEICT products into the curriculum. A number of Key Performance Indicators for the institutions are identified which need to be monitored.

The Key Performance Indicators are:

- No. of teachers trained under Pedagogy Training, Talk to Teachers and Certificate Course in Educational Technology
- No. of students using the various components of NMEICT
- Timing provided in the schedule for access of NMEICT products
- Proportion of usage NPTEL content
- Improvement in student performance

- E-content generation by teachers

Profurn for reporting the data on periodic basis will be developed for use by the institutions.

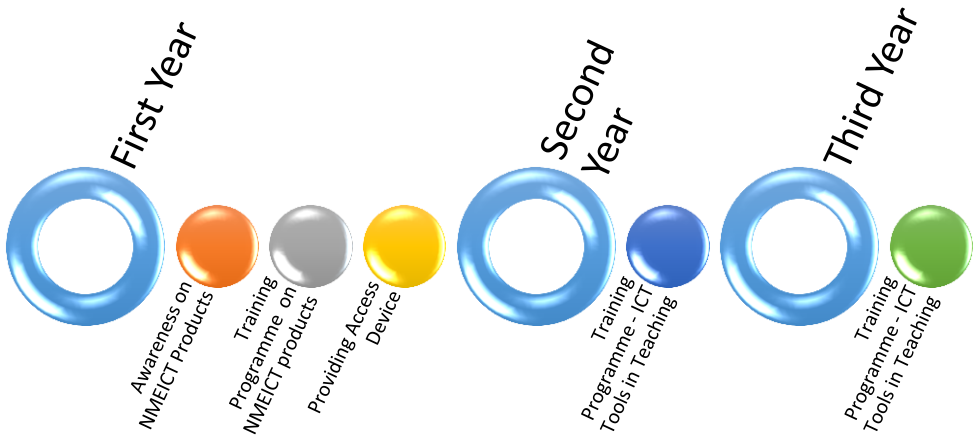
3.0 TOTAL FUNDING REQUIREMENT FOR COORDINATION AND MONITORING BY NITTTR, BHOPAL

The Table No. 9 summarizes the total funding needed for coordination of NMEICT related activities in the Western Region and monitoring by NITTTR, Bhopal.

Table 9: Total funding required for Coordination of NMEICT activities by NITTTR, Bhopal

S. No.	Item	Total Cost in Rs.	Remarks
1	Funding required for the purchase of access device	**3038.2**	*Ref: Table No: 4*
2	Setting up of 16 e-Classrooms in each of the 483 Institutions	**2527.5**	*Ref: Table No:5a*
3	Tendering and procurement process	**150.0**	*Ref: Table No:5b*
4	Funding needed for appointing NMEICT Coordinators	**925.8**	*Ref: Table No: 6*
5	Funding needed for the training programme on certificate course	**127.5**	*Ref: Table No: 7*
6	Workshop on mapping of NPTEL Content with engineering college curriculum	**32.5**	*Ref: Table No: 8*
Gross total amount for Coordination for rolling out NMEICT products by NITTTR, Bhopal		**6801.5**	

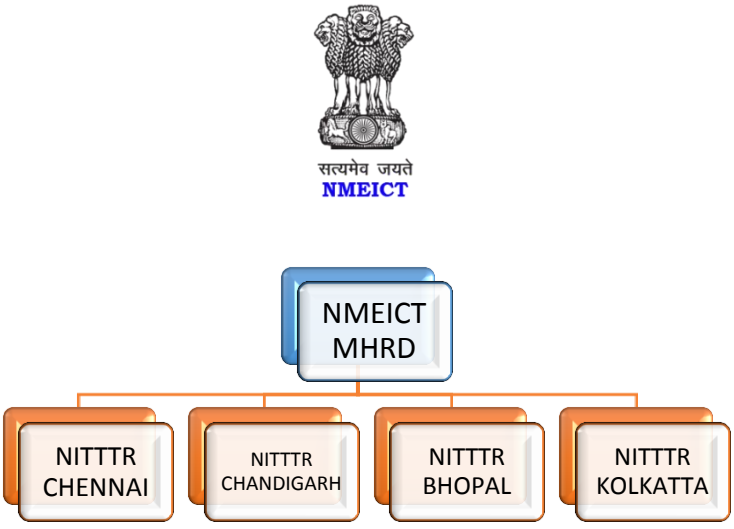
The Gross total amount required for Rolling out MHRD / NMEICT Products in Universities, Engineering Colleges covered under the MoU signed by NITTTR, Bhopal, is **Rs.6801.5 lakhs.**



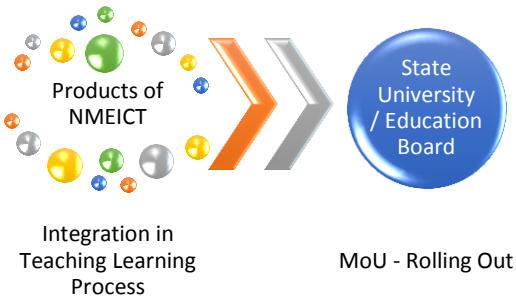
Roadmap of the Implementation

4.0 ADMINISTRATION SETUP TO ROLLOUT THE PROJECT:

Memorandum of Understanding to rollout the products of National Mission on Education through ICT, to state technical universities and technical education board through MHRD extending arm NITTTR was successfully launched on 28th January 2014.It provides a momentous opportunity for all the technical teachers and experts in the country to pool their collective wisdom for the benefit of every Indian learner and, thereby, reducing the digital divide. Under this Mission, a proper balance between content generations, research in critical areas relating to imparting of education and connectivity for integrating our knowledge with the advancements in other countries is to be attempted. NITTTR Bhopal, as a facilitator, is engaged in rolling out of NMEICT under the plan project of NME-ICT of MHRD.



Outcome of NMEICT Products Roll Out



National Advisory Committee (NAC) to rollout NMEICT Products in technical institution will be chaired by JS (TEL), HRD and its composition of members is indicated in the table below.

NATIONAL ADVISORY COMMITTEE TO ROLL OUT NMEICT PRODUCTS	
Chair	The Director, NITTTR, Chennai
Members	Dr. C.S. Arora, Senior consultant NMEICTand any other members to be nominated by JS (TEL)
	The Directors, NITTTR, Chandigarh, Bhopal and Kolkatta
Member Secretary	

Responsibilities of NAC to rollout NMEICT Products includes:

- ✓ Broad policy framework to integrate the products of NMEICT into the curricula of the technical education.
- ✓ Developing curriculum for Pedagogy and Educational Technology courses.
- ✓ Empowering technical teachers in various facets of educational technology.
- ✓ Create suitable governance and operational mechanism in all activities of roll out.
- ✓ Developing framework for gauging the effectiveness of NMEICT through scientifically developed pre and post questionnaire.
- ✓ Monitoring of activities and progress of the rollout.
- ✓ Budget approval and allocations as recommended.

The NAC will meet at least two times in a year to ascertain the progress and provide suggestions to accelerate the entire process.

In addition to the National Advisory Council as an apex body, there will be Programme Implementation and Monitoring Group (PIMG) committee region wise (Four) for each NITTTR. The composition of PIMG will include five to ten members from participating university and directorate of technical education, chaired by corresponding region, NITTTR Director and Principal Investigator of corresponding region as member secretary. The composition of PIMG is shown below.

PROGRAMME IMPLEMENTATION AND MONITORING GROUP (PIMG) - REGIONAL	
Chair	The Director, NITTTR – Corresponding Region
Members	Ms. Aurobhi Das, Jr. Consultant NMEICT, Corresponding NMEICT Projects P.I, Five to Ten experts to be nominated in consultation and direction from JS (TEL)
Member Secretary	Principal Investigator, NITTTR, – Corresponding Region

Responsibilities of PIMG to rollout NMEICT Products includes:

- ✓ Integration of NMEICT products in the curricula of technical universities.
- ✓ Implementation of sensitization of workshop.
- ✓ Prepare the blueprint for processing and reviewing the effectiveness of the project.
- ✓ Design and finalization of training programmes dates to the convenience of all institutes.
- ✓ Designing common framework for utilization of the fund released from the project.
- ✓ Monitoring of activities and progress of the rollout in the respective region.

The PIMG will meet at least two times in a year to ascertain the progress and provide suggestions to accelerate the entire process. Recommendations and action taken is presented before NAC for approval.

In addition to the National Advisory Council and Programme Implementation and Monitoring Group (PIMG), exclusive Project Management Group (PMG) is established state wise to ascertain the progress at grass root level. The composition of PMG is shown below.

PROJECTMANAGEMENT GROUP (PMG) – STATE WISE	
Chair	The Director, NITTTR – Corresponding Region
Members	Five independent domain expertsto be nominated in consultation and direction from JS (TEL)
Member Secretary	Principal Investigator, NITTTR, – Corresponding Region Co- Principal Investigator, NITTTR, – Corresponding Region

Responsibilities of PMG includes:

- ✓ Monitor the effectiveness of various projects/products in NMEICT in the state.
- ✓ Developing and ensuring guidelines to ensure the transfer of technical teachers training to the student community.
- ✓ All recommendations of PMG should be submitted to PIMG for approval.
- ✓ Integrating and promoting technology enabled teaching learning to the mainstream of education.
- ✓ Monitoring of activities and progress of the rollout in the respective state.
- ✓ PMG shall be responsible for review including on-site assessment.

The PMG will meet at least four times in a year to ascertain the progress and provide suggestions to accelerate the entire process. Recommendations and action taken is presented before PIMG for approval.

Appendix-VI

Detailed Project Report (DPR) on “Utilisation of NMEICT Products in State Technical Universities in the Northern Region”.

Appendix-VI

Participation in NMEICT and Utilisation of its Products by the Technical Universities in the Northern Region

Sub-Project

Products and Services directly implemented by NITTTR, Chandigarh

सत्यमेव जयते
NMEICT

A Proposal submitted to
Ministry of Human Resource Development,
Government of India

By

National Institute of Technical Teachers Training and Research,
Sector – 26, Chandigarh-160019

March 2014

CONTENTS

SUMMARY AND APPROVAL REQUEST

1	**Name of the Institution making the proposal**	:	**National Institute of Technical Teachers Training and Research, Chandigarh**
2	**Name of the Project**	:	MHRD Project on "Participation in NMEICT and Utilization of its Products for the Technical Universities"
3	**Reference**	:	MoU dated 28.01.2014 signed between NITTTR, Chandigarh and 4 STUs
4	**Total number of technical universities participating in the project**	:	4
5	**Total number of engineering colleges participating in the project**	:	587
6	**Total number of teachers in the participating institutions**	:	39700
7	**Total number of teachers to be provided with access device**	:	38700 (Based on maximum 100 per institution)
8	**Total number of teachers to be trained with ICT tools in teaching**	:	450 (Master Trainers) and subsequently 9000 faculty members in three years.
9	**Total number of students in the participating institutions**	:	787000
10	**Total cost of the project as proposed by NITTTR, Chandigarh from NMEICT**	:	**Rs. 10001.56 lakhs**

Date:

Director
National Institute of Technical Teachers
Training and Research, Chandigarh

BACKGROUND INFORMATION:

1.1 Rationale:

The National Mission on Education through Information and Communication Technology (NMEICT) is an initiative of the MHRD, Govt. of India, which aims at providing a wide range of educational services to higher education particularly technical education. The project aims at providing and meeting the challenge for our higher education system in leveraging the learning sciences and modern technology that mirror learners reality of their future. A core set of standard based concepts and competencies form the basis of what students learn and in turn what teachers should teach. The pivotal point is any-time availability of desired knowledge at appropriate levels of comprehension at the door step of the learners. The components of the NMEICT are to place the learners at the center and empower them to take control of their own learning by providing flexibility on several dimensions.

The various products of NMEICT have been developed by experts from IITs and IISc who have expertise in the respective content.

NITTTR Chandigarh with its established rapport and reach with the Technical Education System in the Northern Region has the unique strength of providing the needed outreach for the NMEICT products developed by various experts. The Faculty of NITTTR Chandigarh will play needed facilitators' role for making the teachers in the institutions ICT enabled and make effective use of NMEICT products for their classroom Teaching and Assessment.

The important role of NITTTR in this project is envisaged to (a) Roll out the projects of NMEICT (b) Sensitization and training programs of the NMEICT Products (c) Training programme on educational technology, (d) Monitoring the progress made in the project and (e) quantify the impact made through technology enabled teaching and learning. The components of the project are shown in figure 1 which is rolled out in the MoU signed between the technical universities and MHRD through the extended arm NITTTR Chandigarh.

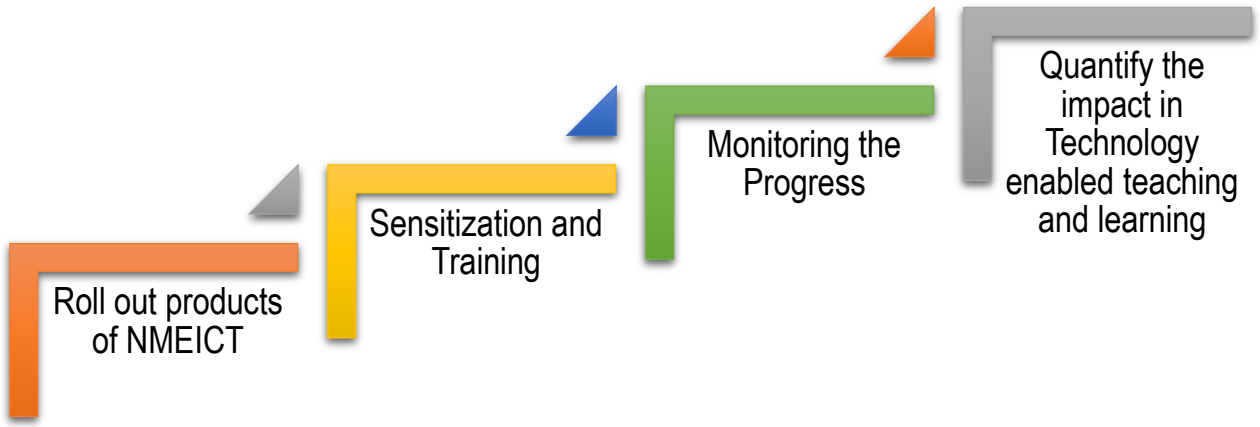


Figure 1: NITTTR in Roll out of NMEICT Products

The rollout of NMEICT products in the technical institutions need to be implemented with utmost care, since it is going to provide paradigm shift and redefine the teaching learning process. NMEICT project already created great impact in the higher education arena through their unique products, which ensure learning take place in any place. To its credit well established connectivity to reach the mass, and inculcate the culture of ICT is well in place. In order to ensure the optimal value and reach the entire society this MoU and subsequent project proposal will derive the required funding from NMEICT. This project investment focusses towards distribution and dissemination of the NMEICT project. Without this, the large amount of investment made towards the project will go waste, without any major benefit to the education system in the country. The concept of MoU and rolling out is placed in right time to improve the knowledge economy through enhanced connectivity. This reinvented role will ensure the effectiveness. NITTTR will spearhead the rolling out activities to ensure proper development of knowledge society. The components of the NMEICT are given in Table 1.

Table - 1: Components of the NMEICT

S. No.	Component	Description	Category
1.	Internet Access to institutions	Provides internet access to technical institutions at speeds ranging from 10 Mbps to 1 Gbps	Augmenting Infrastructure
2.	Affordable Access device / Computers	Provides Tablets / Laptops for working in a Wi-Fi environment for ready access of NMEICT resources	Augmenting Infrastructure
3.	Setting up of e-Classroom	A classroom with access to internet, computers, projection facilities, audio facilities and appropriate seating for the conduct of Virtual classroom using A-view and for the use of all the products and deliverables developed under NMEICT	Augmenting Infrastructure
4.	NPTEL	Consists of large number of Web and Video resources on topics in science, engineering and technology delivered by experts, suitable for undergraduate curriculum	e-Learning resource
5.	Virtual Lab	Provides remote access to labs in various disciplines of science and engineering to learn basic and advanced concepts through remote experimentation	e-Learning resource
6.	Spoken Tutorial	A collection of video tutorials of 10 minutes duration with audio in several languages covering topics on computer science and open source software	e-Learning resource
7.	e-Yantra	A platform for building robotics based solutions with a specially built robot and corresponding open source code; trains next generation of embedded system engineers	Robotics Solution Development Tool

S. No.	Component	Description	Category
8.	A-VIEW	A versatile e-learning tool for distance education (video conferencing) designed especially for multi-location classroom management	Virtual classroom management tool
9.	Talk to Teacher	Training programme for engineering college teachers to enhance their teaching skills in core engineering and science areas	Faculty training

With the availability of such extensive resources developed by experts, it is required to disseminate them to a wider teacher and student community in universities, engineering colleges. It is also required to plan and schedule various learning activities through NMEICT by teachers and students and integrate them into curriculum.

1.2 Objectives:

The objectives of the proposed project are to:

(i) Make available the NMEICT e-Content to teachers and students of technical universities, engineering colleges

(ii) Extend the reach of NMEICT through providing awareness about the cost sharing internet access and access devices to institutions

(iii) Build capacity for e-content generation and establish logical linkage between different activities

(iv) Sensitize teachers in using ICT as a solution for quality improvement and train the teachers in using, creating e-content.

(v) Provide any time availability of desired knowledge at appropriate levels of comprehension for the students

(vi) Provide content in different pedagogical format to provide a variety of learning experiences to the students

(vii) Integrate use of NMEICT resources in the technical curriculum

1.3 Signing of MoU:

In order to achieve the objectives, NITTTR, Chandigarh made extensive discussions with Authorities of Technical Universities and State Boards of Technical Education resulting in signing of the MoU between MHRD through NITTTR, Chandigarh and several institutions. The list of institutions which has signed MoU with NITTTR, Chandigarh along with the estimated beneficiaries is given in Table 2 and Table 3.

The universities, engineering colleges broadly come under the following categories (i) Government, (ii) Government aided and (iii) Private self-financing. As such they exhibit quite reasonable variation in the available infrastructure, location, faculty expertise, academic performance and other indicators. Any initiative such as NMEICT for augmenting academic resources, therefore would need to address both extremes; sustaining the excellence and providing challenging experiences to well performing learners as well as providing quality and basic inputs to others. After a careful consideration of the needs of the universities, engineering colleges for augmentation of academic resources, the authorities in the universities who have signed the MoU have identified a number of institutions to participate in the activities stated specifically in the MoU, as well as any other component of NMEICT, as the need arises. In the MoU it is mutually agreed to empower the faculty members of the university/institution with technology enabled teaching and learning. In this connection, specially designed training programme in educational technology, providing training through outreach programme as part of NMEICT projects, providing access device and financial support to obtain internet connectivity.

Table – 2: Details of Universities signed MoU with NITTTR, Chandigarh

S. No.	State	Name of Organisation / University	No. of Engg. Colleges	No. of Teachers	No. of Students*
1	Rajasthan	Bikaner Technical University	20	2000	20000
2	Uttar Pradesh	UP Technical University	400	20000	600000
3	Punjab	Punjab Technical University	150	16000	150000
4	Himachal Pradesh	Himachal Pradesh Technical University	17	1700	17000
		Total	**587**	**39700**	**787000**

**approximate number reported by the universities and calculated on the basis 1:15 (AICTE norms)*

1.4 Outcome of the Project

The project aims at institutionalizing the participation of State Technical Universities (STUs) and associated engineering colleges in the NMEICT project and utilization of its resources. The project plans to achieve this through commitment from the STUs along with the monitoring and control through NITTTRs on the one hand and roll out of NMEICT products and provision of appropriate funding by NMEICT project and participating institutions/ STUs/ State Governments on the other. Through the implementation of the project the reach of the products to the students and teachers is ensured. The teachers are sensitized in using ICT as a solution for quality technical education and are encouraged to contribute to the body of e-content. The thrust areas proposed under the project will enable integrating the NMEICT products into the curriculum of a range of STUs and associated engineering colleges.

The expected outcome of the project are:

- Integration of NMEICT resources into the curriculum of Degree level institutions through
    - Ready use of NPTEL and Spoken Tutorial resources in every day classroom teaching.
    - Use of Virtual Lab resources for remote experimentation to learn basic and advanced concepts.
    - Use e-yantra for solution development in robotics
    - Providing challenging learning experiences to well performing learners as well as providing quality and basic inputs to others
- Sensitizing teachers to the effective use of NMEICT e-resources and providing them knowledge and resources to contribute to the body of e-resources by their own developmental efforts.
- Effective coordinating, monitoring and review mechanisms at the MHRD,STU, State and NITTTRs for implementation of the thrust areas by the participating institutions.
- Achieving benefits to the quantum of teachers and students as identified in the DPR
- Increase the quality of learning in private and new generation institutions
- Sustain the growth of established institutions
- Increased acceptance of students by the industry

2 THRUST AREAS AND FINANCIAL REQUIREMENTS:

In this proposal the funding component required for NITTTR to implement, roll out and monitor is provided in detail (Figure 2). Thecost sharing component expressed in the MoU between the University and MHRD with respect to internet connectivity is directly dealt by the concerned institute with the BSNL and NITTTR will facilitate in getting it implemented as per MoU. Training programme to sensitize the various products of NMEICT is clearly brought through the outreach programme of the concerned NMEICT Project. **Hence in this proposal only the funding required for NITTTR to roll out NMEICT products, monitoring, providing access device and map them with the state engineering curricula is dealt in detail.**

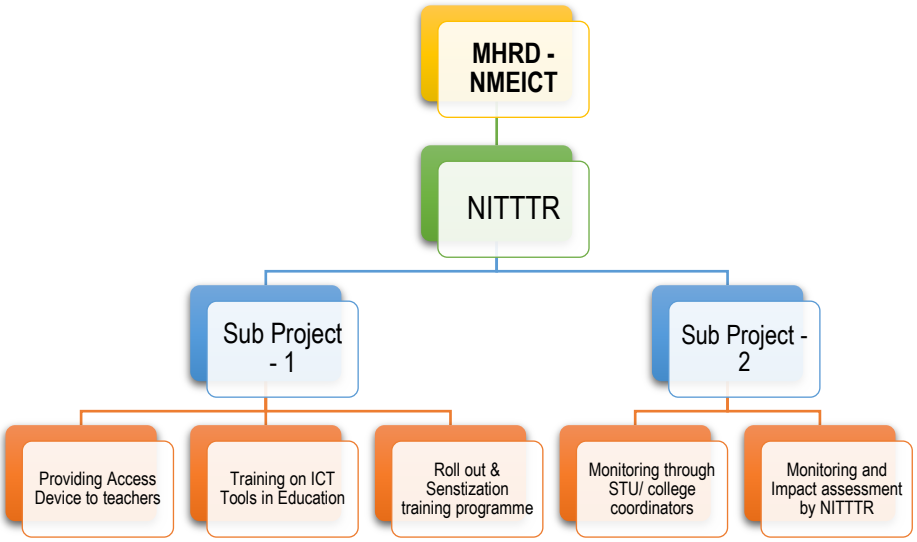


Figure 2: Implementation of NMEICT rolling out through NITTTR

2.1 Thrust Area 1: Providing Access Device / Computers and Accessories to Teachers

As the project aims at providing any-time availability of desired knowledge at the door step of the learners, an appropriate device to access the Internet is very critical. With the availability of Wi-Fi campus, a portable access device allows a lot of flexibility. After extensive review, the numbers of teachers to be provided with an access device / computer with accessories have been estimated by the authorities who have signed the MoU. The number of teachers to be provided with Access Devices calculated on the basis of maximum of 100 per Institution is given in Table 3.

Table 3: Number of Teachers to be provided Access Devices in the Northern Region

Item	Rajasthan	Uttar Pradesh	Punjab	Himachal Pradesh	Total	Remarks
Teachers from Universities/ Engg. Colleges	2000	20000	15000	1700	**38700**	*Access device will be provided to actual number of faculty members if it is less than 100; and if faculty strength is more than 100 it is restricted to 100*

The funding required for providing access device is given in Table 4 which is calculated on the basis of Rs.20,000/- at a cost of the device with a ratio 50:50 for the Govt. of India, the State Govt. and corresponding private funded university/college respectively.

Table 4: Funding required for the purchase of access device

S. No.	Item	Total No. of faculty members to be provided	Total cost for the item Rs. (in Lakhs)	Remarks
1.	Providing Access device / Computer with accessories for teachers (*limited to 100 devices per institutions @ Rs.20,000/- per device (Rs.10000 from NMEICT Project)*)	38700	**3870.0**	*Cost sharing basis 50:50 as per MoU; remaining Rs.3870.0 lakhs need to borne by participating institution*

2.2 Thrust Area 2: Setting up of e-Classroom in the colleges.

Rolling out of NMEICT products to technical institutions, is possible only if the infrastructure is augmented with e-classroom. Hence, it is proposed to establish e-classrooms with 50:50 contribution both from MHRD and academic institution through NITTTR Chandigarh. It is proposed to develop five e-classrooms in each institution. However, NITTTR Chandigarh will access the existing infrastructure and submit the actuals that need to be developed in each institution. All the products of NMEICT viz., NPTEL, Spoken Tutorial, Virtual Lab, FOSSEE will be loaded on the server established in the e-classroom. The Classrooms will have a server, LCD Projector and Audio systems..The total cost of each e-Classroom is estimated to be Rs.3.0 lakhs. The cost will be shared on 50:50 basis. The NMEICT Component of Rs. 1.5 lakhs will be met out of the "Communication and bulk storage server" Component of the NMEICT Mission.

The tendering and procurement of the equipment for the e-Classroom will be carried out by NITTTR Chandigarh. NITTTR Chandigarh will ensure to receive the 50% component of Rs.1.5 lakhs from each college/Institution and after receiving will claim the remaining 50% from NMEICT. The cost for the tendering and procurement process will be included by NITTTR Chandigarh in the project proposal.

Table 5a: Funding required for the setting up e-Classroom

S. No	Item	Total No. of Institutions getting e-Classrooms	Total cost for the item Rs. (in Lakhs)	Remarks
1.	***Setting up of 5 e-Classrooms in each Institution for accessing NMEICT resources (spoken tutorial etc.,).The cost of each classroom is Rs.3.0 lakhs.***	***587*** ***(each Institution will get 5 Classrooms)***	***4402.5***	***Cost sharing basis 50:50 as per MoU; remaining Rs.4402.5 lakhs need to borne by participating institutions***

Table 5b : Funding required by NITTTR, Chandigarh for the tendering and procurement process for setting up e-Classroom

S. No.	Item	Cost Rs. In lakhs	Remarks
1	Advertisement, conduct of committee meetings and expert remuneration	50.0	
5	Travel cost (for four states) consisting of 125 trips to each state with each visit costing Rs.20,000/-	100.0	*Faculty members and project consultant will travel to different institutions to ascertain the supply and installation of items.*
	Sub Total	**150.0**	

2.3 Thrust Area 3: Appointing NMEICT Coordinators

2.3.1 NMEICT Coordinator at STU:

It is required to appoint one NMEICT Coordinator at STU on full time basis in the project to popularize the products of the NMEICT, monitor the NMEICT activities and implement the mandate of the NMEICT MoU in institutions under the control of STU. The funding requirement is given in Table 6. The remuneration for the Coordinator is Rs.40, 000/- per month equally shared between the Govt. of India and the State, appointed full time during the project period.

2.3.2 NMEICT Coordinator at Institutions:

It is required to appoint a person from the existing staff of the college as NMEICT -Coordinator to coordinate the activities of the NMEICT in the College. The funding required for this is given in Table 6. The remuneration for the Coordinator is Rs.10,000/- per month for Engineering college, equally shared between the Govt. of India and the State Govt.

2.3.3 NMEICT Coordinator at NITTTR

The MoU is valid for a period of three years and NITTTR, Chandigarh need to monitor and report progress on a continuous basis. NITTTR, Chandigarh is responsible for five states covering a large number of institutions.

Personnel for monitoring: It is proposed to employ, the following personnel for the monitoring of the project.

i) Consultant – two nos. full time or contract basis at a remuneration of Rs. 50,000/ month
ii) Coordinators- four nos. – part time selected from the NITTTR faculty at a remuneration of Rs.20, 000/ month / each.

Travel expenses: The Consultant, Coordinators and other faculty need to visit the project institutions often for conduct of programs, discussions and review. A budget covering the travel cost as per norms need to be provided to NITTTR, Chandigarh. Table 6 summarizes the funding needed for appointing coordinators by NITTTR, Chandigarh.

Table 6: Funding needed for appointing NMEICT Coordinators:

S. No.	Item	Cost per year Rs. In lakhs	Cost for three years Rs. In lakhs	Remarks
1	Payment to Coordinators at STU (Four Nos) (Fulltime appointment in the project)	19.2	57.6	*Four Numbers at Rs.40000 per month; on 50:50 basis as per MoU; Rs.20000 per month need to be provided from NMEICT Project*
2	Payment to Coordinators at Engineering Colleges (Honorarium to existing faculty member)	352.22	1056.6	*587 Numbers at Rs.10000 per month; on 50:50 basis as per MoU; Rs.5000 per month need to be provided from NMEICT Project*
3	Remuneration for two Consultants at NITTTR	12.0	36.0	*Rs.50000 per month need to be provided from NMEICT Project*
4	Remuneration for four Coordinators at NITTTR	9.6	28.8	*Rs.20000 per month need to be provided from NMEICT Project*
5	Travel cost (for four states) consisting of 100 trips for person to each state with each visit costing Rs.20,000/-	80.0	240.0	*Faculty member and project consultant will travel to different institutions to ascertain, monitor and quantify the impact due to technology enabled teaching and learning;*
	Sub Total	473.02	**1419.06**	

2.3 Thrust Area 4: Rollout and Sensitization of NMEICT Products & Certificate course

In order to get full benefit from the potential of NMEICT and its products, the teachers in the technical institutions need orientation particularly in the following:

(i) adopting and integrating the NMEICT resources in the teaching learning process

(ii) ability to utilize the Direct to Student initiative of NMEICT

(iii) empowerment through Digital Literacy Initiative for creating e-content and running e-classes

In order to provide the necessary orientation for the above, it is proposed to conduct the outreach programme as part of the MoU on various products of NMEICT. It is already decided to provide the training, where concerned institution will bear the TA and DA and the training cost (TA/DA of resource persons, course material and instructional overheads) will be borne by respective NMEICT Projects. In addition to the above sensitization programme, it is also proposed to conduct the training programme "ICT tools for teaching" for the faculty members.

Certificate Programme in ICT Tools for Teaching:

This training will give them the motivation to adopt ICT driven pedagogy and will cover pedagogical practices for integrating ICT initiatives into the Curriculum and familiarization of NMEICT Products. The programme will be offered through a blended mode with face to face and online instructions and enable the teachers to use the open source packages available for creation of e-content and running e-classes. The teachers will be able to create their own e-content by utilizing NMEICT products as well as open source software.

The number of technical teachers taking up these training programme will be identified on the basis of the requirement, and it is decided to train (master trainers) with minimum of ten faculty members from each participating institution. The schedule for the training programme will be five days contact for the phase I followed by the two months of self-learning in their parent institution with project and assignment. Phase II will be for another five days of contact programme followed by one month of development and consolidation of projects in their parent institution. Final phase will be for two days to review and assess their learning through project. This will allow the learners to access course materials, undertake additional further reading, submit assignments, receive feedback and keep up to date with course announcements. All users will be supplied login details ahead of the course and training on the use of LMS is included in the phase I. To leverage the potential of online learning, it is decided to conduct the course through A-View to outreach maximum number of participants.

The Cost is estimated for this programme conducted in three spells. The TA will be Rs. 6,000/- for the three phase per participant and DA would be Rs.6,000/- per participant respectively, for each spell. Training cost would be Rs.50,000/- per programme covering instructional resources, resource persons and institutional overheads.In the case of remote centre, the participants from near by institution will be called for training and the cost for TA will be Rs. 3,000/- for the three phase per participant and DA would be Rs.1,200/- per participant respectively, for each spell. Training cost would be Rs.20,000/- per programme covering instructional resources, resource persons and institutional overheads. The funding required for this training cum workshop is included in Table 7.

Table 7: Funding needed for the training programme on certificate course

S.No	Item	Cost	Total No. of faculty member in the training programme	Total Amount in Rs. In Lakhs	Remarks
Master Trainers(Remote Centre Coordinators) Programmes					
1	Travel allowance for the participants	Rs.6000 (Rs.2000 per phase)	**150**	**9.0**	*(30 participants per programme – Remote Centre Coordinators programme)*
2	DA for the participants	R s.6000 (@ Rs.500 per day)	**150**	**9.0**	
3	Cost of training including remuneration and travel of resource persons and course material	50000	**5** *Programmes /year*	**2.5**	
			Sub Total (A)	**20.5**	

Through A-View					
4	Cost of training including remuneration and travel of resource persons and course material	Rs 4.5 Lakhs per programme	**5** (programmes / year)	**22.5**	*(Total number of remote centre is 10 per phase; A total of 60 participants per center is enrolled for training; and totally 600 participants are trained during one programme. In a year on an average 3000 participants will be trained. Totally 9000 faculty members will be trained in three years)*
			Sub Total (B)	**22.5**	
			Total (for one year)	**42.5**	

2.3 Thrust Area 4: Mapping of NMEICT Resources with Undergraduate Curriculum

A large body of e-content is available through the various components of NMEICT. The undergraduate engineering curricula of the various technical universities show some variation in courses, weightages and student assessment processes. It is required to identify and map the available e-content with the curricula of the various universities.

Mapping the available e-content with the university curricula will aid the following:

1. optimal utilization of NMEICT resources for the requirements of engineering colleges
2. planning and scheduling of various learning activities by teachers and students
3. deciding student assessment schemes

The printed curriculum documents for all the Degree in Engineering programmes will be collected from all institutions which have signed MoU. The institutions will depute teachers of discipline concerned to the workshops organized by the NITTTR, Chandigarh. The workshops will identify and map the appropriate Spoken Tutorial resources matching the Degree Curricula. The timing and venue of the workshops will be decided by NITTTR, Chandigarh in consultation with the STU. The relevant findings of the workshop will be brought out as a document which will act as the reference for all further planning of NMEICT related activities.The funding required for conducting Workshop for Mapping Spoken Tutorial, Virtual Lab and NPTEL content With Undergraduate Curricula in Table8. The Cost is estimated for a one week programme with Rs.2,000/- towards TA and Rs.2,500/- towards DA for one participant. The training cost could be calculated on the basis of Rs.2,000/- per participant covering instructional resources, resource persons and institutional overheads.

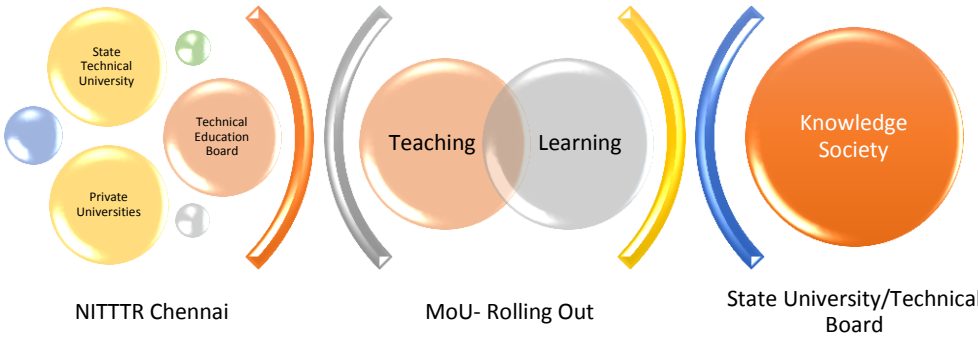
Table 8: Workshop on mapping of NMEICT resources with engineering college curriculum

S.No	Item	Total Amount in Rs. In Lakhs	Remarks
1	Travel allowance for the participants (500 participants – 20 programmes ; TA @ Rs.2000 per participant)	**10.0**	*Spoken Tutorial material developed under NMEICTwill be mapped with undergraduate curriculum*
2	DA for the participants (for one-week programme)	**12.5**	
3	Institutional Overhead on Electricity, Maintenance and Water and course material	**10.0**	
		32.5	

2.5 Monitoring and assessing the impact in Technology enabled teaching learning

2.5.1 Assessment of the NMEICT impact in TELT:

To gauge the efficiency of the NMEICT products in the education, it is decided to quantify through scientifically designed pre and post questionnaire. It provides a greater insight about the creation of knowledge society.



In order to achieve the objectives of the project, the technical institutions need to continuously try integrating NMEICT products into the curriculum. A number of Key Performance Indicators for the institutions are identified which need to be monitored.

The Key Performance Indicators are:

- No. of teachers trained under Pedagogy Training, Talk to Teachers and Certificate Course in Educational Technology
- No. of students using the various components of NMEICT
- Timing provided in the schedule for access of NMEICT products
- Proportion of usage NPTEL content
- Improvement in student performance

- E-content generation by teachers

Profurn for reporting the data on periodic basis will be developed for use by the institutions.

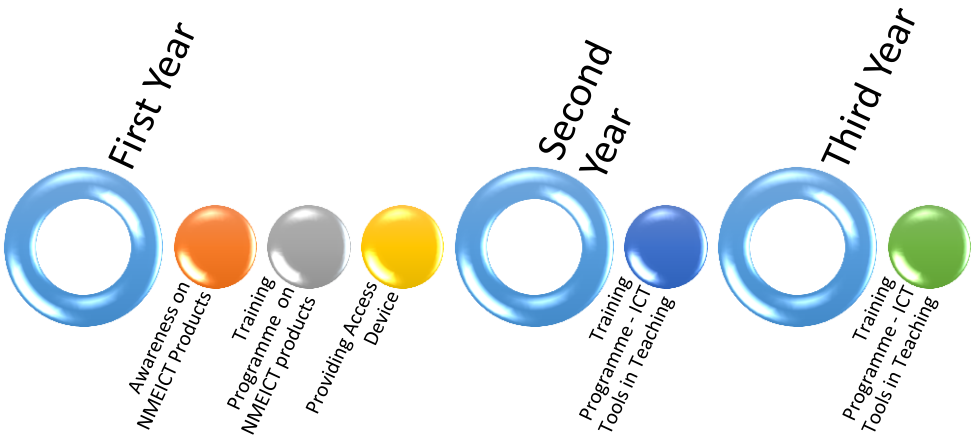
3.0 TOTAL FUNDING REQUIREMENT FOR COORDINATION AND MONITORING BY NITTTR, CHANDIGARH

The Table No. 9 summarizes the total funding needed for coordination of NMEICT related activities in the Northern Region and monitoring by NITTTR, Chandigarh.

Table 9: Total funding required for Coordination of NMEICT activities by NITTTR, Chandigarh

S. No.	Item	Total Cost in Rs.	Remarks
1	Funding required for the purchase of access device	**3870.0**	*Ref: Table No: 4*
2	Setting up of 5 e-Classrooms in each of the 587 Institutions	**4402.5**	*Ref: Table No:5a*
3	Tendering and procurement process	**150.0**	*Ref: Table No:5b*
4	Funding needed for appointing NMEICT Coordinators	**1419.06**	*Ref: Table No: 6*
5	Funding needed for the training programme on certificate course	**127.5**	*Ref: Table No: 7*
6	Workshop on mapping of NPTEL Content with engineering college curriculum	**32.5**	*Ref: Table No: 8*
Gross total amount for Coordination for rolling out NMEICT products by NITTTR, Chandigarh		**10001.56**	

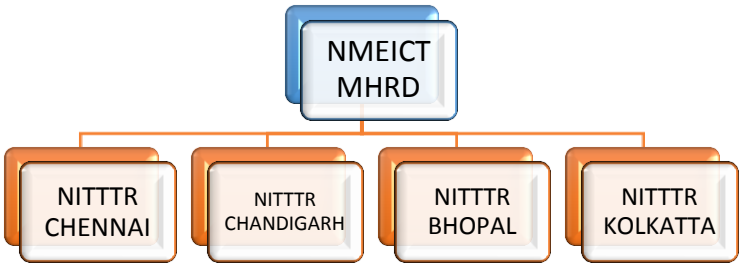
The Gross total amount required for Rolling out MHRD / NMEICT Products in Universities, Engineering Colleges covered under the MoU signed by NITTTR, Chandigarh, is **Rs. 10001.56 lakhs.**



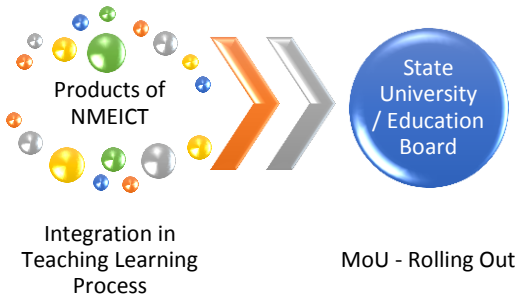
Roadmap of the Implementation

4.0 ADMINISTRATION SETUP TO ROLLOUT THE PROJECT:

Memorandum of Understanding to rollout the products of National Mission on Education through ICT, to state technical universities and technical education board through MHRD extending arm NITTTR was successfully launched on 28th January 2014.It provides a momentous opportunity for all the technical teachers and experts in the country to pool their collective wisdom for the benefit of every Indian learner and, thereby, reducing the digital divide. Under this Mission, a proper balance between content generations, research in critical areas relating to imparting of education and connectivity for integrating our knowledge with the advancements in other countries is to be attempted. NITTTR Chandigarh, as a facilitator, is engaged in rolling out of NMEICT under the plan project of NME-ICT of MHRD.



Outcome of NMEICT Products Roll Out



NationalAdvisory Committee (NAC) to rollout NMEICT Products in technical institution will be chaired by JS (TEL), HRD and its composition of members is indicated in the table below.

NATIONAL ADVISORY COMMITTEE TO ROLL OUT NMEICT PRODUCTS	
Chair	The Director, NITTTR, Chennai
Members	Dr. C.S. Arora, Senior consultant NMEICT and any other members to be nominated by JS (TEL)
	The Directors, NITTTR, Chandigarh, Bhopal and Kolkatta
Member Secretary	

Responsibilities of NAC to rollout NMEICT Products includes:

- ✓ Broad policy framework to integrate the products of NMEICT into the curricula of the technical education.
- ✓ Developing curriculum for Pedagogy and Educational Technology courses.
- ✓ Empowering technical teachers in various facets of educational technology.
- ✓ Create suitable governance and operational mechanism in all activities of roll out.
- ✓ Developing framework for gauging the effectiveness of NMEICT through scientifically developed pre and post questionnaire.
- ✓ Monitoring of activities and progress of the rollout.
- ✓ Budget approval and allocations as recommended.

The NAC will meet at least two times in a year to ascertain the progress and provide suggestions to accelerate the entire process.

In addition to the National Advisory Council as an apex body, there will be Programme Implementation and Monitoring Group (PIMG) committee region wise (Four) for each NITTTR. The composition of PIMG will include five to ten members from participating university and directorate of technical education, chaired by corresponding region, NITTTR Director and Principal Investigator of corresponding region as member secretary. The composition of PIMG is shown below.

PROGRAMME IMPLEMENTATION AND MONITORING GROUP (PIMG) - REGIONAL	
Chair	The Director, NITTTR – Corresponding Region
Members	Shri. Bharat Bhusan, Jr. Consultant NMEICT, Corresponding NMEICT Projects P.I, Five to Ten experts to be nominated in consultation and direction from JS (TEL)
Member Secretary	Principal Investigator, NITTTR, – Corresponding Region

Responsibilities of PIMG to rollout NMEICT Products includes:

- ✓ Integration of NMEICT products in the curricula of technical universities.
- ✓ Implementation of sensitization of workshop.
- ✓ Prepare the blueprint for processing and reviewing the effectiveness of the project.
- ✓ Design and finalization of training programmes dates to the convenience of all institutes.
- ✓ Designing common framework for utilization of the fund released from the project.
- ✓ Monitoring of activities and progress of the rollout in the respective region.

The PIMG will meet at least two times in a year to ascertain the progress and provide suggestions to accelerate the entire process. Recommendations and action taken is presented before NAC for approval.

In addition to the National Advisory Council and Programme Implementation and Monitoring Group (PIMG), exclusive Project Management Group (PMG) is established state wise to ascertain the progress at grass root level. The composition of PMG is shown below.

PROJECTMANAGEMENT GROUP (PMG) – STATE WISE	
Chair	The Director, NITTTR – Corresponding Region
Members	Five independent domain expertsto be nominated in consultation and direction from JS (TEL)
Member Secretary	Principal Investigator, NITTTR, – Corresponding Region Co- Principal Investigator, NITTTR, – Corresponding Region

Responsibilities of PMG includes:

- ✓ Monitor the effectiveness of various projects/products in NMEICT in the state.
- ✓ Developing and ensuring guidelines to ensure the transfer of technical teachers training to the student community.
- ✓ All recommendations of PMG should be submitted to PIMG for approval.
- ✓ Integrating and promoting technology enabled teaching learning to the mainstream of education.
- ✓ Monitoring of activities and progress of the rollout in the respective state.
- ✓ PMG shall be responsible for review including on-site assessment.

The PMG will meet at least four times in a year to ascertain the progress and provide suggestions to accelerate the entire process. Recommendations and action taken is presented before PIMG for approval.

Appendix-VII

Draft for Discussions on “Open Licensing Policy Guidelines”.

National Mission on Education through Information and Communication Technology (NMEICT)

Open Licensing Policy Guidelines

1. Preamble

The National Knowledge Commission (KNC) in 2007 in its recommendations[1] to the Govt of India recognised the role of Open Educational Resources (OER) in the knowledge economy and to up-grade the quality of education. At that time India was the first country in the world to have recognised the potential of OER and Open Access. NKC recommended creation of a National Educational Foundation to develop a web-based repository of high quality educational resources as OER through a collaborative process. It said, "an enabling legal framework that would allow unrestricted access without compromising intellectual authorship must be devised for this purpose". It further recommended strengthening faculty development and teacher training in the area of OER to improve quality. Since the recommendations of NKC, several projects to create learning resources have been initiated with the support of the Govt of India. The National Programme on Technology Enhanced Learning (NPTEL) has emerged as a flagship initiative for Engineering and basic Science courses. In September 2012, the NPTEL released its materials in CC-BY-NC-SA license[2]. The National Institute of Open Schooling (NIOS)[3] has also started an OER project and released its materials under CC-BY-NC-SA. However, the National Repository of Open Educational Resources[4] (NROER) at National Council for Educational Research and Training (NCERT) has adopted a CC-BY-SA license.

Intergovernmental agencies like the United Nations Educational, Scientific and Cultural Organisation (UNESCO[5]) and the Commonwealth of Learning (COL[6]) have adopted open licensing policy for their materials, and have been advocating the use of open license for public funded resources, while respecting the intellectual property rights. In fact, the World OER Congress in 2012 organised by UNESCO and COL released the OER Paris Declaration[7] 2012 that urges Governments, educational institutions and teachers to release educational materials as OER.

Release of learning resources, software and technology in an appropriate open license regime would foster an environment of openness, collaboration, and a culture of sharing, reuse and adaptation amongst institutions and teachers to enhance the quality of education in the country. Learners will have easy access to digital and non-digital resources available either freely or at a low cost. Teachers in remote areas will have access to quality resources and can contextualise the materials without worrying about prior permissions and copyright issues, if materials developed under NMEICT are available in an openly licensed manner. Open licensing will

[1] http://knowledgecommission.gov.in/downloads/report2009/eng/report09.pdf
[2] http://nptel.iitm.ac.in/
[3] http://oer.nios.ac.in/wiki/index.php/NIOS_Copyright_Policy
[4] http://nroer.gov.in/home/
[5] http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ERI/pdf/oa_policy_rev2.pdf
[6] http://www.col.org/progServ/policy/Pages/oer.aspx
[7] http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Paris%20OER%20Declaration_01.pdf

also foster innovations in software development and create an ecosystem for the products delivered through the Mission funding. As the Govt of India has been providing financial support to develop learning content, software and technology, release of these in open license would enhance their utility, relevance and further development. For the e-Governance, it may be noted that Govt of India has already notified[8] an open standard policy[9].

2. Principles of Openness

The following shall be the basic principles of openness adopted in all the projects funded by NMEICT:

(a) All information products (content, software and technology) shall be treated as national resource. Unless specifically declared, all such information shall be freely accessible the general public through the Web.
(b) Community engagement shall be a part of all activities, and use read-write tools available on the web shall be encouraged.
(c) Information and knowledge resources generated shall be made available in a persistent permanent basis freely to all through the Web.
(d) Information creation/authoring and dissemination shall be done using commonly accepted standards in such a way so as to encourage discoverability, and capture relevant metadata to promote sharing.
(e) While the moral rights of the creator will remain with the original contributor, all intellectual property rights (IPR) shall be transferred to the Govt of India to enable it to be released in an appropriate open license.
(f) All information and knowledge resources shall be released in a suitable open license to optimise social and economic value of the investment.

Overall the principle of free, online, persistence and permanence, and open shall govern all the activities under the NMEICT projects.

3. Guidelines

(a) These guidelines shall be applicable to all the knowledge resources developed with the support of NMEICT.
(b) There shall be a single portal/gateway for all the knowledge resources developed under the NMEICT. Sakshat can be the common gateway for this purpose.
(c) Regardless of whether these resources may remain in distributed platforms or on a NMEICT Cloud, the Portal/Gateway will provide links, and also ensure permanent access to them.
(d) All educational materials shall be released under an appropriate open licensing regime, current preference being CC-BY-SA[10]. This license will permit users to share (copy and redistribute) the material in any medium or format; and adapt (remix, transform, and build upon) the material for any purpose, even commercially. The user shall provide attribution

8 https://www.egovstandards.gov.in/sites/default/files/Notifications/Notifications%20of%20Standards/Notification%20for%20Policy%20on%20Open%20Standards.pdf

9 https://www.egovstandards.gov.in/sites/default/files/Policy/Policy%20On%20Open%20Standards/Policy_on_Open_Standards_for_e-Governance.pdf

10 http://creativecommons.org/licenses/by-sa/4.0/

to the original creator, and also, mandatorily, distribute any adaptation and/or enhancements under the same license.

(e) When the grantee/creator use other open license materials in his/her works, the license shall adhere to their specific licensing conditions, and intimate NMEICT about the same.

(f) All software delivered under the project, these shall be released in open source using an appropriate license and the source code shall be made available online on a permanent basis using an acceptable depository.

(g) The agency or institution that has developed the software shall create a community of developers to ensure long-term sustainability of the project.

(h) All content developed under the Mission shall use open formats for delivery of the outputs. Use of proprietary software will be strongly discourages. However, if proprietary software is used for any development work, the source file in its final version along with the relevant APIs should also be made available online to enable others to re-use the same.

4. Implementation

(a) Implementation of the open license policy guidelines shall be the responsibility of the central project Unit.

(b) The status of the adherence to this policy shall be reported every three months to the Project Approval Board (PAB).

(c) Non-compliance to the policy shall result in stopping of further grants and/or recovery of the funds.

(d) Advice on licensing shall be provided upon request to specific projects by the central project unit.

(e) Workshop on the open license schema adopted by the Mission shall be organised from time to time for the project grantee to adhere to the guidelines.

Appendix-VIII

Detailed Project Report (DPR) on “Virtual Labs (Phase II)”.

MISSION PROJECT

Outreach, Integration and Maintenance of Virtual labs

PHASE-II

Information relating to department/Institute

1. Name of Institute with complete address	:	Indian Institute of Technology, Delhi
2. Title of the Research Project	:	Deployment and Maintenance of Virtual Labs
3. Department/Broad Area	:	Inter-disciplinary (Science and Engineering)
4. Major areas of research in the Department	:	The Participating Institutes cover most of the major areas of research in Science and Engineering.
5. Names & Designation of Principal Researchers in the major areas and list of publication during last five years based on work done in the Department	:	Please see Annexure I
6. Is it Inter-disciplinary Project	:	Yes
7. Is it Inter-Institutional Project	:	Yes
8. Is any Industry/Usage agency participating	:	No
9. Brief of completed and or ongoing research projects supported by MHRD/AICTE in the Department during last 5 years.	:	Please see Annexure I

PART-II

Information relating to department/Institute

10. PRINCIPAL INVESTIGATOR

a.	*Name*	*:*	*R. K. Shevgaonkar*
b.	Designation	:	Director, IIT Delhi
c.	Age	:	
d.	Educational Qualification	:	Ph.D.
e.	Areas of specialization	:	Signal Processing, Communications
f.	Experience (Teaching & Research)	:	Please see Annexure I
g.	Selected list of papers published	:	Please see Annexure I

CO-INVESTIGATORS

a.	*Name*	*:*	***Ranjan Bose***
b.	Designation	:	Professor, EE Department, IIT Delhi
c.	Age	:	42 Years
d.	Educational Qualification	:	Ph.D.
e.	Areas of specialization	:	Wireless communications
f.	Experience (Teaching & Research)	:	Please see Annexure I
g.	Selected list of papers published	:	Please see Annexure I
a.	*Name*	*:*	***Suresh Bhalla***
b.	Designation	:	Associate Professor, Civil Engineering Department, IIT Delhi.
c.	Age	:	40 Years
d.	Educational Qualification	:	Ph.D.
e.	Areas of specialization	:	Structural Engineering, Health Monitoring, Smart Materials and Structures.

11. In case it is a joint project with other Institution, research labs and industries, name(s) of participating investigators.

The following is the list of participating investigators (see Annexure I for further details):

(a) Ranjan Bose	IIT Delhi	rbose@ee.iitd.ac.in
(b) Suresh Bhalla	IIT Delhi	sbhalla@civil.iitd.ac.in
(c) Kantesh Balani	IIT Kanpur	kbalani@iitk.ac.in
(d) Santosh Noronha	IIT Bombay	noronha@che.iitb.ac.in
(e) C.S. Kumar	IIT Kharagpur	kumar@mech.iitkgp.ernet.in
(f) Ratnajit Bhattacharjee	IIT Guwahati	ratnajit@iitg.ernet.in
(g) Vinod Kumar	IIT Roorkee	vinodfee@iitr.ernet.in
(h) Jayanthi Sivaswamy	IIIT Hyderabad	jsivaswamy@iiit.ac.in
(i) Krishnashree Achuthan	AmritaUniversity	krishna@amrita.edu
(j) Soami Satsanghi	Dayalbagh University	deiusic@gmail.com
(k) Rahul Swarup Sharma	Dayalbagh University	rahulswarup@dei.ac.in
(l)) K V Gangadharan	NITK Suratkal	kvganga@nitk.ac.in
(m) () Sudhir Agashe	COE Pune	sda.instru@coep.ac.in

12. In case industry/user agency is participating, whether a MOU has been signed or letter of intent given.

Not applicable

13. Present commitments of the Principal Investigator: Please see Annexure I.

14. Other members of the Research Group to work on proposed Projects:

Different faculty members from all the participating institutes will be involved for the development of the Virtual Labs

PART-III
About the Research Project

15. (a) Summary of the project (in brief)

Good lab facilities and updated lab experiments are critical for any engineering college. Physical distances and the lack of resources often make it difficult to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource.The Virtual Labs project addresses the issue of lack of good lab facilities, as well as trained teachers, by making remote and simulation based experimentation possible through World Wide Web. With the present day internet and computer technologies, these limitations no longer hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Yet another objective is to arouse the curiosity of the students and permit them to learn at their own pace. This facilitates the absorption of basic and advanced concepts through remote experimentation. Internet based experimentation further permits use of resources – knowledge, software, and data available on the web, apart from encouraging skillful experiments being simultaneously performed at points separated in space. Specifically, the Virtual labs developed already provide the following:

(a) Access to quality labs to those engineering colleges that lack these lab facilities.
(b) Access to quality labs as a complementary facility to those colleges that already have labs
(c) A complete Learning management System around these labs
(d) Teacher-training and skill-set augmentation through workshops and on-site training.

In the First Phase of the Virtual Labs project, web-enabled experiments have been designed for remote operation and viewing. Over 50,000 students, (in approximately 150 colleges) have used the Virtual Labs and have provided user-feedback. The primary focus of the Second Phase of the Virtual Labs project is to reach out all potential users of Virtual Labs, in order to address the following issues:

- To maintain and upkeep the existing operational virtual labs
- To port Virtual Labs to a common platform and host it on a national server.
- To create a ‘single package’ of simulation-based Virtual Labs to be distributed to users.
- To engage private agencies for outreach of Virtual Labs: (i) awareness about labs and (ii) usage of labs.
- To identify the gap areas between the typical syllabi of technical universities and the existing labs and to develop additional labs/experiments to fill these gaps.

- To convert labs not based on free and open source technologies to open source.
- To port the existing labs to mobile platformMobile platform Tablets.
- To identify and work with government, private agencies and professional bodies for granting 'Certificate to users of Virtual Labs'.

(b) Justification, importance of project, etc.

Over 100 Virtual Labs have already been developed and many of them are being used by various colleges. It is important to keep these labs in 'up and running' condition. Usage pattern of these labs show that these labs are increasingly used 'outside' the lab hours, which was one of the original motivations for this project. Based on the user-feedback, bugs need to be fixed. Currently, labs are undergoing extensive field testing. 'Limited deployment' of many of the virtual labs have also been carried out, where they are regularly used by colleges. The next logical step is to deploy these labs at a national level so that they reach all the engineering colleges that will benefit from them. This would mean taking the labs to the colleges present in the urban areas as well as the rural region of India. Based on the user-feedback, gap areas need to be identified and further virtual labs and lab experiments will have to be developed. Currently, Virtual Labs have been developed in various institutes, on different platforms. Most of the labs are currently running on individual servers, or as standalone applications. Engineering effort is needed to propel the Virtual Labs to the next level where (a) they run from a common web framework and runtime environment, such as mobile platformMobile platform tablet. (b) They provide the user with a rich virtual lab environment with support for account management, persistence, fast turn-around time on the web, user-friendly interfaces, localization, etc. required to integrate the use of Virtual Labs with the academic and learning processes at the colleges.

(c) Details of the work already done by Principal Investigator in this area :

Please see Annexure I.**16.**

Total amount required: **Rs.** Sixty Nine Crore,Seventy One Lakh,Sixty five Thousand Five Hundred (**Rs. 69,71,65,500)**

17. Budget of the proposal along with item-wise breakup

The item-wise break-up of the budget is given in Table 1. The proposed budget is for **three years** from the date of receipt of funds.

TABLE 1. OVERALL BUDGET BREAKUP

S.No.	Items	Budget#			Total (in Lacs)
		First Year (in Lacs)	Second Year (in Lacs)	Third Year (in Lacs)	
1	Deployment and Outreach	264.5	289.03	319.39	872.92
2	Integration and Maintenance	**861**	**944.9**	**1037.9**	**2843.8**
3	Development of new experiments (300expt.x 3 Lacs/expt.)*	300	300	300	900
4	Honoraria	40	40	40	120
5	Central platform Engineering	546.388	509.8203	560.80233	**1617.0106**
6	Data Center	34.515	50.43	98.15	183.095
7	Software License	200	0	0	200
8	Reviews / Mid-term evaluations/Internal Workshops	70.95	78.04	85.84	234.83
	Total	**2317.353**	**2212.22**	**2442.082**	**6971.655**

#Detailed justification for the budget is provided in the subsequent tables.*Roughly 100 experiments will be developed every year.

18. Summary sheet: Given on the following page

SUMMARY SHEET

1.	Name of the Institution:	Indian Institute of Technology, Delhi
2.	Title of the Project:	Integration and Maintenance of Virtual Labs Phase-II.
3.	Name of the Department:	This is a joint project of 11 participating institutes
4.	Cost of the Project:	**Rs.** Sixty Nine Crore,Seventy One Lakh,Sixty five Thousand Five Hundred (**Rs. 69,71,65,500)**
5.	Amount released earlier if any:	None
6.	Utilization position in respect of grants released earlier for various projects (Details to be given project-wise)	
	(i) Fully spent	UC attached
	(ii) Unspent, proposal to utilize it	UC attached
7.	Reasons for unspent balance:	N/A
8.	Name of the Principal Investigator responsible for implementation of the Project:	

Director, IIT Delhi

(NAME & SIGNATURE OF THE PRINCIAPAL INVESTIGATOR)

For Office Use Only

1. Name of the Area :

2. Recommendations:

   - Approved
   - Not approved
   - Deferred Amount (Rs._____ in lakhs)
   - Transferred to area

3. Remarks, if any

   (common for all the 3 schemes)

4. **Certificate**

1. Certified

   (i) that the Principal Investigator is due to retirement during the currency of this project.

   (ii) that the Principal Investigator is a regular employee of this Institution. However in case he/she proceeds sabbatical/resigns/proceeds VRS etc., the Institute will ensure to replace PI by a compatible academician to ensure that without any brake whatsoever, project will be completed within the stipulated period of 3 years.

   (iii) that it will be ensured that the implementation will be carried out on mission mode with no time or cost overrun and we are aware that ministry will neither provide any extension of time nor additional funding.

   (iv) that no over heads will be charges by the Institution for this project and all facilitation including other essential/infrastructure support like air-conditioning etc. will be provided by the Institution.

Seal of the Institution

Signature of Head of the Institution (Name)

Detailed Project Report

OUTREACH,INTEGRATION AND MAINTENANCE OF VIRTUAL LABS

1. BACKGROUND AND MOTIVATION

Good lab facilities and updated lab experiments are critical for any engineering college. Physical distances and the lack of resources often make it difficult to perform experiments, especially when they involve sophisticated instruments. Also, good teachers are always a scarce resource. The 'Virtual Labs' project addresses this issue of lack of good lab facilities, as well as trained teachers, by making remote experimentation possible. With the present day internet and computer technologies, these limitations no longer hamper students and researchers in enhancing their skills and knowledge. Also, in a country such as ours, costly instruments and equipment need to be shared with fellow researchers to the extent possible. Yet another objective is to arouse the curiosity of the students and permit them to learn at their own pace. This facilitates the absorption of basic and advanced concepts through remote experimentation. Internet based experimentation further permits use of resources – knowledge, software, and data available on the web, apart from encouraging skillful experiments being simultaneously performed at points separated in space. Specifically, the Virtual Labs project addresses the following:

(a) Access to quality labs to those engineering colleges that lack these lab facilities.
(b) Access to quality labs as a complementary facility to those colleges that already have labs
(c) A complete Learning management System around these labs
(d) Teacher-training and skill-set augmentation through workshops and on-site training.

In the First Phase of the Virtual Labs project, web-enabled experiments have been designed for remote operation and viewing. Over 50,000 students, (in approximately 150 colleges) have used the Virtual Labs and have provided user-feedback. The primary focus of the Second Phase of the Virtual Labs project is to maintain the labs already developed and reach out to all potential users of Virtual Labs, in order to address the following issues:

1).To maintain/upkeep the existing operational virtual labs.
2).To port Virtual Labs to a common platform and host it on a national server.
3).To create a 'single package' of simulation-based Virtual Labs to be distributed to users.
4).To engage private agencies for outreach of Virtual Labs: (i) awareness about labs and (ii) usage of labs.

5).To identify the gap areas between the typical syllabi of technical universities and the existing labs and to develop additional labs/experiments to fill these gaps.

6).To convert labs not based on free and open source technologies to open source.

7).To port the existing labs to mobile platformMobile platform Tablets.

8).To identify and work with government, private agencies and professional bodies for granting 'Certificate to users of Virtual Labs'.

2. OBJECTIVES OF THE PROJECT

The main objectives of this project are listed below.

(a) To maintain/upkeep the existing operational virtual labs.

Over 100 Virtual Labs have already been developed and many of them are being widely used by various colleges. It is important to keep these labs in 'up and running'condition. Usage pattern of these labs show that these labs are increasingly used 'outside' the lab hours, which was one of the original motivations for this project. The maintenance of the labs will include man power that will be responsible for the back-end server related issues, as well as,the software/hardware up-gradation as and when required. Based on the user-feedback, bugs will be identified and fixed. The maintenance of labs would be done at the institute level so as to maintain the quality of the labs.

(b) To port Virtual Labs to a common platform and host it on a national server.

Currently, labs have been developed in various institutes, on different platforms. Most of the labs are currently running on individual servers, or as standalone applications. Significant engineering effort is therefore needed to propel the Virtual Labs to the next level where (a) they run from a common web framework and runtime environment, (b) all the labs are hosted on common national server (c) they provide the user with a rich virtual lab environment with support for account management, persistence, fast turn-around time on the web, polished user interfaces, localization, etc. required to integrate the use of Virtual Labs with the academic and learning process at the colleges.

(c) To create a 'single package' of simulation-based Virtual Labs to be **distributed to users.**

Whereas objective (a) ensures that the labs we hosted on a national server, given the limits of connectivity in some remote/backward areas of the country, a number of colleges may still face difficulty in accessing and using these. It is therefore envisaged to create a single package of the simulation based labs, which do not involve any hardware, for distribution to the individual colleges. Total size of the memory required is expected to large and best medium, say DVD or Pen drive or external Hard drive need to be explored.

(d) To engage private agencies for outreach of Virtual Labs: (i) awareness about labs and usage of labs.

Although significant attempts have been made in Phase I to reach to maximum possible number of colleges, it is also a fact that most potential users are still unaware of the existence of the virtual labs and their potentials. It is therefore envisaged in Phase II to engage special agencies to (i) create awareness of the labs among students and faculty members (ii) organize on-site workshops to provide a minimum level training to the local faculty members/research scholars in the colleges. When publicized in this fashion, the faculty members in the colleges will seriously engage their students in using the virtual labs.

(e) To identify the gap areas between the typical syllabi of technical universities and the existing labs and to develop additional labs/experiments to fill these gaps.

Currently, the virtual labs have resulted from the efforts of few interested faculty members who came forward to create these facilities in their specific domains. Given the different syllabi across the country, these still do not address all aspects of a typical Undergraduate Engineering syllabus.

(f) To convert labs not based on free and open source technologies to open source.

Currently, the labs have been built on various platforms and specialized software. The users may need to install these software's on their PC's to be able to use the applications seamlessly. This may limit the outreach of virtual labs seriously. This issue will be duly addressed in Phase II of the project by ensuring that the simulation can be run by users using open source or free software.

(g) To port the existing labs to mobile platform Mobile platform Tablets.

The success of mobile platform Mobile platform Project has given a new prospect to UG students of India to be able to afford a reasonably good Tablet at a small price. Phase II of the Virtual labs project aims to make sure that all experiments have compatibility with mobile platform Mobile platform Tablet so as to reach out to maximum number of users.

(h) To identify and work with government, private agencies and professional bodies for granting 'Certificate to users of Virtual Labs'.

Although Virtual labs aim to supplement the academic requirements of the UG students, much needs to be done so that local faculty members can evaluate the students after they attempt the experiments. A possible solution is to engage a third party for awarding of certification to users by online Techniques. The Phase II of the project will explore the possibility of engaging government, private bodies and private agencies in this endeavor.

3. METHODOLOGY

(a) Methodology for maintenance of Virtual labs already developed.

A Virtual Labs Maintenance team will be established at each participating institute. This team will be responsible for keeping the labs 'up and running'. Additionally, they will fix any bugs/errors that are reported. The team will also use the domain expertise of the faculty lab developer in order to carry out continuous improvement of the lab. The maintenance team will fix bugs, make changes in the contents whenever required, add new experiments, and keep all labs online. A total of 24 engineers (1 engineer per 7 labs) are envisaged for this purpose.

(b) Methodology to port Virtual Labs to a common platform and host it on a national server.

The virtual labs may be seen as a collection of web applications. These applications interact with a user client at one end and with a set of common and core virtual lab services (elaborated below) on the other end via APIs (Application Programming Interfaces) developed/adapted specifically for virtual labs. Vendor specific APIs shall not be used so as to allow for migration from one server to other. Phase 2 will require that Virtual labs run from a uniform platform. Much engineering effort will be spent on designing and implementing this central platform and then carrying out the process of integration of each lab to this platform.

The 'integration activities' will be carried out at two levels:

(i) Locally at each participating institute.

(ii) Central Integration.

A 'Local Virtual Labs Engineering and Integration team' will be established at each participating institute. This team will consist of software and systems engineers supervised by a faculty member. The responsibility of the engineering and integration team is to carry out the integration of the labs to the central framework.IIIT Hyderabad will host the central integration team under the supervision of Prof.Venkatesh Choppella, who will act as National Integration Coordinator (NIC).The local integration team will interface with the central integration team. A total of 165 engineers (1 engineer for each lab at the local institute in addition to 51 engineers at IIIT Hyderabad will be hired). In Phase 1, a faculty lab developer (FLD) worked with a group of engineers/programmers to develop a lab. In Phase 2, the emphasis will be on engineering and integration and this will require a structure as outlined below:

Central platform engineering team: The role of this team is (a) to design and run the central data centre to host labs, and (b) to design new engineering platforms (UI, Akaash, API development, analytics, etc.) with which labs will be integrated. The team will consist of network, systems and software engineers and web designers.

Institute integration team: The role of this team is to carry out the integration of labs to the new platforms, maintain and fix bugs in experiments and the lab, and add new features to the existing labs. The per institute engineering team will be supervised by an Institute Integration Coordinator (IIC). The IIC's experience in software and systems engineering will be crucial to the success of the integration effort. The team under the IIC will consist of systems and software engineers and/or web designers. This team will interface with the central engineering team.

(Per lab) Faculty Lab Developer: The role of the faculty lab developer in Phase 2 is to conceptualize and prototype new experiments or improvements on existing ones. The new labs/experiments will be integrated to the central platform by the institute integration team. It is targeted to make 40 labs ready by the first year and 80 labs by the second year of the project.

(c) Methodology to create a 'single package' of simulation-based Virtual Labs to be distributed to users.

The contents of all existing simulation based Virtual Labs will be evaluated and a single package suitable for distribution across the engineering colleges will be created. The final product could be in the form of a package of DVDs or pen drives or external hard drives. The set will be produced discipline wise in consultation with Discipline wise National Coordinator (DNC).The first set shall be released around June 2014.

Packaging and distribution: Labs will be distributed on media (like DVDs). A uniform packaging (like Debian .deb distributions), distribution processes, and an updating (eg., dpkg of Debian or apt-get of Ubuntu) framework will need to be implemented.

(d) Methodology to engage private agencies for outreach of Virtual Labs: (i) awareness about labs and (ii) usage of labs.

Exhaustive field trials are presently being carried out on the labs already developed. The user community is made to feel a part of the development process, as their feedback is used to improve and augment the labs under development. Given the large number of engineering colleges across the country, private colleges and other agencies will be roped in to make the process fast track. The process of field trials and limited deployment has been standardized during as is depicted in Fig. 1. The process starts with a workshop, which explains the concept of the Virtual Labs project and provides an overview. Demonstrations are invariably given to showcase the power of Virtual Labs. After the workshop, an expression of interest is sought. This is done to ensure a basic level of commitment. Those who qualify are declared Nodal Centers, and two Nodal Center Coordinators are selected as liaison persons. This is followed by extensive on-site training and on-site workshops. The exchange of ideas and discussions take place during the Nodal Center Coordinators' meetings, which are held regularly. Regular workshops and teacher-training would also form a part of this activity. A team of Field Engineers will conduct the workshop and provide hands on session for the experiments under all the labs. Three field engineers per institute have been envisaged for this purpose. The field engineers will mostly be on travelling and will be accountable for giving live field demonstrations of the experiments as well as aid in the process of troubleshooting. Incentives have been kept in project budget for nodal coordinators as well as users who provide feedback

after the workshop. In addition, to direct physical workshops, remote workshops where first half of the day shall be a remote lecture and the second half shall be practical session shall also be used.

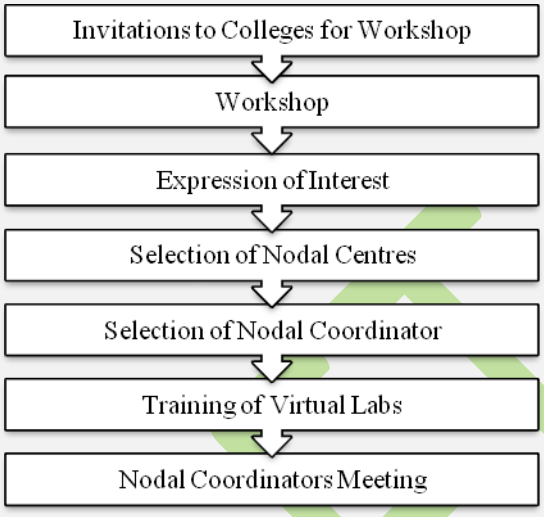


Fig. 1 the Flowchart for the selection of Nodal Centres.

TABLE 2 PROPOSED WORKSHOPS BY PICS FOR OUTREACH

S.No	Name of PIC	Number of Nodal centers	Usages of Virtual Labs	Number of Workshops/ Remote Training	Total number of participants trained in workshops
1	IIT-D	25	54,000 *	5	500
2	IIT-R	25	54,000	5	500
3	IIT-G	15	32,400	5	500
4	AMRITA	60	1,29,600	5	500
5	IIT-K	25	54,000	5	500
6	IIT-B	25	54,000	5	500
7	DAYALBAGH	25	54,000	5	500
8	IIIT-H	25	54,000	5	500
9	IIT-KGP	25	54,000	5	500
10	NIT-K	25	54,000	5	500
11	COE, Pune	25	54,000	5	500
12	Grand Total	300	6,48,000	55	5500

National Integration Coordinator (NIC) -IIIT Hyderabad
National Outreach Coordinator (NOC) -IIT Delhi

(e) Methodology to identify the gap areas between the typical syllabi of technical Universities and the existing labs and to develop additional labs/experiments to fill these gaps.

Development of Virtual Labs is continuous process. The feedback of the academic as well as the user-community will be taken so as to fill-up the gap areas where Virtual Labs / Lab experiments are missing. Different institutes will be encouraged to participate in the development activity. Expert committees will be formed to identify gap areas in selected domains and provide their recommendations to the lab developers, in consultation with DNCs.

(f) Methodology to convert labs not based on free and open source technologies to open source.

Conversion to FOSS and standard platforms: Many labs are currently dependent on proprietary software or non-standard platforms (content management systems, operating systems, animation front-ends; see Table 1).These labs will need to have major parts of their implementation rewritten to use free and open source software and standard platforms wherever possible. Specifically, wherever possible Python, Scilab and SciPy APIs and bindings will need to be developed. All labs will need to run on the mobile platformMobile platform (Android) based platform. Unfortunately, the Android platform does not support Flash or the standard Java SDK. Central platform engineering will release alternative APIs based on FOSS for both front-end (Javascript) and back-end platforms wherever possible. Also, many labs are currently using non-standard web platforms (content management systems, operating system, animation front-ends, etc., see Table 1). A large part of the integration will involve migrating to a uniform platform. Three years down the line, the cost for software licenses shall be toned down to zero.

Table 3: Extent of use of non-standard and/or proprietary platforms in Virtual Labs. Numbers are lower bound estimates because of incomplete information.

Platform	Number of labs
Flash	63
Java front end	15
CMS	118
Windows	10
Matlab	10
Labview	10

Suitable open source platforms shall be identified. The concerned labs will be identified and their application will be converted to open source in a phased manner.

(g) Methodology to port the existing labs to mobile platformMobile platform Tablets.

The lab developers will check the compatibility of their experiments with mobile platformMobile platform. All compatible experiments shall carry an announcement in their regard to attract mobile platformMobile platform Users. This will be done by the central platform engineering team headed by Prof.Venkatesh Choppella at IIIT-Hyderabad.

The role of this team will be (a) to design and run the central data centre to host labs, and (b) to design new engineering platforms (UI, mobile platformMobile platform, API development, analytics, etc.) with which labs will be integrated. The team will consist of network, systems and software engineers and web designers.

(h)Methodology to identify and work with government, private agencies and professional bodies for granting 'Certificate to users of Virtual Labs'.

Although Virtual labs aim to supplement the academic requirements of the UG students, much needs to be done so that local faculty members can evaluate the students after they attempt the experiments. A possible solution is to engage a third party for awarding of certification to usages by online techniques. The phase-II of the project will explore the possibility of engaging government and private bodies/agencies in this endeavor.

Other Related Issues

A Virtual Lab is ultimately a web application. A standard software application development model incorporates automatic versioning, software issue-tracking, testing and licensing and release management. Sustaining Virtual Labs will require long term and continuous development of the lab software. For this to happen, a proper software development process model is a sine qua non. The following tasks will be undertaken as a part of the engineering/integration of Virtual labs:

(i)Versioning: Automatic versioning allows improvement and modification of the lab's content and the software in a controlled manner by maintaining a history of all past revisions.

Carrying out development under a version control regime is also critical for issue tracking and release management (described further below).

(ii)Issue-tracking: While the content and software developed for the Virtual Labs has undergone review by experts, errors in the content and bugs in the software are likely to persist beyond the release of the lab. An issue tracking system is a systematic way of cataloguing bugs reported by users and thus a crucial part of managing the lab's software development process.

(iii)Release Management: Selecting a particular version of the labware and readying it so that it can be deployed on a central platform is called release management. Release management involves a protocol where the lab developer needs to mark a particular version of the labware for release, verify that the particular release matches quality standards (both for content and the software), and hands over a lab deliverable to the deployer.

(iv)Licensing: The running of a Virtual lab depends on various types of software applications with different licensing schemes. A proper mechanism for verifying that the labs are using licensed software in the correct manner without violating any copyright issues is essential since these labs will be available as a public URL. Support for a wide range of development frameworks is necessary. Since there has been no standard framework defined for development, Virtual Labs developed so far have used a wide array of development frameworks, depending on the ease of development of the developer. Unifying these will require considerable engineering expertise to ensure uniformity across all developmental platforms to provide a similar outcome.

(v)Acceptance Process: The purpose of the acceptance process is to ensure a Virtual Lab follows a minimum standard of quality. There are several quality parameters, including conformance to a presentation structure (introductory and experiment sections, quizzes, reference material, etc.), verifying that any copyrighted material is properly licensed and acknowledged, ensuring that all end-user license agreements for any software being used to run the lab are in compliance, and making sure that well defined process exist for bug fixing.

Lab Integration Levels:

To achieve quality in the development process, we propose a series of integration levels that each lab will go through in its development. Each integration level is a checkpoint that captures a milestone towards the development and the hosting of the virtual lab. We have defined the initial set of integration levels. Each integration level comes with a series of acceptance criteria for the lab. (Details are along the lines of the terms of association document)

TABLE 4 – Different Levels of Virtual Labs

Level	Sources Versioned	Build Procedure	Deployment Location	Deployment Procedure
0	No	Manual	Developer	Manual
1	Yes	Manual	Developer	Manual
2	Yes	Auto	Developer	Manual
3	Yes	Auto	Test Server	Manual
4	Yes	Auto	Deploy Server	Manual
5	Yes	Auto	Deploy Server	Automated

(vi)Basic Web Security Compliance: Each virtual lab is essentially a web application and accessible as a public URL. It is therefore a prestigious target for attack from malicious users. In order to prevent security breach of the data centre and a compromise of user data, the data centre and virtual lab will need to be fortified at several levels: network, OS, web server, web application, and browser.

(vii)Software code quality: Each virtual lab will need to comply with coding, testing and documentation standards which would be defined by central integration team. These specifications can be refined based on new inputs received and insight gained during the course of the project.

(viii)Lab performance: A virtual-lab is expected to utilize resources fairly and under some expected limits. For example a lab should avoid serving Full-HD (1080p) videos where a normal 480p video quality serves the purpose. This reduces load on Internet bandwidth, storage and processing for both the data-centre and the user, which is necessary for scaling to support large number of users.

(ix)Acceptance Criteria for hosting virtual lab on data centre:

The virtual labs will be hosted on a data centre in a phased manner based on the compliance with the integration levels and checkpoints.

4. CURRENT STATUS

The Pilot Phase of the Virtual Labs project started in April 2009 under the National Mission through ICT. During this phase, approximately 20 labs were developed as proof of concept. The Main Phase began in April 2010. Currently, the New RT Labs project is underway, in which approximately 30 remote-triggered labs are being developed. There are twelve participating institutes: IIT Delhi (coordinating institute), IIT Kanpur, IIT Bombay, IIT Kharagpur, IIT Guwahati, IIT Roorkee, IIIT Hyderabad, Amrita University, Dayalbagh University, NIT Surathkal and COE Pune.

Virtual labs have provided both the students and teachers the access to quality labs in a wide range of topics, spanning different branches of science and engineering. Over 100 Virtual Labs have been developed. The importance and effectiveness of these Virtual Labs can be estimated from the user feedback (see Fig. 2). The labs are also being used outside the labs hours, and also on weekend, as depicted by Figs. 3 and 4.

BROAD AREAS OF VIRTUAL LABS

Electronics and communication Engineering
Computer Science and Engineering
Electrical Engineering
Mechanical Engineering

Chemical Engineering
Biotechnology and Biomedical Engineering
Civil Engineering
Physical Sciences
Chemical Sciences

Details regarding the labs under each discipline are provided in Annexure II.

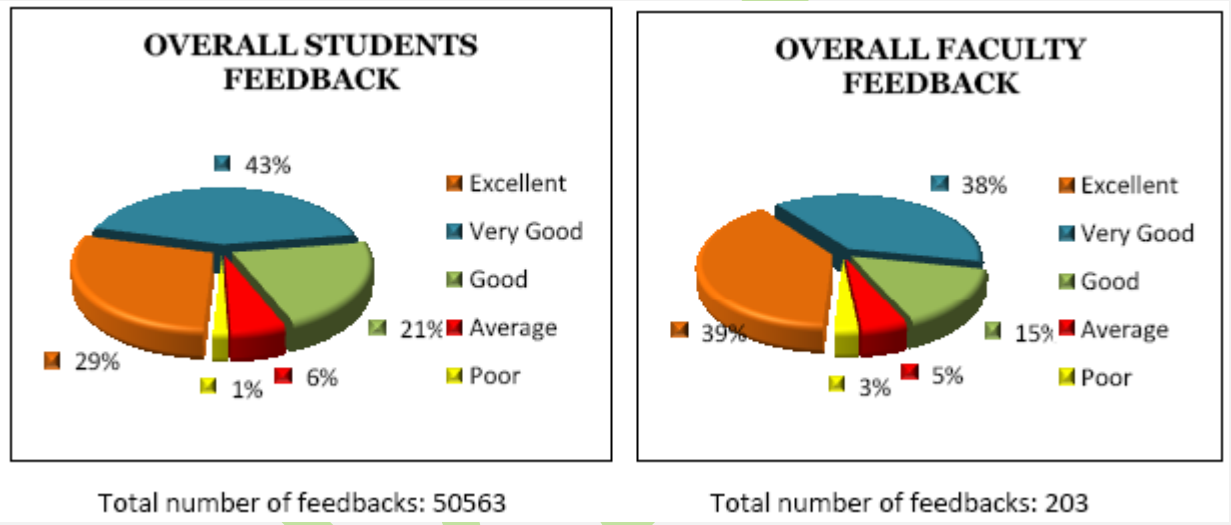


Fig. 2: Feedback of the students and faculty members who have used Virtual Labs to conduct experiments remotely (Dec 2013)

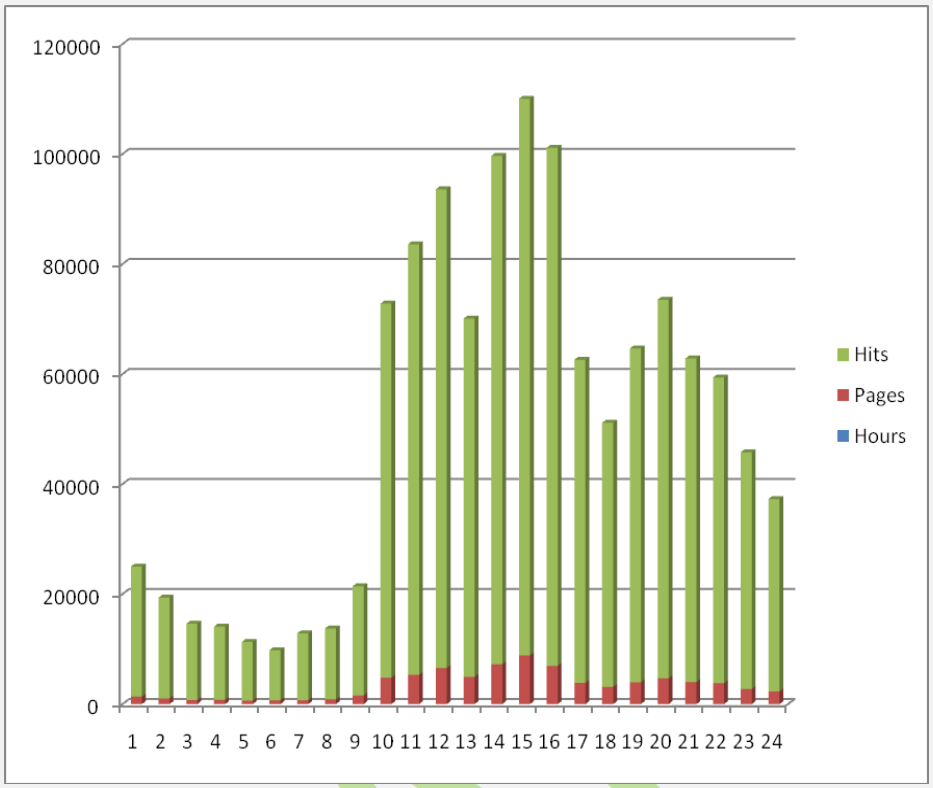


Fig. 3: The numbers of hits on the website and numbers of pages visited by the users on hourly basis (Jan 2014)

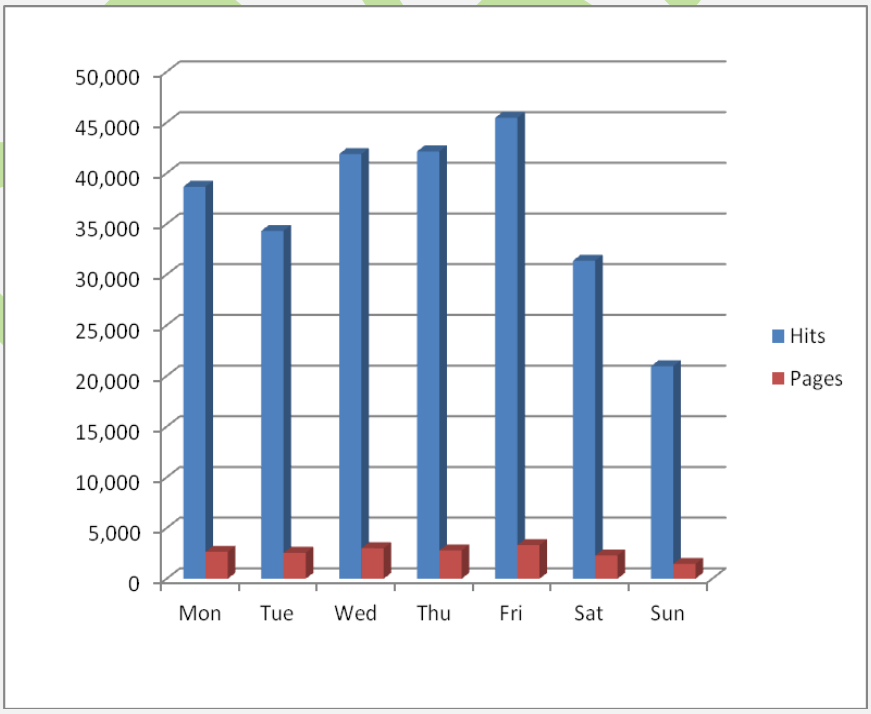


Fig. 4: The number of hits on the website and numbers of pages visited by the users on weekly basis (Jan 2014).

Current Status of Outreach of Virtual Labs

a. Geographical Coverage

Virtual Labs was dedicated to the Nation on 23 February 2012. Virtual Labs are being used in engineering colleges in various parts of the country. The area wise details are given below:

National Capital Region (NCR)

Northern India

Panipat
Meerut
Karnal
Jalandhar
Baddi
Dehradun
Jaipur
Gwalior
Bhopal
Lucknow
Alwar
Kurukshetra
Gurgaon

Southern India

Amritapuri
Bangalore
Coimbatore
Kottam
Hyderabad
Thiruvananthapuram
Chennai
Surathkal

Eastern India

Guwahati
Kharagpur
Durgapur

Western India

Ahmedabad
Pune
Mumbai

Nagpur

Nasik

Potential beneficiaries of the project

The intended beneficiaries of the projects are:

- All students and Faculty Members of Science and Engineering Colleges who do not have access to good lab-facilities and/or instruments.
- High-school students, whose inquisitiveness will be triggered, possibly motivating them to take up higher-studies.
- Researchers in different institutes who can collaborate / share equipment and resources.
- Different engineering colleges, who can benefit from the content and related teaching resources.

The project has completely fulfilled the requirements of the targeted beneficiaries (and even gone beyond). An eco-system has evolved around Virtual Labs, where the community has become involved in evolving and benefitting from the project.

Salient Features

(i) Common website for all Virtual labs

All Virtual Labs can be accessed through a common website: www.vlab.co.in

At the user end, a PC and broadband connectivity enables the users to access Virtual Labs.

(ii) Front-end

All users see a common web-based front-end which has been designed for ease of use. The Virtual Labs have standardized look and feel. All web pages are icon based. PhaseII will ensure that all Virtual labs are mobile platformMobile platform compliant.

(iii) Back-end

The back-end is completely computer-driven. Virtual Labs will provide to the students the result of an experiment by one of the following methods (or possibly a combination):

Modeling the physical phenomenon by a set of equations and carrying out simulations to yield the result of the particular experiment.

Providing a corresponding measurement data for the Virtual Lab experiment based previously carried out measurements on an actual system.

Remotely triggering an experiment in an actual lab and providing the student the result of the experiment through the computer interface.

(iv) Learning Management System (LMS)

Virtual Lab project provides a complete Leaning Management System. For most users, Virtual Lab provides all the relevant material at one place including the Objectives of the Experiment, Procedure, Lab manual, Pre- and Post-experiment quizzes, additional Lab resources, in addition to the Virtual Lab experiment. Most labs also have an associated question bank.

(v) Standardization and best practices

The following standard process development and sharing of best practices have been carried out within the project

- Development of a standard process for Quality Control.
- Development of a standard process for Field Trails.
- Development of a standard process for obtaining user Feedback.
- Development of a standard process for obtaining Feedback of subject experts.
- Continuous Evaluations by Subject Experts, thereby permitting mid-term corrections.
- Use of a standard collaborative platform
- Repository of all project related documents available on a common server

Virtual Lab provides all the relevant material at one place including the Objectives of the Experiment, Procedure, Lab manual, Pre and Post-experiment quizzes, additional Lab resources, in addition to the Virtual Lab experiment.

1. Wiki and Developer forum
2. Standard Administrative Website for all labs

Summary of Field Trials

The Field trials of Virtual labs were conducted in 42 Engineering Institutions around 16 universities comprising of Delhi &NCR, Haryana, Himachal Pradesh, Gujarat, Punjab, Rajasthan, Madhya Pradesh, Uttarakhand and Uttar Pradesh states in June-December 2012 session. Over 200 faculty feedback forms and 50,000 student feedback forms have been collected so far. Over 1000 faculty members have been trained on the Virtual Labs platform.

Methodology of Field Trials

- The Virtual labs team conducted a workshop on Virtual labs for ECE, CSE and Applied Science disciplines in the designated nodal centers.
- The demonstration was given on Virtual labs in each session for one lecture in a classroom.
- The labs chosen for demonstration belonged to the syllabus of the on-going semester.
- The faculty members responsible for the labs/subjects were present during the demonstration.

- After the demo of virtual labs, hands on practice sessions were conducted.
- Upon completion of the demo and hands-on experimentation, the faculty members and students submitted the hard copy of the feedback forms to Virtual labs team members.
- These forms were compiled and analyzed. The bugs/shortcomings were duly reported to the respective virtual labs developers for improvement.

National Impact

Field trials were conducted in over 150 colleges and around 36 workshops were conducted in various colleges of several states (Fig. 5). More than 1,000 faculty members and over 50,000 students were trained during these field trials. Students all over India are now taking advantage of Virtual Labs in order to get the feel of actual lab experimentation.

Fig 5: National Impact of Virtual Labs.

DELIVERABLES OF PROJECT

Definition of Usage instance:

1usage (instance) = loading content of 1 experiment + loading simulation of 1 experiment

1st year [1st Installment: release of 40% of approved budget]
Nodal Centers using Virtual Labs (end of 1st year) = 300
No. of usage for 1st year = 6, 48,000
Two Reviews by an expert panel

2nd year [2nd Installment: release of 30% of approved budget]
New Nodal Centers added to Virtual Labs (during 2nd year) = 22
Total number of Nodal Centers (end of 2nd year) = 300(1st Year) + 22(new)
= 322
No. of usage for 2nd year= 6, 10,500
Cumulative total number of usage =1st year usage + 2nd year usage
= 5, 94,000 + 6, 10,500
=11, 04,500
Two reviews by an expert panel

3rd year [3rd Installment: release of 30% of approved budget]
New Nodal Centers added to Virtual Labs (during 3rd year) = 25
Total number of Nodal Centers (end of 3rd year) = 297(2nd Year) + 33(new)
= 330
No. of usage for 3rd year= 6, 32,000
Cumulative total number of usage =1st year usage + 2nd year usage + 3rd year usage
= 5, 94,000 + 6, 10,500 + 6, 32,000
=18, 36,500
Two reviews by an expert panel

DETAILS OF BUDGET AND TIME LINE

TABLE 5. OVERALL BUDGET

S.No.	Items	Budget#			Total (in Lacs)
		First Year (in Lacs)	Second Year (in Lacs)	Third Year (in Lacs)	
1	Deployment and Outreach	264.5	289.03	319.39	872.92
2	Integration and Maintenance	1222.0	1344.0	1474.0	**2843.8**
3	Development of new experiments (300expt.x 3 Lacs/expt.)*	300	300	300	900
4	Honoraria	40	40	40	120
5	Central platform Engineering	546.388	509.8203	560.80233	**1617.0106**
6	Data Center	34.515	50.43	98.15	183.095
7	Software License	200	0	0	200
8	Reviews / Mid-term evaluations/Internal Workshops	70.95	78.04	85.84	234.83
	Total	**2317.353**	**2212.22**	**2442.082**	**6971.655**

#Detailed justification for the budget is provided in the subsequent tables.

*Roughly 100 experiments will be developed every year.

TABLE 6. BUDGET FOR DEPLOYMENT AND OUTREACH OF VIRTUAL LABS

Name of the Institute	First Year			Second Year			Third Year		
	Number of Usage	Workshops	Budget (Lacs)	Number of Usage	Workshops	Budget (Lacs)	Number of Usage	Workshops	Budget (Lacs)
IIT Delhi	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
IIT Bombay	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
IIT Kanpur	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
IIT Kharagpur	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
IIT Roorkee	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
IIT Guwahati	32400 (15 NCs)	2	21.1	36720 (17NCs)	2	23.33	43200 (20NCs)	2	26.09
IIIT Hyderabad	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
Amrita University	129600 (60 NCs)	2	31.9	133920 (62NCs)	2	34.13	140400 (65NCs)	2	36.89
Dayalbagh University	54000 (25 NCs)	2	23.5	58320 (27 NCs)	2	25.73	64800 (30 NCs)	2	28.49
NITK Surathkal	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
COE Pune	54000 (25 NCs)	2	23.5	58320 (27NCs)	2	25.73	64800 (30 NCs)	2	28.49
Total	648000* (300NCs)	22	264.5	695520** (322NCs)	22	289.03	766800*** (355NCs)	22	319.39

*Total Number of usage for 1st year **Total Number of usage for 2nd year

***Total Number of usage for 3rd year NCs: Nodal Centers

JUSTIFICATION OF BUDGET FOR DEPLOYMENT AND OUTREACH OF VIRTUAL LABS

The calculation is shown for the collection of 6, 48,000 usage from 300 Nodal Centers (NCs) for 1st year and 6, 95,520 usage from 322[300(1st year) +22(new NCs)] Nodal Centers for 2nd year and 7, 66,800 usage from 355[322(2nd year) +33(new NCs)]. The deployment entails site visits to NCs by the field engineers. Here we assume that 30% (approx.) NCs will be within 50 Kms radius (local travel) and 70% (approx.) will be located at larger distances (>50 kms)

FIRST YEAR

EXPENSE	**AMOUNT (LACS)**
Manpower: 3 field engineers per Institute	4 L x 3 (person) = Rs 12 L (Salary Rs 4 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12*x1000 x 25 = Rs 3 L
Workshops	Rs 6 x 2**x1000 x 25 = Rs 3 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	2.5 L
Miscellaneous expenses	2.0 L
Travel	1 L
Total	**23.5 L**

* Cost for 1 usage=Rs 12/-per students as per AICTE norms.
Number of usage=1000
Cost for 1 Nodal Coordinator =Rs 12,000*/- per year

**Rs 6/= per student per workshop, two workshops planned in a year.

As 9 PICs have each 25Ncs

Cost incurred (for 9 Institute) = 23.5 X 9=211.5 L

Cost for IIT-G

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4 L x 3 (person) = Rs 12 L (Salary Rs 4 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12*x1000 x 15 = Rs 1.8 L
Workshops	Rs 6 x 2**x1000 x 15 = Rs 1.8 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	2.5 L
Miscellaneous expenses	2.0 L
Travel	1 L
Total	**21.1 L**

Cost for AMRITA

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4 L x 3 (person) = Rs 12 L (Salary Rs 4 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12*x1000 x 60 = Rs 7.2 L
Workshops	Rs 6 x 2**x1000 x 60 = Rs 7.2 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	2.5 L
Miscellaneous expenses	2.0 L
Travel	1 L
Total	**31.9 L**

Total cost incurred for approx. 6, 48,000 usages (for 11 Institute)

=cost for 9 institute + cost for IIT-G + cost for Amrita

=Rs. 211.5 + 21.1 + 31.9 = **Rs. 264.5 Lacs**

Total cost incurred per Usage (1st year) = 264.5 L/6.48 L

= Rs 40.817 per use

SECOND YEAR

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4.4 L x 3 (person = Rs 13.2 L (Salary Rs 4.4 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12X 1,000 x 27 = Rs 3.24 L
Workshops	Rs 6X2X1000 x 27 = Rs 3.24 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	2.75 L
Miscellaneous expenses	2.2 L
Travel	1.1 L
Total	**25.73 L**

Cost incurred (for 9 Institute) = 25.73 X 9=231.57 L

Cost for IIT-G

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4.4 L x 3 (person = Rs 13.2 L (Salary Rs 4.4 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12X 1,000 x 17 = Rs 2.04 L
Workshops	Rs 6X2X1000 x 17 = Rs 2.04 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	2.75 L
Miscellaneous expenses	2.2 L
Travel	1.1 L
Total	**23.33 L**

Cost for AMRITA

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4.4 L x 3 (person = Rs 13.2 L (Salary Rs 4.4 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12X 1,000 x 62 = Rs 7.44 L
Workshops	Rs 6X2X1000 x 62 = Rs 7.44 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	2.75 L
Miscellaneous expenses	2.2 L
Travel	1.1 L
Total	**34.13 L**

Total cost incurred for approx. 6, 95,520 usages (for 11 Institute)
=cost for 9 institute + cost for IIT-G + cost for Amrita
=Rs. 231.57 + 23.33 + 34.13 = **Rs. 289.03 Lacs**
Total cost incurred per Usage (2nd year) = 289.03 L/6.9552 L
= Rs 41.556 per use

THIRD YEAR

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4.84 L x 3 (persons)=14.52 Lacs (Salary Rs 4.84 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12,000 x 30 = Rs 3.6 L
Workshops	Rs 12,000 x 30 = Rs 3.6 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	3.02 L
Miscellaneous expenses	2.42 L
Travel	1.33 L
Total	**28.49 L**

Cost incurred (for 9 Institute) = 28.49 X 9=256.41 L

Cost for IIT-G

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4.84 L x 3 (persons)=14.52 Lacs (Salary Rs 4.84 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12,000 x 20 = Rs 2.4 L
Workshops	Rs 12,000 x 20 = Rs 2.4 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	3.02 L
Miscellaneous expenses	2.42 L
Travel	1.33 L
Total	**26.09 L**

Cost for AMRITA

EXPENSE	AMOUNT (LACS)
Manpower: 3 field engineers per Institute	4.84 L x 3 (persons)=14.52 Lacs (Salary Rs 4.84 Lacs per annum per person)
Honorarium for Nodal Coordinators	Rs 12,000 x 65 = Rs 7.8 L
Workshops	Rs 12,000 x 65 = Rs 7.8 L
Consumables (Stationery/ Printing/ Publicity material/Internet)	3.02 L
Miscellaneous expenses	2.42 L
Travel	1.33 L
Total	**36.89 L**

Total cost incurred for approx. 7,66,800 usages (for 11 Institute)

=cost for 9 institute + cost for IIT-G + cost for Amrita

=Rs. 256.41 + 26.09 + 36.89 = **Rs. 319.39 Lacs**

Total cost incurred per Usage (3rd year) = 319.39 L/7.668 L

= Rs 41.652 per use

TABLE 7. BUDGET FOR INTEGRATION AND MAINTENANCE

Name of the Institute	No. of Labs	No. of Engineers	1st Year (in Lacs)	2nd Year (in Lacs)	3rd Year (in Lacs)	Total (in Lacs)
IIT Delhi	6	7	45.8947	50.2842	55.15	151.3289
IIT Bombay	11	13	83.3070	91.4377	100.45	275.1947
IIT Kanpur	3	4	26.4473	28.8921	31.6	86.9394
IIT Kharagpur	20	23	146.6491	161.1140	177.15	484.9131
IIT Roorkee	3	4	26.4473	28.8921	31.6	86.9394
IIT Guwahati	9	11	70.3421	77.1763	84.75	232.2684
IIIT Hyderabad	20	23	146.6491	161.1140	177.15	484.9131
Amrita University	20	23	146.6491	161.1140	177.15	484.9131
Dayalbagh University	6	7	45.8947	50.2842	55.15	151.3289
NITK Surathkal	5	6	39.4122	43.1535	47.3	129.8657
COE Pune	11	13	83.3070	91.4377	100.45	275.1947
TOTAL	114	134 *	**861**	**944.9**	**1037.9**	**2843.8**

*1 Engineer per 1 lab for Integration, 1 Engineer per 7 labs for maintenance,

*Maintenance budget includes funds for the new RT Labs, in addition to the existing labs

JUSTIFICATION FOR INTEGRATION/MAINTENANCE

Integration/Maintenance engineer (salary) = Rs 5 Lacs

Total = Number of Engg x Rs 5 Lacs

Manpower Required: 134 0 Engineers for Integration & Maintenance

1st year

Salary : Rs 5 Lacs per annum per person

5 x 134 0 = 670 Lacs

Internet usage 5lacs per Institue

For 11 Institute(i.e. 114 labs)=5x11=55 lacs

Internet usage per lab=55/114=Rs 48245.61

Other costs for 1 lab: - Internet Usage + Consumable =Rs 1,48245.61/lab

Internet Usage : Rs 48245.61

Consumable : 1 Lacs

Total Labs = 114

Other cost for Maintaining 114 labs = 114 x 148245.61 =169 Lacs

Travel cost= Rs 2L (per Institute) X 11=22L

Total Cost = Salary + Other Costs + Travel Cost= 670 +169 + 22

=861.0 Lacs

2nd year

Salary : Rs 5.5 Lacs per annum per person

5.5 x 134 = 737 Lacs

Other costs for 1 lab: - Internet Usage + Consumable = Rs 1,63,070.17

Internet Usage : Rs 53070.17

Consumable : Rs 1.1 Lacs

Total Labs = 114 Other cost for maintaining 114 labs = 114 x 163070.17 = 185.9 Lacs

Travel cost= Rs 2L (per Institute) X 11=22L

Total Cost = Salary + Other Cost + Travel cost = 737 + 185.9 +22

= **944.9 Lacs**

3rd year

Salary : Rs 6.05 Lacs per annum per person

6.05 x 134 = 810.7 Lacs

Other costs for 1 lab: - Internet Usage + Consumable = Rs 1.8 lacs

Internet Usage : Rs 58,377.19

Consumable : Rs 1.21 Lakh

Total Labs = 114

Other cost for maintaining 114 labs = 114 x 1.8 =205.2 Lacs

Travel cost= Rs 2L (per Institute) X 11=22L

Total Cost = Salary + Other Cost + Travel cost= 810.7 + 205.2 + 22 = **1037.9 Lacs**

TABLE 8: BUDGET FOR CENTRAL PLATFORM ENGG.

Items	Budget (in Lacs)			
	First Year	Second Year	Third Year	Total
Salary	351.52	386.672	425.3392	1163.5312
Equipment	72.1	0	0	72.1
Consumables	20	22	24.2	66.2
Travel and Events	31.5	34.65	38.115	104.265
Total	475.12	443.322	487.6542	1406.0962
Inst Overhead @15%	71.268	66.4983	73.14813	210.91443
Grand Total	546.388	509.8203	560.80233	**1617.0106**

JUSTIFICATION OF BUDGET CENTRAL PLATFORM ENGINEERING

TABLE 9: Manpower and Salaries

Salaries for full time staff for central platform engineering (1st year).

VLEAD Position	Reference Designation	Level	Salary (L/mo)	Incr (Rs)	#Incr	Unit Salary (L/yr)	No.	Total (L/yr)
architect	sr proj res sctst	O1	0.58	0.05	4	9.36	2	18.72
res sctst	proj res sctst	O2	0.42	0.045	4	7.2	2	14.4
qual analyst	sr proj engr	O2	0.42	0.045	2	6.12	1	6.12
consultant	proj res sctst	O2	0.42	0.045	2	6.12	2	12.24
tech lead	sr proj engr	O2	0.42	0.045	4	7.2	6	43.2
sr proj engr	sr proj engr	O2	0.42	0.045	1	5.58	6	33.48
proj engr	proj sw engr	O3	0.28	0.035	2	4.2	19	79.8
web designer	proj sw engr	O3	0.28	0.035	2	4.2	1	4.2
sr adm asst	sr proj asst	L1	0.21	0.025	0	2.52	1	2.52
adm asst	proj asst	L2	0.14	0.01	0	1.68	3	5.04
tech writer	sr proj tech asst	L1	0.21	0.025	3	3.42	1	3.42
division head	consultant	O1	0.58	0.05	13	14.76	1	14.76

sr prog mgr	sr proj mgr	O1	0.58	0.05	4	9.36	1	9.36
delivery mgr	sr proj mgr	O1	0.58	0.05	2	8.16	1	8.16
ext liaison	proj mgr	O2	0.42	0.045	3	6.66	1	6.66
hr mgr	proj mgr	O2	0.42	0.045	3	6.66	1	6.66
off attdt	proj attdt	L3	0.095	0.01	0	1.14	2	2.28
Total						**0**	**51**	**271.02**

Table 10

Student assistantship and internship costs for central platform engineering (1st year).

Student position	**Tuition**	**Salary**	**no.**	**Unit cost**	**No.**	**Total**
	(L/yr)	**(L/mo)**	**months**	**(L/yr)**		
PhD	1.5	0.2	12	3.9	5	19.5
MS	1.5	0.15	12	3.3	10	33
BTech		0.1	10	1	10	10
interns		0.1	6	0.6	10	6
summer interns		0.3	2	0.6	20	12
Total				**0**	**55**	**80.5**

Table 11
Total manpower costs central platform engineering (1st year)

Item	**cost**
	(L)
Full time staff	271.02
Students and Interns	80.5
Total	**351.52**

Equipment

Table 12
Equipment and other capital expenditure

Item	Unit Cost(L)	No.	Total(L)
H/W, N/W, storage for Private cloud	25	1	25
Desktops + peripherals	0.35	50	17.5
Laptops	0.5	15	7.5
Tablets	0.3	4	1.2
mobile platformMobile platform tablets	0.05	10	0.5
Printers, office equip.	3	1	3
Projectors	1	2	2
Mini projector	0.2	2	0.4
Remote classroom and video conference recording facility	15	1	15
Total			**72.1**

Consumables

Table 13
Consumables for Central Platform Engineering (1st year)

Item	Unit cost (L)
16Mbps N/W	8
AMC's	2
Communications	2
Books	1
Subscriptions	1.5
Stationery+ cartridges+paper	3
Incidentals	2
Local transportation	0.5
Total	**20**

Travel and Events

Table 14 Travel and Event cost for Central Platform Engineering (1st year).

Event	Cost per person (L)	No. persons per event	Cost per event (L)	No.	Total cost (L)
4 day w/s + travel	0.25	3	0.75	20	15
Sprints, Hackathons	0.004	125	0.5	3	1.5
Project meetings travel	0.25	2	0.5	6	3
Integration meetings travel	0.25	2	0.5	12	6
National Conferences travel,stay, registration	0.4	2	0.8	4	3.2
Hosting visitors	0.05	1	0.05	8	0.4
(boarding, lodging, food)					
Integration meeting hosting	0.05	24	1.2	2	2.4
Total			**0**	**41**	**31.5**

We propose that the virtual-labs be tested through all the integration levels before they are migrated in a phased manner to a public cloud based data center.

JUSTIFICATION FOR DATA CENTRE

TABLE 15: Usages per lab in first year (assuming 6L forms collected)

S.No.	Item	Quantity	Remarks
1	no. forms (Lakhs) for all labs	6L	Deliverable
2.	no. labs in outreach	180	
3.	no. forms collected per lab	3.33K	Row 1 / Row 2
4.	no. experiments done before filling form	1	Assumption
5.	no. usages where form is filled	3.33K	Row 3 x Row 4
6.	no. usages where form not filled	6.67	Assumption 2 times as many will try lab
7.	total usages	10K	Row 5 + Row 6

We assume the usage of the lab does not accumulate any significant storage on the server.

Table 16: Resource consumption for usage instances (single and 10K)

S.No.	Type	#GETS	Data transfer	Storage
1	Content Browsing	50 --		
2.	Loading one experiment	50	10MB -	
3.	Total (for 1 usage)	100	10MB	0
4.	Total (for 10K usages)	1M	100GB	0

Table 17: Lab types and number of servers required

Type of Lab	No.	Amazon IaaS server type	Number of servers/lab	Total No. servers
Client-side	120	Amazon S3 bucket	1	120
Server-side	60	Amazon EC2 VM	1	60

Table 18: Resources and per year costs for one client-side lab (10K usage instances) based on Amazon offerings as of Jan 2014.

Resource	Unit Cost USD/mo	Resources(10K usages per yr)	Total cost (10K usages) (L*INR/yr)	Total cost (20Kusages) (L*INR/yr)	Total cost (50K usages) (L*INR/yr)
GET reqs	0.004/10Kreq	1M	0.00288	0.00576	0.0144
Data xfer	0.12/GB	100GB	0.0864	0.1728	0.432
Storage	0.076/GB	0.1GB	0.0001	0.0001	0.0001
Total			0.08938	0.17866	0.4465

The calculations assume a USD conversion rate of 60 INR/USD.

We assume each client side lab requires 100MB of reusable storage. As can be seen in Table 18, the dominant cost in the data transfer occurs when simulation pages are requested from the server.

Table 19: Resources and per year costs for one server-side lab (10K usage instances)

Resource	Unit Cost USD/mo	Resources(10K usages per yr)	Total cost (10K usages) (L*INR/yr)	Total cost (20K usages) (L*INR/yr)	Total cost (50K usages) (L*INR/yr)
VM	43/VM	1VM	0.31	0.31	0.31
Data xfer	0.12/GB	100GB	0.0864	0.173	0.432
Storage	0	0	0	0	0
Total			0.3964	0.483	0.742

We assume each server side lab has sufficient internal storage to handle upto 50K usages per year. As can be seen in Table 19, the dominant cost for the projected usage is the cost of the VM.

Table 20: Amazon data centre cost growth over three years

Year	Year 1	Year 2	Year 3
Usage per lab	10K	20K	50K
Client-side lab cost (per lab) (L*INR/yr)	0.08938	0.17866	0.4465
No. client-side labs	120	120	120
Total client-side lab costs	10.73	21.45	53.63
Server-side lab cost (per lab) (L*INR/yr)	0.3964	0.483	0.742
No. server-side labs	60	60	60
Total server-side lab costs (L*INR/yr)	23.785	28.98	44.52
Total cost (L) (both lab types)	**34.515**	**50.43**	**98.15**

TABLE 21: BUDGET FOR REVIEWS/MID TERM EVALUATIONS/ INTERNAL WORKSHOP (PER YEAR)

REVIEW TYPE	EXPERT HONORARIUM (Rs)	No.	TRAVEL/ STAY OF EXPERTS (Rs)	No.	NEW LAB DEVELOPERS/INSTITUTE COORDINATORS TRAVEL/STAY (Rs)	No.
New Experiments	4,000	5	23,000	5	23,000	10
Integration	4,000	5	23,000	5	23,000	10
Outreach	4,000	5	23,000	5	23,000	10

Total (experts for 9 discipline + ALL lab developers) = Rs 70, 95,000/ year

JUSTIFICATION OF BUDGET FOR REVIEWS / MID TERM EVALUATIONS / INTERNAL WORKSHOP

Travel/stay of experts (Rs 23,000 x 5 experts) = Rs 1, 15,000
Honoraria of experts (Rs 4,000 x 5 experts) = Rs. 20,000
Total = Rs. 1, 35,000 / discipline (for 5 experts)
New Experiments=1, 35,000
Integration=1, 35,000
Outreach=1, 35,000
Total for (New Experiments+Integration+Outreach) =3 x 1, 35,000=4, 05,000
Total for 9 disciplines = 36, 45,000 (One review per year)
Travel/stay for Lab developers (Rs.23, 000 x 150) = Rs. 34, 50,000 (including old and new labs)
Total (experts for 9 discipline + ALL lab developers) = Rs 70, 95,000/ year

Annexure I

CHECKPOINTS

1. Funding shall be released to the participating institutes on yearly basis.

2. The release of funds for the second and the third years shall be linked to delivery of the committed targets in the preceding years.

Annexure II: Brief CVs of PI and Institute Coordinators

Dr. Raghunath K. Shevgaonkar

Director, IIT Delhi and **Ex-Vice Chancellor, University of Pune**

Indian Institute of Technology Delhi, INDIA

Phone # 011-2659-1701 (Off), 011-2659-1801 (Res), Mobile: 9818001702

Email: rks@iitd.ac.in, rks@ee.iitb.ac.in

Present Address I.I.T. Delhi, Hauz Khas, New Delhi 110016

Permanent Address Department of Electrical Engineering

I.I.T, Bombay, Mumbai - 400 076 INDIA

Education

1985 **Doctor of Philosophy** (Ph.D.) in Electrical Engineering from I. I. T., Bombay/ Indian Institute of Astrophysics/Raman Research Institute, Bangalore on Maximum Entropy Restoration of Astronomical Images.

1977 **Master of Technology** (M.Tech) in Electrical Engineering from I. I. T., Kanpur with specialization in Electromagnetics and Optical fibres.

1975 **Bachelor of Engineering** (BE) in Electronics Engineering from Jiwaji University, Gwalior. **Gold Medallist**.

2007 **Executive Development Program**, Kellogg School of Management, Northwestern University, Chicago, USA

Research Interests

Fiber Optic Communication, Photonics, Non-linear fiber optics, Electromagnetic Waves, Computational Electromagnetics, Antennas, Image Processing, Radio Astronomy.

Academic Positions held:

1990-to date: Professor of Electrical Engineering at I. I. T., Bombay, Job : Teaching and Research in Photonics, Fiber optics, Image processing, Printed antennas, Optically controlled microwave devices.

2009: Visiting Professor, Institute Superior de Electronics de Paris, France**.**

2005: Visiting Professor, High Frequency Institute, ETH, Zurich, Switzerland**.**

2000-2001: Visiting Professor, Computer and Electronics Engineering University of Nebraska, Lincoln, USA (on Sabbatical leave) Job: Teaching and research in Telecommunication.

1987-1990: Assistant Professor at Department of Electrical Engineering, I. I. T., Bombay. Job : Research in Image processing and Photonics.

1986-1987: Faculty Research Associate at University of Maryland, College Park, U.S.A. Job : Solar and Stellar radio astronomy with the VLA.

1985 - 1986 Reader at Indian Institute of Astrophysics, Bangalore Job : Study of Galactic radio sources at decametre wavelength. Image processing of radio images to correct for atmospheric distortion.

1982-1984: Faculty Research Associate at University of Maryland, U. S. A. Job : Microwave radio astronomy with Very Large Array, New Mexico.

1978-1982: Electronics engineer at Indian Institute of Astrophysics /Raman Research Institute, Bangalore. Job : Design, Installation of a large Decametre array used for radio astronomy at Gauribidnur, India.

Administrative Positions held:

2010-2011: Vice Chancellor, University of Pune

2008-2010: Deputy Director (Finance and External Affairs), IIT Bombay.

2005-2008: Dean, Resource Mobilization, IIT, Bombay.

2005-2006: Registrar, IIT, Bombay.

1998-2000: Dean of Students' Affairs, Indian Institute of Technology, Bombay.

2003-2005: Head, Department of Electrical Engineering, IIT, Bombay.

2002-2006: Founder Head, Centre for Distance Engineering Education Programme (CDEEP), IIT, Bombay. The Centre has been setup to generate and disseminate the video and web lectures from experts in IIT to the students of engineering colleges in the country using multi-media technology.

1995-1998: Chairman, Hostel Coordination Unit, Indian Institute of Technology, Bombay.

1992-1995: Warden, Hostel 4, Indian Institute of Technology, Bombay.

1989-1992: Assoc. Warden, Hostel 4, Indian Institute of Technology, Bombay.

Major Academic Awards and Distinctions:

1. **IEEE UG Teaching Award 2011**. Only one award is given annually across the world, and for the first time the award has gone outside the USA.
2. **IETE - CEOT -94 Award** for outstanding contribution in the field of Photonics and Opto-electronics.
3. **Fellow IEEE**
4. **Fellow Indian National Academy of Engineering**
5. **Fellow National Academy of Science, India**

6. **Fellow Institute of Electronics and Telecommunication Engineers**

7. **Fellow Optical Society of India**

8. **Fellow Maharashtra Academy of Science, India**

9. '**Excellence in Teaching Award'** IIT, Bombay 2004.

10. **Top Management Consortium Award 2010 for 'Excellence in Education'**

11. **Dewang Mehta Business School Award 2010 for 'Outstanding contribution to Education'**

12. **Mahaganapati Award for Excellence in Academics and Research, 2010**

13. **National Education Leadership Award 2012 by Headlines TODAY.**

14. **Programme Chair** for **International Conference Photonics 2002**.

15. **Advisor**, Sixth International Infrastructure Business Summit and Expo, TELECOM India 2004.

16. **Member** International Astronomical Union.

17. **Member** Astronomical Society of India**.**

18. **Hon. Editor** **IETE** Special Issue on 'Next Generation Networks' 2008

19. **Editor** IETE Journal of Education

(15) **Memebr of Technical Programme Committees** for many International and National conferences.

(16) **Graduate Fellow** University of Nebraska, Lincoln, USA

Major Academic Achievements:

- Contribution made in wide areas like Radio Astronomy and Antennas, Fiber Optic Communication, Image processing, and Distance Engineering Education.
- A text book on 'Electromagnetic waves' and a monograph on 'Transmission lines' published by McGraw Hill Education India.
- Design and development of a large Decameter Wave Radio Telescope in India.
- Establishing a Centre for distance learning at IIT Bombay.
- Development of image processing and data analysis software for low frequency radio astronomy.
- Study of the Sun from microwave observations using the largest radio telescope, the Very Large Array at New Mexico.

- Modeling and reconstruction of the 3-D structure of solar active regions and solar flares, and estimation of the solar parameters.
- Study of flare stars to establish non-thermal radiation during non-flaring periods.
- Development of Maximum Entropy Image restoration algorithm for polarized images of the Sun obtained with phase unstable aperture synthesis data.
- Establishing an advanced Fiber Optic laboratory at IIT Bombay
- Development of generalized frame work for designing various types of optical fibers like the ultra-low dispersion fibers, dispersion compensating fibers, large effective area fibers etc.
- Innovative idea of optically controlled semiconductor antennas.
- Investigations of optically controlled microwave devices like phase shifter, attenuator, polarizer etc.
- Innovative use of de-convolution algorithm for detection of straight lines in a digital image.
- Electrical modeling of photonic crystal devices for optical filter design.

Books :

1. "Electromagnetic Waves", Published by **Tata McGraw Hill,** 2005. An Undergraduate **text book** for Electronics and Telecommunication Engineering students.

2. " Transmission Lines " Ed. with V. Ramchandran and K. Shankar, IETE Publication, **Tata McGraw Hill** 1998. A **reference book**.

E-material :

1. "Electromagnetic Waves and Transmission Lines", Video Lectures, NPTEL, MHRD, Govt. of India. (Available on Youtube)

2. "Advanced Fiber Optic Communication", Video Lectures for a full PG course.

3. "Electromagnetic Waves and Transmission Lines", Interactive Web course for UG programme, NPTEL, MHRD, Govt. of India.

4. "Fiber Optic Communication" Interactive Web course for UG/PG programme, NPTEL, MHRD, Govt. of India.

Paper published in Professional Journals and Proceedings:

More than **150 papers** published in the area of Fiber optics, Radio Astronomy, Antennas, Image processing etc. (list attached).

Thesis/Dissertations guided : (List attached)

Ph. D.	14 + 4 in progress
M. Tech	41
B. Tech .	> 50
M. Sc.	2

Short term courses conducted under Continuing Education Program :

(a) Fibre optic communication and Photonics (5 days) **Four** times

(b) Image processing (5 days)

(c) Antennas (3 days)

(d) Satellite communication (3 days)

(e) Telematics (5 days) **Two** times

(f) Computational Electromagnetics (5 days)

(g) Electromagnetic Waves (5days) **Three** times

(h) Many invited talks in short term courses on Antennas, Image processing, Fiber optic communication, Electromagnetics, etc.

Sponsored Projects handled :

(a) National Project for Technology Enhanced Learning (NPTEL-II and III), under the MHRD.

(b) National Project for Technology Enhanced Learning (NPTEL-I), under MHRD.

(c) Fibre optic communication by Ministry of Human Research Development, India.

(d) MIC Tapered slot antenna under Defence Science and Technology Research, India.

(e)Fibre optic communication and photonic switching Ministry of Human Research Development, India.

(f)VLSI designing of picture processing unit for DTV under Department of Electronics, India

(g)Wavelength Division Multiplexed fibre optic links under All India Council of Technical Education, India.

(g)Optically controlled Semiconductor Antenna under Department of Electronics, Govt. of India

Consultancy Projects :

Automatic Signature Verification by Tata Infotech.

Hindi Script reading System by Tata Infotech.

Other Activities :

Academic :

Setting up Fiber Optics Laboratory at IIT, Mumbai.

Development of a 20 min. video program on fibre optics for UGC,

Continuing Education Program.

Development of educational software to effectively demonstrate the concepts of

Electromagnetic Waves

Development of graphical package to bring out concepts of fibre optic communication more effectively.

Development of CAD for Microwave Amplifier Design.

Development of Beam Propagation software for non-linear pulse propagation in a fiber.

FEM program for analyzing dispersion characteristics of a fiber with arbitrary refractive index profile.

Administrative :

Member, ICT mission project of MHRD.

National Principal Coordinator for developing e-learning learning material for entire curriculum in Electronics and Telecommunication Engineering.

Member, AICTE committee for revision of NBA norms according to the Washington Accord.

Member of Accreditation team to NITs

Expert Member, Selection committes of DTE, Mumbai University.

Expert Member, IITs, NITs, DA-IICT, Gujrat University.

Member, Academic Board, College of Engineering, Pune.

Member, Academic committee for ExTC, College of Engineering, Pune

Member, Advisory Board, VJTI, Mumbai.

Member, Academic Council, Babasaheb Ambedkar Technical University, Lonere.

Member, Senate of SGGS College of Engineering, Nanded.

Member, Advisory Council, KJ Somaiya College, Mumbai University.

External Expert, Department of Technical Education, Maharashtra.

Member, Research Advisory Committee, SAMEER, Bombay.

Member, Board of Studies, University of Goa.

Served as Member of Departmental Under Graduate Committee, Department of Electrical Engineering IIT, Bombay.

Served as Member of Under Graduate Programme Committee of IIT, Bombay.

Served as external expert for DRDO, RAC over a period of 1991-1994.

Served as external expert for Goa, Public Service Commission.

Served as external expert for State Bank of India, Bombay.

Served as examiner in GATE and other IIT's and Universities.

Member of Scientific Advisory Committee SAMEER, Mumbai.

External Expert for Indian Space Research Organization, Bangalore.

Extracurricular Activities :

Music : **Bachelor of Music degree** in Hindustani Classical music (Sitar) from Kheragadh University.

Hindi Poem Writing, Painting etc.

Ranjan Bose

Professor, Department of Electrical Engineering,

IIT Delhi, Hauz Khas, New Delhi 110016.

Education:

University of Pennsylvania, Philadelphia, USA 9/93-12/95

Ph.D. in Electrical Engineering, December 1995.

University of Pennsylvania, Philadelphia, USA 9/92-8/93

M.S. in Electrical Engineering, December 1993.

Indian Institute of Technology, Kanpur, India 8/88-5/92

B.Tech. in Electrical Engineering, May 1992.

Experience

Head of the School 09/10 – present

Bharti School of Telecom Technology and Management,

Indian Institute of Technology, Delhi, India

Professor 05/10 – present

Microsoft Chair Professor since May 2010

Department of Electrical Engineering,

Indian Institute of Technology, Delhi, India.

Associate Professor 07/02 – 10/06

Assistant Professor 11/97 – 07/02

Senior Design Engineer 1/96 - 9/97

(Alliance Semiconductor Inc., San Jose, CA, USA)

Research Interests: Ultra-Wideband (UWB) Communications, Broadband Wireless Access and Coding Theory. Currently heading the Wireless Research Lab in IIT Delhi.

Sponsored R&D Projects:

- "Design and Development of a high-speed Ultra Wideband Communication System"
- "Indoor Wireless Communications"
- "Secure Communication using Chaos Theory"
- "Automatic tracking using Direction of Arrival**"**

Publications

Book: *Information Theory, Coding and Cryptography*, 2E, Tata-McGraw Hill, New Delhi, May 2008. ISBN: 0070669015

Journal Papers: 30

Conference Papers: 67

Patents: 12

Awards: URSI Young Scientist award in 1999, Humboldt Fellowship in July 2000,

Indian National Academy of Engineers (INAE) Young Engineers Award in 2003, AICTE Career Award for Young Teachers in 2004 and the BOYSCAST Fellowship in 2005.

Selected List of Journal Papers:

1. **R. Bose** and K. Hamacher, "Alternate Entropy measure for assessing Volatility in Financial Markets," *Physical Review E*, vol. 86., Iss. 5, Nov. 2012.

2. **R. Bose**, "An information-Theoretic approach to CLEAN," *IEEE Transactions on Aerospace and Electronic Systems*, (accepted Sep. 2012)

3. N. Ramakrishnan and **R. Bose**, "Dipole entropy based techniques for segmentation of introns and exons in DNA," *Applied Physics Letters*, vol. 101, 083701 Aug 2012.

4. S. Chouhan, M. Balakrishnan and **R. Bose**, "System Level Design Space Exploration Methodology for Energy Efficient Sensor Node Configurations: An Experimental Validation," *IEEE Transactions on CAD*, vol. 31, Iss. 4, pp. 586-596, Apr. 2012.

5. N. Subramanian and **R. Bose**, "Dipole angular entropy techniques for intron-exon segregation in DNA," *Europhysics Letters*, vol. 98, 28002, Apr 2012.

6. **R. Bose**, "Active CLEAN: A Modified CLEAN Algorithm for High Range Resolution Profiles of Contiguous Targets with Thinned Spectrum," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 48, Iss. 2, Feb. 2012 pp. 930 – 939.

7. **R. Bose**, "Lean CLEAN: A Deconvolution Algorithm for Radar Imaging of Contiguous Targets," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 47, Iss. 3, Jul. 2011. pp. 2190 – 2199.

8. **R. Bose** and S. Chouhan, "Super-information: A novel measure of information useful for DNA sequences," *Phys. Rev. E*, 83(5):051918, May 2011.

9. **R. Bose**, "The Effect of Swarming on Biodiversity in Non-symmetric Rock-Paper-Scissor Game," *IET Systems Biology*, Vol. 4, Iss. 3, 2010. pp. 177–184

10. V.V. Mani and **R. Bose**, "Direction of Arrival Estimation of Multiple UWB Signals", *Wireless Personal Communications*, ISSN: 0929-6212, Oct. 2009.

11. S. Chouhan, **R. Bose**, M. Balakrishnan, "Integrated Energy Analysis of Error Correcting Codes and Modulation for Energy Efficient Wireless Sensor Nodes," *IEEE Transactions on Wireless Communications*, vol. 8, no. 10, Oct. 2009. pp. 5348 – 5355.

12. S. Chouhan, **R. Bose** and M. Balakrishnan, "A Framework for Energy Consumption Based Design Space Exploration for Wireless Sensor Nodes," *IEEE Transactions on CAD*, vol. 28, no. 7, Jul. 2009. pp. 1017 – 1024.

13. M. R. Bhatnagar, Arti M.K., A. Hjørungnes, **R. Bose**, and L. Song, "Multiuser Relaying of High Rate Space-Time Code in Cooperative Networks", *Wireless Personal Communications*, Springer Netherlands, Apr. 2009. pp. 1-13. ISSN: 0929-6212.

14. A. Tyagi and **R. Bose**, "M-PAM Space-Time Trellis Codes for UWB MIMO Communications," *IET Communications*, vol. 2, Issue 4, Apr. 2008. pp. 514-522.

15. A. Tyagi and **R. Bose**, "PPM Space-Time Trellis Coding for UWB-IR MIMO Communication Systems", *IET Communications*, vol. 2, Issue 2, Feb 2008. pp. 366-371.

16. A. Tyagi and **R. Bose**, "A New Distance Notion for PPAM Space-Time Trellis Codes for UWB MIMO Communications," *IEEE Transactions on Communications*, vol. 55, no. 7, Jul. 2007. pp. 1279-1282.

17. **R. Bose**, "An efficient method to calculate the free distance of convolutional codes," *WSEAS Transactions on Electronics*, Issue 10, vol. 3, Oct. 2006. pp. 525-529.

18. **R. Bose** and S. Pathak, "A Novel Compression and Encryption Scheme using Variable Model Arithmetic Coding and Coupled Chaotic System," *IEEE Transactions on Circuits and Systems I,* vol. 53, no. 4, Apr. 2006. pp. 848-857.

19. **R. Bose**, "A novel Public Key Encryption technique based on Multiple Chaotic Systems," *Physical Review Letters*, vol. 95, issue 9, Sep 2005. 098702

20. G. Bauer, **R. Bose** and R. Jakoby**, "**Three Dimensional Interference Investigations for LMDS Networks using an Urban Database," *Special Issue of IEEE Transactions on Antennas and Propagation*, vol. 53, issue 8, Aug. 2005. pp. 2464-2470.

21. **R. Bose**, "Improving capacity in LMDS networks using Trellis Coded Modulation," *EURASIP Journal on Wireless Communications and Networking*, Issue 2, Nov. 2004. pp. 365-373.

22. **R. Bose**, G. Bauer and R. Jakoby, "Two-Dimensional Line of Sight Interference Analysis of LMDS Networks for the Down- and Uplink," *IEEE Transactions on Antennas and Propagation*, vol. 52, issue 9, Sep. 2004. pp. 2464-2473.

23. V.S. Chiranjeevi and **R. Bose**, "Performance of Hybrid Turbo coding scheme for Optical PPM communication systems," *WSEAS Transactions on Communications*, Issue 3, vol. 2, Jul. 2003. pp. 323-333.

24. **R. Bose**, "Sequence CLEAN Technique using Breeder Genetic Algorithm for Contiguous RADAR Target Images with High Sidelobes," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 39, no. 1, Jan. 2003. pp. 368-373.

25. **R. Bose**, A. Freedman, and B. D. Steinberg, "Sequence CLEAN: A Modified Deconvolution Technique for Microwave Images of Contiguous Targets," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 38, no. 1, Jan. 2002. pp. 89-97.

26. **R. Bose** and A. Kumar, "Reducing frequency reuse distance in cellular communications using trellis coded modulation," *IEE Proceedings on Communications*, vol. 148, Issue 3, Jun. 2001, pp. 149-154.

27. **R. Bose**, A. Hayn, and R. Jakoby**,** "Intra- and inter cell interference investigations for broadband radio access systems above 10 GHz," *Journal of Telecommunications and Information Technology*, no. 2, Jun. 2001, pp. 10-20.

28. **R. Bose**, "A Smart Technique for determining Base Station Locations in an Urban Environment," *IEEE Transactions on Vehicular Technology*, vol. 50, no.1, Jan. 2001. pp. 43-47.

29. A. Freedman, **R. Bose**, and B.D. Steinberg, "Thinned Stepped Frequency Waveforms to Furnish Existing Radars with Imaging Capability," *IEEE Aerospace and Electronic Systems Magazine*, Nov. 1996. pp. 39-43.

30. A. Freedman, **R. Bose** and B.D. Steinberg, "Techniques to improve the CLEAN Deconvolution Algorithm," *Journal of the Franklin Institute*, vol. 332B, no.5, Sep. 1995. pp. 535-554.

Dr Suresh Bhalla
Associate Professor Department of Civil Engineering
Indian Institute of Technology Delhi (IITD)

BRIEF BIO-SKETCH

Dr. Suresh Bhalla is currently Associate Professor at the Department of Civil Engineering, IIT Delhi. His main areas of interest are smart structures, structural health monitoring, electro-mechanical impedance (EMI) technique, bio-mechanics, and more recently, engineered bamboo structures. Dr. Bhalla has published over 100 papers in international/ national refereed journals, conferences and workshops of repute. He has also co-authored a book "Smart Materials in Structural Health Monitoring, Control and Bio-mechanics" and contributed chapters for three other books. His publications are highly cited in the Web of Science and Scopus by peers, represented by the an h-index of 12 in Web of Science and 13 in Scopus. His pioneering paper on monitoring of RC structures published in 2000 has received over 130 citations in the Web of Science so far. Dr. Bhalla has been the recipient of several awards such as award for teaching excellence, outstanding young faculty fellow, and more recently the best paper award along with his student by the National Association of Corrosion Engineers (NACE) during CORCON 2012. Dr. Bhalla has completed R&D projects amounting to Rs 959 lacs ($1.6 million) and type A consultancy jobs amounting to Rs 45 lacs ($77000).

RESEARCH AREAS OF INTEREST

Structural health monitoring; smart material and structures; non-destructive evaluation; system identification; computational mechanics; adaptation and transfer of aerospace technologies to mechanical and civil engineering systems; bio-mechanics; tensegrity structures; engineered bamboo structures.

ACADEMIC QUALIFICATIONS

(1) **Ph. D, 2004, Structures and Mechanics**
School of Civil and Environmental Engineering**,** *Nanyang Technological University,* Singapore 639798.
Ph. D Thesis Title: *A Mechanical Impedance Approach for Structural Identification, Health Monitoring and Non-Destructive Evaluation Using Piezo-Impedance Transducers.*

(2) **M. Eng., 2001 (gold medal) , Structures and Mechanics**
School of Civil & Environmental Engineering, *Nanyang Technological University,* Singapore 639798
M. Eng. Thesis Title: *Smart System Based Automated Health Monitoring of Structures.*

(3) **B. Tech.,1995 (silver medal), Civil Engineering**
Indian Institute of Technology, Delhi, Hauz Khas, New Delhi 110 016. (India).

PROFESSIONAL EXPERIENCE

(1) *December 2010-Present:* Associate Professor*,* ***Department of Civil Engineering, Indian Institute of Technology Delhi, India.***

(2) *December 2004-December 2010:* Assistant Professor, ***Department of Civil Engineering, Indian Institute of Technology Delhi, India.***

(3) **March 2004-December 2004:** ***Project officer***, School of Civil & Environmental Engineering, Nanyang Technological University, Singapore.
Project Title: **Comprehensive Structural Monitoring of Underground Structures During Construction and Operation*, sponsored by*** *Defence Science Technology Agency (DSTA)****, Singapore, under Underground Technology and Rock Engineering (UTRE) programme.***

(4) **July 1996-December 2000:** ***Structural Design Engineer***, Structural Engineering Department, Engineers India Ltd.

(5) **July 1995 – July 1996:** ***Management Trainee*****,** Structural Engineering Department, Engineers India Ltd., Bhikaji Cama Place, New Delhi –110 066. (India)

AWARDS AND PRIZES

(1) **Best Paper Award,** 2012, during CORCON 2012, 26-29 September, 2012 for paper "*Early Detection of Corrosion in RC Structures Using EMI Technique*", by T. Visalakshi and S. Bhalla.
(2) **Teaching Excellence Award**, 2011, First Semester 2010-11, for *Structural Analysis II* (CEL 331), Indian Institute of Technology Delhi.
(3) **Outstanding Young Faculty Award**, 2008, awarded by Kusuma Trust, Gibraltar.

(4) **Young Researcher Fellowship Award**, 2003, Second MIT Conference on Computational Fluid and Solid Mechanics, Massachusetts Institute of Technology (MIT), USA.
(5) **Gold Medal**, September 2001, National Science and Technology Board (NSTB), Singapore, for best M.Eng. Thesis in Civil Engineering.
(6) **Silver Medal,** August 1995, for securing highest Cumulative Grade Point Average (CGPA) among the 1995 graduating batch in Civil Engineering at the Indian Institute of Technology, Delhi, India.
(7) **Mehta Tarlok Chand Memorial Award,** 1994, for highest CGPA among third year students of Civil Engineering at IIT Delhi.
(8) **Major General Harkirat Singh Memorial Scholarship,** 1994, by the Association of Consulting Engineers (India).

PUBLICATIONS SUMMARY

BOOKS	INTERNATIONAL JOURNALS	CONFERENCES		WORKSHOPS		TOTAL
		Int	Nat	Int	Nat	
04	36	45	08	02	06	**101**

PROJECTS/ THESIS GUIDED

Ph. D	M. Tech./M. S.	SRFFP[1]	B. Tech. (Final year)	B. Tech. (Mini)	SURA[2]
04 (completed) 05 (ongoing)	25 (completed) 05 (ongoing)	03 (completed) 0 (ongoing)	43 (completed) 2 (ongoing)	34 (completed) 0 (ongoing)	04 (completed) 0 (ongoing)

Further details can be found at: http://web.iitd.ac.in/~sbhalla

DEPARTMENTAL POSITIONS

1. **Sep 2012-Present:** Convener, Departmental Research Committee, Civil Engineering Department, IIT Delhi.
2. **Sep 2011-Sep 2012:** Coordinator, Structural Engineering Section, Civil Engineering Department, IIT Delhi.
3. **Dec 2007-Dec 2010:** Incharge, Structural Engineering Laboratory (http://strlab.iitd.ac.in) , Civil Engineering Department, IIT Delhi.
4. **Sep 2005-Dec 2007:** Co-Incharge, Structural Engineering Laboratory (http://strlab.iitd.ac.in) , Civil Engineering Department, IIT Delhi.

SELECTED PUBLICATIONS

1. Moharana, S. and **Bhalla, S.** (2014), "Influence of Adhesive Bond Layer on Power and Energy Efficiency of Piezo-Impedance Transducer" Journal of Intelligent Material Systems and Structures, accepted on 21 Jan 2014, under press.
2. Moharana, S. and **Bhalla, S.** (2014), "A Continuum Based Modelling Approach for Adhesively Bonded Piezo-Transducers for EMI Technique" International Journal of Solids and Structures, Vol. 51, No. 6 (Mar), pp. 1299-1310. **DOI: 10.1016/j.ijsolstr.2013.12.022**

3. Kaur, N. and **Bhalla, S.** (2014), "Feasibility of Energy Harvesting from Thin Piezo Patches via Axial Strain (d_{31}) Actuation Mode", Journal of Civil Structural Health Monitoring, Vol. 4, No. 1 (Feb), pp. 1-15, **DOI: 10.1007/s13349-013-0048-1**
4. Visalakshi, T., **Bhalla, S.,** and Gupta, A. (2013) "Corrosion Assessment of RC Structures Based on Equivalent Structural Parameters Using EMI Technique", Journal of Intelligent Material Systems and Structures, accepted on 10 June 2013, published online on 04 Sep 2013 (in queue for print), **DOI: 10.1177/1045389X13498317**
5. **Bhalla, S.** and Suresh, R. (2013), "Condition Monitoring of Bones using Piezo-Transducers", Meccanica, Vol. 48, No. 9(Nov), pp. 2233-2244. **DOI: 10.1007/s11012-013-9740-9**
6. **Bhalla, S.** and Moharana, S. (2013), "A Refined Shear Lag Model for Adhesively Bonded Piezo-Impedance Transducers" Journal of Intelligent Material Systems and Structures, Vol. 24, No. 1 (Jan), pp. 33-48. **DOI: 10.1177/1045389X12457837**
7. **Bhalla, S.,** Panigrahi, R. and Gupta, A. (2013), "Damage Assessment of Tensegrity Structures using Piezo-Transducers", Meccanica, Vol. 48, No 6, pp. 1465-1478.
   DOI : 10.1007/s11012-012-9678-3
8. **Bhalla, S.**, Vittal, A. P. R and Veljkovic, M. (2012), "Piezo-Impedance Transducers for Residual Fatigue Life Assessment of Bolted Steel Joints", Structural Health Monitoring, *An International Journal*, Vol. 11, No 6 (Nov), pp. 733-750. **DOI: 10.1177/1475921712458708**
9. Mohrana, S. and **Bhalla, S.** (2012), "Numerical Investigation of Shear Lag Effect on PZT-Structure Interaction: Review and Application", Current Science, Vol. 103, No. 6 (Sep), pp. 685-696.
10. Shanker, R., **Bhalla, S.** and Gupta, A. (2011), "Dual Use of PZT Patches as Sensors in Global Dynamic and Local EMI Techniques for Structural Health Monitoring", Journal of Intelligent Material Systems and Structures, Vol. 22, No. 16 (Nov), pp. 1841-1856
    DOI :10.1177/1045389X11414219
11. **Bhalla, S.**, Tuli, S., and Arora, R. (2011), "Defect Detection in Concrete Structures Using Thermal Imaging Technique", Experimental Techniques, Vol. 35, No.4 (July/August), pp.39-43.

Kantesh Balani

Assistant Professor
Department of Materials Science and Engineering
Indian Institute of Technology Kanpur
Kanpur-208016, India

SHORT BIOSKETCH

Dr. Kantesh Balani joined as an Assistant Professor in the Department of Materials and Metallurgical Engineering (now Materials Science & Engineering) at Indian Institute of Technology (IIT) Kanpur in July 2008. He earned his doctorate in Mechanical Engineering from Florida International University, Miami, FL, in 2007. His research concentrated on the role of carbon nanotube dispersion in enhancing the fracture toughness of Al_2O_3 nanocomposite. He has also worked on bio-ceramic hydroxyapatite coatings for bio-medical applications. He pursued his post doctoral research in the Nanomechanics and Nanotribology Laboratory (NMNTL) and Plasma Forming Laboratory (PFL), Florida International University, Miami, FL. He is recipient of several fellowships and awards such as 2012 TMS *Young Leader Professional Development Award* (received during TMS 2012 Annual Meeting in Mar. 11-15, 2012, Orlando, US) by Materials Processing & Manufacturing Division, *Materials Science and Engineering C Young Researcher Award 2011* by Elsevier, *Young Engineer Award 2010* by Indian National Academy of Engineering, *Young Metallurgist Award 2010* from Indian Institute of Metals, *Young Scientist Award* in Materials Science division by Indian Science Congress Association 2009, *R.L. Thakur Memorial Prize* 2009 (Indian Ceramics Association), *David Merchant International Student Achievement* Award 2007, *Arthur E. Focke LeaderShape* Award 2004, RCTF (*Research Challenge Trust Fund*) Fellowship 2002, *Sudharshan Bhat Memorial Prize* and *S. Ananthramakrishnan Memorial Prize 2001,* and *Deutscher Akademischer Austausch Dienst (DAAD) Scholarship 2001.*

His ***h-index of 15*** (total citations exceeding 710) endorses his research productivity even at his early career stage. He is co-author of the book "***Advanced Structural Ceramics"*** (*Wiley*, 2011), and has adapted "***The Science and Engineering of Materials***" (*Cengage Learning*, 2012). He has presented over 40 lectures in the international conferences and has over 55 publications in the peer-reviewed international journals and over eight conference proceedings. He has procured a funding of over US$600,000 during his last four years of tenure as Asst. Professor at IIT Kanpur. His research interests include nanomechanics and nanotribology of bio/nano composites, synthesis and processing of polymeric/ceramic nanocomposites, and energy materials. Currently, he is reviewer of over twenty technical journals from Elsevier, Blackwell Publishing Inc., Wiley, Springer, Hindawi, Highwire, MRS India/INSA, ACS Publications, Institution of Civil Engineers and American Society of Metals. He serves as a key reader for *Metallurgical and Materials Transactions A*, and is involved in the editorial board of *Recent Patents on Materials Science* (Bentham), *Recent Patents on Nanotechnology* (Bentham), *Nanomaterials and Energy (Institution of Civil Engineers), Journal of Materials & Metallurgical Engineering* (STM Journals), *Journal of NanoScience, NanoEngineering & Applications* (STM Journals), and *Journal of Engineering* (Hindawi).

EDUCATION

- 2007, ***Ph.D***., Mechanical and Materials Engineering, *Florida International University* (FIU), Miami, Florida (CGPA ***3.975/ 4.0***). ***Best Ph.D. Student, Deans Award, Dissertation Year Fellowship.***
- 2002, ***M.S.***, Materials Science and Engineering, *University of Kentucky*, Lexington, KY (CGPA ***3.57/ 4.0***). ***Research Challenge Trust Fund Fellowship.***
- 2001, ***M.Tech.***, Metallurgical and Materials Engineering, *Indian Institute of Technology (IIT) Madras*, India (CGPA: ***9.86/ 10.0***). ***DAAD (Deutscher Akademischer Austausch Dienst) Scholarship*** and ***Sudharshan Bhat and S. Ananthramakrishnan Memorial Prize.***
- 1999, ***B. E.***, Metallurgical Engineering, *PSG College of Technology*, India (***83.5 %***). ***Best Outgoing Student.***

PUBLICATIONS/ SEMINARS GIVEN
Peer-Reviewed Publications: **60**
International Talks: **Over 45**

ACADEMIC/ RESEARCH HONORS

- **Editor** of ***special thematic issue*** on "*Solid Electrolytes: Emerging Global Competitors For Satisfying Energy Needs*" in Journal *Nanomaterials and Energy*, ICE Publications, Sept. 2012.
- ***Letter of appreciation*** from Chairman, Academic Senate, for ***extraordinary teaching*** the course MSE617 (Mathematics and Computational Methods) in Fall 2011.
- Recipient of "***2012 TMS Materials Processing & Manufacturing Division Young Leader Professional Development Award"*** received during TMS 2012 Annual Meeting Mar. 11-15, 2012 at Orlando, FL, USA.
- Awarded ***Materials Science and Engineering C Young Researcher Award* 2011** by Elsevier for exceptional research efforts involving materials for biological applications on Nov. 29, 2011, Boston, USA.
- Received ***INAE (Indian National Academy of Engineering) Young Engineer Award 2010*** on Dec. 10th 2010, Visakhapatnam, India.
- Have been chosen for ***National Academy of Sciences, India*** (NASI) ***Young Scientist Platinum Jubilee Award*** 2010, which was presented on Dec. 4th 2010, Jaipur, India.
- Received "***Young Metallurgist of the Year***" award 2010 instituted by *Ministry of Steel, Govt. of India*, on Nov. 14th 2010 during *National Metallurgist Day* celebration, Bangalore, India.
- ***Young Scientist Award*** 2009 in Materials Science division by ***Indian Science Congress Association*** on Jan. 5th 2010, Trivandrum, India.
- Awarded ***Dr. R.L. Thakur Memial Award-2009*** from the ***Indian Ceramic Society*** on Dec. 11th 2009, Trivandrum, India.
- ***Faculty Advisor*** for "***Material Advantage @ IIT Kanpur***" since Dec. 2008. Chapter bagged "***Most Students Recruited***" membership challenge in Fall 2009 with a *cash prize of US$ 500* competing against more than 60 active chapters worldwide. Then, chapter has also received "***Most Creative Recruitment Strategies Award***" in Fall 2011 with a cash award of *US$ 250.*
- Selected by *National Phi Beta Delta Honor Society* to receive "***2007 David Merchant International Student Achievement Award"*** owing to superior scholastic achievements. Annually only one international scholar is presented such a prestigious award worldwide. It consists of awarding $500 check with the acknowledgment certificate. Among more than 150 chapters worldwide, as president of Phi Beta Delta – Zeta Alpha Chapter at FIU, I received "*Eileen M. Evans Overall Outstanding Chapter for 2006-07*".
- Inducted *as full-member* in ***Sigma Xi*** honor society in Oct. 2007.
- Received "***2006-07 Dean's Award***" for highly productive doctoral student in the College of Engineering, FIU, with monetary award of $2000.
- Received "***Dissertation Year Fellowship"*** to pursue doctoral research at Florida International University, 2006-07.
- Selected to attend *research-proposal writing workshop* organized by ***National Science Foundation***, Aug. 22-23, 2007, University of Fairbanks, Alaska, USA.
- Awarded "***Best PhD Student***" by Department of Mechanical and Materials Engineering, FIU, for maintaining best grade point average, Spring 2005.
- Awarded "***National Science Foundation (NSF) Travel Scholarship***" to present a student poster during NSF Design and Manufacturing Innovation Conference at St. Louis, MO, July 24-27th 2006.
- ***Won*** a team technical quiz competition "***Materials Bowl***" during 2007 TMS (The Minerals, Metals and Materials) Annual meeting held in Orlando, Feb. 24-Mar. 1st, 2007. Overall twelve teams participated from colleges such as *Georgia Tech., Carnegie Mellon, Colorado School of Mines,* etc.
- Recipient of **RCTF** (*Research Challenge Trust Fund*) **Fellowship** for potential and capability in research at University of Kentucky during 2001-02.
- Awarded ***Deutscher Akademischer Austausch Dienst (DAAD) Scholarship*****,** based on merit, to pursue M. Tech. Project at Materialprufungsanatalt (State Material Testing), University of *Stuttgart, Germany* (May2000-Feb.2001).

- Awarded ***Sudharshan Bhat Memorial Prize*** and ***S. Ananthramakrishnan Memorial Prize*** for "**Best Academic Record**" in Metallurgical Engineering branch for M.Tech. at IIT (Indian Institute of Technology) Madras, India, 2001.
- Awarded as **"*Best Outgoing Student*"** by Department of Metallurgical Engineering, P.S.G. College of Technology, Coimbatore, India for overall excellence in academics and sports (1999).

STUDENT-THESIS GUIDED:
PhD: 2 completed (9 ongoing)
M. Tech.: 5 completed (5 ongoing)

RESEARCH PROJECTS:
A total of over Rs. 3.00 crores (US$ 600,000) with external funding of Rs. 2.45 crores (US$ 490,000), being the main PI for projects ~ Rs. 2.28 crores (US $ 456,000).

Santosh B. Noronha

Assistant Professor
Department of Chemical Engineering
Indian Institute of Technology Bombay
Powai, Mumbai-400076, India

Education (Post-Graduation onwards & Professional Career)

Sl No.	Institution Place	Degree Awarded	Year	Field of Study
1	IIT Madras	B. Tech.	1990	Chemical Engineering
2	Univeristy of Maryland	Ph.D.	1996	Biochemical Engineering
3.	NIH, Bethesda, MD	PDF	2000	Bioprocess Engineering

Position and Employment *(Starting with the most recent employment)*

Sl No.	Institution Place	Position	From (Date)	To (date)
1	IIT Bombay	Asst. Professor	2001	

Professional Experience and Training

I am a biochemical engineer by training who has evolved multidisciplinary interests. I have focused on understanding various metabolic and regulatory aspects of microbial systems, towards rationally manipulating their productivity for production of therapeutics. In parallel I have focused on developing algorithms for online adaptive control and optimization such bioprocesses. I have recently developed a recombinant process for production of the chiral intermediate R-PAC, via a biotransformation route in *S. cerevisiae*. The process development aspects involved here included overexpression of the relevant enzyme in yeast, intensification of the catalysis by site directed mutagenesis of the enzyme, followed by reactor-level optimization. This process has been translated to a pharma company (which cosponsored the work along with DST (Drugs and Pharma)) and is undergoing the patenting process now in several countries.

Selected peer-reviewed publications (Ten best publications in chronological order)

Reshamwala, S., Noronha, S.B. , "Biofilm formation in Escherichia coli cra mutants is impaired due to down-regulation of curli biosynthesis.", Arch Microbiol., vol. 193 (10), pp. 711 - 722, 2011

Shiloach, J., Reshamwala, S., Noronha, S.B., Negrete, A. , "Analyzing metabolic variations in different bacterial strains, historical perspectives and current trends - example E. coli", Current Opinion in Biotechnology, vol. 21, issue 1, pp. 21 - 26, 2010

Gokhale, A., Kunder, R., Goel, A., Sarin, R., Moiyadi, A., Shenoy, A., Mamidipally, C., Noronha, S., Kannan, S., Shirsat, N.V. , "Distinctive microRNA signature of medulloblastomas associated with the WNT signaling pathway", Journal of Cancer Research and Therapeutics, vol. 6, pp. 521-529, 2010.

Pusha, S., Gudi, R., Noronha, S. , "Polar classification with correspondence analysis for fault isolation", Journal of Process Control, vol. 19, issue 4, pp. 656 - 663, 2009.

Karra, S., Shaw, R., Patwardhan, S.C., Noronha, S. , "Adaptive model predictive control of multivariable time-varying systems", Industrial and Engineering Chemistry Research, vol. 47,

issue 8, pp. 2708 - 2720, 2008

Mukhopadhyay, M., Noronha, S.B., Suraishkumar, G.K. , "Copper biosorption in a column of pretreated Aspergillus niger biomass", Chemical Engineering Journal, vol. 144, issue 3, pp. 386 - 390, 2008

Mukhopadhyay, M., Noronha, S.B., Suraishkumar, G.K. , "Kinetic modeling for the biosorption of copper by pretreated Aspergillus niger biomass", Bioresource Technology, vol. 98, issue 9, pp. 1781 - 1787, 2007

Porwal, G., Jain, S., Babu, S.D., Singh, D., Nanavati, H., Noronha, S. , "Protein structure prediction aided by geometrical and probabilistic constraints", Journal of Computational Chemistry, vol. 28, issue 12, pp. 1943 - 1952, 2007

Kumar, R., Nanavati, H., Noronha, S.B., Mahajani, S.M. , "A continuous process for the recovery of lactic acid by reactive distillation", Journal of Chemical Technology and Biotechnology, vol. 81,issue 11, pp. 1767 - 1777, 2006

Noronha, S., Yeh, H., T. F.l Spande and J. Shiloach. “Investigation of the TCA cycle and the glyoxylate shunt in Escherichia coli BL21 and JM109 using (13)C-NMR/MS. Biotechnol. Bioeng. 68(3) 316-327. 2000

Noronha, S., L. W. Wagner, N. H. Matheson and J. Shiloach. Use of an ethanol sensor for feedback control of growth and expression of TBV25H in Saccharomyces cerevisiae. Biotechnol Bioeng 63: 285-289. 1999

P. Sriram

Professor,
Department of Aerospace Engineering,
I.I.T., Madras
Chennai-600 036, TN

Education

- B.Tech. (Aero) - IIT Madras, 1982
- M.S. (Aero) - Georgia Institute of Technology, USA, 1984
- Ph.D. - Georgia Institute of Technology, USA, 1988

Work History

- Dean (Administration), IIT Madras, 2011 – present
- Head, Department of Aerospace Engineering, IIT Madras, 2009 – 2011
- Professor, IIT Madras, 2004 – present
- Visiting Professor, Wichita State University, USA, 2004 – 2005
- Head, Computer Centre, IIT Madras, 1998 – 2001
- Associate Professor, IIT Madras, 1996 – 2004
- Assistant Professor, IIT Madras, 1995 – 1996
- Visiting Faculty IIT Madras, 1994 – 1995
- Assistant Professor, Wichita State University, USA, 1991 – 1994
- Post Doctoral Fellow, Georgia Tech, 1988 – 1991
- Graduate Research Assistant (1/2 time), Georgia Tech, 1984 – 1988
- Graduate Research Assistant (1/3 time), Georgia Tech, 1982 – 1984

Most recently taught courses at IIT Madras and elsewhere

- AS352 Aero Lab.-II
- AS302/AE332 Aircraft Design
- AS304 Experimental Strees Analysis
- AE772 Experimental Techniques Structural Mechanics
- AS-401 Detailed design and Manufacturing
- AS-303 Vibration

- AS-351 Aerospace Lab-I

Research Interests

- Structural Mechanics
- Composites
- Fatigue and Fracture
- Computer Networking
- Distributed and Parallel Processing

Career Highlights

- Top notch performer at every step as detailed below
- B.Tech. Gold Medallist at IIT Madras (1982)
- M.S. aggregate of 100% at Georgia Tech (1984)
- Ph.D. Thesis nominated for best thesis award (1988)
- Post Doctoral Work awarded Best Paper by ASTM (1989)
- Polished Professor at Wichita State University (1992)
- Nominated for University-wide Best Teacher award (1993)
- Short-listed for Marquis' Who's Who in the World (1996)
- Author of about 40 research papers including 18 in international journals with mean citation rate of over 6 citations per paper
- Principal Investigator on sponsored research projects of value Rs. 5.84 crores, consulting projects of value Rs. 6.74 lakhs and continuing education projects of value Rs. 72.4 lakhs

C.S. Kumar

Associate Professor
Department of Mechanical Engineering
IIT Kharagpur
Kharagpur-721302, West Bengal

1. Name in full : CHERUVU SIVA KUMAR

2. Address
Associate Professor,Dept. of Mechanical Engg.,
Indian Institute of Technology Kharagpur
Kharagpur – 721 302, West Bengal, India

3. Date of Birth : September 21, 1966

4. Nationality : Indian

5. Areas of Specialisation :
Robotics, Control Systems and Computer Networks

6.Qualifications :
B.Tech (Hons.), Mechanical Engineering (Manufacturing Science and Engieering) IIT Kharagpur, 1987
Ph.D. (Mechanical Engineering), IIT Kharagpur, 1995
Post Doc fellow (STA/Now JSPS), AIST, Tsukuba, Japan, 1999

7. Professional Associations:
Member IEEE (Robotics and Automation; Communication Systems and Oceanic Engineering Societies)
Member American Society of Mechanical Engineers
Member Robotics Society of India

8. Publications:
Journal Papers **:** 11
Book Chapters: 1
Conference Papers: 42

9.Ph.D./M.Tech Supervision
(i) Ph.D Thesis Supervision: 4 (5 ongoing)
(ii) M.Tech Thesis Supervision : 38 (3 ongoing)

10. Sponsored projects as PI/ co-PI (sin 2006):

1. "Development of an Autonomous Underwater Vehicle", Ministry of Earth Sciences. (as co-PI and group lead on Navigation and control) completed November 2011
2. "Establishment of a Nationwide QoS Network test bed", Ministry of Communications and Information Technology. (as PI)
3. "Mission Project on Virtual Labs - Pilot Phase, Main Phase and Real Time Labs", Ministry of Human resources Department, along with IIT Delhi, ongoing since 2009 (as Participating Insititute Coordinator, IIT Kharagpur and Discipline National Coordinator, Mechanical Sciences).
4. "Aluminium Alloys and Materials for Underwater Vehicles", Ministry of Earth Sciences (National Institute of Ocean Technologies) as Co-PI since 2011.

11. Selected Publications:

1. Vasu K, Sumit Maheshwari, Sudipta Mahapatra, C.S. Kumar, "An Energy and QoS Aware FUZZY-TOP Vertical Handover Decision Mechanism for Heterogeneous Wireless Networks", *IET Networks* (To appear February 2013)
2. Vasu K, Sumit Maheswari, Sudipta Mahapatra, C.S.Kumar, "QoS Aware Fuzzy Rule Based Vertical Handoff Decision Algorithm Incorporating a New Evaluation Model for Wireless Heterogeneous Networks" *EURASIP Journal for Wireless Communications and Networking*, Vol 2012:322 (2012)
3. Sumit Maheshwari, Sudipta Mahapatra, C.S Kumar, Vasu K, "A Joint Parametric Prediction Model for Wireless Internet Traffic using Hidden Markov Model", *Springer WINET*, Vol 1, Pages 1-15 (2012)
4. G.B. Madhab, C.S. Kumar, and P.K. Mishra "Modelling and Control of Bio-inspired microgripper", *International Journal of Manufacturing Technology and Management*, 21, 160-175 (2010)
5. R.Prasanth Kumar, C.S.Kumar, A. Dasgupta and D.Sen, "Time-Delay Control of an Autonomous Underwater Vehicle: Theory and Experimental Results" *Ocean Engineering - Special Issue of Ocean Engineering on Autonomous Underwater Vehicles*, 36, 74-81 (2009)
6. Prassanth Kumar R., Dasgupta Anirvan, Kumar C.S.", A New Tracking Controller Design for Underwater Vehicles Using Quadratic Stabilization" *Journal of Dynamic Systems Measurement and Control*, Vol 130, (2008)
7. R. Prasanth Kumar, A. Dasgupta and C.S. Kumar, "Robust Trajectory Control of Underwater Vehicles using Time Delay Control Law", *Ocean Engineering*, 34, 842-849 (2007)
8. J.Krishnaiah, C.S.Kumar, M.A.Faruqi, "Modelling and Control of Chaotic Processes though their bifurcation diagrams generated with the help of recurrent neural network models Part II: An industrial study", *Journal of Process Control* (2006)
9. J.Krishnaiah, C.S.Kumar, M.A.Faruqi, "Modelling and Control of Chaotic Processes though their bifurcation diagrams generated with the help of recurrent neural network models Part I: simulation studies",*Journal of Process Control*, (2006)
10. R. Prasanth Kumar, A. Dasgupta and C.S. Kumar, "Real-time optimal motion planning for autonomous underwater vehicles", *Ocean Engineering*, 32, Issues 11-12 (2005)
11. Kumar, C.S., A. Dasgupta and A. Mukherjee., "A study on Interaction Control through Passive Degrees of Freedom: Stability and Adaptation of Impedance Variation". *Special Issue on Control Systems for students, Part II, Journal of the IETE*, July-Dec 1992.
12. Contributed a chapter "*Control Strategies in Physical Domains*" in the book entitled "*Bond graph in modeling simulation and fault identification*" by Amalendu Mukherjee, Ranjit Karmakar and Arun Kumar Samantaray, I.K.International, New Delhi, ISBN 81-88237-96-5 June 2006.
13. Vasu K, Sudipta Mahapatra, C.S Kumar, "An Analytical Framework for Evaluating MIPv6 Protocols Applying Transport Engineering Concepts", *ACM MSWiM 2012*, Vol. 1, Pages 53-60, Paphos, Cyprus.
14. Gupta, P.K.; Parul Saraswat; Kumar, C.S; Saswat Chakrabarti; Rajakumar, R.V.; "Measurement of Power Consumption in MultiMedia Mobiles for Various Network Activities in 2G/3G Networks" IEEE ANTS, 2012.
15. Gupta, P.K.; Rajakumar, R.V.; Kumar, C.S.; , "Energy Impact of Signalling Protocols in 3GPP-LTE and Guidelines For Savings," IEEE Indicon, 2012.
16. Gupta, P.K.; Rajakumar, R.V.; Kumar, C.S.; , "Analysis of Impact of Network Activity on Energy Efficiency of 3GPP-LTE, " IEEE Indicon, 2012.
17. Gupta, P.K.; Rajakumar, R.V.; Kumar, C.S.;, "Energy cost analysis of data plane and control plane protocols for 3GPP-LTE, " National Conference on Communications (NCC), 2012, vol., no., pp.1-5, 3-5 Feb. 2012.
18. Gan Chaudhuri, S.; Kumar, C.S.; RajaKumar, R.V.; , "Validation of a DiffServ based QoS model implementation for real-time traffic in a test bed," IEEE *National Conference on Communications (NCC), 2012*, vol., no., pp.1-5, 3-5 Feb. 2012.

19. Jallu Krishnaiah, C.S. Kumar, and M.A. Faruqi; "Intelligent Chaos Controller: A Computational Intelligence Based Approach for Data-Driven Real-World Systems"; Proceedings of the International Conference on Information Systems Design and Intelligent Applications, Advances in Intelligent and Soft Computing 2012 (INDIA 2012), AISC 132, pp. 273–280.
20. Vasu K, Sumit Maheshwari, Sudipta Mahapatra, C. S. Kumar, "QoS Aware Fuzzy Rule Based Vertical Handoff Decision Algorithm for Wireless Heterogeneous Networks", *IEEE NCC*, Page(s): 371-375, Jan, 2011, IISc, Bangalore, India.
21. Sumit Maheshwari, Vasu K, Sudipta Mahapatra, C. S. Kumar, "A Joint-Parametric Realistic Traffic Model for Wireless Internet using Hidden Markov Model", *IEEE CSQRWT*, July, 2011, HIT, Harbin, China.
22. Vasu K, Sudipta Mahapatra, C.S Kumar, "MIPv6 Protocols: A Survey and Comparative Analysis", *CoNeCo 2012*, Vol. 4, pp. 73–93, 2012. © CS&IT-CSCP AIRCC, Coimbatore, India.
23. Vasu K, Sudipta Mahapatra, C.S Kumar, "Bulk Binding Update Procedure for PMIPv6 Based Intelligent Transportation Systems", *WiMo 2012*, Vol. 4, pp. 207-223, 2012. © CS&IT-CSCP AIRCC, Coimbatore, India.
24. Sumit Maheshwari, Vasu K, C. S. Kumar, Sudipta Mahapatra, "Measurement and Comparative Analysis of UDP Traffic over Wireless Networks", *ICWN, July, 2011,* Las Vegas, USA.
25. Sumit Maheshwari, Vasu K, C. S. Kumar, Sudipta Mahapatra, "Measurement and Analysis of UDP Traffic over Wi-Fi and GPRS", *ICCCD*, Dec, 2010, IIT Kharagpur, India.
26. Ayan Sinha; Madhusudan Chakraborty; Sudipto Ghosh; C.S. Kumar; Jitesh H. Panchal; Janet K. Allen; David L. McDowell; Farrokh Mistree *Microstructure-mediated integration of material and product design - Undersea submersible,* Proceedings of the ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 2009, DETC2009 2010;5(PART A):467-478.
27. Krishnaiah.J, C.S.Kumar, M.A.Faruqi, *Analysing Behaviour of Submerged Arc Furnace using Recurrent Neural Networks,* General Abstracts: TMS-2007 Material Processing and Manufacturing Division, Modelling and Simulation of Materials and Processes, Feb 25- March 1, 2007, ORLANDO, FLORIDA USA.
28. Pretty Khare, G.B.Madhab, C.S.Kumar and P.K.Mishra, *Optimizing Design of Piezoelectric Actuated Compliant Microgripper Mechanism,* Proceedings of the 13th National Conference on Mechanisms and Machines (NaCoMM07), Bangalore, December 2007. Nacomm-2007-112.
29. T.S. Simil and C.S.Kumar, *"Planning micromanipulations using haptic interaction environment"*, Proceedings of the 13th National Conference on Mechanisms and Machines, Bangalore, December 2007.
30. Pretty Khare, Madhab, G.B., C.S.Kumar and P.K.Mishra *"Optimizing Design of Piezoelectric Actuated Compliant Microgripper Mechanism"*, Proceedings of the 13th National Conference on Mechanisms and Machines, Bangalore, December 2007.

Ratnajit Bhattacharjee

Professor
Department of Electronics and Electrical Engineering
IIT Guwahati
Guwahati-781039, Assam

Dr. Ratnajit Bhattacharjee received his B. E. in Electronics and Telecommunication Engineering (First Class Honors) from Gauhati University (REC (at present NIT) Silchar), M. Tech. (E and ECE Department, Microwave Engineering specialization) from IIT Kharagpur and Ph. D. (Engineering) from Jadavpur University Kolkata. Presently he is a Professor in the Department of Electronics and Electrical Engineering, IIT Guwahati and also the Head of the Department. Prior to joining IIT Guwahati, he served as a faculty member in REC (at present NIT) Silchar. His research interests include Wireless communication, Wireless networks, Microstrip antennas, Microwave Engineering and Electromagnetics. He has published over ninety research papers in journals, international and national conferences. He has developed a web course on Electromagnetic Theory under the NPTEL project of MHRD. He is involved with the ongoing mission project of MHRD on Virtual labs at various capacities (Discipline wise national coordinator for Electrical Engineering, Institute coordinator for IIT Guwahati as well as laboratory development activities). Two students have completed their doctoral research under his guidance. At present ten (four are joint supervisions) research scholars are working under his supervision in the areas of antenna design, wireless communication, MIMO radar and communication networks. He has also supervised twenty nine M. Tech thesis (includes ten joint supervisions). He has been involved in several research projects. He was a Co-investigator for the contracted research from NICT Japan in the area of Next Generation Wireless Networks and was a member of the research team of the Tiny6 STIC project dealing with IPv6 and Sensor Networks. He has been an investigator of the DIT sponsored research project on Ultra Wide Band Radio Technology and its Application. He has also been involved as principal investigator in a sponsored research project on antenna system development from ISRO. He has acted as reviewer for several conferences and journals. He was TPC chair for the Communication Symposium of the fifteenth National Conference on Communications, 2009 (NCC 2009) and also served as TPC member and session chair in some conferences. In NIT Silchar, he was one of the coordinators for the setting up of Campus Wide Optical Fiber based network under the Centre for Excellence scheme and was also Head of the Department of ETE for about a year. He is a member of IEEE and life member of Indian Society of Technical Education.

Some Recent Journal Publications:

1. Samar Shailendra, R. Bhattacharjee, and Sanjay K. Bose, “An implementation of Min–Max optimization for multipath SCTP through bandwidth estimation based resource pooling technique”, In press, *AEU-International Journal of Electronics and Communications(Elsevier)*
2. H. Katiyar and R. Bhattacharjee, “On the Performance of Decode-and-Forward Relaying with Multi-Antenna Destination”, *Elsevier’s Int. J. Electron. Commun. (AEUe)* vol 66, Issue 1 January, 2012, pp. 1-6.
3. Samar Shailendra, R. Bhattacharjee, and Sanjay K. Bose, “MPSCTP: A Simple and Efficient Multipath Algorithm for SCTP”, *IEEE Communications Letters*, VOL. 15, NO. 10, Oct. 2011 pp. 1139-1141.

4. H. Katiyar and R. Bhattacharjee, “Average capacity and signal-to-noise ratio analysis of multi-antenna regenerative cooperative relay in Rayleigh fading channel”, *IET Communications,* vol. 5, Oct. 2011, pp. 1971-1977.
5. Himanshu Katiyar and R. Bhattacharjee, “Performance of two-hop infrastructure based multi-antenna regenerative relaying in Rayleigh fading channel”, *Elsevier's Physical Communication ,* vol 4, Issue 3, Sep. 2011, pp. 190-195.
6. Himanshu Katiyar and R. Bhattacharjee, “Outage Performance of Multi-antenna Relay Cooperation in Absence of Direct Link”, *IEEE Communications Letters*, vol. 15, no. 4, Apr. 2011, pp. 398-400.
7. B. S. Paul and R. Bhattacharjee, “Time and Angle of Arrival Statistics of Mobile-to-Mobile Communication Channel Employing Dual Annular Strip Model*”, IETE Journal of Research*, vol. 56, issue 6, 2010, pp. 275-281.
8. Himanshu Katiyar and R. Bhattacharjee, “Performance of MRC combining Multi-antenna Cooperative Relay network”, *Elsevier's Int. J. Electron. Commun.(AEU)*, vol. 64, issue 10, pp. 988-991, Oct. 2010.
9. Himanshu Katiyar and R. Bhattacharjee, “Performance of Two-Hop Regenerative Relay Network under Correlated Nakagami-m Fading at Multi-antenna Relay”, *IEEE Communications Letters*, vol. 13, no. 10, Nov. 2009, pp. 820-822.
10. Himanshu Katiyar and R. Bhattacharjee, “Outage Performance of Two-hop Multi-antenna Cooperative relaying in Rayleigh Fading Channel”, *IET Electronics Letters*, vol. 45, no. 17, Aug. 2009, pp. 881-883.
11. B. S. Paul, A. Hasan, H. Madheshiya and R. Bhattacharjee, “Time and Angle of Arrival Statistics of Mobile-to-Mobile Communication Channel Employing Circular Scattering Model”, *IETE Journal of Research*, vol. 55, issue 6, 2009, pp. 275-281.
12. Himanshu Katiyar and R. Bhattacharjee, “Power Allocation Strategies for Non-Regenerative Relay Network in Nakagami-m Fading Channel”, *IETE Journal of Research*, vol. 55, issue 5, 2009, pp. 205-211.

Vinod Kumar

Professor & Head Electrical Engineering Department

IIT Roorkee

ROORKEE-247 667 India

Research Interest : ECG Signal Processing and Analysis; Digital Signal and Image Processing; Transducer Instrumentation.

Supervision of Students

1. PhD theses : 16 completed + 7 in progress
2. ME dissertations: 76 completed + 4 in progress
3. BE projects : more than 100 completed

Qualification

- BSc Engg. (Electrical) Hons., 1973
- ME (Measurement and Instrumentation) Hons., 1975
- PhD (Biosystem Modelling and Analysis), 1984

Distinctions/Honours /Awards

1. Member International Program Committee, 31st Annual IEEE Engineering in Medicine & Biology Society Conference to be held in Minnesota, 2009
2. The Corps of Engineers Prize: Institution of Engineers (I) 2008
3. Honorary Editor, Medical Electronics, IETE Journal of Research April-2007
4. Member Editorial Board, International Journal of Medical Engineering and Informatics (IJMEI)
5. Editor, International Journal of Highly Reliable Electronic System Design
6. Guest Editor, IETE Journal of Research, Special issue on Biomedical Signal & Image Processing to published in Nov-Dec 2007.
7. The Railway Board's Prize: Certificate of Award on a research paper by Institution Of Engineers(I) 2006
8. Ist IETE-R S Khandpur Medical Instrumentation Gold Medal in recognition of life time achievements and outstanding contribution in the field of Biomedical Instrumentation 2006
9. The Brij Mohanlal Memorial Prize by Institution of Engineers (I) 2005
10. Outstanding Teacher's Award during 2005 IIT Roorkee
11. Excellent Performance during 2004-05 IIT Roorkee
12. Excellent Performance during 2003-04 IIT Roorkee

13. Excellent Performance during 2001-02 and 2002-03 IIT Roorkee
14. IETE K S Krishna Memorial Award 2004
15. Khosla Cash Award & Prize, Awarded by IIT Roorkee, 2002
16. Khosla Cash Prize, University of Roorkee, Roorkee, 2001
17. Khosla Annual Research Prize, University of Roorkee, Roorkee, 1994
18. Certificate of Merit for research paper by Institution of Engineers (I) 1994
19. Certificate of Merit for research paper by Institution of Engineers (I) 1990
20. Gold Medal for standing first class first in M.E. (Measurement and Instrumentation) 1975
21. J. Mukhopadhyay Medal for standing first class first in M.E. (Electrical) among all branches 1975

Membership of Professional Bodies

1. Life Fellow, Institution of Engineers (I)
2. Senior Member, IEEE, USA
3. Member, IEE, UK
4. Life Fellow, Institution of Electronics and Telecommunication Engineers
5. Life Member, Biomedical Engineering Society of India
6. Life Member, Indian Society for Technical Education
7. Life Member, Systems Society of India
8. Life Member, Ultrasonic Society of India
9. Life Member, Instrument Society of India

Member of Governing Board/Senate/BOS of Engineering Institutes

1. Member, Board of Studies, Delhi University, Delhi
2. Member, Board of Studies, Punjab University, Chandigarh
3. Member, Institute Research Board, TIET, Patiala
4. Member, Board of Studies, TIET, Patiala
5. Member, Board of Studies, MITS, Gwalior
6. Member – Board of Studies (Biomedical Engineering), Rajeev Gandhi Proudyogiki Vishwavidyalaya, Bhopal
7. Member of the Senate, Dr BRANIT, Jalandhar

Invited Talks/Speaker 2000 onwards

1. Computers in Medicine, National seminar on Trends in Industrial Electronics, Transducer, Control and Communication, TIET, Patiala, November 14-15, 2000
2. Role of Computers in Medicine during National Symposium on Instrumentation

   (NSI-26), IRDE, DRDO, Dehradun , October 31-Nov. 2, 2001

3. Bridge Instrumentation during National Workshop on Research Interest in

   Bridge Engineering – Present and Future, Organised by Bridge Engineering Group, UOR Roorkee March 15, 2001

4. Expert lecture on DSP, IRDE, DRDO, Dehradun, November 21-2002

5. Expert lectures on Telemedicine, SLIET, Longowal, December 27 & 28, 2002

6. Expert lecture, MITS, Gwalior, August 29, 2002

7. Invited Lecture, National Workshop on DSP and its Applications, RAIT, Mumbai, July 3-7,2006

8. Invited Lecture, ECG Signal Analysis, SGGGS, Nanded, Dec 2006.

9. Delivered a seminar on HRV Analysis , University of Washington, Department of

   Bioengineering , Washington, Seattle, March 2008

10. Delivered a seminar on ECG Signal Analysis, PHYSIO CONTROL, Redmond, WA 98052 USA, March 2008

11. Invited talk on E-Governance, NIT Jallandhar Nov 2008.

Administrative Experience

- Prof & Head, Department of Electrical Engineering(Jan 2009-)
- Coordinator, QIP Centre, IIT Roorkee (till date)
- Head, Continuing Education Centre, IIT Roorkee (till date)
- Head, Information Super Highway Centre, IIT Roorkee (Jan 2002- Jan 2005)
- Coordinator, Educational Technology Service Cell, IIT Roorkee (2002-2003)
- Chairman, Spl Purchase Committee (Software), IIT Roorkee (till date)
- Coordinator , Audio Visual Research Centre, IITR (Sept 2001- March 2002)
- Director, Audio Visual Research Centre, University of Roorkee (1999-2001)
- Associate Dean Academic, University of Roorkee (for 2 yrs)
- Chief Warden of UG/PG Hostel for 3 years

(a) Officer-in-charge:

(i) Instrumentation & Signal Processing Laboratory 15years

(ii) Biomedical Engg. Laboratory tilldate

(b)	**Member of the Department Committees:**	
(i)	Chairman, Department Research Committee	
(ii)	Finance & Purchase Committee:	8 years
(iii)	Department Professorial Committee	4 years
(iv)	P.G.& U.G. Academic Programme Committee:	3 years each
(v)	Deptt. Administrative Committee:	8 years (till date)
(c)	Member of University/Institute Level Committees:	
(i)	The Senate (till date)	
(ii)	The Syndicate (upto 2001)	
(iii)	The Academic Council (upto 2001)	
(iv)	The Research Degree Committee (upto 2001) (v) VISION 2020	
(vi)	Member PG (Engineering) Admission Committee of the University 1999 & 2001	
(vii)	Member, University/Institute Lecture Series Committee (up to 2004) (viii) Member, Group Purchase Committee (Till date)	

Professional Experience:

(a) 33 years of teaching and research experience in the field of Biomedical Instrumentation, Signal Processing and Transducer Instrumentation. Interaction with industries to provide them consultancy in the area of Instrumentation and Signal Processing.

(b) Monograph Written : 2 nos.

Books Written : 1

(c) Expert in many meetings, organised by the All India Council for Technical Education, Ministry of Information Technology, and Department of Science and Technology for the evaluation of R&D projects in the area of Biomedical Engineering/Instrumentation.

(d) Member of PG Academic Board of AICTE for 2 years for the approval of new PG courses in Engineering Institutes.

(e) Subject Expert in many interview panels for the posts of Professor/ Associate Professor/Lecturer in Engineering Institutes of National Importance.

Sponsored Research Projects completed

(As Principal Investigator/Investigator)

1. National Competitiveness in the Knowledge Economy, MIT, GOI, Rs 497.00 lacs (in progress). This is a joint project being executed by IITM, IMI, NPC & IITR.

2. Setting-up of Community Information and Service Centres in five boarder districts of Uttarakhand, GoUK , Rs 113.00 lacs (inprogress)

3. Pro-Poor IT Initiatives in Uttaranchal – Data Centre, Community Information Centres and Networking, UNDP, Rs. 336 lacs

4. Intelligent Fault Diagnosis of High Performance Electric Drives, MHRD, New Delhi. 13.00 lacs .

5. Development of Integrated Software for Quantification of Autonomic Tone, Ministry of Communication & Information Technology, New Delhi, in collaboration with IIT Delhi & AIIMS New Delhi.

6. Establishment of Correlation between Ultrasound Signal and Flow Geometry CSIR, New Delhi, Rs. 3.9 lacs .

7. Future Extraction and Interpretations of Ultrasound Medical Images, AICTE, New Delhi, Rs. 5.0 lacs .

8. Condition Monitoring System for Human Cardiac System and Large Electric

Machines, DST, New Delhi, Rs. 20,00,000/- .

9. Development of `A Computerized ECG Interpreter for Mass Healthcare', AICTE, New Delhi, Rs. 8, 00,000/-.

10. Expert System Based Condition Monitoring of Industrial Drives Department of

Science & Technology, New Delhi, Rs. 11,47,000/-

11. Studies on Development of Efficient Heating System for Biogas Digesters, Ministry of Non-Conventional Energy Sources 1998., Rs. 14,58,000/-

12. Information Technology, State of Art and Application to Industry, All India Council for Technical Education, New Delhi, 1995. Rs. 2.5 lacs

13. Computer Based Monitoring, Protection and Control of Power Stations. Ministry of Human Resource Development, India 1992. Rs. 10.0 lacs14. Disease Classification based on ECG and Blood Pressure data. Rs. 1.0 Lac, Ministry of Education, through University of Roorkee. 1988.

15. Microprocessor based Analysis and Interpretation of ECG signal, sponsored by

University of Roorkee, Roorkee. 1986.

16. Development of time optimal policy for Heomodialysis system, sponsored by U.G.C. New Delhi. 1985.

17. Development of test bench for testing of circuits, sponsored by University of Roorkee, Roorkee. 1985.

18. Reliability Based Design of Electronic System considering Catastrophic and Gradual Failure, sponsored by Department of Electronics, Govt. of India, 1984, Rs. 12.0 Lac

Consultancy projects

(As Principal Investigator or Investigator)

1. Development of Software & Sensors for Testing of Energy Meters, REIL Jaipur, Rs 4.00 lacs (inprogress).

2. Setting-up of Community Information and Service Centres in five boarder districts of Uttarakhand, GoUK , Rs 378.00 lacs (inprogress)

3. Development of ECG package for analysis, BARC Mumbai, Rs 5.00 lacs.

4. Pro-Poor e-governance initiatives in Uttranchal, GoU, Rs. 200.00 lacs.

5. Performance Evaluation of Small Hydroelectric Power Plants, MNES, Rs. 25.00 lacs

6. Pro-poor IT initiatives in Uttaranchal – Data Centre, Community Information Centres and Networking, UNDP, Rs. 144 lacs

7. RLA & RMU studies of electrical equipment of Nirgajini Power Plant, U.P. Jal Vidyut Nigam Ltd., Rs. 3.50 lacs

8. Performance evaluation of small hydroelectric power plants, MNES, Rs. 2.00 lacs

9. RLA & RMU studies of electrical equipment of Mohammadpur Power Plant, U.P. Jal Vidyut Nigam Ltd., Rs. 2.4 lacs

10. Computer controlled vibration damper test system, Asbesco (India) Pvt. Ltd., Calcutta, Rs. 50,000/-, 2000.

11. Design and development of computerised calibration system for static energy meters. M/s REIL, Jaipur Rs. 5,30,000/-, 1999.

12. Design and development of 12 kV Impulse Voltage Generator, M/s Capital Power Systems Ltd., Noida, Rs. 1,40,000/-, 1999.

13. Design and development alternating flux density meter, M/s Capital Power Systems Ltd., Noida, Rs. 14,000/-, 1999.

14. Design and development of impulse voltage generator for electromechanical energy meters, M/s G.E.C. Alsthom, Calcutta, Rs. 75,000/-, 1998.15. Design and development of impulse test system for the energy meters, as per specification of the firm VXL Landis & Gyr Ltd., Rs. 1,50,000/-, 1998.

16. Computerized calibration of three-phase static energy meters, M/s Rajsthan Electronics and Instruments Ltd., Jaipur, Rs.2,47,000/-, 1998.

17. Development of PC based ECG monitor. M/s Bergan Healthcare Pvt. Ltd., Gurgaon, Rs. 50,000/-, 1998.

18. Development of an electromagnet analyzer, M/s Havell's Industries, New Delhi, Rs. 40,000/-, 1997.

19. Computer aided calibration and routing testing of energy meters in the production line, M/s Towers & Transformers, Ghaziabad, Rs. 50,000/-, 1997.

20. Instrumentation of 235 m RCC Tower at Pitampura, New Delhi, consultancy Rs. 2.5 Lac and Total cost of project Rs. 75.0 Lac, Directorate General Doordarshan, Mandi house, New Delhi, 1997.

21. Development of microprocessor control for A.C. coaches, Research, Design & Standards Organisation, Ministry of Railways, Lucknow, Rs.1,25,000/-, 1996.

22. PC based vibration testing of energy meter as per IS: 13010-1990, M/s Towers & Transformers, Ghaziabad, Rs. 50,000/-, 1996.

23. Design and development of impulse testing setup as per IS: 13010-1990, M/s Havell's Industries, New Delhi, Rs. 40,000/-, 1996.

24. Design and development of energy meter impulse testing setup, M/s Baroda Electric Co., Rs. 30,000/-, 1994.

25. Design and development of Impulse Generator. Towers & Transformers, New Delhi. Rs. 30,000/-, 1993.

26. Model testing of 375 m multiflue chimney in wind tunnel, M/s CESC Ltd., Victoria House, Calcutta. Rs. 50,000/-, 1993.

27. Design and development of a test equipment (Impulse Generator) Rs.15,000, ECE Industries , Hyderabad. - 1992.

28. Design and development of software and hardware for PC based flow and discharge monitoring system, Irrigation Research Institute, Bhopal (Through Western Precision Instruments, Roorkee), Rs. 22,000/- 1992.

29. Development of software for PC based data acquisition, monitoring and analysis for turbogenerator testing, Bharat Heavy Electricals Ltd., Hardwar. (Through New Engineering Enterprises, Roorkee) Rs. 20,000/-, 1992.

30. Development of software and hardware for on-line data acquisition , processing & display for wind tunnel studies, Central Building Research Institute, Roorkee, Rs.22,000, 1991.

31. Development of microprocessor based on-line torque speed recording and plotting system. Bharat Heavy Electricals Ltd. Hardwar, Rs. 45,000/-, 1990.32. Review of DC to DC converter circuit design. Centre for Development of Telematics, New Delhi, Rs.20,000. - 1986.

33. Technical discussions and design/development consultancy in the field of instrumentation to many industries. Rs. 10,000/-

34. System design for PC based vibration monitoring and control system, as per IS: 13010- 1990, M/s APEEC, Hydrabad, Rs. 75,000/-.

35. Development of software for on-line monitoring and display of 64 channel temperature signals for ISRO through M/s Recordtech, Roorkee, Rs. 30,000/-

36. Design and development of zero power factor source for energy meter testing, M/s Havell's Industries, New Delhi, Rs. 20,000/-.

37. Design and development of computerized calibration system for batch testing of static energy meters, M/s REIL, Jaipur, Rs. 5,30,000/-

38. Technical discussions and consultancy in the area of energy meter calibration, M/s REIL, Jaipur, @ Rs. 1000/- per day.

39. Transfer of technology - for the calibration of static energy meters to M/s Bergen Electronics Ltd., Gurgoan, (one prototype unit + consultancy charges).

40. Design and development of a prototype unit for fault detection equipment, M/s Jindal Electronics, Roorkee, Rs. 60,000/-.

41. Design and development of 10 kV Impulse Voltage Generator, M/S H.S. Chawla & Co., New Delhi, Rs. 1,40,000/-.
42. Design and development of 5 kV, 0.5J, 1.2/50 µs bipolar impulse voltage tester, M/S National Test House, Ghaziabad, Rs. 80,000/-
43. Design and development of 6 kV, 0.5J, 1.2/50 µs bipolar impulse voltage tester, M/S National Test House, Ghaziabad, Rs. 80,000/-
44. Design and development of vibration test system, M/S National Test House, Ghaziabad, Rs. 3,50,000/-
45. Design and development of test equipment for voltage interruption, voltage dips short time over current, M/S H.S. Chawla & Col., New Delhi, Rs. 1,00,000/-
46. Residual-life estimation of electrical equipment of Mohammedpur Power House, Uttaranchal Power Corporation, Dehradun, Rs. 2.40 lacs.
47. Short-time overcurrent, voltage interruption and voltage dip testers for static watthour meters, National Test House, Ghaziabad, Rs. 1.25 lacs
48. Renovation & modernization studies of Galogi Power Plant, Uttaranchal Hydropower Corp., Rs. 0.20 lac
49. Stator Core Fault Detection System, BHEL, Hardwar, Rs. 60,000/-.

Short Term Courses Organised

About 20 courses have been organised in the past 15 years in the field of Instrumentation, Biomedical Engineering and testing of Electrical & Electronic instruments as per IS & International Standards for the teachers of engineering colleges and for engineers working in industries and research organizations.

Workshop/Conferences Organised

1. Organised one day Workshop on "Biomedical Engineering Education" sponsored by AICTE, New Delhi. In this workshop packages/syllabi in the area of Biomedical Engineering were finalised in 1996.
2. Organised one day Continuing Medical Education Programme for Military Hospital, Roorkee during March 14, 1999.
3. Organised National Conference on "Biomedical Engineering" during April 21-22, 2000 at Roorkee.
4. Organised one day workshop on “National Accreditation Board for Testing and Calibration Laboratories” on 29 September 2001.
5. Organised International Conference on “Computer Applications in Electrical Engineering – Recent Advances”, during Feb. 21-23, 2002.
6. Organised QIP Workshop on Establishment of ECG Database of Healthy Native Popuplation, May 2008
7. Organised QIP course Comprehensive Electrocardiography: ECG Lead s systems, Signal Processing (Computer) Interpretation, Clinical Application” Oct 2008

PhD Theses Supervised/Under Progress

Completed

1. Myoelectric Signal Analysis in Hansenology – (DS Emanuel,1989)
2. Digital Processing of low frequency Random Signals Using Orthogonal Functions – (Ashwani Kumar,1992)
3. Ultrasonic Imaging System for Flaw Characterization - (RS Anand,1993)
4. Performance Improvement of Vibration Transducers & Their Applications – (Ashok Trivedi, 1997)
5. Ambulatory Monitoring and Analysis of ECG Signals – (PK Kulkarni,1998)
6. Artificial Neural Network Based ECG Classification – (G Vijaya, 1998)
7. Analysis and Interpretation of ECG Signal Using Wavelet Transform – (ST Hamde, 2000)
8. Developments in ANN Based Controllers for On-Line Process Control Appl. – (LM Waghmare,1999)9. Intelligent Diagnostic and Monitoring of Electrical Drives–(Saad ASA Kazzaz, 2001)
10. Computer Aided Analysis and Interpretation of EMG Signals for Disease Diagnosis- (AK Wadhwani, 2003)
11. ECG Data Compression for Telemedicine- (VK Giri, 2003)
12. Analysis and Interpretation of Heart Rate and Blood Pressure Variability (Dilbag Singh, 2004)
13. Medical Image Analysis and Compression for Tele-consultation (Sukhwinder Singh, 2005)
14. Vibration Analysis for Fault Identification in Rotating Machines (S. Wadhwani, from Jan 2006)
15. Protocol and Algorithms for Data Handling in Telecardiology (Mandeep Singh, 2007
16. Physiological Manifestations under Venom Interaction and their Analysis (Ranjan Maheshwari, 2007)
17. Segmentation and interpretation of Ultrasound Medical Images (Vibhakar Shrimali, Dec 2008)

Currently in Progress

18. Intelligent Health Monitoring & Fault Diagnosis of IM (Khawaja Hina Ahmed, from Jan 2004)
19. Condition Monitoring of Rotating Electrical Machine (Rajesh Patel, from Jan 2004)
20. Studies in Detection of DIM Targets(Haribabu Shrivastava, from 2006)
21. Heart Rate Variability (Ramesh Kumar Sunkaria, from 2005)
22. Medical Image Processing (Deepti 2007)

LIST OF RESEARCH PAPERS (JOINTLY) FROM 1990 ONWARDS

Journal Publications (FROM 2000 ONWARDS):

1. "Current Trends in Segmentation of Medical Ultrasound Bmode Images: A Review", accepted for publication in IETE Technical Reviews, Jan 2009.
2. "Medical feature based evaluation of structuring elements for morphological enhancement of ultrasonic images". Accepted in Journal of Medical Engineering and Technology, 2008.
3. "Citizen-centric E-governance project in Uttaranchal, India" , The Journal of Community Informatics, Vol 4, No 2 (2008) Special Issue: E-Governance and Community Informatics.
4. 'FAULT CLASSIFICATION FOR ROLLING ELEMENT BEARING IN ELECTRIC MACHINES', IETE Journal of research, vol .
5. 'Image preprocessing algorithms for detection of small point airborne targets' Accepted for publication in Defence Science Journal, Aug 2008.
6. "Medical Feature Based Qualitative Evaluation of Denoising Techniques for Ultrasound Liver Images". Accepted in International Journal of Signal and Imaging Systems Engineering,2008.
7. "Neural network based species identification in venom interacted cases in India", J. Venom.Anim. Toxins including Tropical Disease, Vol 13, No.4, 2007, pp 766-781.
8. "Non-arrhythmic ECG Data Compression using EBP-NN and Feature Extraction using Wavelet Transform", IE(I), Jr. – ET, Volume 88, July 2007, pp 39-48.
9. "Innovative Approach of Info Portal and Standards for e-Gov Apps" PC Quest 20, Special issue on Future Technology Roadmap, Dec 2007, pp 52-56.
10. " A new statistical PCA-ICA algorithm for R-peaks in ECG", Int J Cardiology, available online PMID:17655943 July 24, 2007.
11. " Artifacts and noise removal in electrocardiograms using independent component analysis", Int J Cardiology, available online PMID:176897, Aug 7, 2007.
12. "Vibration – Based bearing fault detection of main motors of steel rolling mill", Int J of Electrical Analysis available online ISSN:0973-8088, Nov. 1, 2007.
13. "Adaptive Threshold Based Block Classification in Medical Image Compression for Teleradiology", Computers in Biology & Medicine, Vol 37, issue 6, June 2007, pp 811 819.
14. "DWT-DCT hybrid scheme for Medical Image Compression", Journal of Medical Engineering & Technology, Volume 31,issue 2, March 2007, pp 109-122.
15. "Optimization of Block Size for DCT-Based Medical Image Compression", Journal of Medical Engineering & Technology, Volume 31, issue 2, March 2007, pp 129-143.
16. "Reduction of Blocking Artifects in JPEG Compressed Images", Journal of Digital Signal Processing, Volume 17, No.1, Jan 2007, pp 225-243.

17. "Modified SPIHT Wavelet Compression for ECG Signal", Journal of Medical Engineering & Technology, Volume 31,issue 1, Jan 2007, pp 29-35.

18. "Online Fingerprint Verification", Journal of Medical Engineering & Technology, Volume 31,issue 1, Jan 2007, pp 36-45.

19. "Detail-Preserving Image Information Restoration guided by SVM based noise mapping", Journal of Digital Signal Processing, accepted 2006.

20. "Spectral Evaluation of Aging on Heart Rate and Blood Pressure Variability in Healthy Subjects", Journal of Medical Engineering & Technology, Vol. 30, No. 3, pp. 145-150, May-June, 2006.

21. "Telemedicine – in Context to Indian Health Scenario", Journal of the Institution of Engineers (I), Comp. Engg. Division, Vol. 87, pp. 38-45, May, 2006.

22. "Vibration Based Fault Diagnosis of Induction Motor", IETE Technical Reviews, Vol 23, No. 2, March-April, 2006.

23. "The Time Evolution of Frequency Components of Heart Rate Variability Using Wavelets", IETE Journal of Research, Vol. 52, No. 1, January-February, 2006.

24. "Direct Data Compression of ECG Signal for Telemedicine", Int. J. of Systems Science, Vol. 37, No. 1, pp. 45-63, January, 2006.

25. "Toxicity and Symptomatic Identification of Species involved in Snakebites in the Indian Subcontinent", J. Venom. Anim. Toxins including Tropical Disease, Vol. 12, No. 1, pp. 3-18, February, 2006.

26. "Wavelet Based Vibration Monitoring for Detection of Faults in Ball Bearings of Rotating Machines", Journal of the Institution of Engineers (I), India, Vol. 86, pp. 77-81, September, 2005.

27. "An improved windowing technique for heart rate variability power spectrum estimation", Journal of Medical Engineering & Technology, Vol. 29, No. 2, pp. 95-101, March, 2005.

28. "Improved modified AZTEC technique for ECG data compression: Effect of length of parabolic filter on reconstructed signal", Computers & Electrical Engineering, Vol. 31, No. 4-5, pp. 334-344, June-July, 2005.

29. "Intelligent Condition Monitoring & Fault Diagnosis of Induction Motor", Journal of Multi Disciplinary Engineering Technologies, Vol. 1, No. 1, pp. 1-6, July-December, 2005.

30. "Road Roughness Measurement using PSD Approach", Journal of the Institution of Engineers (I), CE Division, Vol. 85, pp. 193-201, November, 2004.

31. "Hansen disease diagnostics using wavelets, Fuzzy and EBP-NN based Expert system", IETE Technical Review, Vol. 21, No. 2, pp. 153-175, March- April, 2004.

32. "Non-arrhythmic ECG data compression using EBP-NN and feature extraction using wavelet transform", Journal of the Institution of Engineers (I), ET Division, Accepted, June, 2004.

33. "Effects of RR segment duration on HRV spectrum estimation", Physiological

Measurement, Vol. 25, pp. 721-735, June, 2004.

34. "Heuristic strategy for the optimal selection of neural network parameter", International Journal of Computational Intelligence, Vol. 1, No. 3, pp. 131-134, April, 2004.

35. "Sampling frequency of RR- interval time series for spectral analysis of the heart rate variability", Journal of Medical Engineering & Technology, Vol. 28, No. 6, pp. 263-272, 2004.

36. "Instrumentation of bridges for monitoring thermal gradients-laboratory model studies", Highway Research Bulletin, Vol. 70, pp. 167-180, 2004.

37. "ECG Data Compression using EBP-NN", IETE Technical Review, Vol. 20, No. 6, pp.

583-604, November- December, 2003.

38. "Quality assurance in cardiac disease diagnostic using computerized feature extraction of ECG signal", IETE Technical Review, Vol. 20, No. 4, pp. 377-386, July- August, 2003.39. "Telecardiology for effective health care services", Journal of Medical Engineering & Technology, Vol. 27, No. 4, pp. 149-159, July- August, 2003.

40. "Cascade control of interconnected system using neural network", IETE Journal of Research, Vol. 48, No. 6, pp. 461-469, November- December, 2002.

41. "Remote monitoring of bridge structures- Instrumentation and Internet access", Bridge Engineering: Some Issues of Research Interest, (Book), June, 2002.

42. "QRS detection using new wavelets", Journal of Medical Engineering & Technology,

Vol. 26, No. 1, pp. 7-15, February, 2002.

43. "Feature extraction from ECG signal using wavelet transforms for disease diagnostics", Int. J. of Systems Science, Vol. 33, No. 13, pp. 1073-1085, 2002.

44. "A linear Area Estimation Technique for SNR Enhancement and Echo Detection in Ultrasound Signals", Journal of the Institution of Engineers (I), ET Division, Vol. 82, pp. 20-23, July, 2001.

45. "ECG data Compression using Non-redundant Templates", IETE Technical Review, Vol. 17, No. 5, pp. 299-310, September- October, 2000.

Conference Publications (FROM 2000 ONWARDS):

1. "Semi-Automatic Level Set Segmentation of Ultrasound Images for Fetal Growth Evaluation", The IASTED International Conference on Signal and Image processing (SIP2008) Kauilua-Kona, USA, 18-20, August, 2008, Paper Ref No-623

2. "Interactive Feature Extraction of Ultrasound Medical Images for Fetal Growth Evaluation", International Conference on Recent Advancements and Applications of Computer in Electrical Engineering (RACE 2007), Bikaner , Rajasthan, India, 24-25 March 2007.

3. "Diagnostic features based comparative evaluation of wavelet filters for ultrasound medical images", Accepted for The 2006 International Conference on Image Processing, Computer Vision, and Pattern Recognition, La Vegas, USA, 26-29, June, Paper ID #: IPC4549, 2006.

4. "Time-Evolution of Cardiovascular Variability During Autonomic Function Tests in Physiological Investigations" Proceedings of the 28th IEEE, EMBS Annual International Conference, New York City, USA, Aug 30-Sept 3, 2006 pp [1772-74]

5. "SVM Based System for classification of Micro calcifications in Digital Mammograms", Proceedings of the 28th IEEE, EMBS Annual International Conference, New York City, USA, Aug 30-Sept 3, 2006 pp [4747-50]

6. "WAVELET FILTER EVALUATION FOR HRV SIGNAL PROCESSING", 3rd International Conference on Advances in Medical, Signal and Information Processing (MEDSIP 2006) , July 17-19,2006 Glasgow UK.

7. "ECG Modeling and QRS Detection using Principal Component Analysis", ", 3rd International Conference on Advances in Medical, Signal and Information Processing (MEDSIP 2006) , July 17-19,2006 Glasgow UK

8. "Snakebite Epidemiology in Kota Division, Rajasthan", National Conference on Controls, Communication and Bioinformatics (NCCCB-2006), March 8-10, 2006 Kota, INDIA.

9. "A new Approach to ECG modeling using Principal Component Analysis", National Conference on Controls, Communication and Bioinformatics (NCCCB-2006), March

8-10, 2006 Kota, INDIA.

10. "Speckle suppression for Image Enhancement for Ultrasound Medical Images: Comparative Evaluation of Wavelet Filters", National Conference on Controls, Communication and Bioinformatics (NCCCB-2006), March 8-10, 2006 Kota, INDIA.

11. "Quantitative measures for evaluation of mammographic image contrast enhancement techniques", Proc, National conference on information and emerging technologies, IET, Bhaddal, Punjab (INDIA). Feb 17 – 18, 2006. pp.[17 – 22]

12. Poincare Plot: An Efficient HRV Delineator for mass screening in the Assessment of Cardiovascular and Autonomic systems, Proc. Computer Applications in Electrical Engineering Recent Advances, CERA 05, IIT Roorkee, Sept. 28 – Oct. 1, 2005.

13. Improved modified AZTEC technique for ECG data compression: Effect of length of parabolic filter on reconstructed signal", Proc. Computer Applications in Electrical Engineering Recent Advances, CERA 05, IIT Roorkee, Sept. 28 – Oct. 1, 2005.

14. "Statistical based sub band filtering technique for enhancement of digital mammograms", Proc. National conference on computational intelligence in electrical engineering, SLIET, Longowal, Punjab (INDIA). November 18 – 19, 2005. pp. [29 – 32].

15. "Public Private Partnership in e-Governance: The Uttaranchal Experience", International Conference on "e-Governance in the Developing World: Best Practices and Critical Success Factors", July 29-31, 2005 Hydrabad, INDIA.

16. "Inferential MRAC Neural Controller For Temperature Control Of CST Process", 24th IASTED International Conference on MODELLING, IDENTIFICATION, AND CONTROL (MIC 2005), February 16-18, 2005 Innsbruck, AUSTRIA.

17. "Virtual Instrument for Real Time Monitoring and Control of Temperature", Proceeding of the International Conference on "Emerging Technologies in Intelligent System and Control" (EISCO-2005), January 5-7, 2005 Coimbatore, INDIA.

18. "Effect of RR Segment Duration on Short-Term HRV Assessment Using Poincare Plot", Second international Conference on Intelligent sensing and information processing, January 4-7, 2005 IIT Madras, INDIA.

19. "Neural Network Based Motor Current Analysis For Fault Detection Of Bearings", International Conference on Cognitive Systems (ICCS), December 14-15, 2004 New Delhi, INDIA.

20. "Fault Detection Of Three Phase Induction Motor Using Neural Network", International Conference on Cognitive Systems (ICCS), December 14-15, 2004 New Delhi, INDIA.

21. "Disease Diagnostics using Neural Network", International Conference on Cognitive Systems (ICCS), December 14-15, 2004 New Delhi, INDIA.

22. "Removing Blocking Artifacts in Compressed Medical Images", Proceedings of 1st International Bio-Engineering Conference 2004, September 8-10, 2004 Singapore.

23. "Fuzzy Variable Structure Controlled Non- Linear Fast Response DC Drive", NSC- 2004, December 16-18, 2004 Vellore Institute of Technology, Vellore, INDIA.

24. "Non-Linear System Modeling and Analysis using Multi-layered Neural Network", NSC- 2004, December 16-18, 2004 Vellore Institute of Technology, Vellore, INDIA.

25. "Information security through biometrics", National Conference on Research and Practices in current areas of IT, March 26-27, 2004 SLIET Longowal (PB), INDIA.

26. "A complete scheme for data compression for telecardiology", World Congress on Medical Physics & Biomedical Engineering, August 24-29, 2003 Sydney, Australia.

27. "Vibration based fault diagnosis of dry bearing in induction motor", 4th Int. R&D Conf, January 28-31, 2003 Aurangabad, INDIA.

28. "Condition monitoring of rolling element bearing", Int. Symposium on Process Systems Engg. and Control, January 3-4, 2003 IIT Bombay, INDIA.

29. "Effect of supply disturbances on vibration profile of induction motor", Twelfth National Power Systems Conference, December 27-29, 2002 IIT Kharagpur, INDIA.

30. "On Noise Segmentation and Filtering", International Conference on Control, Instrumentation & Information Communication CIIC, Dec. 2001 Kolkatta, (INDIA).

31. "Stator current monitoring for detection and diagnosis of faults in induction motors", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

32. "EBP-NN based ECG data compression", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), pp 175-187, February 21-23, 2002 IIT, Roorkee, INDIA.

33. "Stability aspects of the neural controller", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

34. "PSCAD/EMTDC TSC-TCR type SVC control scheme and dynamic performance simulation for industrial load bus", Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances' (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

35. “Condition monitoring of induction motor based rotor reference frame model”, Proc.- International Conference on Computer Applications in Electrical Engineering – Recent Advances’ (CERA-01), February 21-23, 2002 IIT, Roorkee, INDIA.

36. “Digital instrumentation for bridges– Possibilities and limitations”, National Workshop on Research Interests in Bridge Engineering – Present and Future, March 15, 2001 New Delhi, INDIA.

37. “Vibration based induction machine faults identification using wavelet transforms”,

International Conference on Mathematical Modeling, January, 2001 Roorkee, INDIA.

38. “Performance study of some four arm ac bridges used as notch filters”, National Conf. On Trends in Industrial Electronics Transducers, Control and Communication, November 14-15, 2000 TIET, Patiala (Punjab), INDIA.

39. “ANN based vibration diagnostics of induction machines”, International Conference on Power Management, November, 2000 Lucknow, INDIA.

40. “Temperature control of CST process using Gaussian neural network with adaptive learning rate”, Proc. IEEE Int. Conf. on Control Applications, September 25-27, 2000 Anchorage, Alaska, USA.

41. “Study and analysis of heart rate variability using wavelet transform and power spectral density distribution”, National Conference on Biomedical Engg., April, 2000 U.O.R., Roorkee, INDIA.

42. “Computerized cardiac disease diagnostics using wavelet transforms and modified scoring criteria”, Proceedings SBME & NM, January, 2000 BARC Mumbai, INDIA.

Jayanthi Sivaswamy

International Institute of Information Technology (IIIT-H)

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- **EDUCATION**

Ph.D. and M.S. in Electrical Engineering **1992, 1986**

Syracuse University, Syracuse, U.S.A.

B.S. in Electrical Engineering **1984**

Rochester Institute of Technology (RIT), Rochester, U.S.A.

- **WORK EXPERIENCE**

Professor, **International Inst. of Information Technology (IIIT), Hyderabad, India**, (July 2006-).

Associate Professor, **International Inst. of Information Technology (IIIT), Hyderabad, India**, (July 2001- June 2006).

*Lecturer (Tenured)***,** Dept. of Electrical & Electronic Engineering, **The University of Auckland, New Zealand**, (Jan. 1993 - June 2001).

Recent visiting positions

Visiting Research Fellow, **School of Engineering, University of Warwick, UK**, (May 2004).

Visiting Research Fellow, **ISIS, School of Electronics and Computer Science, University of Southampton**, (June-July 2004).

- **RESEARCH PUBLICATIONS (selected over past 5 yrs)**
  - ***Book / book chapters***
  - *Sivaswamy J, Agarwal A, Chawla M, Rani A & Das T (2008) Extraction of Capillary Non-perfusion from fundus fluroscein angiograms. In* ***Biomedical engineering systems and technology*** *(eds.) Fred A, Filipe J and Gamboa H , pp. 176-188, Berlin: Springer, ISBN: 3-540-92218-0.*

- *Middleton L. & Sivaswamy J. (2005) Hexagonal Image Processing - a practical approach, London: Springer, ISBN: 1-85233-914-4.*
- ***Journals and conferences***

Keerthi Ram, Yogesh Babu, Sivaswamy J (2009) Curvature orientation histograms for detection and matching of vascular landmarks in retinal images,. Proc. **SPIE Medical Imaging 09**, Orlando.

Krishnashree Achuthan

Professor, ECE Department

CEO, Amrita TBI

Amrita Vishwa Vidyapeetham, India

Education

Ph. D., Chemical Engineering, *December 1998*

Clarkson University, Potsdam, NY.

(Research conducted at Sandia National Laboratories, Albuquerque, NM)

M. S., Chemical Engineering, *May 1994*

Clarkson University, Potsdam, NY.

B. Tech, Chemical Engineering, *April 1992*

Anna University, Madras, India

Experience

Teaching & Research at *Amrita University, Amritapuri (2008 – Present)*

- Liasion for several Indo-US and Indo-European consortiums on Amrita's behalf (most recent is European Union's Erasmus Mundus program)
- Lead cross-continental projects/students of Amrita University and UT Austin related to OLPC, innovative technologies.
- Lead advisor in the geotechnical areas of research in relation in soil mechanics
- Heading the Technology Business Incubator Division

IT Industry

Amrita Technologies, Kochi (2007 – 2008)

- Productization of Hospital Information Systems Products in India.
- Lead Professional Services Management for HIS Clients

IC Industry

Advanced Micro Devices, Sunnyvale, California (1998 – 2006)

Spansion LLC, Sunnyvale, California

- Developed and implemented unit processes in CMP for 65nm, 90nm and 130 nm technologies in the FEOL & MEOL modules such as STI, Gate and Contact. Several of theses processes are running in full production modes in > 10,000 wafers per week wafer-start fabs.
- Introduced new module processes to save costs of manufacturing and ease of operation. Estimated gains characterized by throughput and consumable costs run in $Ms.
- Led cross-site (U.S. and abroad) teams in the evaluation of several tool platforms for semi-conductor processing applications
- Characterized impact of process induced defectivity on overall yield for BEOL integration.
- Recognized & rewarded as key contributor to the introduction of novel techniques and development of Flash processes.
- Developed creative uses of existing unit processes to mitigate contamination issues and overall defectivity in manufacturing processes.
- Assisted in the materials research and characterization for novel gate architectures.
- Leading process development of metal plating processes for current and future generation technologies. Characterization and improvement of process efficiencies through the addition of organic additives.
- Proactive participation in the resolution of issues related to manufacturing of transistor devices.

- **Patents & Publications**
  - K. Achuthan, B. Davis, J. Xie, K. Sahota, US Patent # 7358191, Apr. 2008.
  - U. Kim, H. Kinoshita, Y. Sun, K. Achuthan, C. H. Raeder, C. M. Foster, H. K. Sachar, K. Sahota, US Patent # 7307002, Dec. 2007
  - K. Achuthan, U. Kim, K. Sahota, P. C. Regalado, US Patent # 7294573, Nov. 2007
  - K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent # 7125776, Oct. 2006
  - K. Achuthan, K. Sahota, US Patent # 7077728, July 2006
  - K. Sahota, K. Achuthan, US Patent # 7052969, May 2006
  - K. Achuthan, P. K. Cheung, C. Tabery, J. Y. Yang, N. Cheng, M. V. Ngo, US Patent # 6989563, Jan. 2006
  - K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent # 6982464, Jan. 2006
  - E. H. Lingunis, K. Achuthan, M. V. Ngo, C. Tabery, J. Y. Yang, US Patent # 6933219, Aug. 2005
  - K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent #, 6855607, Feb. 2005
  - K. Achuthan, S. S. Ahmed, H. Wang, B. Yu, US Patent # 6812076, Nov. 2004
  - K. Sahota, J. P Erhardt, A. Halliyal, M. V. Ngo, K. Achuthan, US Patent # 6770523, Aug. 2004
  - K. Achuthan S. S. Ahmed, H. Wang, B. Yu, US Patent # 6756643, June 2004
  - K. Achuthan, A. P. Marathe, US Patent # 6649511, Nov. 2003

- K. Sahota, K. Achuthan, US Patent # 6613646, Sep. 2003.
- J. Thomas, U. Kim, K. Achuthan, US Patent # 6610577, Aug 2003
- U. Kim, D. Hopper, Y. Wu, K. Achuthan, US Patent # 6607925, Aug 2003
- J. Bhakta, K. Achuthan, A. Hui, US Patent # 6605517, Aug 2003.
- K. Achuthan, K. Sahota, US Patent # 6569747, May 2003
- K. Achuthan, S. Lopatin, US Patent # 6559546, May 2003.
- K. Achuthan, A. P. Marathe, US Patent # 6498397, Dec. 2002
- K. Achuthan, S. Lopatin, US Patent # 6498093, Dec. 2002
- K. Achuthan, S. Lopatin, US Patent # 6472310, Oct. 2002
- K. Achuthan, C. M. Woo, US Patent # 6462409, Oct. 2002
- K. Sahota, K. Achuthan, S. Lopatin, US Patent # 6426297, July 20002
- S. Lopatin, K. Achuthan, US Patent # 6423433, July 2002
- K. Achuthan, S. Avanzino, K. Sahota, US Patent # 6314869, July 2002
- S. Lopatin, K. Achuthan, US Patent # 6291348, Sep. 2001.
- Fractal Properties of Polyurethane Pads, K. Achuthan et. al, CAMP Conference, July 1998.
- Investigation of pad deformation and conditioning during chemical-mechanical polishing of silicon dioxide films, K. Achuthan et. al *J. Electronic Materials* **25**, 1628-1632 (1996).
- Complex Distillation Calculations, **Best Paper Award**, R. Taylor, K. Achuthan et. al, *Computers and Chemical Eng.,*1996.

Soami P. Satsangee

Name: Dr. Soami P. Satsangee

Designation: Reader & Head, University Science Instrumentation Centre, Dayalbagh, Agra.

Date of Birth: 2/3/1961

Address, email & mobile no:

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Dayalbagh Educational Institute,

Dayalbagh, Agra.

Email: deiusic@gmail.com

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Qualifications:

Degree Awarded	Subject	University	Year
MSc. (5 years Integrated Course)	Chemistry	IIT Kanpur	1984
Ph.D.	Inorganic Chemistry	State University of New York, Stony Brook, USA	1990

Ph.D. Thesis Title:

The Chemistry of Aryl Thiolate Ruthenium Complexes.

Job Experience:

1991: Research Assistant at IIT Delhi (under Prof. Khandelwal, Chemistry Department).

1992-1995: Lecturer in Chemistry, St. Stephen's College, Delhi University.

1995-1999: Lecturer, University Science Instrumentation Centre, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra.

1999-present: Reader & Head, University Science Instrumentation Centre, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra.

Job Profile:

USIC job is very varied. However, at present, the following are the job activities (in order of priority):

1. Teaching & Research.
2. Overall Supervision of repair jobs in USIC (Electronic, Mechanical & Glassblowing).
3. Fabrication of Computer based Low Cost Instruments (Analytical, Biomedical).

4. Supervising students of science (Chemistry, Physics) & Engineering (Electronics) in project work.

Memberships:

American Chemical Society, Systems Society of India (Life Member)

Area of Specialization:

Instrumentation (Analytical, Virtual & Biomedical), Chemical Education

Area of Research:

Instrumentation & Nanotechnology

Teaching & Research Experience:

18 years (Teaching- MSc. (Chemistry) & M.Tech (Bioinstrumentation))

Papers Published (Last 8 years):

20 (with 2 Book Chapters)

Monographs:

Prepared 6 manuals for short courses offered by USIC.

Thesis guided:

1. Ph.D. -1 (ongoing M.Phil. cum PhD.)
2. M.Tech(Engineering Systems)-6
3. MSc.(Chemistry)-7
4. B.Tech(Electronics)-2

Research Projects carried out:

Minor -2

Major(co-PI)-1

Workshops organized (National & International)- 6

Extension work:

Extending USIC's Advisory & Technical Services for Community Based Charitable Institutions.

Co-Curricular activities:

Computers, cycling, reading & community service.

Dr. K V Gangadharan

1. Name: Dr. K V Gangadharan
2. Designation: : Professor
3. Department: Mechanical Engineering
4. Date of Birth: : 31-05-68
5. Nationality: Indian
6. Qualification

Qualification:	Year	Institute/ University
Ph.D (Dynamics, Vibration & FEM)	2001	IIT Madras
M.E. (Manufacturing Technology)	1992	REC Trichy (NIT Trichy)
B.Tech. (Mechanical Engineering)	1989	Calicut University

7. Professional Experience :14 years Teaching (at NITK Surathkal)

Designation	From	To
Professor	01-01-2009	
Assistant. Professor	31-10-2001	01-01-2009
Senior Grade Lecturer	11-12-1999	31-10-2001
Lecturer	16-2-1993	11-12-1999

8. Industrial Experience FACT Udyoganadal , Kerala (A process Industry) – 1 year National Aeronautical Laboratory, Bangalore – Six months
9. Research Interests: Vibration and its control, Dynamics, Smart materials & Composites, FEM, Condition monitoring , Machine Tool Dynamics, Experimental Methods
10. PhD Research scholar 1 awarded + 4 (on going)
11. M Tech Thesis Guided 14 completed + 4 on going
12. B Tech Thesis Guided 16 completed +2 on going
13. Sponsored Research Projects (Last five years)

Title	Agency	Status	Year of completion
Magneto Rheological Fluid	MHRD	Completed	2007
Active Vibration Control of Flexible Structures using Mag-	MHRD	Completed	2009

14. Consultancy Projects:

15. Out of Class Room Student pro jects

16. Publications:http://people.nitk.ac.in/index.php?q=kvganga-research.html

Journals: International – 6

(a) Umashankar K S, Abhinav Alva, K V Gangadharan and Vijay Desai (2009)Damping behaviour of cast and sintered aluminium,ARPN Journal of Engineering and Applied Sciences,

(b) K. V. Gangadharan, C. Sujatha, V. Ramamurti. (2008) Dynamic response of railroad vehicles: a frequency domain approach. Int. J. Heavy Vehicle Systems (IJHVS), Vol. 15, No.1 . pp 65-81

Title	Organization	Status
Thermax Pune – Fabric bag filter	Thermax Pune	Ongoing
GMR Power plant- Dynamic analysis of bacon buoy and chlorination pipe	GMR Ltd	Completed
Compressor Testing and Pressure gauge calibra- tion for Marine jobs	Yojaka Marine Pvt Ltd	Completed
MRPL Vibration analysis of Plant Equipment	ONGC –MRPL	Completed
Vibration and Sound measurement	Various Industries	Completed

Title	Remarks
SAE BAJA All terrain Vehicle (2007, 2009)	Won II prize (Rs 4.5 Lakh prize) in 2007
Quake Rates (a mobile robots to help quake hit area rescue operation)	
Flying Car	

(c) Shivaram A C , K V Gangadharan, (2007) Statistical modelling of a magneto-rheological fluid damper using design of experiments approach, Int. Journal of Smart Materials and Structures 16,(2007), pp1310-1314

(d) K. V. Gangadharan, C. Sujatha, V. Ramamurti . (2008) Dynamic response of railroad vehicle to rail joints and average vertical profile (AVP) A Time Domain Approach. Int. J. Heavy Vehicle Systems (IJHVS) Vol. 14, No. 4 . pp 402-420

(e) K. V. Gangadharan, C. Sujatha, V. Ramamurti. (2009) Ride Comfort Evaluation of a Railway Coach, To appear in Int. J. Heavy Vehicle Systems (IJHVS).

(f) Shivaram A C , K. V. Gangadharan, B R Balaraddi (2009) Constant velocity drop test setup using MR fluid brake and Fuzzy controller. Communicated to Int. Journal of Smart Materials and Structure.

Conferences: International- 14

(a) Ravish, K. V. Gangadharan, (2009)'Recurrence Quantification Analysis to Monitor Conditions in Machine Tools', International Conference on Advanced Manufacturing and automation, (INCAMA- 2009), March 26-28, Kalasalingam University.

(b) Abhinav Alva, Ravish, Abhishek Pandey, Umashankar K. S., K. V. Gangadharan, (2009) 'Potential Application of Tuned Mass Absorbers in Mechanical Vibrations', International Conference on Advanced Manufacturing and automation, (INCAMA- 2009), March 26-28, Kalasalingam University.

(c) Umashankar K. S., Abhinav Alva, K. V. Gangadharan, Vijay Desai, (2009) 'Estimation of Damping in Cast and Sintered Aluminium', International Conference on Advanced Manufacturing and automation, (INCAMA- 2009), March 26-28, Kalasalingam University.

(d) Umashankar K. S, Anil Kumar, K. V. Gangadharan, Vijay Desai,(2008) 'Comparison of Damping ratios of Al/Al-Si alloys', Fascinating Advancement in Mechanical Engineering, Dec 11-13, 2008, MEPCO SCHLENK Engineering College, Shivakasi.

(e) Vijay Desai, K. V. Gangadharan, Umashankar K. S, (2008) Modeling and Experimental Verification of Damping ratio in Al and Al-Si Alloys, KU-NITK Joint Seminar 2008, Recent Advances in Engineering & Technology, Held at Kagoshima University, Japan, Nov 27-28, 2008. pp101-108

(f) Shridhar D. Mhalsekar, Mohan G, Shrikantha S. Rao, K. V. Gangadharan, (2008) Estima- tion of the Wear in Milling Insert during Face Milling Operation. International conference on Micro Electromechanical Systems, Oct 22-23, 2008, Anjuman College of Engineering, Bhatkal.

(g) Umashankar K S, Vijay desai, K. V. Gangadharan, (2007), Experimental process optimization through-Design of Experiments for machining of Aluminium alloy, International Conference on Engineering Design.in 2007, Indian Institute of Science Bangalore,

(h) Mohan Kumar, K. V. Gangadharan (2007), Variable Damping Coefficient Twin-Tube Damper – An Experimental Study, International Conference on "Recent Developments in Structural Engineering (RDSE-2007)" on 30 – 31 August and 1 September, 2007 at Manipal

Institute of Technology, Manipal.

(i) Mohan Kumar, K. V. Gangadharan (2007), Experimental Analysis of a Semi-Active Damp- ing Device for Vibration Isolation, International Conference on "International Conference on Advances in Mechanical Engineering (ICAME-2007)" to be held on 24 – 26 October, 2007 at Manipal Institute of Technology, Manipal.

(j) Umashankar K S, Vijay desai, K. V. Gangadharan (2007), CNT reinforced Al/Al alloy-A Review, International Conference on Advances in Manufacturing Engineering-2007, Manipal Institute of Technology Manipal, October 24-26, 2007.

(k) Anil Kumar C, Umashankar K S, K. V. Gangadharan, Vijay Desai (2007), Modeling of damping behavior in material-A Review, International Symposium on Advanced Materials & Processing (ISAMP), Basaveshwara engineering college Bagalkote, October 29-30, 2007.

(l) Shivaram AC, K V Gangadharan (2006), Factorial analysis of Magneto-Rheological damper used for semi-active vibration control, 2nd International Congress on Computational Mechan- ics and Simulation, Indian Institute of Technology Guwahati, December 8-10, 2006.

(m) K. V. Gangadharan, C. Sujatha, V. Ramamurti. (2004) Experimental and Analytical Ride Comfort Evaluation of a Railway Coach, IMAC-XXII Conference & Exposition on Structural Dynamics, Hyatt Regency, Dearborn, Dearborn, Michigan, January 26-29, 2004.

(n) K. V. Gangadharan, C. Sujatha, V. Ramamurti (1999) Railroad vehicle dynamics a com- parison of rigid body model and FE model. Proceedings of the Asia Pacific Vibration Conference , Singapore 1999, V2, 939944.

Conference: National - 13

(a) George Varghese, K. V. Gangadharan, (2009), Tuned Mass Dampers: An Experimental Study, Autoschecraft 2009, Techincal Fest at MCE Hassan, 3rd April 2009. (won first prize for best paper award)

(b) Shridhar D Mhalsekar, Mohan G, Shrikantha S Rao, K. V. Gangadharan, (2009), Quantification of Milling Inserts using Time Series Analysis of Vibration Signals, National Conference on Evolving Trends in Mechanical Engineering, March 13-14, 2009, The Oxford College of Engineering, Bangalore.

(c) Ravish, Shridhar D. Mhalsekar, K. V. Gangadharan, (2008) Recurrence Quantification Analysis as a Possible Tool to Monitor the Condition in Machine Tools. Advances in Mechanical Engineering, October 28-30, 2008 at MIT, Manipal.

(d) Abhinav Alva, Umashankar K. S, K. V. Gangadharan, (2008) , Vijay Desai,

'Experimental Verification of Damping Model', Advances in Mechanical Engineering, October 28-30, 2008 at MIT, Manipal.

(e) Umashankar K. S, Abhinav Alva, K. V. Gangadharan, Vijay Desai,(2008) 'Study on Hard- ness and compaction of Al/Al-Si alloys', Advances in Mechanical Engineering, October 28-30,

2008 at MIT, Manipal.

(f) B R Balaraddi, B Krishnaprasad, K V Gangadharan (2006), Design and Aanalysis of a Smart Barke, National conference on emerging trends in Mechanical Engineering, BMS College of Engineering, Bangalore, February 10-11 2006.

(g) B R Balaraddi, B Krishnaprasad, K V Gangadharan (2006), Magnetorheological brake – A new approach, National Conference PG-FEST-06, NMAM Institute of Technology, Nitte, February 28-29 2006.

(h) Mohan Kumar, Janardhan Padiyar M, K V Gangadharan (2005) Experimental Investiga- tion on Effect of Magnetic Field Over Damping Coefficient in Smart Fluid Damper, National Conference on "Recent Developments in Structural Engineering (RDSE-2005)" on August 29-30 2005 at Manipal Institute of Technology Manipal.

(i) Mohan Kumar, K. V.Gangadharan, B Rajendra (2005), Recent Advances In Semi-Active Damping Of Structures, National Conference on "Recent Developments in Structural Engi- neering (RDSE-2005)" on August 29-30 2005 at Manipal Institute of Technology Manipal.

(j) K. V. Gangadharan, Mohan Kumar, Vijay Kumar Myageri (2005), Magnetorheological fluid: a smart semi active damping medium, National level PG fest 2005, NMAMIT,NITTE March, 29-30, 2005. (won second prize for best paper award).

(k) Shivaram AC, K V Gangadharan (2005), PC-Based Fuzzy vibration control for an electro-dynamic shaker, National level conference VI MANTRA 2005, Organized by National Instruments-India, November 8-9 2005.

(l) K K Appukuttan, K V Gangadharan (2002) Reliability based maintenance and diagnostics engineering. National conference on recent trends in condition monitoring of machines, March 4-5 2002 , At NMAM Institute of Technology, Nitte

(m) K. V. Gangadharan, C. Sujatha, V. Ramamurti (2000) Railroad vehicle dynamics Exper- imental studies on Mass Rapid Transit System (MRTS) at Chennai. Proceedings of the 12 th ISME Conference on Mechanical engineering , 1012 Jan. 2001, 357 – 363.

Prof. Sudhir Dattatraya Agashe

1.	Name	Prof. Sudhir Dattatraya Agashe Dean Academics
2.	Address	Department of Instrumentation and Control Engineering College of Engineering Pune, Shivaji Nagar Pune -411005
3.	Contact Details	020- 25507172 (O) 9890229539 (M) E-mail: sda@instru.coep.org.in

4. Qualification:
   - Ph.D in Instrumentation Pune University in 2007
   - Diploma in Business Management (April 2000)
   - ME (E&TC) with specialisation in Instrumentation (1998)
   - BE (Instrumentation and Control) (1989)
   - Diploma in Electrical Engineering (1986)

5. Experience:
   - 2009 till date working as Dean Academic, COE, Pune
   - 2007 till date working as Professor and Head Instrumentation and Control, COE, Pune
   - 1999- 2007 Asst. Professor, Head Instrumentation and Control COE, Pune.
   - 1995-1999 Lecturer in Instrumentation
   - 1994-1995 Alfa Laval (India) Limited
   - 1992-1994 Innovators systems.
   - 1989-1992 Inventa Controls and Systems (P) Ltd.

6. Conferences attended/ paper presented

Total number of papers presented: 11

- International conference on Machine Automation Barcelona, Spain 2008.
- International Conference on Instrumentation (IEEE workshop at Canada 2006)
- International Conference on Instrumentation (IEEE workshop at Brazil 2007)
- International Conference on Instrumentation (INCON 2004)
- Journal of Instrument Society of India paper on “Model Heat Exchange Automation”

7.	Academic attainments	➢ Research project in progress "Braille Printer" worth Rs. 5.00 Lakh. ➢ Completed one Research Project " SMART Energy meter", worth Rs. 3.00 Lakh. ➢ Acquired a patent for the product "Flow measurement and control system for solar water heater/Air heater System" in April 2003. ➢ Completed 2 MODROBs in the field of Process Instrumentation worth Rs. 17 Lakhs. ➢ Developed innovative method for result analysis. ➢ Developed package for dairy simulation. ➢ Recognized research guide of Pune University for Doctoral work
8.	Administrative attainments	➢ Setting-up of Industrial Automation Training Centre in collaboration with Emerson Process Management, USA, Rockwell Automation, and Messung Systems, Pune. (Worth Rs.90 Lakhs) ➢ Revenue generation worth Rs. 10 Lakhs in last one year
9.	Membership of professional bodies and key positions held	➢ Life member and Vice President of Instrument Society of India. ➢ Life member Indian Society for Technical Education ➢ Ex. Chair and Member IEEE, Measurement and Instrumentation Society under Bombay Section of IEEE (R10) ➢ Project coordinator TEQIP

Annexure III: LIST OF VIRTUAL LABS ALREADY DEVELOPED

List of Virtual Labs already developed are available at http://vlab.co.in

Appendix-IX

Detailed Project Report (DPR) on “ICT Mapping in Higher EducationBetween IIT Bombay& the National University of Singapore”.

ICT strategies for Indian Higher Education

Identifying gaps, recognizing success and encouraging adoption

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Proposal for a joint project on

IT mapping in higher education

Between IIT Bombay and the National University of Singapore (supported by the NMEICT)

Background

A joint "IT Mapping Exercise" has been under consideration by the MHRD, India and the National University of Singapore since March 2013. These discussions were initiated by Mr Pawan Agarwal, Advisor (Higher Education), Planning Commission. In-principle agreement to embark on the joint project was reached in a video-conference between Dr Ashok Thakur, Secretary (HE), MHRD, and Prof Tan Chorh Chuan, President, NUS, on 3 June 2013.

They recognized a need to encourage wider usage and adoption of technology in Indian higher-education and were of the view that an IT Mapping Exercise could identify the gaps that exist in adoption and ways to overcome these gaps by sharing of best practices among institutions.

Objectives

The purpose of this exercise is to identify and understand successful methods and processes in the use of ICT in higher education, and to recommend methods of absorbing them.

The Mapping Exercise aims to:

- **Assess the present infrastructure and use of IT in participating institutions**
  Present systematically the state of the use of IT in higher education in the participating institutions, covering infrastructure and systems, as well as strategies, policies and practices, principally in the area of teaching and learning, but also including other areas such as research and innovation, internationalization, administration and governance;

- **Share best practices**
  Facilitate mutual learning through comparative study among participating institutions, with a view to establishing "best practices" in the field;

Disseminate findings to a wider audience

Disseminate the findings to the wider global higher education community through appropriate forms of publication and communication.

Prepare systems and channels for adoption of best practices

Prepare a toolkit and set up systems in place to enable participating and non-participating institutions to adopt the best practices.

The main outcome expected

The main objective of this exercise is to compile the best ICT practices followed in some of the leading educational institutions in India and to compare them with those of a few of the leading overseas institutions, such as NUS and CMU. This work will help us find where we stand and recommend future directions. It will also give a qualitative picture of the benefits of ICT adoption and the methods to do it. The results will be of immediate relevance to the National Mission on Education through ICT (NMEICT), a centrally sponsored scheme which focuses on leveraging ICT for the education in India.

At the end of this study, we may be in a position to identify processes that will be helpful to follow. We may also be in a position to find out institutions that can help establish some services for others. For example, an organisation that has a good handle on the installation of Moodle may be in a position to establish this service through a cloud for all other institutions. Such an offering may be made available for many components of administrative systems as well, even if an integrated ERP system is not possible.

The project could also have templates, checklists on the best processes to follow in technologies involving:

- Lessons on-demand (Anytime anywhere access to content)
- MOOCs (Massive Open Online Courses)/ Distance education solutions
- Hybrid learning and Flip Classrooms
- Clicker based interactions
- Social media
- Learning management systems
- Cloud solutions
- IT security solutions
- Campus networks
- Student learning solutions
- Digital classrooms
- Web-based student services

- Online exam & evaluation systems
- Student record management systems
- Marketing & CRM systems
- ERP systems
- Collaboration systems
- Digital libraries

Besides this a channel of communication will be created with contact details of heads of the technology projects– recognized by MHRD as having best practices/expertise in the area. These designated points of contact can be approached for guidance/updates by institutions even after this project is over.

The MHRD will also take responsibility of regularly updating the information on this website in consultation with the participating institutions.

This project will aim the adoption of best practices in at least 20% (TBD) of institutions in India.

Project Plan and Strategy

Partners & participating institutions

The principal partners could be Indian Institute of Technology (IIT), Bombay, and the National University of Singapore (NUS). The participating institutions will comprise of around 15 institutions of higher learning in India, to be identified by IIT-B, NUS, the MHRD and the Planning Commission of India; and upon mutual agreement, 2 or 3 other institutions beyond India and Singapore.

Principal Partners

- IIT Bombay
- National University of Singapore

Participating Institutions proposed by (NMEICT)

- SNDT University Bombay - Prof Jayshree Shinde
- IIITHyderabd- Prof Venkatesh Chopella
- Amrita University- Prof Kamal
- Dayalbag Univeristy- Prof Sonali Bhatnagar
- IIT Chennai / IISER Mohali- Professor Mangal
- IISER Mohali - Prof Satyamurthy
- IIT Kanpur- Prof R.K Thareja
- IIM C - Chairman
- BHU – Dr. Abhijeet Singh
- AMU- Dr Syed
- SASTRA University- Dr Shankar Sriram
- Knowledge Consortium of Gujarat - Dr Jayanti Ravi (Commissioner Technical Education)
- Prof. Avinash C Pandey, VC Bundelkhand University
- Mizoram University- Dr Pratap
- NIT Calicut- Dr Radha
- Saurashtra University- Dr Seth

Participating Institutions (others-proposed)

- Mumbai University, Prof. Rajan Welukar
- BITS Pilani
- Delhi University
- Goa University
- Hyderabad University
- IIT Delhi
- JNU
- Presidency University
- Symbiosis University
- St. Xavier's Mumbai
- NIT Trichy - Prof. Balasundaram
- IISER Trivandrum
- RGIT Hyderabad
- Bundelkhand University

Advisory Committee:

- Advisor Higher Education, Planning Commission
- Mission Director, NMEICT
- Representative, National University of Singapore
- Representative, IIT Bombay

Proposed Phases and Timelines

Phases	Duration
Conceptualisation (Scope of work, teams, areas of focus, methods)	Feb- April, 2014
Data collection (Online, Video, Questionnaire)	April-June, 2014
Analysis and Comparative Study (Capstone Forum)	June-July, 2014
Dissemination	July-Sept, 2014

Conceptualization (Phase 1)

1	**Definition of the scope of work**
2	**Definition of the areas of focus**
3	**Method of data collection**
4	**Framework for comparative study**

1. Definition of the scope of work

- Identify nodal officers in participating institutions
- Joint briefing & discussion of the preliminary scope of work through videoconference/google hangout
- Sharing of the final definition of the scope of work
- Scope of work to include:
  - Detailed note on objectives and methods/means on each of the tasks/sub-tasks in the three phases
  - Name of the responsible person, dependencies, resources required, timeline, costs for each of the tasks

2. Definition of the areas of focus

Area	Details
Teaching and learning	Content creation, delivery, pedagogy, facilitation of collaborative projects in research and otherwise, innovative learning techniques (flip classrooms, Clicker based, Social media, LMS)
Management of academic processes and resources	Examination and evaluation systems, grades/transcripts generation, library, online courseware
Management of administrative processes	Budgeting, scheduling of classes, payrolls, accounts, attendance, transport, purchase and procurement, fees, disciplinary records, appraisal process of academic and administrative staff members
Management of student affairs and campus life	Engagement with prospective recruiters (placement companies), alumni affairs, extra-curricular activities, events, conferences

IT Hardware and software (passive and active components)	Cabling and internet providing infrastructure and preparedness for future requirements of bandwidth etc. Servers, switches, security infrastructure to address present requirements and future-readiness. Software and hardware for managing academic and administrative systems

3. **Method of data collection**

- Online questionnaire
- Video interviews of relevant stakeholders i.e. IT in charge, faculty, students, administrative staff of participating institution, IT service (network, data center, hardware) providers
- In person visit and reporting by core team to assess gaps and understand the best practices
- Online platform for discussions, feedback and collaborative work

4. Framework for comparative study

- Areas/processes enabled by IT
- Extent of enablement & sophistication of the processes
- Investment in hardware and software
- Level of adoption/usage in each process/area - ranging from being just tactical to delivering strategic/significant advantage in savings of costs/time/enhancing the experience of learning/administering
- Feedback and perceived benefits by the relevant stakeholder as per the process concerned
- Future readiness

Data Collection (Phase 2)

1	Defining the means and method of data collection
2	Sending an online questionnaire and facilitating completion by the nodal officers at the participating institutions
3	Video interviews in person with key stakeholders
4	Establishing a channel for queries and updates
5	Visit by Indian delegation to Singapore/NUS and other international participants
6	Finalization of the delegates, objectives and tasks to be accomplished in the visit, sharing and finalization of the objectives with the team at NUS, travel and stay plans
7	Visa, ticketing

Analysis & Comparative Study (Phase 3)

1	Capstone forum
2	Finalising the date and venue, list of invitees, invitation, flow of events and agenda, travel and stay plans
3	Organising the venue, arrangements for the seminar, logistics of movement, visa and tickets
4	Executing the event and publishing of the 'White Paper' from the event

Dissemination (Phase 4)

An indicative list of the formats we can use are listed below:

- A case study in hardcopy
- A website that sustains the engagement of different participating institutions and chronicles the adoption of IT at these institutions even after the project is over
- Social media that increases participation of various stakeholders
- Regular articles in a newsletter related to the project

Summary of Phases and Key Tasks

Phases	Key tasks
Conceptualization	– Writing of the scope of work – Facilitation of meetings & finalizing scope of work – Defining focus areas – Finalizing the method and framework of data collection – Kick-off meet of all participating institutions and partners in Delhi
Data collection	– Design of online questionnaire – Video interviews – Creation of online platform Trip to participating institutions
Analysis and Comparative Study	– Defining of the comparative framework – Data Analysis – Capstone Forum Event at NUS of all participating institutions
Dissemination	– Printing – Ongoing maintenance of the website – Production of Video and CD – Meet of all participants in Delhi/Mumbai

Resources Required

1. Each participating institution will contribute the necessary human and financial resources for all non-travel -related work that it carries out under this Exercise (Phases I—IV).
2. For travel-related expenses, the home partner shall bear the international travel (airfare, visa, etc) and accommodation expenses, while the host partner shall bear the local hospitality expenses (ground transfer, meals, etc, excluding accommodation) as well as provide assistance for arrangement of accommodation. In addition, NUS will absorb all internal administrative costs involved in the visit by the Indian delegation, while MHRD India will absorb all costs involved in organising and hosting the capstone forum.
3. MHRD will also bear all project management related costs. Each participating institution will nominate a team of 3 persons to oversee its work under this Exercise. This team shall typically comprise the chief academic officer, the chief technology officer, and the chief administrative officer.

Project Management

A project director will be identified to supervise the project. This director will work with the help of two project managers one based in Delhi and another in Mumbai to run the project. This team will in turn be helped by the designated project leaders in participating institutions. The overall Exercise shall be overseen by Secretary (HE), MHRD India, a representative of NUS and a representative of IIT Bombay.

Draft Budget

Works/Resources	Costs in Lacs (INR)	Comments
Project Director	TBD	
Project Manager (Delhi)	4.0	50 pm for 8 months
Project Manager (Mumbai)	4.0	50 pm for 8 months
Technical Advisor	1.6	20 pm for 8 months
Support staff	1.6	20 pm for 8 months
Data Analyst	0.7	Salary: 35k per month; 2 months;
Online/Website team	2.8	Lump sum for one time set up; Cost of maintenance and updation 10k per month; 8 months
Video production team	4.5	3 videos per institute for 10 institutions; 15k per video

Works/Resources	Costs in Lacs (INR)	Comments
Event organization	3.9	Event Manager 35k per event for 3 events; Average cost of event per person Rs.5000; 40 participants; travel/ stay for 20 participants
Domestic travel and stay	4.5	3 members X 10 institutes X 1 day of stay @ (Rs. 20,000 per person of travel + Rs. 5000 for stay)
International travel and stay	12.7	5 members X 3 days of stay @ (Rs. 50,000 for air ticket to Singapore +Rs. 10,000 per day for stay per person) 5 members X 7 days of stay @ (Rs. 90,000 for air ticket to USA+Rs. 12,000 per day for stay per person)
Production of collateral (report, CD, reference material etc.)	1.0	Rs. 1000 per piece for 50 recipients
Contingency	7.0	
Total	**53.1**	

Impact and beneficiaries

This exercise will

- Help participating institutions identify gaps in adoption of technology.
- Give recognition to the participating institutions that have established excellent IT practices
- Create a channel and system for non-participating institutions to learn from the best practices of participating institutions
- Lead to adoption of best practices in technology in 20% (TBD) of Indian institutions

This will help MHRD to play the Role of Enabler by connecting an Institution (public/private) which wants to adopt a new Technology and an Institution that has already implemented the Technology successfully.

Appendix-X

Proposal for “Adoption of Free and Open Source Software in Education (FOSSEE) Phase-II IIT Bombay”.

Appendix-X

Adoption of Free and Open Source Software in Education (FOSSEE), IIT Bombay
Proposal for Phase II

1 Executive Summary

Control number: me-20021010551

PI: Profs. Shivasubramanian Gopalakrishnan (Mechanical), Ashutosh Mahajan (IE&OR), Jayendran Venkateswaran (IE&OR), Supratik Chakraborty (Computer Science), Prabhu Ramachandran (Aerospace), Madhu Belur (Electrical), Mani Bhushan (Chemical), Kannan Moudgalya (Chemical). In order to address the PRSG recommendation of extending this work to other FOSS systems, four new faculty members from three other departments have joined this activity, as proposed and accepted in the SC meeting held on 16 March 2013.

Institution: Indian Institute of Technology Bombay. As per the PRSG recommendation, we are proposing the inclusion of fifteen collaborator institutions, with a funding of Rs. 10 lakhs to each of them, with specified deliverables.

Budget: Rs. 15.99 crore for a period of three years. This includes a Rs. 3.0 crore component, meant for collaborator institutions and Rs. 2.52 crore, to be given as honoraria to Textbook Companion Creators and Lab Migrators, mostly students and faculty members from colleges.

Current Financial Status: We have a balance of Rs. 34.50 lakhs at the time of writing this proposal. This will cover the expenses for only three months.

Main Deliverables: The following are the main deliverables:

- One thousand *additional* textbook companions and lab migrations in three years, in all FOSS systems together.
- Support for 1,000 SELF workshops to be organised by the Spoken Tutorial Team. Support also for Online tests.
- Publicising the FOSS activity at colleges through postal campaigns and other methods.
- Nurturing and training partner institutions across the country for spreading the FOSS culture.
- Working with government agencies and curriculum boards of universities to adopt FOSS in their curricula.
- Strengthening the chosen FOSS system's capabilities, where applicable.
- Working with the Aakash Team and helping them with domain support.
- Focus FOSS systems: Scilab, Python, OpenFOAM, Oscad, SimPy and COIN-OR, at present. We may extend the support to other FOSS systems, such as R and OpenModelica and also open hardware initiatives as well, depending on the interest of the PIs and the collaborating institutions of the FOSSEE project.

2 Phase I of FOSSEE

In this section, we summarise the activities of the FOSSEE project in Phase I.

2.1 Objectives

The aim of the FOSSEE project is to eliminate the use of proprietary/commercial software packages in Science and Engineering Education across India and replace them with Free and Open Source Software (FOSS). The shift to FOSS packages will save the educational institutions huge amounts of money. Students trained to use the state-of-the-art FOSS packages will be able to give their prospective employers a huge benefit: especially for small and medium sized companies. FOSS will immensely help the students who wish to become entrepreneurs.

At the start of the FOSSEE project, we were focusing on engineering and science only. Because of the increased interest and the ability to accommodate other subject areas as well, we now support the FOSS activities in other disciplines as well. To reflect this reality, we have re-assigned the meaning of the word FOSSEE: it now denotes Free and Open Source Software for Education.

2.2 Nomenclature

In this section, we explain the meaning of some of the important terms coined in the first phase of the FOSSEE and sister projects of NMEICT. These will be required for the rest of the report.

2.2.1 SELF Workshops

This phrase has been coined by the sister project, *Spoken Tutorials*, also funded by NMEICT. These workshops are conducted by the Spoken Tutorial team through volunteers in various colleges, even without domain experts. These workshops are conducted using *self learning* material, called *Spoken Tutorials*, see `http://spoken-tutorial.org`. These workshops are of two hour duration.

The Spoken Tutorial team does not have the domain expertise required to create the tutorials, to set online exams and to provide the forum support. These activities are carried out by the FOSSEE team.

2.2.2 Textbook Companion (TBC)

One of the major shortcomings of FOSS tools is the lack of documentation. Proprietary software creators deploy invest a lot of money and other resources to develop good documentation. In this project, we decided to address this important issue through Textbook Companions.

We wanted to create documents for FOSS using our abundantly available work force, namely, students. Unfortunately, creating a document requires mature people. Students are good in writing programs, not documents. We addressed this by solving the inverse problem: ask the students to write programs for existing documents. Textbooks can be considered as good documents.

Textbook companion (TBC) activity creates code for solved examples of standard textbooks using FOSS. These are created by students and the faculty of colleges from different parts of India. Students who create these books are given an honorarium of Rs. 10,000 for each companion and their teachers who helped review are given an honorarium of Rs. 5,000 per companion.

If anyone wants to understand what a program does, all that they have to do is to go through the corresponding example in the associated textbook. If TBCs are available for all textbooks used in our educational programmes, we would not need proprietary software, at least for classroom use.

2.2.3 Lab Migration

Shifting theory classes to FOSS tools is not enough, if we want a college to refrain from using proprietary tools. So long as a proprietary tool is required in the labs, we cannot eliminate them. To address this issue, we started the lab migration activity. Through this effort, we provide equivalent FOSS programs for every college that runs a lab using proprietary software. If a student or a teacher creates this equivalent code, we pay them an honorarium, and release it as open source software for public use. This activity allows an expert from any college or profession from any part of India to help another college to migrate to FOSS tools.

2.3 Project activities

To achieve the above objectives, the FOSSEE project had proposed various activities that involved students/teachers across Indian colleges. The activities are listed and described below.

2.3.1 Workshops

- Seven workshops were originally proposed in the DPR and were increased to 55 in the SC meeting of Feb. 2012. Against this target, 117 (42 in Scilab, 70 in Python, 3 in OpenFOAM and 2 in Oscad) have been completed. In addition, the FOSSEE team helped the Spoken Tutorial team organise 698 workshops (450 in Scilab, 240 in Python and 8 in OpenFOAM) through the SELF mode. Scilab and Oscad have been taught extensively in the 10,000 teacher training programmes held on 28-29 June 2012 and 14 June 2013 respectively.

- The FOSSEE team conducted a total of 117 workshops in Scilab, Python, OpenFOAM and Oscad in the contact mode. Each of these workshops was two to four days long. Most of the participants were faculty members from science and engineering colleges. These workshops were conducted in different parts of India.

- The FOSSEE team has also helped the Spoken Tutorial project team in conducting the Scilab and Python workshops in non-contact mode, known as SELF workshops. The FOSSEE team helped create a total of 77 spoken tutorials for Scilab, Python and OpenFOAM along with the instruction sheets required for the workshop. The FOSSEE team provided the necessary domain assistance, such as answering questions through Skype, during the SELF workshops organised by the Spoken Tutorial project team. During the last one year, a total of about 450 Scilab, 240 Python and 8 OpenFOAM, SELF workshops have been conducted in this manner, training about 22,000 students and faculty members. About 75% of the people who appeared in online tests after these workshops have passed the test.

- The FOSSEE team offered a six hour long Scilab workshop in the first 10,000 Teacher Training Programme of 28-29 June 2012. More than 8,000 engineering college teachers participated in this programme, devoted to Scilab training. Another workshop on Oscad was conducted on 14 June 2013 wherein around 7500 teachers were trained.

2.3.2 Textbook Companion

- The textbook companion activity, although not in the original DPR, was later proposed to the SC and got approved. Against the 100 textbook companions proposed to be completed, 200 have been completed. A submission portal and availability on GARUDA cloud are the additional achievements.
- As these rates have been constant for four years, we need to revise them.
- More than 200 textbook companions have been completed as on 16 September 2013. A majority of these books are in Scilab followed by Python and Oscad.
- The FOSSEE team has created a submission portal that allows the code for each example to be uploaded individually. It is possible to download this code from the Scilab website (http://scilab.in). The code is available for one or more examples, individually or for an entire book, absolutely free of cost.
- Textbook companion is a valuable resource for educational community. From the convenience view point, a web based Scilab engine has been created by FOSSEE. For enhanced performance and safety, this facility has been ported by the FOSSEE team to the GARUDA Grid, with the help from the GARUDA Team at CDAC, Bengaluru.
  Scilab on cloud (http://scilab.in/scilab-on-cloud) allows to write an entirely new Scilab code or modify an already existing code to execute online. This enables quick research and experimentation with various parameters (or) inputs with ease.

2.3.3 Lab Migration

- Lab migration activity, though not in the original DPR, was later proposed to the SC and got approved. In total, 5 labs have been migrated and 28 are in progress.
- So long as a college uses Matlab in a lab, they will never shift to Scilab. This activity helps address this issue.
- The FOSSEE team helps colleges migrate their Matlab based labs to Scilab. A faculty from a college gives a statement of their Matlab based experiments. On getting an undertaking for two years that they will conduct their labs through Scilab, the FOSSEE team develops the Scilab equivalent of these experiments. Alternatively, this conversion can be done by the students and faculty from various colleges. On successful completion of this work on the portal, the participants are paid an honorarium. This new initiative has been started so as to help colleges migrate to Scilab completely.
- Unlike a textbook companion which has a well defined task, the lab migration activity is not so well defined. While in the former, the initiative can be taken by the FOSSEE team, the proposal should come from a professor in the latter. We are trying to address this issue by mass posting campaigns, further explained in section 3.6, and the initial results are promising.

2.3.4 Conferences

- In the DPR, two conferences were proposed. This number was revised to five in the Feb. 2012 SC meeting. Six conferences have been held by the FOSSEE project so far.

- International conferences on Python for Education and Scientific computing (SciPy.in) were organized by Python resource team in FOSSEE in the year 2009 (Technopark, Trivandrum), year 2010 (Hyderabad), year 2011 (IIT Bombay) and the same was conducted in December 2012 at IIT Bombay. The team also conducted SAGE days in 2009 at IIT Bombay and sponsored PyCon 2010 in Bangalore.

- The conferences serve as a good advertisement for the project and attract interested new employees, spreads the word about the projects all over the country and encourages academic participation. They offer participants a means to meet internationally renowned experts in the field. The project also benefits, as it can locate potential employees. Finally, the conferences help nurture and build a community. For example, as a direct result of a participant's presentation at the conference, a new special interest group on signal processing with Python was formed in early 2012. As a result, we are urging the different sub-projects to conduct conferences from time to time as we believe this would be valuable in the long run.

2.3.5 Course Conversion

- Course conversion was not in the original DPR, but was later presented to the SC and got approved. The target of completing five courses converted has been met. The following is the list of completed courses:

  1. Digital Control (CL 692)
  2. State Estimation: Theory and Applications (CL 653)
  3. Nonlinear Dynamical Systems (EE 613)
  4. Digital Signal Processing (EE 603)
  5. Matrix Computations (EE 636)

- The course conversion effort aims to provide the necessary help to teach a course using Scilab. In addition to solved examples, it helps port the code of assignment problems also into Scilab. Five courses have been converted using Scilab.

2.3.6 Other activities

Course on SDES: A semester long course in Software Development Techniques in Engineering and Science (SDES) has been designed by the Python team of FOSSEE to equip students with skills in Python, Bash/Linux, Latex, Version Control and Test Driven Development. The course and all its course material is now included in the curriculum of IIT Bombay and BHU, Varanasi. Furthermore, through the Thousand Teacher Training programme, the Python resource team in FOSSEE trained a total of 725 teachers across India on SDES.

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Hardware Interface: The FOSSEE team has come up with Scilab based data acquisition systems using COMEDI (COntrol and MEasurement Device Interface with drivers for more than 400 A/D cards and digital I/O cards, a Linux project), Xcos (block oriented simulation tool) and HART (hardware access real time toolbox). Various combinations of the above have been validated for data acquisition and control. The FOSSEE team also helped the SBHS (single board heater system of the virtual labs project funded by NMEICT) to be controlled remotely using the above mentioned hardware access software, along with Python for connectivity and Scilab for control algorithm design. Hardware access has been provided in Windows through a serial interface.

Electronic Circuit Simulation: The FOSSEE team has developed an electronic circuit simulator based on FOSS components, such as KiCAD and NGSpice. Scilab is used in this simulator to explain the results. This software has the potential to be used as an alternative to OrCAD, at least in the academic institutions. We call this software as Oscad. We also published a book on Oscad. This software was introduced and used in the 10,000 Teacher Training Programme on Analog Electronics, conducted by IIT Kharagpur. This software requires further improvement, so as to be useful to teachers and students of engineering colleges. We also need to help conduct SELF workshops, to create TBCs and to migrate labs using Oscad.

FOSS on Aakash: The FOSSEE team helped port C, C++, Python, Scilab and Oscad onto the Aakash tablet.

Postal Campaign: In order to publicise our activities and to meet the shortfall in the lab migration project, a postal campaign was initiated by the Scilab group during the last week of December, 2012. About 4,150 Heads of various Departments in about 700 AICTE recognised colleges were invited to organise Scilab SELF workshops and to participate in lab migration and textbook companion projects. Within a span of two weeks, about 50 Heads have contacted us, expressing their willingness to participate in the above mentioned Scilab activities. Similarly, same exercise was conducted with OpenFOAM wherein 868 colleges were contacted. Out of which around 25 colleges have already responded and the number is increasing. The shortfall in the lab migration targets will be addressed soon. We also expect an increased awareness of the Scilab, Python, OpenFOAM and Oscad activities and more people to contact us in the near future. This response is much more than what we obtained for magazine advertisements. For example, we received only one email for an advertisement of LibreOffice free workshop advertisement placed in the back cover of Linux for You, placed at a cost of Rs. 50,000. We hope to follow such a postal campaign for other activities also in the near future.

2.4 Summary of Phase I: Deliverables and Fund Release

In this section, we present a summary of deliverables and the details of fund release.

Table 1: Promised vs. Delivered in Phase I

Item	Proposed	Achieved
Contact workshops for teachers	55	70
Remote, SELF, Workshops for students and teachers	–	874
Conferences	6	7
Textbook Companions	100	250
Spoken Tutorials	40	61
Course Conversion	5	5
Lab Migration	–	10

2.4.1 Deliverables

In this section, we summarise the promise vs. deliverables in Phase I of the FOSSEE project. It is presented in a tabular form in Table 1. As explained earlier, some of the items in this Table were not in the original DPR, but later proposed and accepted by the Standing Committee and the PAB.

2.4.2 Schedule of Release of Funds

In this section, we show the schedule of fund release against a total approved amount of Rs. 318.5 lakh. The details are in Table 2.

Table 2: Schedule of release of funds in Phase I and current status

No.	Date	Amount
1	16 March 2011	95,00,000
2	27 March 2012	50,00,000
3	9 September 2013	1,10,00,000
4	26 December 2013	63,50,000
	Total	3,18,50,000
	Amount of funds spent	2,83,96,437
	Balance amount	34,58,563

2.5 Scalability and Efficacy of the FOSSEE approach

We are glad to say that through the experiments undertaken in Phase I of the FOSSEE project, we have identified the components that work well and also the processes we need to follow. For example, we found that asking one student to complete one textbook companion over a period of one month is better than asking a group of people to complete the same task in a shorter time span.

Although we arrived at this result using Scilab and Python, these results are applicable across all FOSS activities, including the new ones, to be discussed in the next section.

Most of the resources can be shared across different FOSS systems. For example, the software created for uploading of the Scilab textbook companions, can be used for other FOSS systems as well. Moreover, the interface required for lab migration could also be easily arrived at, starting from that for the textbook companion. In a similar way, the successful method of postal campaign and training through SELF workshops can easily be replicated across all FOSS activities.

Expanding the focus of FOSSEE activities to new FOSS topics promote synergy and efficiency as well. For example, the expertise available in Python based GUI development will help meet this requirement in Oscad and OpenFOAM, two new activities proposed in the next section.

Finally, FOSSEE is important because it encourages students to tinker and experiment with a well written source code. It fuels curiosity which is so important in education.

3 Deliverables for Phase II

The main objective of Phase II of the FOSSEE project is to build on the foundation laid in the first phase to promote open source software in education. There are good indications that our effort is bearing fruit. SVNIT is the first institution to save large sums of money by switching over to Scilab, see Section A on Page 18. We also came to know that most proposals made to AICTE for the purchase of Matlab have been rejected and that a substantial sum has been saved, as a result. We also came to know that the AICTE has started advising engineering colleges to shift to Scilab and approved all the proposals on faculty development programmes on Scilab, see Section B on Page 19. This is expected to increase our work enormously, as all such proposals seem to have shown our group as the main resource. We cannot shy away from this responsibility at this juncture. On the positive side, our engagement with the new users of Scilab and the other open source software will provide stability and could result in using the same for long time to come.

As mentioned above, it is proposed to scale up the activities of Scilab and Python. We propose to continue with the activities of textbook companion and lab migration. As there is an increasing acceptability of these, in particular Scilab, there have been many offers from students and faculty of various colleges, the need to support these also increases. Lately, AICTE has started advising engineering colleges to shift to Scilab and accepting the faculty development programmes. The FOSSEE team has to continue to work with Scilab and Python for these reasons.

In the recently held PRSG meeting, the need to expand the focus of the FOSS packages was strongly emphasized. We had restricted our focus to just Scilab and Python to ensure there is a high perceivable benefit in at least these, rather than unorganized diluted efforts in several FOSS packages simultaneously. Now with tangible benefits felt by various other institutions benefiting from the FOSSEE efforts, and in view of the strong recommendation received from the PRSG, we have decided to take up the following actively:

- COIN-OR (open-source software for Operations Research)
- Oscad (open source software for CAD) - for more details, please visit section 3.6
- OpenFOAM (state-of-the-art and open-source package for Computational Fluid Dynamics)

- OpenFormal, a suite of software formal verification tools

Scilab and Python are extremely useful also in related applications. For example, Python based GUIs will be useful in the following FOSS development activities proposed in the next section: Oscad, OpenFOAM and OpenFormal. Scilab based computations are useful for Oscad and COIN-OR. We will go through some of these in detail below.

We would like to bring the newly identified FOSS, namely COIN-OR, Oscad and OpenFOAM to the level of acceptability of Scilab and Python. We would also like to bring OpenCL and OpenFormal to usable level.

We would like to develop Textbook Companions (TBCs) for all the books listed by AICTE. A detailed breakup of the AICTE books along with the information on the status of the TBCs is in the attachment. It can be seen that a large number of TBCs are yet to be created. While Scilab is expected to be the most popular FOSS, we also expect Python, Oscad, OpenFOAM and COIN-OR to be useful for several books. We would like at least one TBC to be available for every textbook in the AICTE list.

3.1 Python

The Python group will develop an online application for immediate remote evaluation of codes submitted by a learner. This will help for self-evaluation. While existing evaluation procedures are just objective type questions, this is not ideal for *programming* skills. This development is already completed to a so-called beta version. A bug-free full development is proposed.

The Python group also proposes to develop advanced spoken tutorials. Further, the Python group will closely work with other groups in FOSSEE for the ability to call COIN-OR (FOSS optimization routines) from within Python. The development of a GUI for the OpenFOAM package is also planned using Python tools.

We expect to create a large number of Python Textbook Companions in the second phase.

3.2 Python: SimPy

SimPy (SIMulation in PYthon) is an open source platform-independent toolkit for simulation, released under GNU GPL. SimPy is an object-oriented process-based discrete event simulation language based on standard Python. SimPy provides the modeler with components of a simulation model such Processes, Resources and Buffers. It also provides Monitor variables for gathering statistics. Random variates are implemented using the standard Python random module. SimPy is based on ideas from Simula and SIMSCRIPT II. It also simulates parallel processes using Python co-routines.

SimPy is well suited for teaching, research as well as in project use in discrete-event simulation. A variety of scenarios can be modeled such as: manufacturing flows, traffic networks, disease dynamics, work flow studies etc.

SimPy is a open source alternative to commercial simulation packages such as AnyLogic, Arena, Witness, ExtendSim, Quest, FlexSim, all of which are expensive even for academic use.

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Many colleges in India and abroad offer courses and/or labs on simulation modeling, and are currently using one or more of the above commercial packages. Also, there is significant interest in Indian industry in the use of simulation tools for improved decision making. Teaching materials and tutorials for SimPy along with improved modules will be beneficial.

3.3 Scilab

The activities in Scilab will include scaling up the Lab Migration activity (described in section 3.5). Additional textbook companions will be completed.

The Textbook Companion has become an important resource for Scilab users. More than 150 textbook companions are already available. They are on the GARUDA cloud now. We are also in the process of porting them on to Aakash. It is proposed to establish a wiki like environment, along with a version control facility, for this resource. It should allow end users to create new versions. We should have the capability to rank a particular version or to recall an old one, if the new one is found to be working incorrectly.

It is proposed to create a good search facility through crowd sourcing. A visitor to our portal, http://scilab.in should be able to create a link for a Scilab resource that they are familiar with. Other people should be able to rank it. With user contribution, the number of resources available in this archive will grow. If we can establish a search facility within this archive, along with the ranking of it, it will be a very useful search.

We also intend to organize conferences that will bring together various experts in Scilab across India and abroad. The Scilab team will work closely with the COIN-OR group to develop an interface for calling FOSS optimization routines of COIN-OR from within Scilab. (The ability of Matlab to call CPLEX routines is currently unavailable in Scilab.)

As explained earlier, Scilab based differential equation solver is useful to *explain* the solution that arises in NGSpice, as a part of Oscad. Such an explanation facility is not available even in commercial software systems.

3.4 COIN-OR

COIN-OR or the COmputational INfrastructure for Operations Research is an online repository of open source software for the operations research and industrial engineering community. It provides more than 40 different open source packages for modeling and solving different types of optimization problems. The software is available under the Common Public License (CPL), which is more liberal than even the GPL. The software permits the users to modify and redistribute code, libraries and binaries. The COIN-OR initiative was started in late 1990's jointly by OR experts in both academia and industry, notably IBM. Since then it has grown to become the largest software repository for OR tools and software. Its members have affiliation not only in leading universities and national laboratories across the world, but also several industries including IBM, Yahoo and Exxon Mobil.

Most notable amongst the tools available through COIN-OR is CBC (COIN Branch and Cut Solver), the solver for integer and linear optimization. It is a fast and robust open source alternative to proprietary solvers CPLEX and GUROBI. There are many applications of integer and linear

optimization in supply chain management, logistics, planning and decision making. Lately, it is gaining popularity in engineering and scientific applications like design of chemical reactors, electrical circuits and power transmission networks. Open source tools like CBC are already used in many industrial and academic projects, but unfortunately have not received much attention in India.

COIN-OR projects other than CBC also offer fast and robust open-source alternatives to commercial solvers. IPOPT (replacement for KNITRO and CONOPT) is a package to solve nonlinear optimization problems. Couenne (replacement for BARON and LINDO) is suitable for mixed-integer nonlinear problems. COIN-OR also hosts other solvers like LEMON for network/graph problems and CSDP for semi definite programming problems that have no commercial counterparts today, but are likely to have some in the future.

Software for writing optimization problems in mathematical form is also equally important. GAMS and AMPL are two such modeling platforms that are both proprietary. COIN-OR offers Pyomo modeling language as an alternative. Written in Python, this package provides a language for optimization along with all the features and flexibility of the Python language. Proprietary toolboxes are also available for MATLAB and spreadsheet software like Microsoft Excel. No notable FOSS alternatives exist, but some promising work is being done.

Outside IIT Bombay, we are not familiar with any academic or industrial users of COIN-OR packages in India. This lack of awareness is quite alarming, but not entirely unexpected as these tools have gained "mainstream" attention only in the last few years. These tools are especially useful for small and medium scale businesses that need to make optimal strategic and tactical decisions very often, but cannot afford expensive software like SAS and IBM CPLEX.

Our goal is to popularize the above mentioned FOSS tools amongst students of engineering as well as management sciences. Educating students using FOSS in this field will reap good financial and technological benefits in the future. Many of these commercial expenses are prohibitively expensive, even for academic use. A single license of GAMS, for instance, costs a minimum of $640 (Rs. 35000). This version allows a single user at a time for very limited types and sizes of problems.

Some of the above-mentioned software provide free but closed-source versions for teaching. CPLEX and AMPL are the two main software in this category. Such software should not be encouraged in educational institutions in spite of the monetary attraction. First, they do not provide any opportunity to let inquisitive students read and modify the underlying source code. Such restrictions may stifle curiosity. Second, the students familiar with proprietary software only may be inclined to use the expensive commercial versions when they leave the academic setting. Such 'addiction' is particularly dangerous for medium and small scale businesses. Third, it is not clear whether such free academic versions will remain free in the future. Thus, an exclusive dependence on them is a risk.

We propose to spread COIN-OR by making maximum use of the platform created by the FOSSEE project. We will create textbook companions for books used in graduate and postgraduate courses. These companions will contain instructions and examples of using COIN-OR packages for problems tackled in the textbooks. Spoken tutorials on how to use the different tools in various settings will be created. We will harness the expertise of FOSSEE team to conduct live workshops

and self-workshops for hands-on training of students and teachers. We will develop course material for a computational lab for operations research. Since many institutions in India cover only the theoretical aspects of operations research in their curriculum, this material will be particularly useful in introducing a practical computing course.

Besides popularising COIN-OR and creating material for teaching/training, we will also develop tools to make the use of COIN-OR even more convenient. Some of the COIN-OR tools, most notably CBC, IPOPT and Couenne lack interfaces to LibreOffice and Scilab and have limited operability with Python. We propose to develop interfaces to these software in the earlier stages of the project so that we can spread their popularity effectively in the later stages.

3.5 Oscad: Open Source Computer Aided Design

Using open source software components, the FOSSEE team has developed an open source software called Oscad, an acronym for open source computer aided design software, a potential replacement for OrCAD, at least for the academic institutions. Oscad has the following capabilities:

1. Ability to create circuit diagrams using the open source software, EESCHEMA
2. Ability to create gerber file, suitable for PCB making
3. Passing the above information to NGSpice through an appropriate netlist and obtaining simulation results
4. Providing explanation facility through Scilab

The Oscad team also published a book on Oscad and made it available to all the 7,000+ college teachers who participated in the 10,000 Teacher Training Programme on Analog Electronics, conducted by IIT Kharagpur. This team has started working on Textbook Companion and Lab Migration as well.

For the software to be useful, several other features have to be added. Some are, integration with the open source software for breadboard, Fritzing and providing capability to work with VHDL and Verilog.

It should be pointed out that the Mission Document states that one of its objectives is to find an open source replacement for the commercially available OrCAD.

3.6 OpenFOAM

OpenFOAM is an open source toolkit for continuum mechanics. The packaging of OpenFOAM is done by OpenCFD Ltd. at the ESI Group and distributed under the GNU Public License (GPL) by the OpenFOAM foundation. It is developed in an object oriented framework using C++ and provides fundamentals classes for discretisation operators, linear algebra solvers, mesh handling capability etc. The fundamental classes provided by OpenFOAM allows the rapid construction of numerical solvers for continuum mechanics solver.

OpenFOAM is ideally suited for computational fluid dynamics (CFD) both as a teaching and a research tool. It solves a wide range of computational physics problems from turbulence, heat transfer, multiphase flows, chemical kinetics and electromagnetics to name a few.

It is the perfect state of the art tool for CFD and a competitive open source alternative to commercial CFD packages such as FLUENT, StarCD and StarCCM+. OpenFOAM has already made significant inroads in both industry and academia, primarily in North America and Europe. Apart from strong user community, regular workshops and training programs are available and accessible to researchers and students in these locations.

Currently there are very few academic users of OpenFOAM in India. Industry in India is also looking at the potential growth in OpenFOAM usage for their research purposes. A nascent programme for providing teaching material and tutorials for OpenFOAM has been started at IIT Bombay and an enormous growth potential is seen in both the interest and usage of this software.

3.7 OpenFormal: FOSS tools for Formal Verification

Formal methods are increasingly being used in the industry for design, analysis, verification, validation and testing of complex software and hardware systems. The Turing Award (Nobel Prize in computing) in 2007 was awarded to three computer scientists for developing algorithms and technologies that made model-checking (a specific formal verification technology) applicable in practice. Leading hardware and software companies like Intel, Fujitsu, IBM, Microsoft etc. have now institutionalized formal verification technologies as part of their product verification and validation pipelines. Unfortunately, there are a few institutions in India where educational and research activities in formal verification are carried out thoroughly. The Centre for Formal Design and Verification of Software (CFDVS) at IIT Bombay, funded by the Board of Research in Nuclear Sciences, has been at the forefront of activities (both educational and research) in this domain over the past decade. However, most tools developed as part of this effort have not been publicized and popularized as much as they could have been for want of manpower resources. In addition, there are several free and open source public-domain tools and libraries developed elsewhere that form the back-end engine of a large number of formal verification application tools. Notable ones among them are propositional satisfiability solvers (minisat and picosat), binary decision diagram libraries (cudd), satisfiability modulo theory solvers (mathsat, boolector, stp), finite-state model-checkers (nusmv, spin), software model checkers (cbmc) etc. The proposed activity in this sub-domain under the FOSSEE project consists of two parts:

1. Training on and popularizing the usage of FOSS tools and libraries already available for formal verification applications. This would include minisat, cudd, nusmv and cbmc. These tools are already available in a mature form, although they lack a user base outside those institutions where serious research activity in formal methods is undertaken. The goal of this component of the activity would be to make these tools accessible to a much larger set of institutions, so that these can be used for both educational purposes and to spur research in related areas.

2. Converting a set of tools developed at CFDVS, IIT Bombay to a form where it can be released in the public-domain as a FOSS tool. These tools include a Quantified Boolean Formula (QBF) solver, a Quantifier Eliminator for Linear Arithmetic on Bit-vectors and a Word-level Model Checker for VHDL Designs. Currently, we have working prototypes of all

of these tools that have been applied to several large problem instances. However, these tools are not in the most polished forms, and have primarily been used in projects and research activities where the authors of the tools were themselves involved in a major way. Making these tools accessible to a larger community (both for educational and research purposes) requires significant re-factoring of the existing code, re-coding several parts in a modular form, and providing proper documentation and tutorials.

We propose the following deliverables:

1. By end of 1^{st} year: Tutorials and demos for using NuSMV, converting the Word-level Model Checker for VHDL Designs to a form where it can released as a FOSS software.

2. By end of 2^{nd} year: Tutorials and demos for CBMC, converting the Quantified Boolean Formula solver to a form where it can be released as a FOSS software.

4 Collaborating institutions for FOSSEE

FOSS is too important activity to be left to only one institution, namely IIT Bombay. Also, in a large country like India, there should be other institutions that have FOSS enthusiasts and experts. Bringing in such institutions as collaborators will bring to this project a much desired stability. Moreover, this will increase the reach of FOSS activities in different parts of the country. Through this method, the expertise gathered at IIT Bombay can be shared with other enthusiasts from different parts of the country. The PRSG of FOSSEE has also made the above said observations.

Providing a seed money to each collaborator will help them work with enthusiasm, especially when they are from small colleges. In order to ensure proper fund utilization, it is proposed to identify clear deliverables and the release of payment against performance only. There could be slight variation between different collaborators as to what each will do. But all their activities will be closely related to the approved activities of FOSSEE. Moreover, they will be paid according to the cost model that FOSSEE works with. We propose a total of Rs. 10 lakhs per collaborating institution per year, with the following funds breakup:

We have identified two institutions for the first year:

- IIT Kharagpur
  Prof. Rajib Mall, Head of the Dept. of Computer Science and Engineering

- Thiagarajar College of Engineering, Madurai
  Dr. Mercy Shalinie, HoD, Dept of Computer Science

The above collaborators have been actively helping the FOSSEE project conduct workshops or have the potential and enthusiasm to work in this area. They have been independently pursuing some of our project objectives even before we got in touch with them. Having them as a collaborator is ideal given their keenness and given our past interaction with them.

We propose to collaborate with three more, yet to be identified, institutions in the first year of Phase II of the FOSSEE project. In the second year, we propose to work with a total of ten collaborator institutions. In the third year, we hope to add another five institutions.

Table 3: Funds breakup for collaborating institutions

Item	**Remark/budget rate (Rs.)**	**Rs. (in lakhs)**
Textbook Companions (5)	30k per textbook	1.5
Lab migration (5)	20k per lab	1.0
Conduct of SELF workshops (25)	2k per workshop	0.5
Conventional workshop	Organisational expenses	1.0
Exercises/Online-test/evaluation for the conventional workshop		0.2
Programmer/coordinator salary		3.0
Faculty honorarium		1.0
Toolbox development		0.5
Publicity/promotion/postal campaign		0.5
Consumables		0.5
Contingency		0.3
Total		10.0

5 Funds sought

In this section, we present the overall budget for the FOSSEE activity for the next three years. A detailed breakup of the budget is given in Table 4. The justification for the salary budget is given in Table 5. While arriving at this budget, we have to keep the following three things in mind:

1. Increase in the number of the activity. Let us take the *Forum Support*, presented in Table 5, for example. We expect the forum activity to increase enormously, as the activities of FOSSEE and Spoken Tutorial get popular and more colleges and students participate in them.

2. Increase in the difficulty level of the activities. For example, in the Textbook Companion activity, easier books will get completed first and the more difficult books will be taken up only later on. When the books are difficult, often we ask the students to complete only half a book to be eligible for a full honorarium payment.

3. In quite a few books, not one software is sufficient for creating textbook companions. For example, one may have to use Scilab and OpenFOAM to create a complete textbook companion. Similarly, in another textbook, one may need Oscad and Python. This requires more than one type of expertise required for creation, review by a domain expert and review by our team, thereby increasing the cost quite a bit.

4. Finally, the salaries have progressively increase with time. The salary given to entry level B.E. graduates in 2009 was Rs 12,000 per month. Now, it is Rs. 21,000 per month. Similarly, all salaries have increased by about 75%.

In line with the increased expenses due to books becoming more difficult and higher salaries, an increase of about 50% in the honorarium (Rs. 15,000 to 23,000) for the first year and about 10% thereafter for every subsequent year is proposed.

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Table 4: Budget for three years and the total (Rs. crore)

Head	I yr	II yr	III yr	Total
Salaries[0]	1.05	1.40	1.80	4.25
Honorarium for textbook companion creators[1]	0.69	0.88	0.95	2.52
Collaborating partner institutions[2]	0.50	1.00	1.50	3.00
Travel[3]	0.20	0.25	0.30	0.75
Postal campaign expenses[4]	0.10	0.15	0.20	0.45
Other promotional expenses (stalls, media)	0.15	0.20	0.25	0.60
Conferences and workshops[5]	0.20	0.25	0.30	0.75
Equipment	0.15	0.20	0.25	0.60
Web hosting expenses	0.05	0.10	0.15	0.30
Consumables	0.13	0.16	0.20	0.49
Other FOSS systems to be taken up for promotion[6]	0.00	0.50	1.00	1.50
Contingency	0.10	0.15	0.20	0.45
Coordinator's honorarium	0.08	0.10	0.15	0.33
Total	3.40	5.34	7.25	15.99

[0]Calculated on the basis of 30, 35, 40 people working on the project, with average annual salaries of Rs. 3.5 lakh, 4.0 lakh and 4.5 lakh, in the three years, respectively.

[1]More than 95% of the textbook companion creators and lab migrators are students and faculty members from institutions other than IITs. Basis: 300, 350, 350 units (textbook companion and lab migration together), at an average honorarium of Rs. 23,000, 25,000 and 27,000, in the three years, respectively. The reason to increase the first year honorarium to Rs. 23,000 from 15,000 is explained in the previous page: (a) higher cost of living (b) books becoming more difficult and (c) more than one software required to complete a textbook companion. In all, IIT Bombay will create 1,000 units (300+350+350) in the three years.

[2]Based on average institutional support of Rs. 10 lakhs per year. It is proposed to support 5 institutions for three years, 5 institutions for two years and 5 institutions for one year. A detailed justification for this amount is given in Table 3. It is to be noted that the deliverables mentioned in this Table are **additional**, i.e., these are over and above what is to be delivered by IIT Bombay.

[3]An average of four air travels by five PIs per year by economy class and an average of two air travels by 15 staff members every year. About a fourth of the expenses are for travel by rail/road. These travels are giving talks in important meetings, meeting collaborators, and advocacy.

[4]Based on average docket price of Rs. 25 to 50 (depends on the print volume of brochures) for 4,000 and 1,000 colleges per mailing in the first year and increasing progressively.

[5]We have budgeted Rs. 5 lakhs for these conferences/workshops. A large number of experts are expected to attend these. At the assumed cost, we expect to conduct 4, 5 and 5 units of these, with a provision for cost escalation.

[6]Provision for other FOSS systems to be taken up for support. Some examples are R, OpenModelica and OpenCL. We may also work on open source hardware. The additional systems will depend on the new faculty members who may participate in the future.

6 Justification for the budget

In this section, we explain the reasons for the manpower we have requested. The total funds of this section agrees with the Salaries Head of the previous section. All other budget heads have been explained in the previous section.

Table 5: Justification for the salaries component of Table 4

Activity	I Yr	II Yr	III Yr
Web pages[0]	20	22	28
Forum support[1]	10	15	20
Textbook companion[2]	30	44	53
Wiki like evolution of TBC [3]	0	9	10
Postal campaign[4]	5	10	12
Online test support[5]	10	15	20
Help in conducting workshops[6]	5	10	15
Promotion/advocacy [7]	5	5	10
Extending capabilities of FOSS[8]	20	10	12
Total	105	140	180

[0]Given the importance and the amount of work involved, we would need equivalent of 5 full time web designers, web programmers and system administrators together.

[1]To help answer the questions to be raised by students who undergo SELF workshops or use the web resources directly. These amounts are much smaller than those required to conduct contact workshops by experts. This activity is extremely important, given that a lot of learning has to happen through the *self* mode. Calculated on the basis of 5, 6, 7 staff members working half time in the three years.

[2]There is quite a bit of work to be done before a textbook companion is accepted. Some of the activities are, review of pilot work, assigning a TBC, plagiarism check, interacting with authors of textbooks (as opposed to the authors of TBC), reviewing and accepting TBC, and accounting. These are over and above the honorarium budgeted in Table 4. For these additional activities, we have budgeted per book cost of Rs. 10,000, Rs. 12,500 and Rs. 15,000, respectively, for three years. Recall that we have proposed 300, 350 and 350 textbooks in the three years, respectively.

[3]This is for the wiki like evolution of TBC repertoire. Numbers of employees assumed are 0, 2 and 2, in 3 years.

[4]The amounts mentioned in Table 4 against this head are based on actual printing and postal expenses. The following activities also need to be considered: designing brochures, creating content for the brochures, getting addresses of recipients, and working with the databases for automated mailing list generation. The total cost is still less than what a marketing company would charge for such campaigns. These costs are arrived at on the following basis: 2, 3 and 3 staff members working half time, with a manager spending a fourth of their time.

[5]This involves creation and maintenance of an online testing portal, implementing methods for automated evaluation and maintaining and enlarging the database of questions. Calculated on the basis of 4, 5 and 5 staff members working full time with two managers working half time.

[6]Domain related questions of the participants of the SELF workshop are not given by the Spoken Tutorial team. The domain expertise required to answer these questions should come from the FOSSEE team. These costs are arrived at on the following basis: 2, 3 and 3 staff members working half time, with a manager spending a fourth of their time.

[7]We have assumed part time support of 1, 1, and 2 marketing managers.

[8]These amounts are for the software engineers who will carry out all the extension of the FOSS systems (GUI, integration of FOSS systems, etc.) proposed in this project. Estimated on the basis of 5, 2 and 2 full time staff members in the three years.

A Email correspondence regarding SVNIT saving money by switching over to Scilab

```
X-Received: by 10.182.33.6 with SMTP id n6mr3003239obi.48.1391768755340; Fri,
 07 Feb 2014 02:25:55 -0800 (PST)
MIME-Version: 1.0
Received: by 10.76.75.170 with HTTP; Fri, 7 Feb 2014 02:25:35 -0800 (PST)
From: Bella Tony <belladevassy@gmail.com>
Date: Fri, 7 Feb 2014 15:55:35 +0530
Message-ID: <CAOY-rNNdcYVU3vQAMQgm6mSnQWWZsLj_ikyXK5AH+0sooqv1Dw@mail.gmail.com>
Subject: Fwd: Introduction of Scilab-FOSSEE to SVNIT Surat -fwd
To: sachighai@kpmg.com
Cc: "Prof. Kannan Moudgalya" <kannan@iitb.ac.in>
Content-Type: multipart/alternative; boundary=089e0158a83645892904f1ce6ae6

--089e0158a83645892904f1ce6ae6
Content-Type: text/plain; charset=ISO-8859-1

F.Y.I.

----- Forwarded message ----------
From: Madhu N. Belur <belur@ee.iitb.ac.in>
Date: Thu, Feb 6, 2014 at 9:07 PM
Subject: Introduction of Scilab-FOSEE to SVNIT Surat -fwd
To: Bella Devassy <belladevassy@gmail.com>


----- Forwarded message from Dr. Ashish Panchal <akp@eed.svnit.ac.in> -----

Date: Wed, 4 Dec 2013 23:54:14 +0530
To: belur@iitb.ac.in

Dear Sir,

In the year 2009-2010, S V National Institute of Technology had initiated
the procedure for procuring MATLAB. In the mean time, Prof. M Belur and
his team came to SVNIT Surat and introduced about similar freeware Scilab.
They conducted introductory workshops/tutorials for the faculty and
students. Thereon, the work was successfully transferred to Scilab instead
of MATLAB. Hence the procurement of MATLAB tool boxes etc. were
drastically reduced and we could save lot money because of introduction of
```

such a freeware.

With regards.

PANCHAL ASHISH K.,(Ph.D.,IIT Bombay)
Associate Professor,
Electrical Engineering Department,
S. V. National Institute of Technology,
Ichchanath, Surat-395007
Gujarat, India.
Ph. +91 261 2201674

----- End forwarded message -----

B Email correspondence regarding AICTE's saving through the promotion of FOSS

Return-Path: <belur@ee.iitb.ac.in>
Delivered-To: kannan@iitb.ac.in
Received: (qmail 25292 invoked from network); 26 Nov 2013 09:35:02 +0530
Received: from unknown ([10.200.5.2])
by rp3.iitb.ac.in (qmail-ldap-1.03) with QMQP; 26 Nov 2013 09:35:02 +0530
Delivered-To: CLUSTERHOST rp2.iitb.ac.in kannan@iitb.ac.in
Received: (qmail 11466 invoked from network); 26 Nov 2013 09:35:01 +0530
Received: from unknown (HELO ldns1.iitb.ac.in) ([10.200.12.1])
(envelope-sender <belur@ee.iitb.ac.in>)
by rp2.iitb.ac.in (qmail-ldap-1.03) with SMTP
for <kannan@iitb.ac.in>; 26 Nov 2013 09:35:01 +0530
Received: from bhairav.ee.iitb.ac.in (bhairav.ee.iitb.ac.in [10.107.1.1])
by ldns1.iitb.ac.in (Postfix) with ESMTP id C9533A26BF83;
Tue, 26 Nov 2013 09:34:56 +0530 (IST)
Received: by bhairav.ee.iitb.ac.in (Postfix, from userid 263)
id C754260301B9; Tue, 26 Nov 2013 09:34:56 +0530 (IST)
Date: Tue, 26 Nov 2013 09:34:56 +0530
From: "Madhu N. Belur" <belur@ee.iitb.ac.in>
To: Kannan Moudgalya <kannan@iitb.ac.in>,
Bella Devassy <belladevassy@gmail.com>,
Usha Viswanathan <vichusha@gmail.com>,

300

Kiran Isu <ikirankishore@gmail.com>
Cc: Nmsingh <nmsingh@vjti.org.in>,
"Dr. Navdeep M. Singh" <nmsingh59@gmail.com>,
Prabhu Ramachandran <prabhu@aero.iitb.ac.in>,
Shivasubramanian Gopalakrishnan <sgopalak@iitb.ac.in>
Subject: AICTE money saved
Message-ID: <20131126040456.GA21010@ee.iitb.ac.in>
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Disposition: inline
User-Agent: Mutt/1.4.2.2i

Dear Kannan Sir,

I spoke to Prof. Navdeep Singh.
The following lines are fine with him.

AICTE project evaluation committee saved about Rs. 2 crores
due to various Faculty Development Programmes (FDPs) having been
approved for only open-source packages like Scilab and Python.
Many of the proposals are typically for Matlab: this involves extensive
license purchase first for the FDP and later by the colleges too.
A large percent of the proposals are about training in proprietary packages.
We are told that AICTE FDP proposal committee has approved only
FOSS equivalents thus saved the colleges and AICTE a huge amount.

If asked/insisted, it is ok to tell that we got this info from
Prof. Navdeep Singh. Though it would also be in the minutes.

Singh Sir, I hope the above is ok.

With regards,
Madhu

Appendix-XI

Additional Information for "Adoption of Free and Open Source Software in Education (FOSSEE) Phase-II

IIT Bombay".

1. Usage stats for TBC (Textbook Companion Activity)

Textbook Companion Download Page Hits from Sept 2013 - March 2014

S. No.	Month & Year	Page Hits
1.	Sep 2013	2522
2.	Oct 2013	7269
3.	Nov 2013	8749
4.	Dec 2013	5418
5.	Jan 2014	5038
6.	Feb 2014	1820

Total: 31230+

Completed Books: 285 books by 234 unique users
Books in Progress: 307 books by 307 unique users

2. Testimonials, especially those which talk about how this project and its components have helped people get jobs

- I have started working on Scilab textbook companion with the guidance of my friend. Learning silab from the provided tutorials was easy. I am working in this internship from 3 months. My friends are also working in this internship. We help each other when anyone face any problem regarding any issue and our mentor is also supporting us.This was my 2nd textbook companion. I have successfully completed it. And this has been reviewed by Scilab Team. They provided kind support all the time and replies to our query. I have already received honorarium for my last internship. This was very helpful in my academic activities. This also helped me to reduce the financial burden from my father.

  Mohd. Arif, Department of Computer Science, Uttarakhand Technical University, Chandanwadi (Textbook Companion: Fundamentals of Electronic Devices)

- I had a previous knowledge of MATLAB, which helped me feel comfortable with Scilab interface in no time. The internship is a learning experience as well as benefiting from the financial aspect to any independent student. The surprising aspect is that the interface of Scilab is robust enough to perform decent set of engineering computational activities. There are still some glitches here and there but I hope they will get looked into and prevented from

future versions. The objective and contributions of the people behind this project are appreciable, and it should be remembered that there is a need to widely publicize the efficiency of the software and include more colleges/universities to participate in Lab Migration Project. Also, there is a greater necessity in attracting student community in participating in improving the Scilab software, just like many groups in IITs work on Aakash project. Overall, it is a wonderful experience and I shall participate in Textbook Companion again.

Viswanath Pasumarthi, Department of Chemical Engineering, IIT Guwahati (Textbook Companion: Numerical Methods for Scientists and Engineers)

- I learnt Scilab from the video lectures and resources available on the website. Although my internship is not yet completed but I can definitely say that I learned a lot in the process. Using Scilab to do such complex calculations and plotting graphs made the subject much more interesting. Learning new softwares and tools are always a plus point for student's profile. This project made the subject much more clear to me because I tried to think in a different way for the same problems. Moreover, If I am going to complete the internship, I will get a summer internship certificate from IIT Bombay along with a stipend which will be useful.

Avanesh Gupta, Department of Mechanical Engineering, IIT Bhubaneswar (Textbook Companion: Theory of Machines)

- I am very happy to give you my feedback regarding Scilab and this internship. During this internship, I didn't only learnt about programming aspect, it also helped me to strengthen my fundamental concepts of the subject. Mostly, I used "Matlab to Scilab conversion" feature of Scilab before submitting my codes as I have worked on Matlab from last two years. In my opinion, Scilab is a strong competitor for Matlab besides being open source.

Tanmay Agrawal, Department of Mechanical Engineering, NIT, Hamirpur (Textbook Companion: Principles of Heat Transfer)

- I learnt Scilab through online tutorials. It feels nice to have contributed to an open source knowledge repository.

Ashish Bora, Electrical Engineering, IIT-Bombay (Textbook Compan- ion: Basic Electrical Engineering)

- ˆI have learnt Scilab with the help of tutorials given on the website. My friends and mentor is also supporting me when I face any issue in the coding. This tool is very useful in computations and other academic activities. I have benefited from this internship, Since I no longer need to take Educational loan to pursue my study. I want to give thanks to complete Scilab Team.

  Nitin kumar, Department of Mechanical Engineering, NIT, Hamirpur (Textbook Companion: Turbomachinery Design and Theory)

- ˆI came to know about Scilab by Azeotropy 2k11 fest conducted in IIT-B, and there I attended Scilab workshop and came to know about Textbook Companion Project. I got introduction to Scilab in workshop and learned Scilab from the material provided in the workshop then in the coming summer I did internship under Textbook Companion Project and coded all the solved example problems of Process Systems Analysis and Control textbook into Scilab software (as per the rules of TextBook Companion Project only solved example problems should be coded). And I benefited from this internship in knowledge wise and monetarily also and got a certificate from IITB.

  K. Dheemanth, Department of Chemical Engineering, UCT (A), Os- mania University, Hyderabad (Textbook Companion: Process Systems Analysis and Control)

3 Any information where TBC are being used in regular courses

- ˆI Learnt Scilab from help topics, online pdfs and by downloading completed books codes and interpreting them. I have benefited in a lot many ways. I got to learn something new and its good to be a part of this emerging language. It also helped me understand my book subject thoroughly

  Saurav Suman, Department of Engineering, NIT Jamshedpur (Textbook Companion: Numerical Methods)

4 Details of money saved by various institutions by usage of FOSSEE components

- ***ˆEmail correspondence regarding SVNIT (S. V. National Institute of Technology, Ichchanath, Surat) saving money by switching over to Scilab***

- Forwarded message from Dr. Ashish Panchal <akp@eed.svnit.ac.in> -

Date: Wed, 4 Dec 2013 23:54:14 +0530 To: belur@iitb.ac.in Dear Sir,

In the year 2009-2010, S V National Institute of Technology had initiated the procedure for procuring MATLAB. In the mean time, Prof. M Belur and his team came to SVNIT Surat and introduced about similar freeware Scilab. They conducted introductory workshops/tutorials for the faculty and students. Thereon, the work was successfully transferred to Scilab instead of MATLAB. Hence the procurement of MATLAB tool boxes etc. were drastically reduced and we could save lot money because of introduction of such a freeware.

With regards. - - -

PANCHAL ASHISH K.,(Ph.D.,IIT Bombay) Associate Professor,

Electrical Engineering Department,

S. V. National Institute of Technology, Ichchanath, Surat-395007

Gujarat, India.

Ph. +91 261 2201674

- - -

- ***ˆEmail correspondence regarding AICTE's saving through the promotion of FOSS***

-- - - Forwarded message - - - -

From: Madhu N. Belur belur@ee.iitb.ac.in

Date: Tue, Nov 26, 2013 at 9:34 AM Subject: AICTE money saved To:

Kannan Moudgalya <kannan@iitb.ac.in>, Bella Devassy <belladevassy@gmail.com>, Usha Viswanathan <vichusha@gmail.com>, Kiran Isu <ikirankishore@gmail.com>

Cc: Nmsingh <nmsingh@vjti.org.in>, Dr. Navdeep M. Singh <nmsingh59@gmail.com>, Prabhu Ramachandran <prabhu@aero.iitb.ac.in>, Shivasubramanian Gopalakrishnan sgopalak@iitb.ac.in

Dear Kannan Sir,

I spoke to Prof. Navdeep Singh. The following lines are fine with him.

AICTE project evaluation committee saved about Rs. 2 crores due to various Faculty Development Programmes (FDPs) having been approved for onlyopen-source packages like Scilab and Python. Many of the proposals are typically for Matlab: this involves extensive license purchase first for the FDP and later by the colleges too. A large percent of the proposals are about training in proprietary

packages. We are told that AICTE FDP proposal committee has approved only FOSS equivalents thus saved the colleges and AICTE a huge amount.

If asked/insisted, it is ok to tell that we got this info from Prof. Navdeep Singh. Though it would also be in the minutes.

Singh Sir, I hope the above is ok.

With regards,
Madhu

5 Details of new modules proposed to be developed

Bring the newly identified FOSS, namely COIN-OR, Oscad and Open FOAM to the level of acceptability of Scilab and Python.

COIN-OR:

ˆDevelop tools to make the use of COIN-OR even more convenient. Some of theCOIN-OR tools, most notably CBC, IPOPT and Couenne lack interfaces to LibreOffice and Scilab and have limited operability with Python. We propose to develop interfaces to these software in the earlier stages of the project so that we can spread their popularity effectively in the later stages.

OpenFOAM:

ˆProviding teaching material and tutorials for OpenFOAM has been started at IIT Bombay and an enormous growth potential is seen in both the interest and usage of this software.

Oscad:

ˆ Oscad is a complete EDA tool for circuit design, simulation, analysis and PCB design. It also has some advanced features like model builder (to build model for electronic devices) and sub-circuit builder (for hirearchical circuit design).

ˆFuture work includes the following:

Enhancing the existing GUI of Oscad to make it user friendly.

Enhancement of mixed circuit simulations:

- In Oscad, now the analog blocks of the circuit is simulated using NgSpice. In order to simulate the digital blocks work is going on to add GHDL capabilities to Oscad.

Integrate OpenModelica with Oscad:

- ❖ Openmodelica is an open-source Modelica-based modeling and simulation environment which consists of OMOptim, a circuit optimization tool. By integrating OpenModelica to Oscad we plan to add this capability to Oscad.

Integrate IC (Integrated Circuit) layout design feature with Oscad:

- ❖ Adding IC layout design by integrating the open source software Magic with Oscad.

Conversion of PSpice Netlist to Oscad:

- ❖ We help students and teachers to migrate their circuit design done using proprietary software like PSpice to free and open source software Oscad.

- **Creation of additional Textbook companions,** migrating labs using proprietary software to Oscad and creation of spoken tutorials in Oscad which can serve as an excellent material for self learning.

Open Formal:

- ˆTraining on and popularizing the usage of FOSS tools and libraries already available for formal verification applications. This would include minisat, cudd, nusmv and cbmc. These tools are already available in a mature form, although they lack a user base outside those institutions where serious research activity in formal methods is undertaken. The goal of this component of the activity would be to make these tools accessible to a much larger set of institutions, so that these can be used for both educational purposes and to spur research in related areas.

- Converting a set of tools developed at CFDVS, IIT Bombay to a form where it can be released in the public-domain as a FOSS tool. These tools include a Quantified Boolean Formula (QBF) solver, a Quantifier Eliminator for Linear Arithmetic onBit-vectors and a Word-level Model Checker for VHDL Designs. Currently, we have working prototypes of all of these tools that have been applied to several large problem instances. However, these tools are not in the most polished forms, and have primarily been used in projects and research activities where the authors of the tools were themselves involved in a major way. Making these tools accessible to a larger community (both for educational and research purposes) requires significant re-factoring of the existing code, re-coding several parts in a modular form, and providing proper documentation and tutorials.

Appendix-XII

Financial Due Diligence of "Creation of Courseware e-content Development for remaining 58 UG Subjects at an enhanced rate of Rs.34, 000 per Module" by an independent agency (KPMG Report).

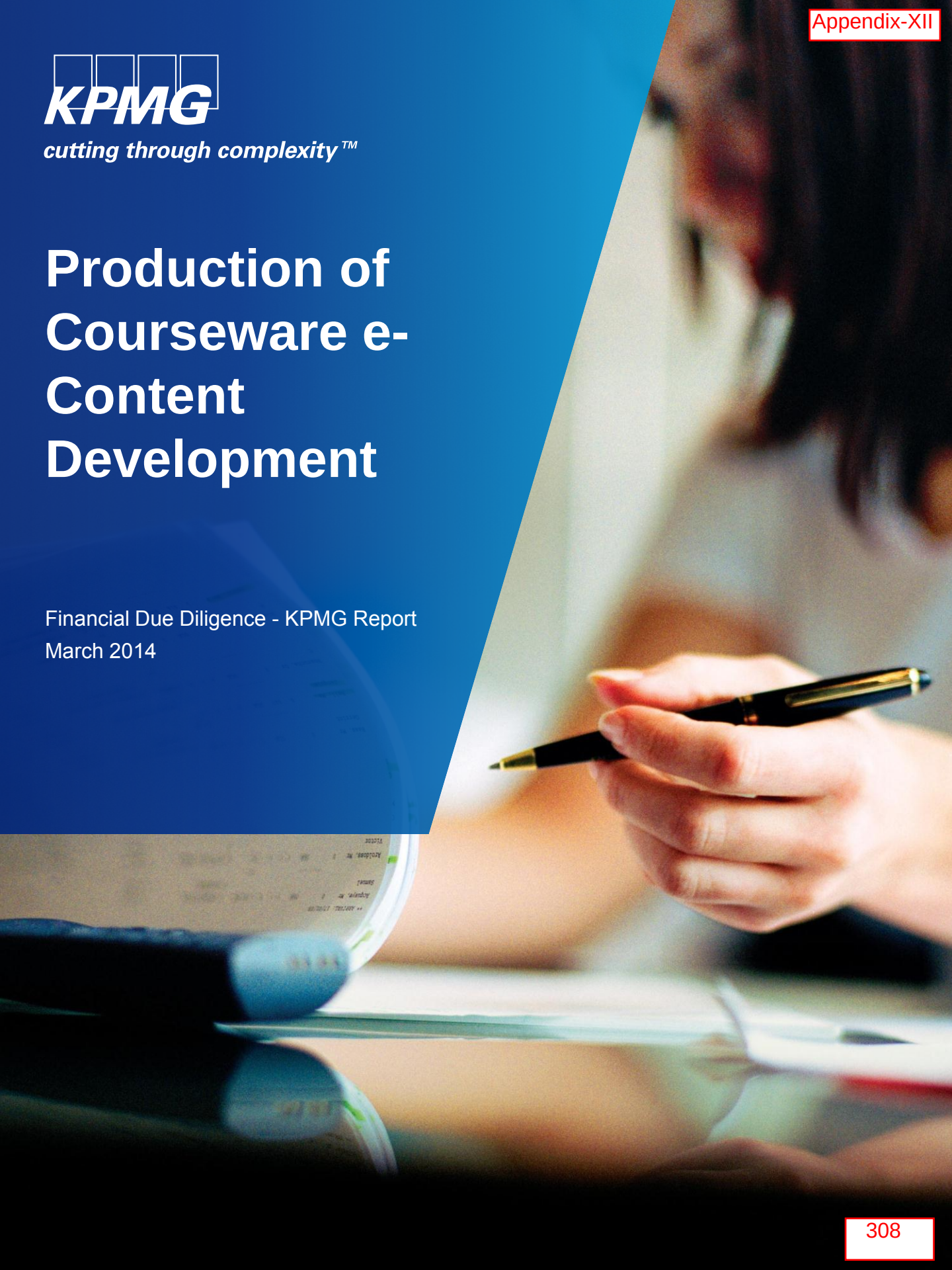
KPMG

cutting through complexity™

Production of Courseware e-Content Development

Financial Due Diligence - KPMG Report

March 2014



Production of Courseware e-Content Development
Project Background

Project Need	The rural-urban and gender bias in higher learning can be overcome by the utilization of e-learning materials by the institutions situated in rural areas.	
Proposed Benefits	While IGNOU and other open universities offer course ware and online content, the e-content courseware from this project will provide highest quality in terms of richness of the content and presentation. Benefits include, • Availability of e-Content in all subjects • Develop teachers' and experts' resources in e-Content creation • Availability of e-Content to teachers and students through various delivery modes for formal / non-formal education, for supplementing and complementing process of teaching and learning in higher education	
Pilot Phase Details	In Phase 1 of the project, 29 subjects (as against planned 19) with an average of 355 modules were developed by CEC, costing INR 18.21 cr. The e-content courseware for eight (8) undergraduate subjects has been made available online from 28th January, 2014.	
Project Scope	In Phase II, production of e-content courseware for remaining 58 subjects (58 subjects * 355 average modules each = 20590 total modules) shall be undertaken, with following activities in scope, • Production of e-Content Modules suitable for use in PC and internet. • Hold Academic, Production, Technical and Research workshops for successful development, upgrade and evaluation of project's objectives Given high focus on the richness and quality of content, for Phase II, the PI had recommended an increase in per module budget to INR 34,000 (from INR 17,500), with each module including, video lecture, transcript, e-book, assignment, certification. The same was accepted by the committee in 30th Nov 2013	
PI	Rajbir Singh, Nageshwar Nath (CEC)	
Project Duration	2 Years	
Budget (Phase 1)	**Proposed Budget**	**Revised Budget**
	INR 71.16 Cr	**INR 71.16 Cr**

Production of Courseware e-Content Development
Key Observations

Parameters	DPR Components / Clarifications / Resolutions	KPMG Comments
Budget Management	■ On a recommended budget of INR 34,000 per 1-hour module, the total proposed budget (content creation and workshops) is driven by a multiplier based on number of subjects (58) and modules (average 355 per subject) in scope (20590 total modules) ■ The output list for 20590 modules is not ready at this time	■ At planned milestones, NMEICT should review the project output (modules + quality) ensure actual output and resulting budget consumption alignment.
Technology Development	■ The completed e-content entire courseware will be made available on MHRD web portal www.sakshat.ac.in and CEC web portal www.cec-ugc.nic.in	■ This will be a very big value add, as it can facilitate future expansion (in terms of students and courses) ■ Standardization will be key, given that a consistent module delivery is being planned, hence the content creation will benefit from standard technical component, process, documents ■ Should plan for a knowledge sharing platform to share best practices and subject matter expertise

Production of Courseware e-Content Development
Project Financials

Budget Breakup (INR Lakhs)				
#	Component	Proposed Budget	Revised Budget	KPMG Comments
-	**Cost per Module**	0.34	0.34	▪ A dedicated committee in Dec 2013 after detailed review recommended a per module budget of INR 34,000 for a 1 hour module including, video lecture, transcript, e-book, assignment, certification. Based on Committee report's review, Phase 1 vs. Phase 2 cost breakup comparison and the understanding that significant part of content development cost in Phase I was allocated to UGC funds, KPMG doesn't find the recommended cost of INR 34,000 per module to be over-estimated.
-	**Average Modules per Subject**	355	355	▪ An average of 355 modules per subject (actual output list not available with the PI) has been taken to arrive at the total project cost. However, based on the review of total modules completed in Phase 1 for 8 subjects (1577 modules), the average number of modules developed is 197. Hence, the 'projected' average of 355 modules per subject is on the higher side leading to significantly higher budget request. As the PI at this time doesn't have the full list of modules for Phase 2 subjects, the average modules per subject for the purpose of budget calculation should be revisited (can be approx. same at Phase 1 average ~200) followed by formal milestone based output review during the course of the project
-	**Total Subjects**	58	58	
1	**Expenditure for e-content modules**	**7000**	**7000**	▪ **Total Subjects * Avg. Modules per Subject * Cost per Module**
2	**Workshops**	116	116	▪ An INR 2 lakhs per 5-days workshop (for each subject) involving around 40 participants and including travel, lodging, food and consumables is justified
	Phase 2 Total	**7116**	**7116**	▪ **No explicit cost savings at this time, however, the actual output (modules) should be reviewed to ensure output vs. budget consumption alignment**

Appendix-XIII

Proposal for “Creating Accessible Study Material for Print Impaired Student-Main Phase”.

Appendix-XIII

Proposal

For the Main Phase

Of the NMEICT Project

Creating Accessible Study Material for Print Impaired Students

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Creating Accessible Study Material for Print Impaired Students

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Objective

This project aims to solve the problem of non-availability of reading materials for print impaired students pursuing higher education courses in universities across the country. This will be achieved by converting and distributing course books and recommended reference books into an accessible e-text DAISY format. The material shall include books in English and regional medium languages. The e-text content can also be used to generate textbooks in Braille, large print and audio formats.

Through this project a large number of agencies and people including students will be involved in the book conversion process. Thus a larger pool of resources will be developed for future requirements as well as more people will be sensitized about the problems of the print impaired.

Along with the development of content, this project also aims to delve into research for development of new technologies which would help in creation of such content in easier manner and at lesser cost, provide ways of making study material other than text matter (e.g., figures, maps) accessible to the print impaired students.

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Background

The original proposal was submitted by the Centre for Internet and Society to MHRD-NMEICT for approval. A pilot phase was approved to IIT Kharagpur and a grant-in-aid of Rs. 53 lakhs was sanctioned. Under this Plot phase a total of 183 books have been converted and made available at http://www.cel.iitkgp.ernet.in/asm/. Training was imparted to several agencies for conversion of books in different languages and a pool of resource persons and agencies have been generated in this phase.

On the basis of the experience gained from the Pilot Phase of the project and as per the recommendations of the Project Review and Supervisory Group (PRSG) and the Standing Committee we present a proposal for the Main phase of the project "Creating Accessible Study Material for Print Impaired Students". About 5000 books in English, Hindi and other regional languages shall be taken up for conversion in this phase along with research for development of a few new technologies in this field.

Wide awareness campaign will be taken up with Universities/students/NGOs so that the contents generated reach the needy students.

Relevant recommendations given by the Standing Committee:

- Indian language TTS should be explored, IIT Kharagpur to look into technology development for this.
- The members felt that since the PI has completed the Pilot Project, looking into the importance and the uniqueness of the project to produce Accessible Study Material for Print Impaired Students, the PI should be encouraged to now take up the Main Project and re-plan the approach keeping in view the experience gained out of the Pilot Project.

Relevant recommendations given by the PRSG:

- The main phase of the project should include the development of a software tool for automatic DAISY tagging of digitised material, which is done manually right now.
- To sustain the interest of the project and create facilities in order to continue the availability of DAISY books even after the completion of the main phase of the project (where about 5000 books in different languages may be converted), some entrepreneurs

should be involved in the conversion process. They may do the conversion work initially under the project and once the project is over, they would continue to provide such services under a sustainable model.

- The scope of this project should also be extended to the conversion of books of the school level, specifically NCERT books.

Duration of the Project

Three years.

Amount of Grant Requested

Rs. 11.077 crores.

Methodology

The tasks under this project can be divided into the two following broad categories, which will again have several sub-categories, some of which may be carried out in parallel.

1. Content Generation
    a) Selection of books
    b) Training and capacity building
    c) Conversion of books
    d) Dissemination
2. Technology Development
    a) Automatic XML tagging of already digitised material
    b) Method(s) for making maps and figures accessible
    c) Simulation of science experiments through computer/web for understanding by print impaired students

d) Dissemination/delivery through web/computer with on the fly audio conversion

1. Content Generation

For content generation, the Hub and Spoke model, with one nodal agency (IIT Kharagpur) and several coordinating agencies (other IIT's, Universities and Colleges, to look after the actual conversion), may be followed.

Responsibilities of Nodal Agency:

- Selection and setting up of co-ordinating agencies, assignation of languages
- Setting guidelines for selection of books and refinement of guidelines for conversion process, proofreading and final DAISY conversion (as formulated under Pilot Phase)
- Setting up guidelines for selection of conversion centres and supervision of training process
- Allocation of fund to the coordinating agencies on the basis of assigned work, in a phase-wise manner (based on experience gained in Pilot Phase)
- Monitoring of progress of work under all coordinating agencies, reallocation of work (if needed)
- Sourcing of various tools and software for conversion process, including Indian language OCR and TTS tools (being developed under different projects)

Responsibilities of Coordinating Agencies:

- Selection of books in languages assigned to them
- Selection of conversion centres and provide appropriate training (with help from DAISY Consortium and DAISY Forum of India)
- Procurement of books, providing books to conversion centres
- Continuous monitoring of the progress of book conversion
- Selection of proofreaders and provide appropriate training
- Quality control and certification of content generated

On the basis of experience gained from the Pilot Phase, the following points are to be considered during the main phase.

Selection of Books: The recent Copyright Amendment Bill passed in Parliament on May 17, 2012 brings many changes making it possible for the print media to be made accessible for the print impaired students. As there is no need to take permission from the owners of the Copyright for converting the books to accessible format, the books can be selected according to the syllabus and the conversion can be started immediately. The list of books will have to be properly compiled, based on the need of the print impaired people, with the help of faculty members from different Universities and organisations under DFI. Some school level NCERT books with mathematical expressions and scientific symbols may also be taken up. A comprehensive list of all books already converted to DAISY format will have to be made so that work is not duplicated. It should also be tried to compile all such DAISY books (as much as possible) and keep it at one place (server) for dissemination.

Digitisation: Now-a-days, most of the publishers print their books digitally by preparing softcopies. The first part of the conversion job is digitising the books and this repetition can be avoided if these already digitised material can be made available for this project. The possibility of procuring this content may be explored.

Books which have already been printed can be scanned and converted to text using OCR. This method is used now for the English language books. Several institutions are developing OCR in Indian languages and once the software is suitably perfected (with about 90% accuracy), these will help reduce the time taken for digitisation of printed books. Very recently, people have started using Hindi OCR for digitisation.

Audio Conversion: The conversion to full DAISY format requires the availability of TTS (text to speech) software in the particular language. As proper TTS is available in English and Hindi, manual recording of audio is not required for these languages. At present, TTS is under development for many of the other Indian languages. Once these are ready, the time and cost for the conversion job will be very much reduced.

Conversion Centres: The following five conversion centres have been identified, trained (wherever needed) and used under the Pilot Phase, out of which the first three centres have

successfully completed all the books assigned to them. It is recommended that these three centres may be retained and the other two explored for future conversion work:

1. Indic Institute for Typing and Other Services, Lucknow for Hindi
2. RCMCT Worth Trust, Chennai for English and Tamil
3. Society for Natural Language Technology Research, Kolkata for Bengali and Assamese
4. National Association for the Blind, Mumbai for Marathi
5. SHWAAS for Marathi

Rates for Conversion: The following rates for conversion have been worked out in the pilot phase. It is recommended that this be used as a guideline while allowing suitable escalation in the cost.

	Conversion Rate (per 1000 characters including spaces)	Proofreading Rate (per 1000 characters including spaces)	Audio recording and synchronization (per page)
English	Rs. 8.00	Rs. 2.30	TTS used
Hindi	Rs. 9.00	Rs. 2.30	TTS used
Tamil	Rs. 10.00	Rs. 2.30	Rs. 60.00
Bengali	Rs. 13.00	Rs. 2.30	Rs. 60.00
Marathi	Rs. 13.00	Rs. 2.30	Not taken up
Assamese	Rs. 13.00	Rs. 2.30	Not taken up

Dissemination: It is proposed that all the content developed under this project be uploaded in a dedicated server kept at IIT Kharagpur. The users (either print impaired individuals or universities/colleges/organizations where such people are enrolled/attached) can register themselves and then download as per their requirement. During the tenure of the project, awareness should be generated among such people regarding the availability of the books from the particular website.

A total of 5000 books are targeted in this phase of work, out of which 2500 would be in English, and rest 2500 in Indian languages. This break-up may be readjusted during the project, depending on the progress of work in different languages and the requirement of books.

The proportion of books to be converted from the 22 scheduled languages of India may be taken up roughly on the basis of the speakers in the language

Percentage wise breakup of speakers of the scheduled languages of India:

Scheduled language	% of Speakers	No. of books
Assamese	1.6	50
Oriya	3.3	100
Urdu	5.3	150
Kannada	3.9	100
Gujarati	4.9	150
Tamil	6.3	150
Telugu	7.9	200
Punjabi	2.8	100
Bengali	8.3	200
Marathi	7.5	200
Malayalam	3.6	100
Hindi	40.2	1000
Total	95.6	2500

The other ten languages (Kashmiri, Sanskrit, Sindhi, Nepali, Konkani, Manipuri, Bodo, Santali, Maithili and Dogri) taken together have only 4.4% speakers and conversion of some books in these may be taken up provided specific requirements come up and resources are available.

2. Technology Development

The nodal agency, IIT Kharagpur, also plans to undertake research and development work in order to provide the print impaired students with some tools and means of accessing textual and other contents. Workshops with various stakeholders will be conducted for better understanding of requirements. User trials at different stages will be done on the various technologies being developed and trainings on the new technologies would be conducted.

Automatic XML tagging: It may be possible to procure material already digitised, either from the publishers or other sources. In order to convert these to DAISY format, in the present scenario, XML tags will have to be manually put in the appropriate places of these documents. A software tool may be developed for automatic insertion of such tags, as much as possible, so that time is saved. Alternately, an editor with XML tag insertion facility may be developed for opening the document and inserting the tags in this semi-automatic manner.

Making maps and figures accessible: Though the text matters in a book can be read out, the description provided for maps and other figures are not easily understood by the visually challenged people. There should be some ways of representing these figures on a tactile device, through which the visually challenged may be able to have a proper feeling and understanding. The presently available system for tactile display of figures and maps are though dots printed on Braille papers. For every figure, a separate sheet has to be used, which makes it bulky and cumbersome. Also, any immediate change in the figure is not possible. Whereas refreshable tactile displays would be able to represent as many figures as possible for a particular size and changes can be directly reflected.

Tactile displays have been used for man-machine interface, as a complement or substitution of the visual presentation of information. Several groups of researchers are investigating the development and use of tactile interfaces. Current research is exploring the human capability to detect different surface textures, colors, and complex patterns and utilize the findings in the development of practical devices. However even as research issues start to be resolved, practical problems in engineering and manufacturing versatile displays that can present tactile sensations to various hand and body areas remain to be tackled in order to arrive at new products with practical use. Pressure, Vibration, Electric field, temperature signals have been used in the different tactile systems implemented so far.

A tactile display system is proposed where a vibration feedback (aided with audio) will be given to the user externally and used for learning of maps and figures. It would essentially be a low or reasonable cost system. This will involve the development of a hardware device along with suitable software and this device can be made available at University libraries, or if possible, interfaced with portable devices (low cost tablets like Akash) to be used by individuals.

The system proposed can be of the following two types:

1. Based on a computer with touch screen monitor and vibrating arrangements with USB interface. This device is expected to be costlier for individual use and is targeted for institutes and libraries.
2. Tablets and other portable devices (such as Akash) and vibrating arrangements with USB interface. This system is expected to be of lower cost and is intended for individual users.

The proposed system will depict tactile information and/or audible information to guide the user through a 2-D map or figure on the touch screen. There will not be any relief map or figure placed on the screen, it will be a normal touch screen connected to a computer on which various maps and figures will be displayed as required. Based on the position of the finger(s) on the touch screen, a USB device will send vibration signals to the user's finger(s) for guiding the user. Simultaneous Audio feedback regarding the position of the finger on the map or figure will also be given for the user's help. The level of frequency and/or amplitude of vibration can denote the distance from a target point on the screen.

Studies have to be conducted on how well users differentiate the changes in signal frequencies and amplitudes. Based on the studies the various levels of frequency and amplitude can be set for representing different parameters.

Multiple vibration sensations may be sent to both hands of the user as per convenience. A protocol has to be devised for this and the users have to be trained at first and the system can be further fine tuned on the basis of their feedback.

For example, a geometrical figure (such as a triangle or rectangle) is to be traced on the touchscreen by the user. The figure may be drawn first, and on moving a finger over the screen, as soon as the user touches any point of the figure, he/she gets a vibration signal. Then the outline of the figure can be traced by moving the finger on the screen as guided by audio feedback. Alternatively, the user may place a finger on a point on the screen and the figure can be generated about that point. After trying with simple geometrical figures, the user can move on to maps and contents may also be created for teaching theorems and problems of geometry through the system.

The software for the above system would be developed with a two-fold purpose. One part would be for development of educational content, which can be used by teachers and trainers. The other part would be for the use of students, who would be able to use the generated content for learning purpose.

In future, refreshable tactile displays can also be developed through the two possible techniques, (1) Electro-active polymers and (2) Electro-vibrating touch screen (Tesla-Touch), on which a lot of research is being done at present

In recent years, electro-active polymers are being used to develop dynamic tactile interfaces for visually impaired people in fast reading and computer-assisted communication. One such interface may consist of three layers. The top layer would be a deformable electro-active polymer film covered with a thin film of gold; the middle layer containing electrodes that would address different positions of the polymer film; and the bottom layer would be a touch-sensitive screen connected to a computer to provide feedback on the position touched by the user. When a voltage is applied to the electrodes, the corresponding segment of the film extends above the film surface, creating a bump that can be sensed by the fingertip.

Disney Research lab is working on TeslaTouch, a new technology for enhancing touch interfaces with tactile sensations. TeslaTouch is based on the electro-vibration phenomenon and does not use any moving parts. It would provide a wide range of tactile sensations to fingers sliding across the display surface. TeslaTouch can be easily combined with a wide range of touch sensing technologies, including capacitive, optical and resistive touch screens. When combined with an interactive display and touch input, it would allow the user to feel virtual elements through touch.

Both these technologies are in the development stage and not yet commercially available. A provision may be kept in this project for using either of the above devices for experimentation, once available commercially.

Simulation of science experiments: This is a very challenging work. It is proposed to take up a few science experiments (taught at the school level) and depict these through audio and tactile devices along with suitable software. Though this will be more like content generation, there are a lot of technicalities involved and there will not be any general method for implementation and lots of technical work will be involved. Inputs from user groups have to be evaluated to work out the type of contents to be developed.

Delivery through web/computer with on the fly audio conversion: The full audio DAISY books can be read by computers, many portable devices as well as directly from websites. But all of these make use of mp3 files, which are stored locally in the device, or in the web server. Instead of handling such large amount of data for each book, it may be possible to read out the books through TTS installed in the local device or on the web server. At present, as English and Hindi TTS are available, a new type of DAISY reader may be developed which will be able to use such

TTS. There would be an option to add other languages seamlessly as soon as TTS for other Indian languages are made available.

Estimated Budget: Rupees eleven crores seven lakhs seventy thousand only.

(All figures are in lakhs of Rupees)

Sl.	Particulars		Cost
1.	**Cost of Conversion of 5000 Books**		637.5
	(To be paid to Conversion Centres as per progress of work)	637.5	
2.	**Manpower**		174.0
	Consultant (Part time) – IIT Kharagpur	15	
	Research Personnel (4) – IIT Kharagpur	60	
	Administrative Personnel (1) – IIT Kharagpur	9	
	Technical Personnel (5) – One at each Coordinating Centres	45	
	Administrative Personnel (5) – One at each Coordinating Centres	45	
3.	**Equipment and Accessories**		46.5
	Dedicated Server – IIT Kharagpur	5	
	Desktop PC's (4 nos.) – IIT Kharagpur	2	
	Laptop (5 nos.) – IIT Kharagpur	2.5	
	Printer (2 nos.) – IIT Kharagpur	1	
	Braille Printer, Display, Image Enhancer – IIT Kharagpur	7.5	
	Handheld devices like Akash – IIT Kharagpur	1	
	Tactile components – IIT Kharagpur	10	
	Software and Conversion Tools – IIT Kharagpur	10	
	Desktop PC's (10 nos.) – Two at each Coordinating Centres	5	
	Printers (5) – One at each Coordinating Centres	2.5	
4.	**Consumables and Contingency**		67.0
	IIT Kharagpur – Rs. 4 lakhs per year	12	
	5 Coordinating agencies – Rs. 2 lakh each per year	30	
	Books	25	
5.	**Travel**		57.0
	IIT Kharagpur – Rs. 5 lakhs per year	15	
	5 Coordinating agencies – Rs. 2 lakhs each per year	30	
	Training – Rs. 1 lakh per training (12 times)	12	
6.	**Miscellaneous**		25.0
	Accessible Website Development – IIT Kharagpur	10	
	Workshops – IIT Kharagpur	6	
	User Trials for technologies being developed – IIT Kharagpur	4	
	Training for New Technologies – IIT Kharagpur	5	
	Sub-Total		1007.0
7.	**Overhead** @ 10% of sub-total		100.7
	Total		1107.7

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Estimate of conversion cost in Main Phase: All books are considered to have 350 pages, with average characters of 2200 per page.

Language	**No. of Books (yearwise)**				**Rate per book (Rs.)**	**Amount (Rs.)**
	1	**2**	**3**	**Total**		
English	500	1000	1000	2500	10500	2,62,50,000
Hindi	200	400	400	1000	12000	1,20,00,000
Regional Languages (Text only DAISY)	240	480	480	1200	12000	1,44,00,000
Regional Languages (With Audio)	60	120	120	300	37000	1,11,00,000
					TOTAL	**6,37,50,000**

As mentioned earlier, the cost of digitization will be reduced if the soft copies of the books are available free of cost in an easily accessible format (such as Open Office or MS Office documents) and in Unicode encoding and font. As most of the publishers were not even willing to allow their books to be converted to accessible format (experience of the Pilot Phase), this will have to be taken up at the Government level. However, if available, the rate of conversion of books will come down, the expected comparative figures are given in the following table. If it is possible to get softcopies of some books, it is proposed to take up the conversion of more number of books in the allocated budget.

	Typing or Scanning & OCR	1st Proof-reading	Marking up	Converting	Audio Converting	Total per page (Rs.)	Total per book (Rs.)
English without soft copy	6	4	6	6	8	30	10500
English with soft copy available	0	4	6	6	8	24	8400
Hindi without soft copy	8	4	6	6	10	34	11900
Hindi with soft copy available	0	4	6	6	10	26	9100
Other languages without soft copy (no audio)	12	6	6	10	0	34	11900
Other languages with soft copy available (no audio)	0	6	6	10	0	22	7700
Other languages without soft copy	12	6	6	10`	72	106	37100
Other languages with soft copy available	0	6	6	10`	72	94	32900

Year-wise budget:

IIT Kharagpur:

Head	**Year 1**	**Year 2**	**Year 3**	**Total**
Book Conversion (To be distributed to coordinating agencies based on volume of work undertaken)	127.50	255.00	255.00	637.50
Manpower	28.00	28.00	28.00	84.00
Equipment and Accessories	34.00	5.00	0.00	39.00
Consumables and Contingency	4.00	4.00	4.00	12.00
Travel	5.00	5.00	5.00	15.00
Miscellaneous	8.00	10.00	7.00	25.00
Sub-total	206.50	307.00	299.00	812.50
Overhead @ 10% of Sub-total	20.65	30.70	29.90	81.25
Total	227.15	337.70	328.90	893.75

Co-ordinating Agencies: To be distributed to each agency commensurate with the volume of work undertaken by them.

Head	**Year 1**	**Year 2**	**Year 3**	**Total**
Manpower	30.00	30.00	30.00	90.00
Equipment and Accessories	7.50	0.00	0.00	7.50
Consumables and Contingency (including books, postage etc.)	15.00	20.00	20.00	55.00
Travel (including training)	18.00	14.00	10.00	42.00
Sub-total	70.50	64.00	60.00	194.50
Overhead @ 10% of Sub-total	7.05	6.40	6.00	19.45
Total	77.55	70.40	66.00	213.95

Gantt Chart

A: Content Generation

Task / Months	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Website modification, development																																				
Selection of Coordinating Agencies																																				
Selection of Conversion Centres																																				
Book selection, procurement																																				
Trainings																																				
Conversion work																																				
Reports																																				

B: Technology Development

Task / Months	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Recruitment of manpower																																				
Interaction with user groups for requirement analysis																																				
Automatic XML tagging																																				
Making maps and figures accessible																																				
Delivery through web/computer with on the fly audio conversion																																				
Simulation of science experiments																																				
Consolidation of developed tools, software, hardware etc.																																				
Workshops, User trials, trainings for new technology																																				
Reports																																				

Appendix-XIV

Financial Due Diligence of "Creating Accessible Study Material for Print Impaired Student- Main Phase" by an independent agency (KPMG Report).

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Creating Accessible Study Material for Print Impaired Students

Financial Due Diligence - KPMG Report

07-March-2014

Creating Accessible Study Material for Print Impaired Students

Project Background

Project Need	Provide technology enabled free access of higher education courses and related content to print impaired students in universities across the country	
Proposed Benefits	Studies suggest that in India about 20,000 to 25,000 print impaired students are pursuing higher education but are hindered by the lack of availability of course material in accessible format. As soon as DAISY books become available free of cost, such students would (and the institutes offer the use of such books) be more empowered to pursue and complete their higher education	
Pilot Phase Details	Pilot phase was led by IIT Kharagpur and involved creation and dissemination of 183 DAISY books (including 115 with audio) with over 1000 students benefited from this. Pilot was executed with a budget of INR 53 lakhs. Several agencies were trained in the conversion of books in different languages, resulting in the creation of strong resource pool	
Project Scope	Conversion of 5,000 course books (both text and reference) targeted to both UG and PG levels of mostly Arts and Commerce streams (visually impaired people generally avoid Science stream, and conversion cost is also much higher). Additionally research in development of a few new technologies in this field Books will be converted to an accessible e-text DAISY format. The material shall include books in English and regional medium languages. The e-text content could also be used to generate textbooks in Braille, large print and audio formats. PRSG has recommended NCERT books to be in scope.	
PI	Pratha Pratim Chakrabarti, Anupam Basu, Sudeshna Sarkar (IIT Kharagpur)	
Project Duration	3 Years	
Budget	**Proposed Budget**	**Revised Budget**
	INR 11.07 Cr	**INR 10.28 Cr**

Creating Accessible Study Material for Print Impaired Students
Key Observations

Parameters	DPR Components / Clarifications / Resolutions	KPMG Comments
Books Conversion	■ 5000 books are envisaged to be converted into DAISY format in house with the assistance of 5 coordinating centers	■ Opportunity to consider outsourcing books conversion (lower costs, repetitive effort and requires no technology development/ expertise)
Availability of books in Soft Copy	■ At present, it is not possible to obtain softcopies of books in the required Unicode format as this format is generally not used by the publishers. Some books may be available in the PDF format, but would require similar amount of processing and hence, cost. ■ Softcopies in the available format would require more effort for conversion and publishers would not be willing to share these, fearing piracy.	■ This is a worst case scenario assuming that 100% of the books will not be available in relevant soft copy format. ■ As and when the soft copies become available, need to revalidate the cost
Technology Development	■ The nodal agency plans to undertake R&D work in order to provide the print impaired students with tools and means of accessing textual and other contents ■ These include : Automatic XML tagging, Making maps and figures accessible, Simulation of science experiments Delivery through web/computer with on the fly audio conversion	■ This will be a very big value add, as it can facilitate future expansion (in terms of students and courses) ■ Standardization will be key
Delivery, Dissemination	■ All the content developed will be uploaded in a dedicated server kept at IIT Kharagpur. The users (either print impaired individuals or Universities /colleges /organizations where such people are enrolled/attached) can register themselves and then download as per their requirement	■ Opportunity to migrate the content to a cloud in future – perhaps the NMEICT cloud, to ensure scalability and cost savings

Creating Accessible Study Material for Print Impaired Students

Project Financials

Budget Breakup (INR Lakhs)				
#	Component	Proposed Budget	Revised Budget	KPMG Comments
1	**Cost of Conversion of 5000 Books**	637.5	637.5	■ Cost of conversion of 5,000 books in the daisy format seems to be in line with industry standards
2	**Manpower**	174	174	■ Manpower consists of 16 employees Manpower costs seemed to be in line with project objectives, industry standards and ministry regulations
3	**Equipment and Accessories**	46.5	45.3	■ Equipment cost was revised in terms of cost of printers Other equipment and accessory costs seem to be in line
4	**Consumables and Contingency**	67	59.4	■ Cost of books was removed from consumables ■ Other consumables - medical facilities and housing were added
5	**Travel**	57	57	■ Travel cost seemed justified in terms of the spread of the project and requirements for travel
6	**Miscellaneous**	25	55	■ Reduction in Website development costs ■ Cost of books was re-allocated from Consumables ■ Lab development and Internet charges were also added to these costs
-	**Overhead @ 10% of sub-total**	100.7	0	■ Overheads were removed as a separate component of the budget as mission projects are advised not to have an overhead component
	Total	**1,107.7**	**1,028.2**	■ **Total savings of ~INR 80 Lakhs after the project review & due diligence by KPMG**

Appendix-XV

Financial Due Diligence of "Creation of an Expert Database (VIDWAN)" Project by an independent agency (KPMG Report).

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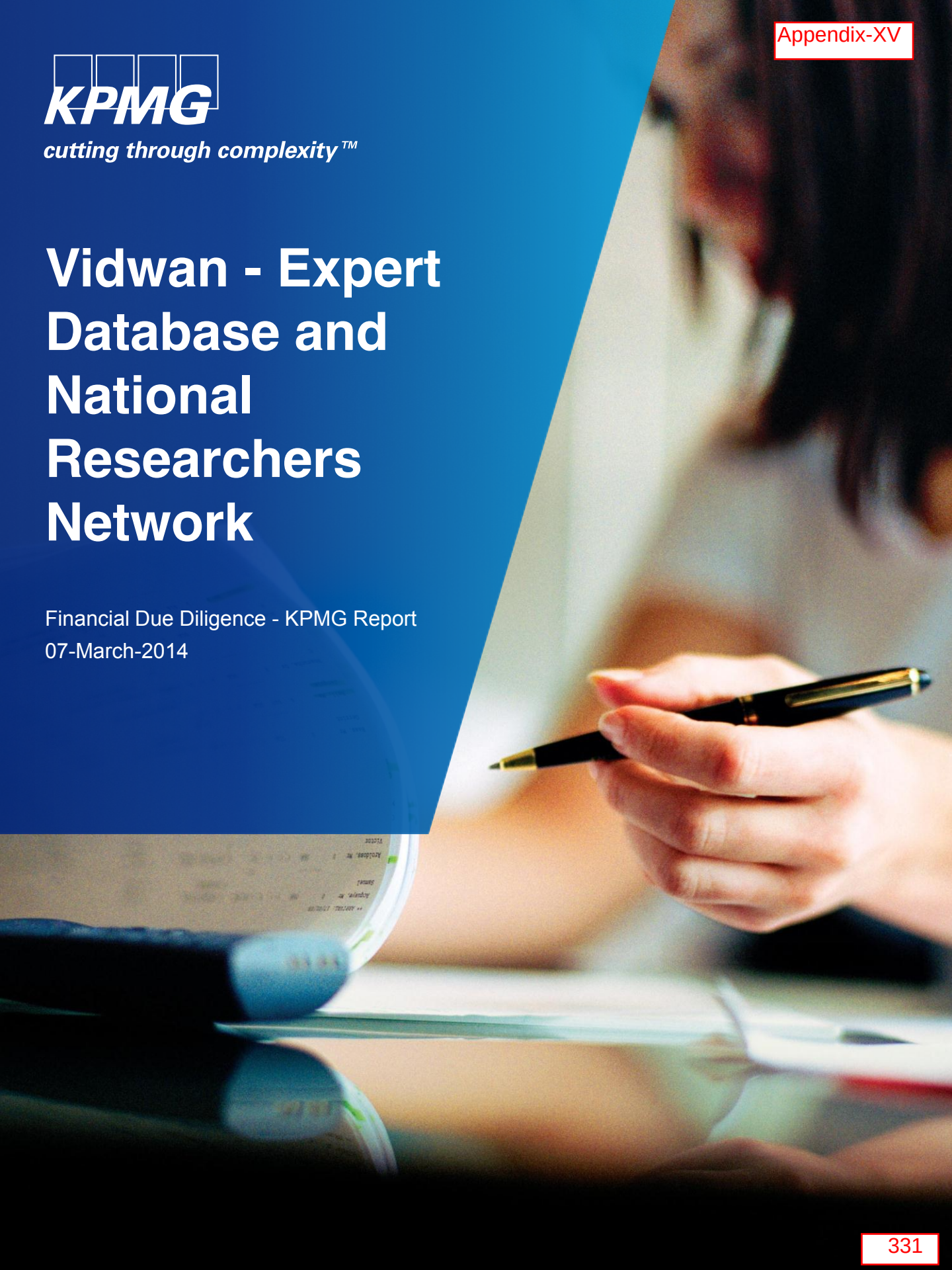
Vidwan - Expert Database and National Researchers Network

Financial Due Diligence - KPMG Report

07-March-2014



Vidwan - Expert Database and National Researchers Network
Project Background

Project Need	To create a central database of Indian experts in all subjects' disciplines with detailed profile information to create a platform for information exchanges & networking opportunities among scientists. This will enhance research momentum & research productivity in the country	
Proposed Benefits	Addresses the challenges relating to locating and coordinating with experts for guiding, research, project proposals and review panels. • Benefit to Experts / Scholars / Researchers community : Find potential scholars with similar expertise, Publicity of expertise to larger research community • Benefit to the R&D Organisation and Academic Institution : Improve faculty collaboration across organisations in India; Develop institutional strength in a given subject area • Benefit to the Policy Makers and Funding Agency : Identify experts for committees and expert panels; Identify areas of intensive research activity	
Project Scope	• Creation of Research Network database with Analytical capabilities and spatial mapping • Convert the existing profile data into RDF/XML format and integrate into semantic software • Update publication data of 11,500 profiles from external databases to the VIDWAN database • Promote the expert database system to reach out academic and R&D organisation • Continue inputting expert profiles through invitation, nomination and voluntary registration	
PI	Mr Kannan, INFLIBNET	
Project Duration	3 Years	
Budget	**Proposed Budget**	**Revised Budget**
	INR 55.38 Lakhs	**INR 52.70 Lakhs**

Vidwan - Expert Database and National Researchers Network
Key Observations

Parameters	DPR Components / Clarifications / Resolutions	KPMG Comments
Advocacy & Outreach	■ Wide publicity will be given through university news, advertisement in conferences & its proceedings and other publications. Deliver lecture and talk to the workshop and conference, where the research community gather ■ <u>The database will be populated through,</u> • Invitation to national & International Awardees and citation laureates • Nomination Head of Educational Institution, R&D organisation and National Level Academies • Voluntary registration	■ As field of research and subject matter continuously evolves, a structured and targeted advocacy is essential for widespread acknowledgement and acceptance of the database, thus creating the required pull & incentive for relevant experts to register with the database
Continuous Maintenance	■ Concerned experts will update his/her profile or Center will update profiles, as and when required ■ Integration with Orcid ID, Researcher ID, Scopus ID, and Google Scholar ID will update the publication information automatically ■ Integration with Sodhganga, IndCat will automatically update information on guided research and book written by the expert respectively	■ A continuous refresh and other agencies integrations will be required to keep expert profile relevant ■ Develop standard processes and system to reach out, remind and engage experts to update their profile regularly
Delivery, Dissemination	The development server will be deployed at the INFLIBNET Centre, Gandhinagar and Production server will be deployed at NMEICT Cloud	■ Ensure that content developed is available on the open cloud and accessible to others

Vidwan - Expert Database and National Researchers Network
Project Financials

Budget Breakup (INR Lakhs)				
#	Component	Proposed Budget	Revised Budget	KPMG Comments
1	**Capital Expenditure**	7	7	▪ Cost of a development server and other equipment like workstation, PCs, printers and scanners are for the first year and seem to be in line with industry standards
2	**Consumables, Travel & Miscellaneous**	16.4	13.99	▪ Travel related and Hardware costs were reduced based on recommendations based on similar expenses in other NMEICT projects ▪ Consumables, stationary, and promotional costs were reduced based on KPMG and PRSG recommendations
3	**Manpower (Contract)**	31.98	31.71	▪ Manpower cost and yearly increments were aligned (reduced) in line with standard practices
	Total	**55.38**	**52.70**	▪ **Total saving of ~INR 2.7 Lakhs after the project review & due diligence by KPMG**

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