EDUCATIONAL TECHNOLOGIES AND SATELLITE BASED EDUCATION FOR HIGHER EDUCATION IN KARNATAKA

(REPORT OF KJA TASK GROUP)

Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)

Government of Karnataka

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MESSAGE

Technology has certainly changed the way we live. We live in a technology-age and hence, it is important for us to be abreast with the latest inventions in the field. The introduction of technology in the educational field has made the process of learning and knowledge-sharing, a more interactive and pleasurable experience. With education, we acquire knowledge of the functioning and use of different pieces of technology. And with the application of technology, we can educate ourselves better. This is the impact that technology and education have on each other. Education boosts the use of technology and technology aids education. Perhaps, the greatest impact of technology on education is the change in perspective. The paradigm shift in thinking from local to global can be attributed to technology.

There is a great need for improving education quality and outreach using of advanced education technologies in Higher Education in Karnataka including assess gaps/issues in current education technology deployment and recommend actions required for enhancing educational outcomes in the State. Overall, the challenge of assessing the impact is more acute than ever. The rise in technologies and the range of ways that they can be used in diverse educational settings across the spectrum of learners, coupled with the pace of change of technology make the task ever more demanding. The focus must shift from the technologies to the pedagogies of use, and the analysis of general impact to the specific differences that technologies make to teaching and learning contexts and interactions with regard to different learners.

KJA TG recommended some of the educational technologies which to be implemented in educational institutions of the state through Higher Education Department of the Government of Karnataka. I am sure that the KJA initiative for the Educational Technology and Satellite Education will be considered by the Department and will be implemented effectively in the State. I thank to the Members of TG especially Sri. B. N. Suresh and Sri. Balakrishna Shetty, Co-chairs of the Group for their work and support in shaping this report. I am thankful to both Sri. S. V. Ranganath, Vice-Chairman, Karnataka Higher Education Council and Sri. Bharatlal Meena, Additional Chief Secretary for very useful inputs on the recommendations and implementation aspects of the report.

On behalf of the KJA, I am extremely pleased to present this report to Government of Karnataka for implementation.

March 14, 2016

(K. Kasturirangan)
Chairman
FOREWORD

Karnataka Jnana Aayoga (KJA) has been constituted by Government of Karnataka and is a body of experts and professionals in various fields who, together, bring a wealth of knowledge and expertise through news ideation, extensive brain-storming and wide consultations on important and relevant issues for the state’s governance and development. To address various issues, KJA has established number of smaller and dedicated groups or teams of experts – who address specific issues of education, sports, policies, arts, skill etc. These task groups/teams interface with relevant GoK departments and would come out with specific recommendations.

One such group that KJA has established is on Education Technologies and EduSat Utilisation Review. This group emphasized on the issue of using advanced education technologies in Higher Education and reviewing of the current EduSat Utilisation in the State – with a view to recommend specific technological steps for higher education, including satellite based education.

One of the important aspects in this direction that the KJA TG took up was to assess the usage of education technologies, and challenges thereof, to determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the state. TG has emphasised the importance of faculty and teachers in this overall scheme and stress for faculty orientation and involvement is given top priority. The TG convened a series of consultation meetings/ dialogue with faculty/experts of higher education of the State and generated necessary inputs. As part of continued consultation, TG has generated its report which comprising of present state of technology usage, institution education needs, review of available technologies, satellite-based educational technologies and key recommendations. KJA hopes that this report will be a core input to the Higher Education Department to bring some of the major changes in the education sector.

I would like to express my gratitude and thanks to Dr. B. N. Suresh and Dr. P. Balakrishna Shetty – Co-Chairs of the Task Group; to Prof. Viraj Kumar, Member-Secretary of the TG and also to all the KJA TG Members who took up this initiative in a successful manner. I would also like to thank Sri. S. V. Ranganath for his timely inputs which has helped the TG in a great manner. I also Thank Sri. Bharatlal Meena, Additional Chief Secretary, Higher Education Department for his co-operation and support.

March 14, 2016

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PREFACE

Karnataka Jnana Aayoga (KJA), at the request of the Higher Education Department of Government of Karnataka (GoK), constituted a Task Group for Educational Technology for Higher Education in Karnataka and EDUSAT Utilisation Review (TG ET-EUR) with the main objective of carrying out a detailed study on available technologies, and to recommend suitable advanced education technologies to enhance the quality of education in higher educational Institutions of Karnataka.

The TG organized a number of meetings and addressed various issues related to (a) existing technologies in the Institutions,(b) needs institutions that advanced technologies could address, (c) appropriate hardware and software configurations, (d) standardization of usage of the technologies across the state (in both urban and rural areas),(e)infrastructure needed to ensure fail-free services, (f) smooth assimilation of these technologies into the present education system, (g) content generation and content delivery, (h) usage of technologies for examinations and administrative purposes, (i) maintenance of equipment and training needs,(j) the role of satellite based education, (k) issues related to cost-effective implementation and (l) all other associated aspects.

While identifying suitable advanced technologies for improving the present education quality, maximum importance is given to the seamless integration of these advanced technologies with the present education system. The role of teachers/faculty in formal classroom-based education is also given due importance. Efforts have been made to blend the technology so recommended with the present education, since the right combination is needed to achieve the desired improvement in the quality of education.

The TG survey indicates that there are a rich and ever-growing variety of technologies available in the form of audio and video recording and editing software; computers, tablets and low-cost mobile devices; edu-conferencing, screen-casting and virtual classrooms; dedicated satellite-based education systems, high-speed computer networks for students and faculty; interactive displays; etc. There are also operational examples of self-instructional digital materials, including audio/video digital instructional materials, organized into learning management systems (LMS). Some of these systems integrate with computer-aided assessment, electronic performance support systems (EPSS), and many other applications for education. While a plethora of technologies are available, it is extremely important to choose the most suitable, effective, efficient and progressive technologies.

To assess and evaluate the specific technology requirements for a variety of educational institutions across the State in both rural and urban, and to evolve constructive and
implementable recommendations, the TG organized two workshops in Karnataka: one at Mysore in February 2015 (in association with the University of Mysore), and another at Bangalore (along with Bangalore University) in June 2015. The main purpose of these workshops was to understand the ways in which technology can play an effective role in higher education institutions in Karnataka, to understand the existing best practices, and to solicit inputs from participants to holistically study all aspects of technologies. The outcome of these workshops has been effectively utilized by the TG in formulating its recommendations.

The TG discussed the outcomes of these two workshops in detail in subsequent meetings, and considering the feedback received by workshop participants and all other relevant aspects of available technologies, identified the most suitable technologies which can be seamlessly assimilated into the present educational system in the state of Karnataka. Discussions were also held with the Principal Secretary Higher Education, GoK and also with the Vice Chairman of the Karnataka State Higher Education Council. Taking all this valuable feedback into account, the TG finalized its recommendations, as detailed in Section 7. While finalizing these recommendations, several aspects which are of utmost importance for effective implementation in all higher education institutions have been considered.

This report initially presents the status on present usage of technologies in various institutions in the state of Karnataka, and brings out the gaps in the existing systems. It also gives the Institution education needs, infrastructure requirements (e.g., uninterrupted power, internet access, maintenance requirements and several other related issues). The full spectrum of technologies, including satellite based educational technologies, have been brought out in detail.

The focus of recommendations is to ensure that Karnataka effectively implements the technologies in higher education and tries to bridge the rural-urban divide. A state-level Quality Assurance is recommended, and a state level mechanism is also recommended to choose the best quality e-content. The TG further recommends that GoK and ISRO should initiate discussions to ensure continuous satellite bandwidth allocation for the state’s education and training needs. One of the important recommendations is to encourage the faculty members to initiate research in Educational Technology. This will greatly assist teachers to actively utilize the technologies, and enhance their stature in society.

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- Prof. K. Rangappa, Vice-Chancellor, Mysore University, Mysuru for his helping hands in convening the workshop
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- Dr. Prabhakar, Director, IQAC, Bangalore University – specifically for organising the workshop and for steering the discussion
- Participants and experts of both the consultation workshops who made us to take up this issues in a successful manner
- KJA Secretariat for overall coordination
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Executive Summary

The objective of the Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review is to study in detail all available technologies for higher education, and to generate suitable recommendations for higher educational institutions in the state of Karnataka. Technologies were chosen based on appropriateness to address issues in both urban and rural areas, likelihood of smooth assimilation into the present education system, and cost-effectiveness.

The TG reviewed the present GoK initiatives for using technology in higher education. Several inefficient manual processes (related to admissions, examinations, etc.) have already been effectively streamlined using technology. The TG has reviewed Smart Classrooms established by the GoK, and has suggested a revised definition of Smart Classrooms based on perceived gaps. Similarly, the TG has reviewed the state of EDUSAT facilities, and has suggested cost-effective ways to upgrade these facilities. While technology can significantly improve efficiency and accountability, the TG reaffirms the importance of teachers, and has focused on technologies that enable teachers to be more effective. In the meanwhile, The TG organized a workshop at the University of Mysore in February 2015 to identify critical institutional needs. These include: electricity, support for equipment maintenance, reliable internet access, faculty training, local access to e-content, and a clear role for teachers using technology in their classrooms, and addressing gaps in existing technology interventions (including EDUSAT). The TG reviewed advances in Education Technology by conducting a workshop at Bangalore University in June 2015, as well as hosting other technology demonstrations. Two promising technologies for reliable internet access even in remote areas are satellite-based internet and the use of TV whitespace. Easy to use software for e-content creation, curation and management was identified, and enhancements to Receive-Only satellite Terminals with GSM-based two-way interactivity and local storage were assessed. Technology for examination evaluation does not encompass the full range of questions that teachers ask, but mature technology for conducting examinations exists.

The TG has characterized the difficulties in successfully using technology in higher education, and has crafted recommendations to ensure that Karnataka leads the country in the use of technology in higher education. The TG believes that this is critical to bridging the rural-urban divide. The recommendations are summarized below:

1. Every classroom in every higher education institution in the state should be converted into a Smart Classroom within the next three years. A revised definition of smart classrooms has been put forward, which critically includes requirements for power, internet, equipment and its maintenance.
2. Every higher education institution must have a Media Server so that relevant e-content is available to students and teachers at all times. The e-content in this repository must be copyright-free. The software should allow local teachers to add to the local repository, log content usage, and save content received via EDUSAT. Additionally, at least one Media Server should be installed in at least one public institution in every taluk (e.g., a State Public Library) so that high-quality e-content, counselling, etc. is available even to learners outside the formal education system, and can help them migrate to the formal system.
3. Every teacher in a Karnataka higher education institution must be provided tools and training to migrate all forms of instructional content that can be digitized into digital form, over the next five years. Tools include a Content Creator computer in each institution with software and hardware to record and edit videos, slides, etc., and high-quality recording studies in all A-grade institutions and Universities. Training includes funding for attending hands-on workshops.

4. A state-level Quality Assurance team should be constituted to identify areas where good-quality e-content is lacking, and to choose the best e-content. The team should frequently rate teachers’ usage of e-content based on creativity in blending existing content into teaching, and creating high-quality new content. The best teachers should receive state-wise recognition in the form of a Technology in Education Fellowship. A separate expert committee should be set up to investigate how to create a Cloud-based State-level Repository of such digital instructional materials.

5. Karnataka must upgrade its EDUSAT Hub and also upgrade all Receive-Only Terminals with 2-way interaction using terrestrial backhaul augmentation, and the ability to save all transmitted e-content to the institution Media Server. Funding for security guards must be provided to each institution, to protect the external-facing components.

6. Concerned GoK departments should set up an Interactive Satellite Education System Utilisation panel to oversee the effective usage of the pooled bandwidth capacity. The state-level Quality Assurance team should ensure that the quality of the material on this network is of appropriate standard.

7. GoK must engage in a dialogue with ISRO to discuss two key points:
   - A commitment partnership between Karnataka and ISRO to ensure satellite continuous bandwidth for the state’s education and training needs
   - A discussion on creating a configuration demand for an education-specific satellite of future using advanced technologies (multi-beam configuration, high-throughput transponders, etc.), even offering Karnataka as a test-bed for testing such satellites for education.

8. All administrative activities related to Admissions, Examinations and Transcripts that can be automated within the next two years. The technology is available today, but care must be taken to ensure that all data security and privacy concerns are adequately addressed.

9. Provide teachers with pathways to initiate research in Educational Technology. Not only will this enhance the stature of teachers in society, it will help teachers actively embrace technologies. These pathways include funding for: conducting research in technology usage in and developing tools for Karnataka higher education institutions, organizing hackathons to encourage academia-industry partnerships (especially with startups), and conducting conferences to share best practices. This initiative can be overseen by a state-level Educational Technologies group, formed by the Karnataka State Higher Education Council (KSHEC).
1. INTRODUCTION

With the proliferation of research and development in technology for education, there is no doubt that the right combination of technologies can dramatically enhance the quality of education. Keeping this in mind, the Higher Education Department (HED) of Government of Karnataka (GoK) requested Karnataka Jnana Aayoga (KJA) to carry out a detailed study on the usage of advanced education technologies, and the potential of emerging technologies for improving quality in higher educational Institutions of Karnataka. KJA deliberated this matter and constituted a Task Group for Educational Technology for Higher Education in Karnataka and EDUSAT Utilisation Review (TG ET-EUR) vide KJA: Order-06: KJA-EduTech-Taskgroup: 2014, dated November 17, 2014, with experts drawn from all over India. A copy of the order is given in Annexure I.

The main objective of the Task Group (TG) was to study in detail all available technologies, and to generate suitable recommendations for Education Technologies for higher educational Institutions in the state of Karnataka. The blueprint has to address (a) standardization of usage of the most appropriate technologies across the state, in both urban and rural areas, (b) smooth assimilation of these technologies into the present education system, and (c) identification of suitable actions for cost-effective implementation all across the state by GoK.

The TG organized a number of sittings/Meetings (Annexure II), and deliberated various issues related to hardware and software configurations, infrastructure needed to ensure fail-free services, content generation, content delivery, usage of technologies for examinations and administrative purposes, issues related to maintenance of equipment, training needs, the role of satellite based education, and several other associated issues. While identifying suitable technologies for improving the present education quality and outreach, maximum importance was given to the seamless integration of advanced education technologies with the present education system. Further the TG has ensured that the modernization efforts should lead to cost-effective implementations, and should result in quantifiable improvements of the education system in the State’s Higher Education sector.

While technology can significantly contribute towards efficient and effective education systems in higher education Institutions, the importance of teachers/faculty and formal classroom-based education should not be underestimated. The TG strongly believes that
“technologies or teachers” is a false dichotomy, and recognizes the potential for technology to modernize our education system while, at the same time, enabling our teachers to be more effective. Technology and education are a powerful combination if they are used to complement each other, and with a clear vision for each to achieve. Therefore, the challenge is to select appropriate technologies that can be seamlessly assimilated into the present educational system, in order to derive the maximum benefit.

The TG survey indicates that there are a rich and ever-growing variety of technologies available in the form of audio and video recording and editing software; computers, tablets and low-cost mobile devices; edu-conferencing, screen-casting and virtual classrooms; dedicated satellite-based education systems, high-speed computer networks for students and faculty; interactive displays; etc. There are also operational examples of self-instructional digital materials, including audio/video digital instructional materials, organized into learning management systems (LMS). Some of these systems integrate with computer-aided assessment, electronic performance support systems (EPSS), and many other applications for education. While a plethora of technologies are available, it is extremely important to choose the most suitable, effective, efficient and progressive technologies.

The TG recommendations also have to address the cost effectiveness of the system, ease of operation and maintenance of the systems, and training needs. In order to assess and evaluate the requirements for a variety of educational institutions across the State, and to evolve constructive and implementable recommendations, the TG felt a need to organize two workshops in Karnataka. The main purpose of these workshops was to understand the ways in which technology can play an effective role in higher education Institutions in Karnataka, to discuss existing best practices, and to solicit inputs from all participants to holistically study all aspects of technology for the TG’s action plan. The outcomes of these workshops have been effectively utilized by the TG in formulating its recommendations.

The first workshop was organized by the TG in association with University of Mysore on “Technology in Higher Education” on February 7, 2015 at Senate Hall, Manasagangotri Campus, University of Mysore (Annexure III). Principals, deans, heads of departments, teachers, other academic/non-academic staff, and students from all educational institutions affiliated to the University, as well as those in geographic proximity to
Mysore, were invited to attend. The purpose of this workshop was to understand the gaps in the education system. The workshop addressed issues with specific reference to (a) Educational Resources, (b) Satellite connectivity in Institutions, (c) Technology Infrastructure, (d) Educational Technology tools for academic processes and examinations, and (e) Inclusiveness in Higher Education and Research. The workshop generated very useful feedback on these focal issues.

On the basis of the first workshop, four key areas where technology was likely to have an impact within the existing system were identified: (a) educational content generation & management, (b) educational content delivery, (c) examinations and administration, and (d) interactive learning environments. In order to understand the state-of-the-art in technology in these areas, a second workshop was organized along with Bangalore University on “Assessing Technologies for Higher Education” at Jnana Jyothi Auditorium, Central University Campus, on 16-17th June, 2015 (Annexure IV). The main aim of this workshop was to assess/evaluate the various educational technologies available in the four focus areas, to determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the State, and to deliberate on future methods of technology assimilation, including satellite based education. Participants represented various higher education Institutions in and around Bangalore, with a similar mix to the first workshop. The useful feedback generated included willingness by faculty members to create and share customized lecture materials, recognition of the importance of two-way communication in class, and an appreciation of the issue of security and privacy with online examination systems. Important concerns raised by the participants with regards to basic infrastructure, namely power supply, backup and high-speed internet connectivity. Another major input was encouragement to create open-source tools, and some faculty members expressed their keen interest to develop such tools. Finally, the conference provided the TG with very valuable inputs on existing technology tools for content generation, content delivery, and for examinations. A set of broad requirements of all stakeholders on technologies was also generated.

The TG discussed the outcomes of these two workshops in detail in subsequent meetings, and finalized its recommendations, taking into account the feedback received by workshop participants. Discussions were also held with the Principal Secretary Higher Education, GoK and also with the Vice Chairman of the Karnataka State Higher
Education Council. Taking all this valuable feedback into account, the TG finalized its recommendations, as detailed in Section 7. While finalizing these recommendations, several aspects which are of utmost importance for effective implementation in all higher education Institutions in Karnataka have been considered, and the details are as given below.

a. Education technologies for each Institution all across Karnataka have been uniformly configured and, the requirements of colleges with very few facilities are also taken into consideration.

b. Details of upgradation of facilities are included, so that these can be done if needed in any of the Institutions.

c. The infrastructure requirements consider issues of cost effectiveness, and include the need for continuous power in every institution.

d. Maintenance and training aspects have been considered.

e. The system elements configured for each Institution are such that they are modular in nature, and can be implemented in a progressive manner over time across all Karnataka.

This report is organized as follows. Section 2 reviews the present focus of initiatives to use education technologies in Karnataka; and Section 3 examines the present institutional usage of such technologies. Section 4 reviews institutional needs, and Section 5 reviews the full spectrum of available technologies. Satellite-based technologies for education are explored in greater detail in Section 6. The specific recommendations of the TG include infrastructure needs, technology details, and maintenance and training requirements and listed in Section 7. The TG also recommends that implementation of education technologies occurs in a phased manner in Karnataka in Section 9. This phased roll-out recommendation is made specifically to study the effectiveness of the proposed recommendations over one year. Based on the experience gained in initial phases, any changes or modifications to elements of the proposed technologies can be identified and appropriately incorporated into subsequent phases all across Karnataka.
2. PRESENT FOCUS OF EDUCATION IN KARNATAKA

This section describes the Government of Karnataka’s current initiatives under the Department of Higher Education (DHE) and Department of Collegiate Education (DCE), and contextualizes these in relation to other national/international efforts.

2.1. Current Projects

The Government of Karnataka has initiated multi-pronged efforts to make use of technology in higher education. One of the key efforts is in using technology to streamline inefficient manual processes. The Departments of Higher Education and Collegiate Education (DHE and DCE) have worked with the National Informatics Centre (NIC) to develop software for a variety of tasks, including:

- Managing Admissions processes, including allocating seats to colleges
- Conducting examinations (entrance examinations as well as college examinations)
- Automated assessment (for restricted types of questions such as multiple-choice)
- Manual assessment (using scanned answer scripts)
- Monitoring projects, placements, entrepreneurship cell, industry interface
- Tracking student and staff attendance (using biometric scanning)
- Managing resources (e.g., assets, human resources including teacher exchange programmes, library resources, questions banks, alumni, donations, endowments, etc.)
- Managing data (e.g., student records, publications, legal records, grievances, self-assessments, Right to Information (RTI) data, accounting, etc.)
- Monitoring institutional quality for accreditation (e.g., NAAC, KSAAC), including student feedback, opinion polls, teacher awards/rewards, etc.
- Creating and managing e-newsletters, and tracking seminars, workshops, etc.
Dashboard software at the level of the Management

Some of these software solutions are still under development, but several are being rolled out in a phased manner across 711 undergraduate colleges and 17 Universities in the state.

An example of such a system is the Education Management Information System (eMIS), which is a web-based online system for the collection, integration and dissemination of accurate and reliable information from all Government First Grade Colleges to support for informed decision making, planning, monitoring and management of collegiate education system. In addition to developing the software, NIC also provides support in running the server. The high-level system architecture is as follows:

![High-Level View of Information Flow in Collegiate Education](http://www.dce.kar.nic.in/About_eMIS.html)

Source: [http://www.dce.kar.nic.in/About_eMIS.html](http://www.dce.kar.nic.in/About_eMIS.html)

Training has been provided for the implementation of this software developed by NIC.

Another key effort has been to develop content repositories containing high-quality e-content. The intention here is to encourage good-quality institutions (including private institutions) to develop and share their e-content and other resources with all other institutions. Thus, students at any institution in Karnataka should be able to access content from any other institution. This is aimed to primarily benefit students at institutions that are under-performing. Although such initiatives are yet to deliver results, some collaboration is underway. One of the first such collaborations is the “TUPUKU” collaboration between Tumkur University, PES University and Kuvempu University.

The Government of Karnataka has also established Smart Classrooms, initially in 50 Government First Grade Colleges across the state. These classrooms are equipped with
short-throw data-projectors and audio systems. In addition, e-content in the form of video lectures, e-Books, audio books and lecture notes pertaining to the undergraduate course syllabi, extra-curricular activities, and personality development modules have been pre-loaded onto lab computers, creating Virtual Classes. This content can be accessed on-demand in two ways: via the lab machines, and also on students’ own devices. One of the computers in the lab is configured as a Media Server and is used for storing e-content. Students can also download this e-content to their personal storage devices, like flash drives, or can download the data over Wireless Local Area Networks (WLAN), as shown in the schematic below:

Source: [http://www.dce.kar.nic.in/VirtualClasses.html](http://www.dce.kar.nic.in/VirtualClasses.html)

Also, Karnataka has enhanced its infrastructure in satellite-based education. A state-of-the-art broadcast studio with virtual class room arrangement has been setup for production and telecasting education programs through EDUSAT satellite, and 198 new Receive-Only Terminals (ROTs) have been setup in colleges during the year 2013-14.

### 2.2. Gaps in existing systems

None of the educational technology solutions can function without regular supply of electricity and (at least) somewhat regular internet connectivity. Thus, unless these major infrastructure demands are met, the institutions that require the most attention are not likely to see any significant improvements, and a significant performance gap will remain between institutions.

As the software for managing administration processes is deployed, there is no doubt that some gaps will be identified and corrected as part of the natural evolution and
integration of these systems. The stakeholders involved (administration staff, instructors, students, parents, etc.) should all benefit from seeing these systems function smoothly, so there is little reason to doubt that these facilities will be improved and used effectively.

With e-content, however, there is a significant gap in training teachers to utilize such content effectively in their own classrooms. The experience of the National Programme on Technology Enhanced Learning (NPTEL) and other national and international e-content development projects has been that the value of such e-content can be maximized when it is “blended” into regular classrooms. Not only does such blended learning improve the quality of the educational experience for students, it also gives teachers a way to improve their understanding of subjects by providing them with a good-quality baseline to start from. However, it is necessary to help teachers (particularly those who are unskilled at using computers) develop the skills needed to blend e-content into their classrooms through regular training. In addition, there is a wealth of e-content available online (both free as well as paid) that has been created by well-regarded national and international organizations. Teachers therefore need to be trained in curating such content, and tools need to be provided to help teachers store this curated content in a manner that is easily accessible to students.

The availability of e-content via virtual classrooms, with the facility to download such e-content onto students’ own devices or flash-drives, is extremely powerful. There is, however, a gap in helping students exploit these resources to their fullest. Such e-content repositories should become an integral part of a digital library, where e-content from lectures can be linked to e-content from other sources (including e-books, e-journals, etc.). It is necessary to provide students with easy-to-use tools to search for relevant e-content using both direct techniques (i.e., with the help of keywords related to the e-content) and indirect techniques (i.e., with the help of keywords from linked content). Such a facility will help students and teachers find what they need quickly, and will therefore encourage them to use the content more effectively.

Finally, there is a gap in precisely identifying the role to be played by satellite-based education in Karnataka. The existing satellite-based system beams content to only a small fraction of students in an institution at any given time, due to the limited number of rooms with satellite receivers. Thus, students are obliged to use the room on a rotational basis, which leads to severe scheduling complications. In addition, since the
vast majority of students who attend a live interactive lecture do not interact “live” with the expert instructor, it is unclear whether any pedagogical benefit is served by this model. As we shall explain later, satellite-based education (when run well) often uses the satellite network as an e-content delivery mechanism, which is an extremely expensive way to deliver e-content. Therefore, if satellite-based education is to have a role in Karnataka, it is critical to define the role it is meant to play, or else to no longer support such a system.

2.3. National and International Scenario

The efforts that Karnataka has launched have parallels at the national and international levels. Several institutions purchase commercial Enterprise Resource Planning (ERP) software and Learning Management Systems (LMS), or make modifications to open-source platforms such as OpenEduCat\(^1\) (an ERP) and Moodle\(^2\) (an LMS). The approach taken by Karnataka to partner with NIC has the advantage of being able to fully customize the software to suit the needs of the state’s education institutions, but it is likely to require a period of time during which errors in the software are discovered and rectified.

Among national efforts to develop good-quality e-content, the National Mission on Education through ICT (NME-ICT) has been highly successful, with the National Programme on Technology Enhanced Learning (NPTEL) being its flagship initiative for Engineering and basic Science courses. Recognizing the role and potential of Open Educational Resources (OER) in the knowledge economy, the National Knowledge Commission (NKC) in 2007 recommended creating a National Educational Foundation to develop a web-based repository of high quality educational resources as OER through a collaborative process, and further recommended strengthening faculty development and teacher training in the area of OER to improve quality. In September 2012, NPTEL released its materials under a CC-BY-NC-SA license. Similarly, the National Repository of Open Educational Resources (NROER) has adopted a CC-BY-SA license model. In addition to these national efforts, high-quality e-content has been created by international institutions and organizations such as MIT, Coursera, Udacity, Khan Academy and edX to name a few. The Government of Karnataka should naturally avoid duplicating such

\(^1\)https://www.openeduca.org/
\(^2\)https://moodle.org/
efforts, but can instead devote resources towards customizing this content in order to better match the curriculum and language of students in the state.

In addition to content generation, one of the goals of NME-ICT was to provide connectivity and access devices to institutions and learners. The National Knowledge Network (NKN) has linked a small number of institutions with reliable, high-speed connectivity. However, a large number of institutions, particularly those in rural areas, remained starved of regular internet (and, in some cases, even regular electricity). Furthermore, devices such as Akashi tablets have not proved as robust as commercially available low-cost computing devices, including smart phones and tablets.

Many countries have a single NME-ICT-like institution that is core to the implementation of ICT/education initiatives including Armenia (NaCET), Australia (EdNA), Chile (Enlaces), Costa Rica (Omar Dengo Foundation), Indonesia (Pustekkom), Malaysia (Smart Schools), Korea (KERIS), Portugal (eEscola), Thailand (NECTEC), UK (Becta), and Uruguay (Plan Ceibal). Countries with successful use-cases of ICT in education usually find helpful to give teachers freedom to decide how much usage of e-content is appropriate (interestingly, in both rich and poor countries, the use of ICTs for educational purposes predominantly happens outside educational institutions). For instance, studies have shown that usage of e-content in Malaysia is only about 20% of class time. Thus, although it is helpful for e-content to be always available, usage is not officially prescribed in countries that have adopted these technologies successfully. However, many countries begin with strong recommendations specifying how ICT and e-content should be used.

The United States has separate Office of Educational Technology (tech.ed.gov), which aims to: (1) promote equity of access by ensuring all learners are connected to broadband internet, (2) support Future Ready educators and a robust ecosystem of entrepreneurs and innovators, and (3) lead cutting-edge research in learning analytics and data, to provide new types of evidence and customize and improve learning. The use of technology to improve learning is three-fold: (1) ensuring that standards and learning objectives undergo a continuous process of revision (in response to a rapidly changing world), (2) to flexibly embody design principles from the learning sciences (including neuroscience), and (3) to reach all learners anytime and anywhere.
The US also uses technology to use assessment data for continuous improvement. Here, technology is used not only to improve assessment materials and processes, but also to ensure that students, educators, and other stakeholders are given timely and actionable feedback about student learning. Furthermore, care is taken to ensure that privacy is maintained while also enabling gathering and sharing of data on student learning for continuous improvement. Lastly, the infrastructure goals in the US are to ensure that students and educators have broadband access to the internet and adequate wireless connectivity using at least one access device with appropriate software.

Despite these well-crafted aims, it is important to note that technology has not always worked as intended in education in the US. In one well-studied example, students from a low-performing institution were given e-content from a world-class institution, created by gifted instructors. Students in these courses did not have access to local instructors, but were taught according to a traditional 12-week semester with deadlines, exams and grades. The performance of these students was poorer than those who were taught traditionally, and the experiment was quickly abandoned.

Nevertheless, there are numerous factors about India that suggest that such technologies can work when teachers are given adequate training and freedoms. Although India ranks 89th on the World Economic Forum’s Network Readiness Index\(^3\) behind China (18th), Malaysia (32nd), Sri Lanka (65th), and this ranking has been falling steadily (from 68th in 2013), our country has a vibrant telephony and internet market that ranks extremely high in terms of competition and affordability. Thus, there is tremendous scope for ICT to bring major improvements. This potential can be tapped particularly effectively in the state of Karnataka.

3. PRESENT STATE OF TECHNOLOGY USAGE IN INSTITUTIONS

This section describes best-practices in the use of technology in education in several Indian institutions. In particular, in order to assess the maturity level of technologies, this review includes best practices in technology usage by eminent public and private institutions, especially because there is a perception that private institutions have actively employed and assimilated technology. It is important to note that several of these best-practices are costly, and even well-funded institutions can rarely afford to incorporate all these practices at once. Nevertheless, a summary of all such practices does provide an overview of how technology is presently being used in higher education institutions in Karnataka.

3.1. Equipment Maintenance

Institutions carefully nurture long-term relationships with local vendors, through which most infrastructures (equipment and spares) are procured. In addition, institutions also create dedicated IT Teams (in some cases, one small team per department in addition to a large institutional team) with skilled technicians who can maintain equipment, identify impending faults, and interface with vendors on behalf of the institution to ensure that equipment is kept functional within a budget. Additionally, some equipment that requires specialized care is covered under AMCs (Annual Maintenance Contracts), and IT Teams are often involved in choosing suitable AMC providers on a competitive basis.

3.2. Learning Management Systems

Institutions often have a single server, or one server per department, for hosting all instructional e-content. This server typically runs Learning Management System (LMS) software, which can be customized to suit the needs of each individual institution. In addition to hosting e-content such as instructor-supplied lecture notes and related materials, an LMS manages a number of course-related functions (e.g., course announcements, student discussion forums, etc.) in one place. These features help students locate materials quickly, and also identify related materials easily. An LMS can, in fact, allow instructors to explicitly link different pieces of content so that students can navigate seamlessly from one type of content (e.g., a video) to another (e.g., a set of slides).
One of the most useful features of an LMS for instructors is its ability to manage electronic submissions of homework assignments. Not only does an LMS time-stamp each submission, it can also help detect plagiarism (from external sources such as websites, as well as between students). Furthermore, an LMS can automatically evaluate certain types of assignments (e.g., multiple choice questions, short-answer questions, etc.) and apply simple rules for partial evaluation (e.g., penalties for late submission). These features save instructors from tedious and time-consuming manual work, and therefore encourage them to assign more hands-on work for their students. This, in turn, can lead to improved learning outcomes for students.

3.3. Classroom Facilities

Classrooms are equipped with a fixed digital display that can be connected to the instructor’s laptop, which can be connected to high-speed internet either via Wi-Fi or LAN. Classrooms are equipped with an amplification system and speakers, which can also be connected to the instructor’s laptop. Some classrooms also allow the instructor’s voice and the digital display to be captured and combined into a video recording of each class, which can be made available to students via the LMS server. Some institutions have successfully been using smart boards for some several years, but unless good training and maintenance is provided, such systems can be fragile. Some instructors have successfully used clicker technology in their classrooms, which allows them to present multiple-choice questions to students, and obtain instant and anonymous feedback that conveys the level of student understanding, and allows instructors to adjust their pace accordingly.

3.4. Remote Lectures and Blended Learning

Indian educational institutions have been responsible for developing world-class software tools for conducting remote lectures, and are active users of this technology. Examples include the multimedia e-learning platform A-VIEW (Amrita Virtual Interactive e-Learning World) developed by Amrita e-Learning Labs, and BITS Pilani’s TelePresence software. Both these software tools simplify the process of conducting live lectures and transmitting audio, video from instructors to students via the internet. They also allow students to respond with questions and comments of their own, which are relayed to the instructor and other students also via the internet, either as an audio stream or as a chat message.
Some educational institutions in Karnataka with freedom and vision to experiment with content and delivery are exploring ways in which existing MOOCs (Massive Open Online Courses) can be blended into the traditional classroom. For example, BMS College (Bangalore) has experimented with Blended MOOCs, where students at the college register for a MOOC offered by IIT Bombay. The novel feature here is that instructors at IIT Bombay are responsible for creating evaluation instruments (assignments, quizzes and exams) worth 20% of the overall course grade. Hence, in addition to relying on subject-matter experts for content, a Blended MOOC also gives local faculty an insight into the design of high-quality assessments.

NPTEL has also recently announced the creation of Local Chapters, where institutions can partner with NPTEL to explain the value of these courses (e.g., by blending them into their regular courses), and encourage students to formally register for these MOOCs. Students who successfully pass the examinations (for which there is a fee and also some scholarships) earn certificates by NPTEL, IIT Madras and other well-recognized bodies. Although the number of institutions in Karnataka that have signed up as Local Chapters is small, this number is expected to increase as employers recognize the value of these certificates.

3.5. Computer-Based Testing

A small number of institutions have created and are experimenting with computer-based testing, which has the potential to improve fairness and efficiency in the evaluation process. Such tests can also be used to gradually build up a database of questions, which can be an extremely useful asset for students who wish to practice questions prior to examinations. Further details are presented in Section 5.5.
4. REVIEW OF INSTITUTION EDUCATION NEEDS

In order to assess institutional needs, the Task Group solicited feedback from principals, heads of departments, and teachers who attended the two Workshops at the University of Mysore and Bangalore University. The first and foremost need identified related to basic infrastructure, which includes regular electricity and internet access. Since electricity is so fundamental to any technological solution in higher education, the TG has explored this need in greater detail.

4.1. Electricity: the primary need

The Government of India has noted that after nearly seven decades of independence, a basic amenity like electricity is still not available to all. About 30 crore Indians have no access to power, and another 25 crore have access for as little as three to four hours per day. It has been estimated that this lack of power costs the economy 1%-3% percent of GDP. Although India produces about 300 gigawatts of power, it must add around 15 gigawatts each year for the next 30 years to keep up with rising demand for electricity. India has launched the Jawaharlal Nehru National Solar Mission to add 100 gigawatts of grid-connected solar power (double the total power generation capacity of Germany), and an additional 75 gigawatts from other renewable energy sources, predominantly wind, by 2022. Fifty-seven gigawatts of the new capacity is planned in the form of so-called “ultra-mega” projects, ranging in size from 500 megawatts up to 10 gigawatts. Unfortunately, power losses in transmission and distribution across India average around 25%, and power lines fail to reach many rural areas. Thus micro-grids, using local power sources at a scale where theft can be detected, are viable option.

In Karnataka, an ongoing joint initiative by Bangalore Electricity Supply Company and The Energy Resources Institute, with financial support from Hindustan Aeronautics Limited, has demonstrated how micro-grids can be created using spaces on college and school terraces to generate solar electricity for institutions, with excess being fed to the grid. This Sustainable Educational Institutions initiative has installed solar panels at 12 educational institutions (nine schools and three colleges) and one hostel, each with a capacity to generate between 5 to 15 kilowatts. The cost of installing a 10 kilowatt panel is about Rs. 12 lakh, without including the additional cost of procuring and maintaining UPS, inverter and battery systems.
As per the recommendations of this TG (Section 7), every classroom in each higher education institution will require at least 750 watts of uninterrupted power to operate basic equipment: the teacher’s laptop, a digital projector, audio equipment, and a few lights and fans. Thus, an investment of Rs. 12 lakh per institution will provide sufficient power for only 13 classrooms. This investment necessary to provide every classroom with power dwarfs the cost of every other recommendation made by this TG. Nevertheless this investment is the most essential one because no other technological solution will operate without power.

4.2. Maintenance of Equipment

Since any infrastructure is subject to wear and tear, it is necessary for schemes proposed by the TG to not only install infrastructure, but include provisions for maintaining equipment as needed. Indeed, “lack of power” and “lack of proper maintenance” is the two single largest reasons for which technology introduced by earlier efforts have failed to produce sustainable impact.

4.3. Reliable Internet Access

At many institutions in Karnataka, internet access is limited for students and faculty members. Sometimes, this is simply due to a lack of power. Even when power is available, internet access can be unavailable due to “last mile” connectivity issues, which is particularly true in remote areas. Here, terrestrial cables can be abruptly cut due to natural or human factors, and repair is often difficult. Even when internet access is possible on campus, access to internet connections is sometimes restricted to a limited set of people (e.g., the principal’s office), perhaps because of concerns that liberal access to bandwidth leads to wasteful usage. It is therefore expected that, at least in the short term, institutions with access to internet can expect occasional disruptions. Therefore, any recommendations made by the TG which rely on online tools should also ensure that these tools remain “somewhat functional” in an offline mode, so that core system features can be used even if the network connection fails. In this regard, the TG actively recommends adopting open-source tools, which can be tailored to suit such demands. It is encouraging to note that some faculty have stated interest in developing such tools.
4.4. Faculty Training

There is an urgent need for faculty training in both basic technology and in pedagogy using technology. This training should be non-disruptive to the regular work-schedule, and should therefore be conducted during summer months, or other relatively quiet times of the academic year. The technological solutions recommended by the TG have consciously been chosen with simplicity of use in mind. Consequently, short training sessions will be sufficient for most teachers to make good use of the proposed technologies. Training will need to pay special attention to the needs of senior faculty, many of whom are less familiar with basics than younger faculty and students with using technology. As a result, an accessible training resource should be made available to all faculty members who need a refresher on how to use the technology. Given the high faculty turnover at many institutions, training on technology must be periodic. Therefore, any undertaking to implement a particular technology must budget for the necessary cost and time for repeated training.

4.5. Local Repositories of e-Content and Student Access

Libraries in educational institutions usually purchase and subscribe to thousands of externally published electronic journals, electronic books and research databases. Most of these electronic resources are available to use both on-site and outside, but restricted to authorized users at an institution. Due to the terms of license agreements, access to such e-content is controlled by a system of authentication, and this may depend on the publisher or service provider of the resource. Thus, there is a great need for a state-level repository to create a high-quality collection of open e-learning/video content.

It is also necessary for teachers and students to access such materials easily. Such a repository could be created and managed on the lines of NPTEL. This e-content can include high-quality notes, created by teachers and also by students. Such notes can be helpful not only to students, but also for teachers who are often under severe stress to cover the syllabus. Furthermore, it is important to make all such e-content available throughout campus (i.e., in libraries, hostels, etc.).

In this regard it is necessary to formulate appropriate rules governing students’ use of mobile devices to access e-content via campus internet facilities. At present, many
institutions disallow mobile phones on campus, and such draconian measures need to be re-examined.

4.6. The Role of the Local Teacher

The importance of two-way communication between instructors and students in class is well recognized. Technologies that over-emphasize “one way” communication of e-content (which includes live lectures, or pre-recorded content with no inputs from the local teacher) often lead to student disengagement. Hence, any such technology intervention should recognize the vital role played by the local faculty member.

4.7. Improving Satellite-Based Education

Although there is a mixed opinion about Satellite-based Education across the State, there are concrete needs that can be addressed to improve such systems. Some faculty members in the TG consultation workshops stated that the training they had received did not prepare them for occasional hardware failures, and as a result the system was often in an unusable state. On the other hand, some faculty members and principals expressed happiness with the content and functionality of the EDUSAT programme, stating that it was functioning effectively at their institution. Nevertheless it is sometimes impossible for an EDUSAT class to be conducted normally (for a variety of reasons). In such circumstances, faculty have requested that the content should be made available for download (e.g., via the Department of Higher Education website, or on CDs).

4.8. Miscellaneous Needs

The need for a system to conduct examinations online and evaluate them automatically is particularly important for foundation courses with large enrolments. In such courses, automated evaluation can ensure accuracy and consistency in the evaluation, which is currently extremely difficult to achieve. However, online examinations may be unsuitable for higher-level courses. It is important to note that there is a great concern with regards to security and privacy issues when dealing with online examination systems.

When it comes to assessment of students’ assignments/projects, automated evaluation tools are once again useful. In addition, there is also a need for plagiarism detection
tools that can motivate students to produce original work. Such tools are necessary to address concerns regarding the ethical use of technology both in and out of colleges. It is well understood that students are outsourcing their projects/assignments/dissertation work, and there has been an explosion in websites where one can download pre-written assignments.

Many faculty members of educational institutions across the state have only limited time available, as they are engaged in numerous administrative roles. Thus, technology that can automate administrative tasks should be developed, which would create time for instructors to focus on teaching and research activities.
5. REVIEW OF FULL SPECTRUM OF TECHNOLOGIES AVAILABLE

This section summarizes the rich variety of technologies available today, with a focus on those technologies that can address the needs of educational institutions in Karnataka that have been identified in Sections 4.3, 4.5, 4.6, 4.7 and 4.8 (other needs identified in Section 4 are not directly addressable by technology, but require appropriate policies). Many of the technologies described here were demonstrated at the Bangalore University workshop conducted by the TG, but some were also demonstrated to TG members at PES University.

5.1. Technologies for Internet Access

The United Nations has estimated that 57% of the world’s population remains offline, and therefore cannot participate in the economic and educational benefits that the internet enables. Recent efforts by technology giants such as Facebook and Google to bring internet to large parts of the world have used non-terrestrial means to transmit data signals. These methods have the advantage of ensuring that internet access is relatively free from certain disruptions (e.g., human factors described in Section 4.3). Both companies have considered the use of solar-powered drones (e.g., Google’s Project Titan) that can circle pre-defined areas for months at a time as a team, providing continuous internet access via a network of laser beams. Google has also considered an alternative using balloon (Project Loon), which uses a different type of vehicle to perform a similar role. Facebook has also announced a partnership with Eutelsat Communications, which aims to provide internet access using satellites to sub-Saharan Africa over the Ka-band, with 75 cm. terrestrial antennae. Eutelsat already has experience delivering satellite-based internet to remote regions over the Ku-band, but spectrum in this band is limited and it also requires larger antennae.

The TG has made a careful study of satellite-based internet, by calling for a demonstration by a company working in this domain. In this demonstration, the receiving equipment consisted of an off-the-shelf 65 cm. antenna (available in the market for about Rs. 500), and required about two hours to install. It is important to note that this antenna is only used to receive (i.e., download) data. The volume of data that is transmitted (i.e., uploaded) by most internet users is extremely small in comparison to the received data. In order to avoid an expensive satellite transmitter, the demonstrated solution uses a 2G dongle to transmit a small amount of data.
(website URL, browser clicks, etc.) to a remote server. Large parts of Karnataka are already having at least one 2G provider, so such a set-up is feasible. The dongle and the antenna are connected to a set-top box (which costs approximately Rs. 20,000). In the demonstration, data was received at a steady rate of 1.7 Mbps, which can be increased with a larger receiver antenna. This bandwidth is adequate for downloading videos and other pre-recorded educational content, but it is insufficient for a live lecture. For the purposes of the demonstration, the current server only supports about 100 simultaneous users, but this server can be upgraded. The set-top box that was demonstrated can support up to 10 connections (either through the in-built Wi-Fi, or via a LAN connection). For the demonstration, a YouTube educational video was successfully played, with a small amount of buffering, but with adequate quality for a classroom.

Another extremely promising technology for widespread internet connectivity involves the use of TV whitespace. The necessary technology and policy decisions (with regards to spectrum, standards, etc.) are still being investigated, but initial studies suggest that the tradeoffs between quality and cost of connectivity is significantly more advantageous with this technology.

5.2. Technologies for e-Content Management

Online educational video repositories (e.g., NPTEL, Khan Academy, etc.) allow online queries to be performed, to help students and instructors locate and download content. Such facilities are extremely useful, but require internet access. An alternate model, therefore, is to manage a local repository of e-content that is likely to be useful to many users, and to provide access to this content over the LAN. This model, which has also been implemented by the Department of Collegiate Education (see Section 2.1), refers to the content-hosting platform as the Media Server. Technologies to query and serve this content were demonstrated at the Bangalore University workshop. As an example, the figure below shows the e-content management software system for the repository at the Indian Institute of Science, Bangalore:
The above figure shows the user typing in a portion of the word “algorithm”, and the system immediately responding with video lectures and other e-content that match this query. For this particular system, this is achieved using keywords. The interface below indicates how “title”, “description”, and other information can be manually provided at the time when each piece of contents uploaded. Queries are performed on this basis of this meta-information. Research efforts are underway to extract such information automatically (e.g., using character and speech recognition techniques), and an experimental platform supporting these advanced features was demonstrated at the Bangalore University workshop.
5.3. Technologies for Content Curation and Creation

A vast amount of e-content, much of it freely available, can be found online. Research efforts are underway to provide easy-to-use tools for instructors to identify appropriate content for a particular need, and present results in an organized manner to instructors.

The workshop at Bangalore University featured a number of software tools that can greatly simplify the task of creating good-quality digital notes and lecture videos. Furthermore, a variety of tools are now available for instructors to create their own e-textbooks, and major online publishers (e.g., Amazon) are now encouraging authors to publish do-it-yourself (DIY) e-books. In the context of Karnataka (and even across India), this opens up an exciting opportunity for instructors to publish in local languages. However, it is important to note that copyright issues (which are well handled by traditional publishers) do need to be properly addressed with DIY-textbooks.

Technology also exists to link e-content of one type with another. For instance, if an instructor wishes to link a set of slides or an interactive evaluation such as a quiz to a specific point in the video, it is possible to do so using digital footnotes associated with the video known as micro-notes. Viewers of a video with micro-notes are given the choice to continue with the video or navigate to related content whenever a micro-note is encountered. If the micro-note relates to a quiz, students can be evaluated and their scores can be recorded. This process is shown in the schematic below:

Source: www.televital.com

5.4. Technologies for Satellite-based Education

One of the concerns with the pedagogical model of satellite-based education (as currently implemented via the EDUSAT programme) is that there is very little opportunity for students to interact with instructors. Satellite Interactive Terminals
(SITs) have been developed as part of the EDUSAT system, however these are more expensive and difficult to maintain. As a result, most institutions which use EDUSAT content have Receive-Only Terminals (ROTs), which do not allow students to ask or answer questions. Nevertheless, technologies are now available to upgrade ROTs using an add-on system, which provides a limited amount of two-way interactivity using 2G connectivity, which is available in almost all areas. The TG has investigated this technology in detail, by inviting a provider for a demonstration.

The system is composed of two parts: the teacher-side and the student-side. The student-side consists of low-cost computing device (which could include a smartphone or tablet) running particular (proprietary) software and the teacher-side consists of a low-cost laptop/desktop running a (proprietary) application, and some additional hardware.

While watching a lecture via the ROT, students can ask questions in two ways: either by typing as an SMS or by “raising their hand” (in which case, a small amount of data is sent via a 2G connection). At the teacher-side, queries is received on the instructor’s terminal. When the teacher wishes to answer question(s), s/he can read out text questions (so that all can hear), or s/he can select the next “raised hand”. In the latter case, the software places a call to the correct classroom via a special hardware piece.

When the student asks a question, the audio heard by the teacher is also sent via a sound-mixer to the satellite uplink (on the teacher-side), so that the question is broadcast to all students. The teacher's answer is broadcast via the satellite system to all students. In places where ROTs have been successfully deployed, this technology enhances the existing satellite infrastructure very well.

In addition to enabling two-way interactivity, the add-on device can be used to monitor student attendance by periodically transmitting still images of the student-side captured via a webcam. If better connectivity (i.e., 3G) is available, it is also possible to transmit live videos.

The add-on unit can also be augmented to store a limited amount of received content, which must be periodically copied onto an external storage medium. Upgrading a single ROT with the add-on device and limited storage is estimated to cost between Rs. 15,000 and Rs. 20,000.
5.5. Technologies for Examinations

Mature technologies for managing complex examination processes were demonstrated at the Bangalore University workshop. Computer-based examinations can be conducted on secure browser-based platforms that can prevent students from performing certain tasks during the test (e.g., minimizing or closing the browser window, copy-pasting information out of or into the test environment, etc.). Furthermore, some environments automatically save student work in case there is a power failure, and allow students to pick up from where they left off once power is restored. Supporting software allows institutions to automate tedious manual tasks such as scheduling, assigning invigilators, disseminating grades, etc.

Despite these impressive capabilities, improvements need to be made in terms of assuring security of digital examination data, and in assuring the quality of such examinations. The latter point is especially important because although digital examinations can offer substantial benefits in terms of rapid and reliable grading, the types of questions that can easily be graded does not encompass the full range of questions that can be manually evaluated. Nevertheless, the range of questions that can be easily auto-graded is worth noting, and is summarized in the table below.

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Question type</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Multiple choice question</td>
<td>Single correct choice per question</td>
</tr>
<tr>
<td>2</td>
<td>Multi-select question</td>
<td>Zero or more correct choices per question</td>
</tr>
<tr>
<td>3</td>
<td>Fill in the blanks</td>
<td>Fill in the missing text with correct answer</td>
</tr>
<tr>
<td>4</td>
<td>Ordering</td>
<td>Order given choices in the correct order</td>
</tr>
<tr>
<td>5</td>
<td>Match the following</td>
<td>Match items in the left column with items in the right column</td>
</tr>
<tr>
<td>6</td>
<td>Short exact answer</td>
<td>Numeric value or expression, or particular keywords</td>
</tr>
</tbody>
</table>

In addition, several important variations of multiple-choice questions (MCQs) have been proposed in the educational research literature, including confidence-based marking (CBM) and MCQs with justifications (MCQJ), which can test student confidence and understanding with greater accuracy than simple MCQs, and are just as easy to auto-grade.
5.6. Virtual Laboratories

Virtual Laboratories can potentially provide students with realistic, hands-on experiences at a fraction of the cost of physical laboratories with expensive equipment and material costs. Although NME-ICT has started an initiative called VLabs, the experience from one lab to the next is non-uniform, and there is no standardization as far as hardware and software requirements are concerned to run these virtual labs in an effective manner. A more promising initiative has been launched by the Karnataka State Council for Science and Technology. Although this is aimed at laboratories at the school level, the technology itself is extensible to higher-education content.

5.7. Technologies for In-class Interaction

Classroom interaction can be improved greatly by interspersing lectures with problem-solving. A promising technology to promote this kind of interaction involves the use of clickers, which are similar to remote-controls, but have buttons marked A, B, C, etc. When an instructor displays a MCQ, students use their individual clickers to select the button corresponding to the choice which they think is best. A receiver connected to the instructor’s computer receives these signals, and the result can instantaneously be made available to both the instructor and the students. This technology permits instructors to immediately assess whether students are understanding a particular concept, and allows students to self-check their understanding anonymously, and in relation to their peers. Low-cost electronic clickers have been developed by IIT Bombay, and an even lower-cost paper-based system has been shown to work reliably by Microsoft Research India.
6. SATELLITE-BASED EDUCATIONAL TECHNOLOGIES

Karnataka is the first state to implement the satellite-based education system known as EDUSAT, and has successfully installed and operated a broad network of Receive-Only Terminals (ROTs). A tremendous amount of time and effort has been invested in utilising EDUSAT for school-level and higher education, resulting in rich experience in pedagogy, curriculum design, operations, maintenance, etc. using the EDUSAT system.

The present health of the EDUSAT infrastructure in Karnataka is a matter of concern. The Task Group has characterized the difficulties faced in successful implementation of satellite-based education in Karnataka, and has also investigated best-practices with regards to extracting the most from the existing EDUSAT programme. These are summarized in the findings detailed below.

6.1. Current Status of EDUSAT in Karnataka

The heart of the EDUSAT programme in Karnataka is the 6.3M Ku-band Hub located at the Department of State Educational Research and Training (DSERT), Bangalore. The Hub, until recently, was kept in operational condition by a Comprehensive Annual Maintenance Contract (CAMC). It has two Satellite Interactive Terminal (SIT) channels, and two Receive-Only Terminal (ROT) channels. The usage of this infrastructure is described below.

Department of Collegiate Education (DCE) utilizes one of the ROT channels for about 3 hours per day, and reaches out to 375 ROTs located in colleges all over the state. Content is prepared and edited using studio facilities at the Government Institute of Printing Technology building, located in Bangalore. This facility and the second ROT channel are both time-shared with the Department of Technical Education (DTE), which operates a further 200 ROTs, and also has a utilization of about 3 hours per day. DCE plans to update its existing ROTs with two-way interactivity (as explained in Section 5.4), together with a 5-year Annual Maintenance Contract (AMC). The DTE equipment is maintained on a per-call basis.

Visvesvaraya Technological University (VTU) has a network of 193 SITs, where facilities for teachers to deliver live lectures are maintained at DSERT in Bangalore. None of these facilities are covered by a CAMC at present, and there is no network utilization of this channel. DSERT operates 175 ROTs, but its 27 SITs are presently non-operational. This
channel is at present being used as an IP-ROT network with about 1000 additional ROTs, with interactivity through Internet/Phone. A small number of this infrastructure (10 SITs and 68 ROTs) is operated by Mysore Tele-education, for the purposes of higher education.

In addition, over 2,500 additional ROTs are used in the State for Primary Education (using one of the ROT channels).

6.2. Challenges Faced in Karnataka

It is clear from the preceding section that the EDUSAT infrastructure in Karnataka is severely under-utilized. There are several reasons for this situation, and although none of these reasons are unique to this State, certain best-practices from other deployments of EDUSAT can serve as useful guidelines for alleviating some of these challenges. While re-examining the role of satellite-based education in Karnataka, it will be important to address each of the following key challenges:

- **Power, maintenance and security of equipment.** There must be sufficient electricity, and funding to ensure that equipment (especially components that are exposed to the elements) can be well-protected, and properly maintained either with trained engineers, or under an AMC with reputable partners who offer reliable services at realistic rates. It is essential that institutions are given flexibility in selecting AMC providers, but must also be held accountable for their choices. Accountable management to ensure timely identification of faults and payment for services rendered can ensure that equipment is well maintained across geographically dispersed receiving sites. Based on available evidence, it appears to be significantly more challenging to maintain SITs than ROTs.

- **MoU for Maintaining the Hub.** Special attention must be devoted to the Hub – without which the entire network will fail to operate. Since this is a resources that is shared by multiple state government departments, it is essential to craft a MoU (Memorandum of Understanding) between the various stakeholders (viz. DSERT, DCE, DTE, VTU, Mysore Tele-education and the Department of Primary Education, Government of Karnataka), to ensure that roles and responsibilities are clearly delineated (e.g., who will operate the hub? Who will maintain it?). For ease of administration, it is advisable to invest in three separate servers at the teacher-end (costing about Rs. 10 lakh each).
• **Fitting timetables and curricula.** Institutions who wish to receive e-content “live” via satellite must adjust their timetables accordingly, and ensure that the content being broadcast matches their curriculum, and matches the skill-levels of students. This appears to be extremely difficult to ensure on a state-wide basis, and hence an unwanted tradeoff must be made between the value of “live” lectures on the one hand, and other educational goals including efficient utilization of time, curriculum coverage, etc.

• **Interactivity during lectures.** The purpose of SITs is to permit interactivity: if students have questions or comments during a lecture, they can ask the instructor. As explained above, SITs are difficult to maintain and are not being used at present in Karnataka, and they have also not proved effective in other EDUSAT deployments. In the DCE network, students and faculty can interact with the live sessions by sending SMS to dedicated mobile numbers. However, this mode of interaction has a significant delay. It is technologically feasible to achieve interactivity more effectively (see Section 5.4), but a more inclusive and effective way could be to involve the local instructor. At present, local instructors cannot play an active role during a live broadcast, because there is no break in the broadcast during which they can add their thoughts, answer questions for students, etc. As a result, it is well understood that very few students pay attention to these lectures.

• **Lack of content storage.** It is also worth noting that in some states, EDUSAT is only being used to delivery pre-recorded (not live) content. In such cases, a mechanism should be provided for ROTs to be able to record broadcasted content. Although such facilities are now being proposed by ISRO (see Section 6.3), it is worth noting that such content can be delivered via internet (e.g., via YouTube), and (far more cheaply) via hard-drives. Both these options for pre-recorded content delivery have been successfully demonstrated by NPTEL.

• **Satellite Interactive Terminals.** SITs are difficult to maintain because of their complexity, and also because of the expense, since they require specifically trained manpower. In addition, all new SITs require three licenses from the Department of Telecommunications (GoI) i.e., WPC, SACFA and NOCC licenses. These are difficult to procure, and have high one-time and recurring licensing fees. Keeping in mind alternatives for interactivity discussed in Section 5.4, SITs can be phased out.

### 6.3. National Plans for Satellite-Based Education

At the national level, ISRO has been in discussions with the Government of India to formulate plans for the future of satellite-based education. A map of the proposed new
network is shown below. As can be seen, one of the Hubs in the new network is at the ISTRAC facility in Bangalore. Thus Hub will be an 11 M Ku-Band DVB-S2 system with MPEG-2 transmission, which is similar to DTH Transmissions.

It is proposed that Karnataka will have five such networks, one each for Technical Education, Collegiate Education, Primary schools, TDCC (Mysore), and VTU. The latter’s network will have capability for interactivity, and a new add-on system for interactivity has been proposed.
New add-on system proposed by ISRO for interactivity

In this proposed system, interactivity will be achieved through existing 2G networks, and ROTs will also have the capability to record content, and store it for playback in the classroom at a more convenient time. Such a system has been demonstrated as a proof of concept, and has significantly lower capital costs than SITs (thanks to its reliance on commercially available components, which reduces the dependency on a single vendor). In addition, the maintenance costs are also much lower than SITs, since there is no need for highly-skilled staff. There are minimum licensing requirements, and ISRO estimates that the technology itself is future proof for at least 5 years.
7. TASK GROUP RECOMMENDATIONS

The goal of the Task Group’s recommendations are to ensure that Karnataka becomes the leading State in India, which utilizes technology wherever possible to enhance availability and accessibility of content (including in local languages), and improves the efficiency and accountability of evaluation and administrative processes related to education. The TG believes that such use of technology is critical to bridging the rural-urban divide. The recommendations for all Government higher-education institutions are summarized below.

7.1. Smart Classrooms

It is important to note that the notion of *smart classrooms* defined below goes considerably beyond the existing definition described in Section 2.1. The Government of Karnataka should strive to convert every classroom in every higher education institution in the state to a smart classroom as per the definition below within the next three years.

- A minimum of 750 watts of uninterrupted power must be available whenever a smart classroom is in use. Since reliable grid-power is not always available (even in urban areas), provisions must be made to store and locally generate sufficient power for all smart classrooms. There must be sufficient electrical outlets in each smart classroom to connect all equipment described below. The Government of Karnataka must first ensure that this minimum per-classroom requirement of reliable power is available before investing in the equipment necessary for smart classrooms (described below).

- All equipment in a smart classroom must be protected for normal wear-and-tear by warranties (for some duration after purchase) and by Maintenance Contracts (immediately thereafter). Every institution should be provided funds for maintaining equipment, but should be granted autonomy to award Maintenance Contracts, and to hire Junior Engineers to perform simple repairs and adjustments. Before investing in any equipment, the Government of Karnataka must ensure that adequate funds for equipment maintenance can be provided for institutions, and institutions must provide accountability mechanisms for ensuring that these funds are utilized to keep equipment properly maintained.

- Each smart classroom must have its own fixed digital projector for displaying a variety of e-content, with sufficient brightness for the room. A “short throw” projector is recommended, projecting onto a whiteboard. Alternatively, the
projector should project onto a plain white wall. A projector screen is not recommended. Each projector should have a remote control, and cables for both HDMI and VGA inputs.

- Each smart classroom should have a laptop that can be used to display slides, videos, and other e-content using the projector. It is recommended to provide one laptop per instructor, but one laptop per smart classroom is acceptable.
- Each smart classroom should have a sufficiently powerful audio system with cables to connect it to the laptop. It is recommended that at least two fixed speakers and an amplifier be provided, but portable speakers with built-in amplifiers may also be acceptable for some smart classrooms.
- Each smart classroom should have access to a shared 100Mbps Local Area Network (LAN) or Wireless LAN (W-LAN), through which the instructor can access the institution’s Media Server (see Section 7.2), and can also access the institution’s internet connection (which must have at least 5Mbps shared bandwidth).
- Since there is a considerable amount of equipment associated with a smart classroom, a secure (lockable) cabinet should be provided to store all equipment.

**7.2. Institutional Media Server**

Every institution of higher education in Karnataka must have a Media Server to store selected e-content locally, so that it is accessible even if internet is unavailable.

- All e-content on the Media Server should be copyright-free so that students can download it and redistribute it as necessary. In this regard, the model developed by NME-ICT can be followed.
- At minimum, the Media Server must store at least 8TB of data. It must be capable of handling at least 20 simultaneous requests for e-content over the LAN (e.g., from classrooms, student hostels, faculty offices, library computers, etc.).
- It must be possible for students to download any e-content available on their institution’s Media Server onto their own device (e.g., mobile device, USB drive, etc.) so that they can learn from this content anytime, anywhere (including in their own homes).
- The Media Server should ideally be located in a secure area (e.g., the institution’s library) where a dust-free, air-conditioned environment, and a dedicated power backup (2KVA is recommended) can be provided.
• Funding must be provided for the Media Server’s own Maintenance Contract and data backup. The latter should back data onto locally available media, and should also leverage cloud-based services (see section 7.3) whenever these are available.

• The software installed on the Media Server should be an easy-to-use Learning Management System (LMS) that allows instructors to add e-content (their own, or curate from other sources) at any time using individual login accounts. The organization of content in the LMS should be flexible enough to cater to varying institutional needs, but should support typical organizational units such as departments and courses. The LMS must permit students to easily locate relevant e-content.

• The Media Server should run secure Usage software that logs genuine usage of e-content (not just logins or page-views) by users at the institution. Institutions that demonstrate high usage of e-content (as per logs) should be provided additional funding to upgrade their hardware.

• The Media Server should run a download manager that allows authorized users (students, instructors and staff) to schedule “heavy” downloads (e.g., educational videos) at times of low network utilization. The logs of this software should also be used to assess e-content usage of institutions at the time of an audit.

• For institutions with EDUSAT facilities, it is highly recommended that the Media Server and the Receive Only Terminal computer should be the same. See Section 7.5 for details.

• Additionally, Media Servers should be created in every State Public Library, or in at least one public institution in every taluk. This will ensure that formal educational e-content of high quality is available to any learner, including those who are unable to attend formal educational institutions for economic reasons, or due to any other factors. The Media Server installation at such locations should also provide learners with access to counsellors to advise students on reintegrating into the formal education system (e.g., through need-based scholarships), to translate their existing skills into formal certifications, and to interactively connect them with academic institutions, employers and entrepreneurs.

7.3. Digital Instruction

Every instructor in a Karnataka higher education institution must be provided tools and training to migrate all forms of instructional content that can be digitized into digital form, over the next five years.
• Every institution should have at least one Content Creator computer that is accessible to instructors, with easy-to-use software and hardware necessary to record and edit e-content (presentations, video clips, etc.) on their own. This machine should ideally be located in a quiet area (such as a faculty staff room), and be internet enabled. Furthermore, the Usage software on the Media Server should log all content created by teachers. Such logs should be used as inputs while recognizing teachers for their contribution in adopting technology for higher education.

• Funds must be provided for institutions to conduct (or send faculty to) training workshops in basic technology and in pedagogy using technology. The training should ensure that teachers: (1) become comfortable with the use of technology, (2) understand how to successfully conduct lectures if and when equipment fails, and (3) learn how to blend existing content effectively with their own teaching. Training should be given on a priority basis to new hires, and to senior faculty who are unfamiliar with the use of technology.

• Every University and A-grade Institution should be provided funds to set up their own studio for recording high-quality e-content. These facilities should be made available to instructors at these institutions, as well as at all affiliated institutions. Instructors at non-affiliated institutions in geographical proximity should also be encouraged to make use of these facilities, to ensure the best utilization of these resources. Each such facility should conduct regular hands-on workshops for e-content creation by recognized experts, and should have at least one trained technician on hand to ensure that instructors can be given prompt help with any hardware and software issues.

• An expert committee should be set up to investigate how to create a Cloud-based State-level Repository of digital instructional materials. This Repository will provide both a single-point access for students and teachers to access content created by other institutions, and will provide data-backup for institutions for their local media servers. The model currently deployed by the Department of Higher Education using State Data Centres should be considered as a starting point.

7.4. Quality Assurance

A state-level Quality Assurance team should be constituted to (1) identify areas where good-quality e-content is lacking (or good-quality content is available, but translations into local languages are necessary) and issue appropriate “call for content” announcements, and (2) to choose the best e-content (in terms of quality, pedagogy,
etc.) developed by institutions in response to such “calls”. Such top-quality e-content should be made available for distribution to all institutions e.g., via the internet or satellite. This team must be responsible for ensuring that all e-content is (1) of a high academic standard (as per a clearly articulated and well-justified definition), (2) of relevance to the syllabi of target institutions, whose objectives may vary. To encourage content-creation in response to such calls, the following steps should be taken.

- Each institution should form an Internal Quality Assurance team consisting of nominated teachers who are responsible for ensuring that the content in the Media Server is of the best quality possible. This team should be empowered to delete any content on the basis of quality. A snapshot of the contents of the Media Server and Usage logs should be submitted to the state-level Quality Assurance team on an annual basis.
- The state-level Quality Assurance team should rate teachers’ usage of e-content on a frequent basis (at least once every 6 months). This rating should be in two separate categories: (a) creativity in blending existing content into teaching, and (b) creating high-quality new content. Teachers whose content is recognized as the best in each of these two categories by the state-level Quality Assurance team should receive state-wise recognition in the form of a Technology in Education Fellowship, which can be instituted in the form of merit-based awards. Recipients of these awards should be encouraged to use high-quality recording studios (see Section 6) to create better quality e-content, if necessary.

### 7.5. Satellite-based Education

The experiences of using satellite-based education in Karnataka have been mixed, with some very positive impacts in terms of educational outreach, and some operational difficulties. These have been detailed in Section 6.2. Despite these concerns, satellite-based education and training is an important technology element for disseminating education material, conducting live classes for distance learning, for training and orienting teachers via workshops, governance training, etc. Technical advances have made it possible to pool satellite bandwidth with terrestrial bandwidth, and this combined network infrastructure that can be maximally and effectively utilized around the clock. Considering this, the Task Group makes the following recommendations:

- Karnataka must move away from one-way satellite education to dedicated 2-way interactivity, which is a crucial requirement for effective education and training. All
institutions with operational EDUSAT equipment should be granted funds to upgrade their Receive-Only Terminals (ROT) with (1) the add-on for interactivity using terrestrial backhaul augmentation (see Section 5.4), and (2) the ability to record all transmitted e-content. SIT systems should be gradually phased out and replaced with robust and lower-cost ROTs with the above-mentioned augmentations.

- Ideally, the receiver-system’s computer in institutions should be the Media Server itself. Not only will this make it easy to store e-content received via satellite directly onto the Media Server, it will also permit any smart classroom (even multiple smart classrooms) to be connected interactively to remote experts via the LAN. This will eliminate one of the major bottlenecks in satellite-based education as it is currently implemented i.e., a single “EDUSAT classroom” that must be shared by students on a rotational basis.

- In order to protect expensive institutional equipment against willful damage/theft (especially equipment with external components such as ROT antennas), funds for at least two Security Guards must be provided to all institutions.

- The Government of Karnataka Departments for Higher Education and Vocational Training must set up an Interactive Satellite Education System Utilisation panel that oversees the usage of the pooled bandwidth capacity and ensures that they are utilized effectively for higher education, training, distance learning, etc. The state-level Quality Assurance team (see Section 7.4) should also ensure that the quality of the material on this network is of appropriate standard.

- The State must engage in a dialogue with ISRO on several fronts on an immediate basis (i.e., within six months) to discuss the following issues:
  i. Karnataka must assure itself of committed satellite bandwidth for education and training on a continuous basis (i.e., without any gaps). Discussions should focus on providing the State with dedicated transponder capacity on ISRO’s satellites, and a commitment partnership should be established.
  ii. Tremendous advances are happening in satellite communications, which can have lasting impact on future capabilities to provide education and training services. Satellite capabilities such as multi-beam configuration, high-throughput transponders, satellite switching networks, and dedicated satellite configurations for two-way synchronous/asynchronous communications are possible. Discussion with ISRO must create a configuration demand for advanced and education-specific satellite of future – even to the extent of offering Karnataka as a test-bed for testing such advanced communication satellites for education. It is recommended that a specific dialogue be taken
up with ISRO for such futuristic and advanced satellite based education systems.

In addition, the issues pertaining to the EDUSAT Hub raised in Section 6.2 must be addressed on an urgent basis. To reiterate, the immediate needs are: (1) crafting a Memorandum of Understanding between the various stakeholders (see Section 6.2 for details) to ensure that roles and responsibilities are clearly delineated, and (2) investing in three separate servers at the teacher-end (approximately Rs. 10 lakh each).

7.6. Technologies for Admissions, Examinations and Transcripts

All administrative activities related to Admissions, Examinations and Transcripts can be performed transparently and effectively using technology available today. Hence, these time-consuming and critical activities should be fully automated within the next two years, after carefully ensuring that all data security and privacy concerns are adequately addressed. In particular, the following processes can be immediately automated.

- All admissions processes (including seat allocations for colleges) should be automated.

- Examination question paper generation should be automated by extracting appropriate questions from subject-specific Question Banks. These should be created and maintained by each University, with a reliable mechanism for quality assurance.

- Student identification information (i.e., identity cards, hall tickets, etc.) should be generated electronically. For examinations, there must be automated systems to verify the identity of a student and their eligibility for a particular examination at the examination venue.

- The processes of scanning and anonymizing answer books, and disseminating the answers to evaluators for digital evaluation should be adopted.

- All questions that can be automatically graded (see Section 5.5) should be evaluated with no human intervention. For all other types of questions (i.e., subjective-type questions), the system should automatically detect significant discrepancies in scores given by multiple evaluators, and these should be automatically flagged for reassessment.
• Institutional transcripts should be automatically created, and should be available to alumni and potential employers (on a fee-basis) for up to at least 15 years after students graduate.

• Suitable Enterprise Resource Planning (ERP) software should be identified to integrate all data gathered by these processes.

In order to ensure greater efficiency and accountability in the examination process, efforts should be made to ensure that all examinations should become computer-based in the next five years. At present, several types of questions in a variety of subjects require written answers, diagrams, etc. Therefore, immediate efforts should be made to establish strong academia-industry partnerships to develop appropriate computer-based systems, or alternative question designs should be explored that do not compromise question quality, but can nevertheless be answered using computers.

7.7. Additional Technologies to be evaluated

The following technologies are promising, but are not quite mature enough (or cost-effective enough) for immediate adoption in higher education.

• Each classroom should have equipment to support clickers for in-class interaction.
• Each teacher should be provided with an automated attendance taking mechanism (e.g., biometric) that immediately uploads data to the attendance records, frees up valuable teacher time for instruction, and promotes greater accountability.
• Institutions should be equipped with a Secure Server where students can upload electronic assignments. Plagiarism-detection software should be installed on the Secure Server.

Note: The Task Group does not recommend “Smart boards” at this time, because of the lack of robustness of this technology (at present), together with the high costs of outlay, maintenance and training. Furthermore, the pedagogical benefit of “smart boards” over the technologies recommended here has not been adequately demonstrated.

7.8. Continuing Research into Technology for Education
The Task Group believes that an extremely effective way to enhance the stature of teachers in society is to help teachers actively embrace technologies, and to provide pathways for them to initiate research in Educational Technology.

The set of available and affordable technologies is rapidly growing, and this Task Group’s survey of technologies will necessarily become out of date in a short while. The Task Group therefore recommends identifying a small number of institutions where research into technologies for education (with emphasis on robust, low-cost technologies with minimal infrastructure demands) can be pursued. These institutions should be granted funds for:

- Conducting research in technology usage in higher education. Initial research focus can include creating open-source technologies (e.g., for creating content in a variety of languages), pedagogy for classrooms where students bring their own devices (e.g., low-cost smartphones), and building tools that allow teachers who actively use social media to share e-content, best practices, etc.
- Organizing hackathons. Students and startups in the educational technology space can be invited to turn promising research prototypes into robust software systems. These can be released as open-source projects, which can be iteratively improved by students as part of their project work.
- Organizing conferences. Institutions can share best-practices in pedagogy with use of technology, and outcomes of research and industry collaborations that have resulted in improved technologies for higher education.

In order to oversee these research activities, the Karnataka State Higher Education Council (KSHEC) should form a state-level Educational Technologies group to provide funds to conduct research, and to attend and organize Educational Technology conferences. The group should also assess the outcomes of these funded research projects conducted by teachers using established methods (i.e., peer-reviewed publications in quality conferences and journals of national and international repute).
8. IMPLEMENTABILITY, USABILITY AND INCLUSIVENESS OF PROPOSED TECHNOLOGIES

In order to tap the intellectual potential of Karnataka’s students, one of the goals of this Task Group is to identify and develop them by providing then state-of-the-art technology. The three most important concerns for Technology in Education are implementability, usability, and inclusiveness. These concerns are important because if advanced and costly technologies are implemented without duly addressing usage requirements and concerns of stakeholders, they may be allowed to fall into disrepair and eventually get outdated. Thus, it is essential to address these concerns.

8.1. Implementability

The technologies proposed by the TG are deliberately modest, keeping in mind the issue of implementability. The primary concern, as indicated in Section 4.1, is that providing minimum amount power to every classroom (which is necessary to enable technology) is extremely costly. One way in which costs can be lowered still further is to transform public libraries and other institutions allied with educational objectives into institutions that additionally support formal education.

Specifically, consider public libraries. In most cases, these are under-utilized. Hence, all such libraries can be converted into local Knowledge Centres of the state, and can host one or more Media Servers for nearby higher educational institutions. Furthermore, each Knowledge Centre can be equipped with reliable access to internet. Thus, even if it is infeasible to provide sufficient power and internet to all educational institutions in a district, each district can have at least one Knowledge Centre where students and teachers can access an internet-enabled Media Server as needed.

8.2. Usability

Since Knowledge Centres are public institutions open to all, the installed infrastructure can be used to impart computer skills to all interested community members. In particular, librarians can obtain training in using the equipment. Training will also need to be given to library staff on how to prevent misuse of equipment and internet facilities. All these efforts are necessary to ensure that the installed systems remain usable and accessible to all, especially in rural areas.
8.3. Inclusiveness

This is the most important aspect of technological solutions in higher education, because students will only respond to such innovations if it directly impacts their curriculum, and hence, their examination. Thus, although students from any part of the state should be able to access global or local online educational contents from any top institution, or online course repository (e.g., Coursera, Udacity, edX, etc.), students need to be given sufficient time and motivation to self-study from these resources. It is recommended that at least 6 hours in a week should be allotted to the students to access these contents from Knowledge Centres. These 6 hours can be considered as self-study, included in curriculum/ examinations. Faculty should guide the students on topics for self-study. Self-study or group study is a great method to explore the intellectual energy and innovative ideas of our students. At least 30% of the curriculum and exam questions should be from these self-study topics.
9. SCHEME ORIENTED ACTION PLAN AND IMPLEMENTATION STRATEGIES

As part of post implementation services, the supplier of hardware/software and other infrastructures provided for a period of 3 years with comprehensive ATS Support to the hardware at no additional cost. It shall include:

- Warranty support
- Annual Technical Support
- Handholding services
  - O&M for servers and related infrastructure supplied and commissioned
  - Central Helpdesk from the STATE designated premises
  - Software maintenance and support services
  - Application functional support services

9.1. Capacity Building

Department shall have at least 20 Master Trainers as part of State Mission Team to train the Lead Trainers of each district for a period of 2 years on a continuous basis with training feedback evaluation. These Trainers can be selected from Teacher Training Academy. The curriculum of the Teacher Training Academies of the State shall have the e-Learning and e-Teaching as its part.

Department to identify at least 10 qualified Trainers with relevant experience and training competency within each District Mission Team to be trained by the State Mission Team. Trainers from State Mission team shall be responsible for implementing the Capacity Building interventions.

Develop overall Training Plan based on District as a unit with strategy, environment, training need analysis and post training evaluation mechanism.

9.2. Learning Management System and Training Portal

Developing a Learning Management System and training portal to provide access to all training content online including documents, demo, audio, video, simulation and
practice, assessment, self-learning and context sensitive help and monitoring, support and reporting.

9.3. Rollout Strategy

The rollout plan needs to be designed in a date-wise, location-wise, module-wise and training and change management-wise manner with suitable mechanisms for incorporating the outcome findings/feedback from each deployment before the next deployment. A detailed Rollout plan for each district, Workshops should be conducted to key officers (State Mission, District Mission & District Core Team) with necessary assistance and facilities. One of the important aspects of the state-wide rollout is the continuous availability of the Domain experts of the Implementation of the State and District Missions.

- A careful capacity planning and performance testing exercise, in addition to thorough testing of the application/components must be done prior to the roll out to ensure no downtime during deployment.
- There should be no “big bang” approach. Instead, the deployment should be done in phases across districts, eventually reaching all districts of the state.
- A suitable architecture and design to support such a phased roll-out should be prepared.
- The roll-out plan must also address installation, configuration, commissioning of non-IT and other components.
- The roll-out plan must also detail roll-out activities considering inter-dependencies in order to minimize last minute surprises.
- There should be comprehensive documentation and user manuals created (in audio or video form where necessary) to document best-practices in roll-out.
- Experts with experience in managing similar roll-outs should be available to ensure smooth roll-out.
- The end users (primarily teachers and institutional support staff/technical staff) should be involved in the deployment process.
End users should also be given relevant training to make it easy for them to adapt to the technology. A clear communication plan should also be given to end users when they need to report problems, suggest changes, seek assistance etc.

Particularly in the initial phases of roll-out, there should be dedicated staff for hand holding support, operation and maintenance etc.

There should be suitable contingency plans and rollback strategies to handle unpredictable challenges.

Most crucially, there should be regular performance monitoring and measuring success plan after each roll out to ensure that the technology intervention is reaping the intended benefits, and that feedback of end-users is being acted upon.

9.4. Rollout Plan

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Activities</th>
<th>Details of Activities</th>
<th>Period (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4 Districts (1 District in Each Region)</td>
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</tr>
<tr>
<td>A</td>
<td>Identification of Cluster</td>
<td></td>
<td>T+2</td>
</tr>
<tr>
<td>B</td>
<td>Audit of Network in the Cluster Colleges</td>
<td></td>
<td>T+6</td>
</tr>
<tr>
<td>C</td>
<td>Audit of hardware &amp; Infra at Cluster Colleges</td>
<td></td>
<td>T+10</td>
</tr>
<tr>
<td>D</td>
<td>Identification of Teaching Staff</td>
<td></td>
<td>T+10</td>
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<tr>
<td>E</td>
<td>Training of Teachers on basic Computer Operations</td>
<td></td>
<td>T+20</td>
</tr>
<tr>
<td>F</td>
<td>Training of Teachers on the e-Teaching S/w or App Application</td>
<td></td>
<td>T+45</td>
</tr>
<tr>
<td>G</td>
<td>Evaluation of Training Effectiveness</td>
<td></td>
<td>T+60</td>
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<tr>
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<td>12 Districts (District wise)</td>
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<td>A</td>
<td>Identification of Cluster</td>
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<td>T+2</td>
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<td>B</td>
<td>Audit of Network in the Cluster Colleges</td>
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<td>C</td>
<td>Audit of hardware &amp; Infra at Cluster Colleges</td>
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<tr>
<td>Phase 3</td>
<td>Districts (Districtwise)</td>
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<td>Identification of Cluster</td>
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<td>Audit of Network in the Cluster Colleges</td>
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<tr>
<td>G</td>
<td>Evaluation of Training Effectiveness</td>
<td>T+60</td>
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</tr>
</tbody>
</table>

**Please Note: Assuming that Infrastructure is ready**

If Connectivity and IT supplies to be part of the Plan then, there is a need to have pre-rollout check on the following.

<table>
<thead>
<tr>
<th>Connectivity</th>
<th>Procurement of IT supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate with service provider for testing and commission of network.</td>
<td>Make procurement schedule and Procure material</td>
</tr>
<tr>
<td>Provide location wise type of connectivity</td>
<td>Validated the configuration and issue delivery Order</td>
</tr>
<tr>
<td>Propose future proof IP scheme for complete state</td>
<td>Distribute material to respective District I/C offices</td>
</tr>
<tr>
<td>Ensure all locations are provided with suitable band with.</td>
<td>Conduct Material inspection on supply</td>
</tr>
<tr>
<td>Distribute materials to respective sites.</td>
<td>Issue clearance for last mile dispatch.</td>
</tr>
</tbody>
</table>
In the 2\textsuperscript{nd} meeting of KJA held on September 22, 2014, the Aayoga has discussed the request from Higher Education Department (HED) of GOK for the need for improving education quality and outreach through usage of advanced education technologies in the general, technological, medical and agricultural Universities of Karnataka. Karnataka was one of the first few states that established an Edusat network in 2007 – with a hub and connectivity to various colleges/institutions. While the Edusat network has been in operation, HED, GOK has requested for a review of the current Edusat utilisation in state and assess gaps/issues and recommend actions required for increasing usage of satellite communications for education activities in the state.

Information and Communication Technologies (ICTs) and Satellite-based Education need to be extensively utilised for imparting education. There are a wide range of technologies available – in the form of Audio and video technology; Computers, tablets and mobile devices; edu-conferencing, dedicated Satellite-based Education, high-speed computer networks for students/faculty etc; Whiteboards; Screen casting; Satellite Virtual classroom and many others. There are also operational examples of self-instructional digital materials, Audi/Video digital instructional materials, Learning Management Systems, Learning Content Management System, Computer-aided assessment and Electronic performance support systems (EPSS) and other classic applications for education.

While technology can significantly contribute towards efficient and effective education at university level, the importance of teachers/faculty and formal class education systems also must be recognised, in the larger context of the education environment in the state. A technology-drive must not and cannot be the main solution; at same time resistance and non-acceptance to modernisation also cannot become a limiting factor for the future generation of students. The goal must be to see how present education technologies is best adapted/assimilated to effectively improve and modernise the education system in the state at the university level.

While a plethora of technologies that are available, it is important to utilise the most suitable, effective, efficient and progressive technologies that can mesh with the existing educational system in the state. KJA has decided that a Task Group of technology and education specialists/experts be constituted to prepare an action plan and bring out a comprehensive and actionable report.

The Task Group will have following membership:

- Dr BN Suresh, Former Member, Space Commission & Former Director, Indian Institute of Space Technology - Co-Chair
- Dr P Balakrishna Shetty, Member, KJA - Co-Chair
KJA Recommendation
on Educational Technologies and Satellite based Education
for Higher Education in Karnataka

and VC, Sri Sidharta Academy of Higher Education
☐ Representative from IGNOU - Member
☐ Representative of ISRO - Member
☐ Mr BS Bhatia, Former Director of DECU/ISRO, Ahmedabad & Expert in Satellite Education Systems and Dev Comm - Member

☐ Dr K S Dasgupta, Director, Indian Institute of Space Technology Thiruvananthapuram - Member
☐ Representative of Shiv Nadar University - Member
☐ Prof S Sadagopan, Member, KJA & Director, IIIT-B - Member
☐ Prof Anurag Behar, Azim Premji University - Member
☐ Dr H Maheshappa, Vice-Chancellor VTU, Belgaum - Member
☐ Prof K S Rangappa, Vice Chancellor, Mysore University - Member
☐ Dr KS Ravindranath, Vice Chancellor, RG UHS - Member
☐ Prof Narayan Gowda, Vice-Chancellor, University of Agriculture Sciences - Member
☐ Commissioner for Collegiate Education - Member
☐ Principal Secretary, Higher Education Department - Member
☐ Dr Mukund Rao, Member-Secretary, KJA - Member
☐ Dr. Nazeer Ahmed, Member, KJA - Member
☐ Prof Viraj Kumar, PES University - Member-Secretary
☐ Ms Jayashri, KJA Secretariat - Convenor

Terms of Reference:

☐ The main objective of the Task group is to prepare a blue-print for Education Technologies - Action Plan for Karnataka – that will help standardise the use of most appropriate technologies across the state in universities, actions for assimilation/embedding the technologies into the present education system and ultimately enable a scheme-oriented planning input to GOK. Amongst other important issues, the Task Group will:

☐ Assess and evaluate, in a holistic manner, the state of educational technologies usage in Karnataka university and higher education system
☐ Study/assess available modern education technologies and recommend suitable systems, including “packaging” a standardised suite for universities across the state; undertake any demonstrative assessment studies that may be required
☐ Recommend an Action plan for educational technologies – addressing suggested technologies to adopt; implementation issues; broad cost plan; institutional and interface issues and a way of working out a GOK scheme for this.
☐ Assess present status of Edusat usage in the state and identify gaps – both technological and institutional; identify the best way of using Satellite-based education system across the state
☐ Recommend an Action Plan for Satellite-based education – technological aspects, institutional aspects, requirement of transponders and interface with ISRO, broad cost plan, institutional and interface issues etc
☐ Address any other related aspect on education technologies and Satellite-based education, which the Task Group may feel necessary.
Towards the above, KJA the Task Group may undertake wide consultations across the universities, organise consultation workshop of experts to solicit inputs and holistically study all aspects of education technologies for the Action Plan.

Co-Chairs of the Task Group, in discussion with Member-Secretary, KJA, may co-opt any other expert to the Task Group, as required.

Specific budget has been earmarked by KJA for the Education Technologies assessment activity. The expenses of the Task Team and for the Plan development would be met from this approved budget. For administrative purposes, the meetings of Task Team will be treated on par with any other KJA meetings – thus, all expenses for meetings, any travel/fees/honorarium and any other meeting expenses etc can be met from KJA funds, as per KJA procedures. Funds related to this activity will be expended upon approval of Chairs of Task Group and as per procedures of KJA.

The term of the Task Team will be for a period of 6 months from the date of issue of this order.

This order issues after consultation with Higher Education Department, GOK and with the approval and under authority of Chairman, KJA.

(Mukund Rao)
Member-Secretary, KJA

To,
All Members and Convenor of KJA Education Technologies Task Group

Copies for information to:

All Members of KJA
Chief Secretary of Karnataka
Principal Secretary, Dept of Higher Education
Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)
Bangalore


November 25, 2014

Sub: Establishment of KJA Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review

☐ In partial modification to the Karnataka Jnana Aayoga Office Order-06: KJA-EduTechTaskgroup: 2014 dated: November 17, 2014, Dr. Nazeer Ahmed, Member, KJA and Advisor, World Organization for Research Development and Education is included as a Member of the Task Group.

☐ This amendment order issues with the approval and under authority of Chairman, KJA.

(Mukund Rao)
Member-Secretary, KJA

To,

☐ Dr Nazeer Ahmed, Member, KJA
☐ All Members and Convenor of KJA Education Technologies Task Group

Copies for information to:

☐ All Members of KJA
☐ Chief Secretary of Karnataka
☐ Principal Secretary, Dept of Higher Education
Karnataka Jnana Aayoga  
(Karnataka Knowledge Commission)  
Government of Karnataka

Ref: KJA: 06/1: KJA-EduTechTaskgroup: 2015  
June 27, 2015

Sub: Extension of term of the KJA - Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review


• This amendment order issues with the approval and under authority of Chairman, KJA.

(Mukund Rao)  
Member-Secretary, KJA

To,

• All Members and Convenor of KJA Education Technologies Task Group

Copies for information to:

• All Members of KJA  
• Chief Secretary of Karnataka  
• Principal Secretary, Dept of Higher Education
Karnataka Jnana Aayoga  
(Karnataka Knowledge Commission)  
Government of Karnataka

October 30, 2015

Sub: Re-Extension of term of the KJA - Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review


- This amendment order issues with the approval and under authority of Chairman, KJA.  

(Mukund Rao)  
Member-Secretary, KJA

To,

- All Members and Convenor of KJA Education Technologies Task Group

Copies for information to:

- All Members of KJA
- Chief Secretary of Karnataka
- Principal Secretary, Dept of Higher Education
ANNEXURE II
Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)
Government of Karnataka

Minutes of the First Meeting of the Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ETEUR)

Date: December 5, 2014
Venue: Room No. 218, II Floor, Vikas Soudha, Bengaluru
Time: 11.00 AM

Members Present:
1. Dr. B. N. Suresh, Co-Chair, ETEUR
2. Dr. P. Balakrishna Shetty, Co-Chair, ETEUR
3. Sri. B. S. Bhatia, Former Director of DECU/ISRO and Member, ETEUR
4. Dr. K. S. Rangappa, Vice-Chancellor, Mysore University and Member, ETEUR
5. Dr. Raju Gowda, Registrar, University of Agricultural Sciences
7. Dr. V. S. Veeranna Gowda, Representative from Dept. of Collegiate Education (DCE)
8. Dr. Viraj Kumar, MS of ETEUR
9. Ms. Jayashri, Convenor, ETEUR

Deliberations:

Agenda 1: Remarks by the Co-Chairs and Members

1. Dr. B. N. Suresh in his opening remarks welcomed the gathering and informed that the Higher Education Department, GoK requested KJA - for the need for improving education quality and outreach using of advanced education technologies in Higher Education in Karnataka and requested for a review of the current EduSat utilization in the State, including assess gaps/issues in current education technology deployment and recommend actions required for enhancing educational outcomes in the State using educational technology. In order to prepare an action plan and to bring out a comprehensive and actionable report, KJA constituted TG on ETEUR to address the above requests of HED and ultimately propose a scheme-oriented planning output to GoK. He mentioned that the main aim of this meeting is to discuss various points listed as agenda and thoroughly discuss the terms of reference to the Task Group, modify them as necessary. He reiterated that the recommendations of the TG should include specific actions which are implementable by the Govt. The discussions and recommendations have to address the best combination of both terrestrial and space technologies which would improve the quality of education in the
State. Then, he requested the members to introduce themselves before proceeding to the agenda items.

2. Dr. Shetty in his introductory remarks mentioned that the TG has to propose/deliver a portfolio of technology solutions and provide strategic educational technologies guidance to help the stakeholders of the education. He solicited for ideas and thoughts on the Educational Technologies from the members.

3. Dr. B. S. Bhatia noted successful instances where communication technologies, especially satellite communications networks, have been successfully deployed in the advanced medical sciences. He cited the Sanjay Gandhi Postgraduate Institute of Medical Sciences as an example of an institution that used telemedicine/tele-health to great effect in reaching out to remote and inaccessible areas. He stated that satellite technology was best suited for broadcasting content in a live manner, and therefore should be used in the higher education only where appropriate. He also noted that a key weakness of the EDUSAT programme was a failure to involve faculty members, who ultimately know best how to integrate high-quality educational content with the demands of their own students and institutions. He therefore highlighted the need for educational technology to facilitate teachers. He further pointed out the need to train teachers in using any proposed educational technology recommended by the TG.

4. Dr. Rangappa welcomed the use of technology advancements in education, but stressed the need to distinguish between two kinds of Universities in the State – Distance/Virtual Universities (where such educational technology is the fundamental mechanism underlying all educational activities) and Conventional Universities (where ET must be deployed in harmony with the existing system involving faculty and students at physical premises). He noted, for instance, how improper use of technology in the classroom can undermine the authority of the faculty member, or can lead to student distraction or misuse. (This last point was further emphasized by Dr. Shetty, who demonstrated how one student used an electronic device to cheat on examinations.)

5. Prof. Raju Gowda illustrated a successful use of educational technology in the area of remote sensing applications, to address the needs of students in this sector. Tele-education provides a virtual classroom facility to far-flung villages or remote areas in the country and helps impart the necessary skills to thousands of students from selected experts.

Agenda 2: Importance and Relevance of TG

6. Dr. Viraj Kumar suggested that it was important to clearly identify the existing problems that the TG will attempt to address for “improving educational quality and outreach”, keeping in mind the 6-month timeline. One problem could be “inaccessibility of high quality lecture content”. He noted that although efforts such as the National Programme on Technology Enhanced Learning (NPTEL) has made high-quality lectures (in some domains) available
online for free download, these can be inaccessible for students and faculty who struggle with English. He therefore proposed that the TG consider ways in which technology can overcome such accessibility issues, and suggested Micronotes (an ongoing research effort with NPTEL where students and faculty can create digital footnotes for video lectures in their own language) as a viable option to consider. He also suggested other problems that the TG could consider where educational technology could be impactful, including in the examination design and evaluation process.

7. Sri. C. R. Francis noted that VTU has already implemented some effective solutions in the case of examination design and evaluation, using question banks and digital evaluation of scanned answer scripts, which would be worth investigating further by the TG. He also suggested that “high quality lecture content” must recognize that there are at least three levels of students: above-average, average, and below-average. The TG should ensure that the pursuit of “high quality” should not neglect the needs of the weaker students, and in fact must find ways to cater more towards them.

8. Sri. B. S. Bhatia reviewed his experiences with the EDUSAT programme and stated that although the use of satellite technology to broadcast “live” content was appropriate a decade ago, the TG should give preference to “asynchronous” modes of content delivery in the context of higher education. While noting that there were important instances where synchronized delivery was preferable, he stated that live lectures place numerous constraints on academic institutions, faculty, and students. He also noted that the National Knowledge Network (NKN) greatly facilitates content delivery in the asynchronous mode.

9. The Members unanimously felt that the traditional teacher-centric method which has been going on for decades has now been modified and enhanced, owing to technology. The infusion of technology into teaching and learning has a remarkable influence on the instructional strategies of the educational institutions. Technology can help pave the way for both teachers and students, but it certainly requires a teacher who is adept at creating a course that raises the pedagogical benefits of that technology has towards helping students meet the desired learning outcomes. A roadmap needs to be followed for matching technological tools to learning outcomes, so that technology can be used to get students to interact with course content in an engaging and productive fashion.

**Agenda 3: Brief discussion on Terms of Reference**

10. Dr. B. N. Suresh reviewed the terms of references in the Office Order of TG, alluding to specific missions or tasks to accomplish a shared goal in prescribed period of 6 months.

11. Sri. B. S. Bhatia suggested that the phrase “standardise the use of most appropriate technologies across the state in universities” was too restrictive. Instead, the TG
should prepare a blue-print that will offer a menu of packages, each with appropriate technologies for different types of universities across the state.

12. Dr. Shetty suggested that the TG should organize a workshop with stakeholders to assess the needs of a variety of colleges, and technology providers should be consulted thereafter to determine what solutions are available.

13. Dr. Rangappa mentioned that term “Karnataka University” should be replaced with ‘Universities in Karnataka’ or ‘State Universities’, to avoid confusion with the specific institution named Karnataka University.

14. Dr. B. N. Suresh clarified that the TG would recommend an “Action Plan for Satellite-based education” only when it had ascertained that satellite-based education had a well-defined role to play in higher education.

**Agenda 4: Suggestions and discussions on applicable technologies**

15. Dr. Viraj opined, in order to complete the assigned task in 6 months, it is essential to have specific teams to focus on sub-tasks and generate the needed inputs for further discussions. He listed out the following:
   - General Requirements for technologies
   - Available terrestrial technologies
   - Utilisation of satellite technologies

16. Dr. Bhatia suggested listing out different hybrid distribution technologies and this has to be done in consultation with the industry players. He also suggested that the faculty need to be involved and training them in specific tools for course-level assessment as well as reinforcing the general importance of outcomes assessment as a means for improving student learning outcomes.

17. Dr. Shetty expressed that the state universities must have the centre for Excellence and it has to be exposed to the faculty of respective institutions. To assess and to evaluate the educational technologies of the state, TG has to organize workshop or stakeholders consultation in which the TG could evolve with constructive and productive ideas on ET. He also highlighted the need for inclusive education practices in technology and skill development. He expressed that the outcome-based education which is not confine to exam should be promoted in educational system around the items that all students should be able to do at the end of the learning experience. There should not be specified style of teaching or assessment in outcome-based education instead classes, opportunities, and assessments should all be based around helping students to achieve the specified outcomes.
18. Dr. Veeranna Gowda shared that the DCE, as an e-learning initiative, introduced Tele-education through EDUSAT during the year 2007 on a pilot basis by installing Receive Only Terminals (ROTs) at 142 locations. A state-of-the-art broadcast studio with virtual class room arrangement is setup for production and telecasting education programs through EDUSAT satellite. 198 new RoT’s have been setup in colleges during the year 2013-14. A total of 304 Government First Grade Colleges across the state are in DCE’s EDUSAT program network. Recorded and Live education lectures are being telecasted regularly between 10.00 am and 4.00 pm on all week days. Students and faculty from colleges can interact with the live sessions by sending SMS to the dedicated mobile numbers.

19. Sri. Francis suggested offering educational channels for all disciplines (the programmes in these channels to be re-telecasted) through the cheapest technology – DTH. The host of the educational channels for students showcases issues like current affairs and that is of high importance to teachers and educators. He also made a mention of Washington Accord, which is an agreement to accept undergraduate engineering degrees that were obtained using outcome based education methods. He suggested to assess the outcomes of the education.

The action plan was divided into:

20. **Formation of sub-committees to address some of the specific points**
   Following sub-committees and reference persons were decided to constitute under the TG:
   - Content Identification, customization and generation – Dr. Viraj Kumar
   - Assessment of present Technology and Infrastructure in the institutions and gaps (if any) – Prof. Rangappa/his nominee
   - Technology and Infrastructure needed from available technologies, including newer/emerging technologies in storage, distribution, etc. along with costs - Dr. B. S. Bhatia and representative from DHE
   - Status of EduSat and other relevant Satellite Technology – Dr. Vikram Desai

   The members of the TG may suggest additional experts for the sub-committees listed above. Based on these inputs the composition of the sub-committees will be firmed up in the next meeting.

   *(Action: Dr. Viraj Kumar to co-ordinate and formalize sub-committees terms and composition)*

**Agenda 5: Action Plan**

21. **Places to visit a few institutions and identification of teams for visit**
   It was decided to organize a one day workshop on ‘Technology in Higher Education’ at Mysore University campus during the 3rd week of January. To work out the details of the workshop, Prof. Rangappa invited the other members of the TG to visit his office. Plan to
visit a few institutions could be generated as and when the TG feel necessary. It was also felt to have another workshop/seminar with the Industry providers, after thoroughly understanding needs of faculty/institutions.

(Action: Ms. Jayashri to co-ordinate with the Vice-Chancellor, Mysore University for the visit and preliminary meeting to discuss the workshop)

22. Review of current GoK schemes related to education technologies
Sri. Francis was asked to provide the list of the schemes to Dr. Viraj and Dr. Viraj to be in touch with the Department to get detailed information on ET.

(Action: Sri. Francis and Dr. Viraj Kumar)

23. Tentative agenda for the II meeting of TG
The II meeting of TG tentatively to be scheduled on January 9, 2015 from 11.00 AM to 1.30 PM.
Members listed out the following tentative agenda:
• Adoption of first MoM of the TG
• Plan of ‘Technology in Higher Education’ Workshop at Mysore
• Integration of ET in Examination process (review to be presented by Dr. Shetty)
• Formation of sub-committees and its members
• GoK schemes related to ET (review to be presented by DHE)
• Any other

(Action: Dr. Viraj Kumar to work on the agenda for the II meeting)

24. Members opined that, if suitable representatives from Amrita Institute, NIIT University, BITS Pilani and National Informatics Centre (NIC) could also be involved in the TG activities appropriately, it may be useful.

25. The meeting concluded with a Vote of Thanks by Dr. B. N. Suresh at 3.30 PM.

Dr. Viraj Kumar
Member Secretary, Task Group on ETEUR
With support from
Ms. Jayashri, Convenor, TG on ET-EUR

To:
• All the Members of TG

Copy to:
• Chairman, KJA
• Member Secretary, KJA
Karnataka Jnana Aayoga (Karnataka Knowledge Commission)
Government of Karnataka

Minutes of the Second Meeting of the Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ETEUR)

Date: January 8, 2015
Venue: Room No. 422, IV Floor, Vikasa Soudha, Bengaluru
Time: 11.00 AM

Members Present:
1. Dr. B. N. Suresh, Co-Chair, TG ET-EUR
2. Dr. P. Balakrishna Shetty, Co-Chair, TG ET-EUR
3. Dr. Mukund Rao, Member, TG ET-EUR
4. Dr. Nazeer Ahmed, Member, TG ET-EUR
5. Dr. Vikram Desai, Member, TG ET-EUR
6. Dr. K. S. Dasgupta, Member, TG ET-EUR
7. Dr. Munir Ahmed, Director, RGUHS (on behalf of Dr. K. S. Ravindranath, Vice-Chancellor, RGUHS)
8. Dr. Raju Gowda, Registrar, University of Agricultural Sciences (on behalf of Dr. D. P. Kumar, Vice-Chancellor, UAS)
10. Sri Srikanth, Representative from Dept. of Collegiate Education (DCE)
11. Dr. Viraj Kumar, MS of ETEUR
12. Ms. Jayashri, Convenor, ETEUR

Dr. Nazeer Ahmed congratulated and presented a bouquet of flowers to Dr. B. N. Suresh as he took over as a President of Indian National Academy of Engineering.

Deliberations:

Introductory Remarks by Co-Chairs
Dr. Suresh welcomed all the members and mentioned that the agenda and background notes have been provided to all the members. He gave a quick overview of TG and in the last meeting of TG, it was discussed on the importance and relevance of TG, reviewed the terms of references of TG, alluding to specific missions or tasks to accomplish a shared goal in specified period, detail action plan for TG and enumerated the activities – Workshop and consultation meetings. With technology, education has taken a whole new meaning that it leaves us with no doubt that our educational system has been transformed owing to the ever-advancing technology. Technology and education are a great combination if used together with a right combination and vision. There are many views on modernizing education and making it technology aided and therefore he requested the members to give their opinions/views on improving education quality and outreach through usage of advanced education technologies and how present education technologies are seamlessly integrated to effectively improve and modernize the education system in the State especially Higher Education sector. He also reiterated that a roadmap needs to be followed for matching technological tools to learning outcomes, so that technology can be used to get students to interact with course content in an engaging and productive fashion.
Dr. Shetty in his opening remarks said that he has attended the Conference of South Zone Vice Chancellors-2015 at Vellore Institute of Technology, the conclave aimed to deliberate various issues concerning higher education including access, quality, governance, financing, student services and value education among others. Based on the deliberations of the Conference, he mentioned that the Technological innovation, long a hallmark of academic research, is changing the very way of universities teaching and students learning. For academic institutions, charged with equipping students to compete in today’s knowledge economy, the possibilities are great. Distance education, sophisticated learning-management systems and the opportunity to collaborate with organizations/institutions from around the world are just some of the transformational benefits that universities are embracing.

**Agenda 1: Adoption of the minutes of the first meeting**

8. The minutes of the first meeting of TG was considered and adopted unanimously by the members.

**Agenda 2: Plan of ‘Technology in Higher Education’ workshop at Mysore**

9. In absence of Vice-Chancellor, University of Mysore the schedule and outline of the workshop was discussed in meeting. Dr. Rangappa in principally requested (by phone) Dr. Shetty to discuss and to take necessary actions pertaining to the workshop on his behalf.

10. Dr. Dasgupta mentioned that Questionnaire survey is one of the important tools to collect the inputs from the stakeholders and the results from the analysis of these questionnaire can provide useful suggestions for construction of the action plan by TG. He also felt that the one-day workshop is too ambitious as it is intense in nature and suggested to convene for two days.

11. Dr. Mukund Rao mentioned that the Visvesvaraya Technological University (VTU) and Dept. of Collegiate Education (DCE) implemented some effective solutions and educational initiative which would be worth investigating further by TG. VTU implemented EDUSAT based e-classes for technical education and teaching-learning processes through technology integration are being achieved by establishing Smart Class by DCE. He added that EDUSAT network could be used for administrative purposes and even for conducting online examinations and evaluations. He also said that possibility exists to upgrade technology to enable interconnectivity between national and regional beams of EDUSAT for conducting classes across the country.

12. Dr. Vikram Desai suggested to involve Department of State Education Research and Training (DSERT) as it has undertaken various academic activities through the effective utilization of technology.

13. Mr. Francis suggested to include National Informatics Centre (NIC) in the activities of the workshop as they have done tremendous work on/with the Common Entrance Test (CET). Thus it possesses domain expertise and provides solid foundation in the software development process.

14. Dr. Suresh mentioned that the workshop is mainly to get necessary feedback from all stakeholders. The outcome of the workshop has to generate the factual information relating to the Information and Communication Technologies and Satellite-based Education. Technology/service providers will be consulted later after consolidating the requirements based on the feedback of the Workshop.
15. Based on the suggestions/discussions raised by the TG members, the outline of the workshop was revised which is as follows:

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00-10.30</td>
<td>Introductory Function</td>
<td>TG co-chairs and Vice-Chancellor, University of Mysore</td>
</tr>
<tr>
<td>10.30-10.45</td>
<td>Tea/Coffee</td>
<td></td>
</tr>
<tr>
<td>10.45-12.15</td>
<td>Educational Resources: Access and Usage of IT tools and OER – successes and challenges</td>
<td>Two speakers from Educational Institutions</td>
</tr>
<tr>
<td>12.15-12.45</td>
<td>Satellite connectivity in Institutions: Successes, Challenges and Opportunities</td>
<td>Representatives from DCE and VTU</td>
</tr>
<tr>
<td>12.45-1.00</td>
<td>Open Discussion</td>
<td>Q&amp;A session led by above speaker; moderated by MS (TG)</td>
</tr>
<tr>
<td>1.00-1.30</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>1.30-2.15</td>
<td>Technology Infrastructure needed to use IT Tools and OER in Institutions</td>
<td>Mr. Sadagopan, NPTEL, NMEICT, Director DSERT</td>
</tr>
<tr>
<td>2.15-2.30</td>
<td>Open Discussion</td>
<td>Q&amp;A session with the panel</td>
</tr>
<tr>
<td>2.30-3.15</td>
<td>Using ET tools for academic process and assessment (Examinations): Opportunities and Challenges</td>
<td>Registrar (Evaluation) of Mysore University, representatives (by Dr. P Balakrishna Shetty)</td>
</tr>
<tr>
<td>3.15-3.30</td>
<td>Tea/Coffee</td>
<td></td>
</tr>
<tr>
<td>3.30-4.00</td>
<td>Inclusiveness in Higher Education, Research by Students</td>
<td>Moderator: Dr. P Balakrishna Shetty</td>
</tr>
<tr>
<td>4.00-4.15</td>
<td>Open Discussion</td>
<td>Q&amp;A with the panel</td>
</tr>
<tr>
<td>4.15-5.00</td>
<td>Wrap-up and Valedictory</td>
<td>Dr. Nazeer Ahmed and Lead Speakers for earlier sessions</td>
</tr>
</tbody>
</table>

16. Dr. Viraj Kumar requested the members to freeze the date for the workshop. It was decided to schedule it on February 7, 2015; Saturday and it was agreed that the logistical support will be provided by the University of Mysore.

(Action: Dr. Shetty and Dr. Viraj to freeze the outline of the workshop in consultation with Dr. Rangappa, Vice-Chancellor of University of Mysore)

**Agenda 3: Integration of ET in Examination Process**

17. Dr. Dasgupta opined that an exam-oriented education model that limits educational innovation, a critical shortage of educational resources, and a lack of inter-disciplinary human capital that can effectively integrate technology into the educational environment. He illustrated his point by recalling how DECU once broadcast supplementary (after-school) courses in Shillong, but the classes
were poorly attended. He stated that by including questions from these broadcast courses on the examination, attendance could be dramatically improved. Traditional exam-oriented education can't meet the demand of modern society and enterprise. Quality education theory and pattern begin to develop. The technology can't be separated in the development of quality education. As a necessary condition, technology plays an important promoting role in quality education. It provides basic guarantee for carrying out quality education. Teaching through Distance education seeks to upgrade the knowledge and understanding continuously which could also be the part and parcel of it and complement the Educational Technologies. Online degree programmes and distance learning have gained a firm foothold in universities around the world. What was once considered a niche channel for the delivery of educational content has rapidly become mainstream, creating wider access to education, new markets for content and expanded revenue opportunities for academic institutions.

18. Dr. Shetty stated that the requirement of the ET is not only to the students but also to the faculty to promote pedagogical development and participation in collaborative projects which would ultimately create a multifunctional room for faculty teaching and learning development.

19. Dr. Nazeer Ahmed expressed that Technology is a new facilitator of next-generation learning activities because it enables us to embed assessment into instruction more efficiently. Embedding technology assessment activities that are consistent with learning activities provide ongoing feedback to teachers and students to guide teachers and that ongoing feedback enables improved student learning. Embedding performance assessments into learning activities provides direct evidence of what students know and can do with what they know. When technology effectively integrated into the curriculum, technology tools can extend learning in powerful ways. Schools should seek more ways to use technology for the greatest gain in student achievement, particularly in urban and rural/small-town schools. One should encourage schools to use technology in more creative ways by permitting more flexibility in instruction and by providing incentives that support technology-enriched programs. More ways should be found to motivate the most experienced educators to use technology through better training and more curriculum-related opportunities.

20. Dr. Vikram Desai mentioned that the Technology-based self-assessment is used in a wide variety of disciplines. Facilities are available with of a bank of MCQs for students to test themselves whenever they wish. A wide range of disciplines, which often include some self-testing material integrated or separate from the teaching materials. Technology is merely a supportive tool or ‘vehicle’ to transmit/deliver/convey pedagogical content, together with applicable teaching and learning strategies, to students.

21. Dr. Munir Ahmed briefed on the initiatives undertaken in RGUHS over the past 10 years with digital transmission of Question papers. University’s end-to-end automation of its operations is based on Information and Communications Technology (ICT) enabled examination management system. This system provides web-based interface for all exam applications, including getting hall tickets, announcement of results and availing of scanned copy of answer scripts. Digital Translation and Digital Evaluation actually splice away administrative drudgery and plug question paper leak. In addition, the process of exploring scanning answer scripts and transmit to multiple evaluators in parallel is presently underway. He also suggested that the RGUHS would be well-placed to speak of these achievements in the workshop.
22. Dr. Mukund Rao put forth that rapid growth in the field of education has made governance in academic sector a very complex task. The 21st century has witnessed tremendous advancements in technology which has led to far-reaching developments in the administrative system. Cost-effective technology combined with the flexibility in learning and administrative activities is essential to enhance efficiency. Technology plays a vital role in supporting powerful, efficient management and administration in education sector. It is specified that technology can be used right from examination process, evaluation process and administration to education institution. Technology in education should be non-human intervention which has to be accurate and play a major role in reducing operational inefficiency and improving decision-making in many areas of governance. He also stressed on to create State level Question bank on each subjects to be thought of. Educational Practices like Digital evaluation system which is unique and has less than 0% margin of error unlike the conventional system where the margin of error is high.

23. Prof. Raju Gowda mentioned that the selective 100 questions out of 1000 questions are digitally transmitted to the affiliated colleges of the University, wherein these colleges could take a print out during the examination day which actually minimizing the stress level of the University/Colleges.

24. Mr. Francis shared about Choice Based Credit System wherein it is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education. Under this System the students would opt for their own choice of courses and learn at their own pace, while undergoing additional courses and acquire more than the required credits, so that they could adopt an interdisciplinary approach to learning to make it more practical oriented. This would also help the students to become mobilized and learn across various institutions around the country without any hindrance.He also made a mention of Washington Accord, which is an agreement to accept undergraduate engineering degrees that were obtained using outcome based education methods; he opined that the accord could be applied to unconventional subjects. The recommendations of the Committee also should be in the policy framework along with specific actions which are implementable by the Govt. The framework should also contain actionable/probable budget.

25. Mr. Srikanth shared that the teaching-learning processes through technology integration is being achieved by establishing smart class rooms and virtual classes in Government First Grade Colleges, under Dept. of Collegiate Education. The Smart Class Room concept enables the faculty to use state-of-the-art ICT facilities like projectors, audio systems and computers for accessing on-line content, use multimedia like video, audio, animations and images in class room for making teaching more effective and lucid. The Virtual Class is a computing platform where the video lectures stored in the media server are accessed on-demand for Live-streaming. A gamut of e-contents in the form of video lectures, e-Books, audio books and lecture notes pertaining to the undergraduate course syllabi, extra-curricular programmes and personality development modules available online as open courses are being pooled in for invigorating teaching and learning in Government First Grade Colleges. Marking the gaps in the available e-contents and the topics prescribed in the syllabi, lectures by subject experts are being recorded at the Department Studio. These e-resources will be distributed to all the Government First Grade Colleges and will be made available to students/staff to access through computers. Alongside, Wireless Local Area Networks will be set up for enabling students to access the stored e-contents through their smart phones and tablets.
26. Dr. Suresh requested the members to prepare a small/short note on the existing sources of ET and what has to be done and how to implement which could be presented in the next meeting of TG. He also opined that the suggestions/views could also be obtained from the different stakeholders.

*(Action: Dr. Viraj and Ms. Jayashri to co-ordinate with the TG Members to get a page of note for the next meeting of TG)*

**Agenda 4: Formation of Sub-Committees and its Members**

27. Dr. Suresh said that in the previous meeting of the TG, the following sub-committees were constituted under the TG, he requested the members to give their opinions and suggest experts for the subcommittees. Based on the inputs provided by the TG members, the composition of the sub-committees will be firmed up. He also requested the reference persons of the sub-committees to co-opt the members.

28. Based on the suggestions/views obtained by members the composition of the sub-committees were restructured:

<table>
<thead>
<tr>
<th>Sub-Committees</th>
<th>Members</th>
<th>Reference Persons</th>
</tr>
</thead>
</table>
| 1. Content Identification, customization and generation Technology | 1. Representation from University of Agriculture  
2. Representation from Rajiv Gandhi University of Health Sciences  
3. Representation from VTU  
4. Dr. Rahul Sharma  
5. Dharmesh Bhat | Dr. Viraj Kumar                                      |
| 2. Assessment of present Technology and Infrastructure in the institutions and gaps | Mr. Tangvel, Director-Technical, NIC (Bangalore Chapter) | Prof. Rangappa             |
| 3. Technology and Infrastructure needed from available technologies, including newer/emerging technologies in storage, distribution, etc. along with costs | Sri. B.S. Bhat |                                                           |
| 4. Status of EduSat and other relevant Satellite Technology | Raj Shekar, DECU | Dr. Vikram Desai                                      |

29. Dr. Mukund Rao suggested the establishment of State Knowledge Network (SKN) on the lines of National Knowledge Network (NKN) for establishing a strong and robust internal network which is capable of providing secure and reliable connectivity. With the use of SKN, institutions will be able to transcend space and time limitations in accessing information and knowledge and derive the associated benefits for themselves and for the society. SKN could connect all universities and other institutions and facilitate the flow of information and knowledge across the country.

*(Action: Dr. Viraj to co-ordinate and formalize sub-committees terms and composition)*
Agenda 5: GoK Schemes related to ET

30. Dr. Suresh requested Mr. Francis to give a snapshot of the schemes which are available/related to ET in the next meeting.

(Action: Dr. Viraj/Ms. Jayashri to co-ordinate with Mr. Francis)

Agenda 6: Discussion on Budget for TG

31. Based on the discussion, the TG proposed a budget of INR 12 lakhs for 2015-16:

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Particulars</th>
<th>Cost Estimation for 2015-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TG Meeting Expenses</td>
<td>Includes Members Sitting Fee, Hospitality, travel</td>
<td>INR 110,000</td>
</tr>
<tr>
<td>2</td>
<td>TG Meeting Members Travel</td>
<td>Travel support to the members of outside Karnataka</td>
<td>INR 200,000</td>
</tr>
<tr>
<td>3</td>
<td>Consultation Meetings</td>
<td>Visits to institutions within Karnataka: Mysore, North Karnataka, Hyderabad Karnataka</td>
<td>INR 100,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visit to other institutions outside Karnataka (Kerala, NCR (?))</td>
<td>INR 140,000</td>
</tr>
<tr>
<td>4</td>
<td>Workshop/high level consultation meeting expenses</td>
<td>Educational Institutions - 200 persons</td>
<td>INR 400,000</td>
</tr>
<tr>
<td>5</td>
<td>Industry consultation</td>
<td>Service Providers/industries - 100 persons</td>
<td>INR 100,000</td>
</tr>
<tr>
<td>6</td>
<td>Report Publication</td>
<td>200 copies and e-report to the website of KJA</td>
<td>INR 100,000</td>
</tr>
<tr>
<td>7</td>
<td>Miscellaneous</td>
<td>Lumpsum</td>
<td>INR 50,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td>INR 1,200,000</td>
</tr>
</tbody>
</table>

(Action: Ms. Jayashri to take up for a formal approval by Member Secretary, KJA)

32. The meeting concluded with a Vote of Thanks by Dr. B. N. Suresh at 1.30 PM.

Dr. Viraj Kumar
Member Secretary, TG on ET-EUR
With support from Ms. Jayashri, Convenor, TG on ET-EUR

To,
- All Members of TG
Copies to:
- Chairman, KJA
- Member Secretary, KJA
Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)
Government of Karnataka

Minutes of the Third Meeting of the Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ETEUR)

Date: March 23, 2015
Venue: Room No. 422, IV Floor, Vikasa Soudha, Bengaluru
Time: 11.00 AM

Members Present:
1. Dr. B. N. Suresh, Co-Chair, TG ET-EUR
2. Dr. P. Balakrishna Shetty, Co-Chair, TG ET-EUR
3. Prof. S. Sadagopan, Member, TG ET-EUR
4. Dr. K. S. Dasgupta, Member, TG ET-EUR
5. Prof. K. R. V. Raja Balasubramanian, Adjunct Faculty, IIIT-B
7. Dr. Ramesh Reddy, Informatics Officer, Dept. of Collegiate Education (DCE)
8. Sri Srikanth, Representative from Dept. of Collegiate Education (DCE)
9. Dr. Viraj Kumar, Member-Secretary, ET-EUR
10. Ms. Jayashri, Convenor, ET-EUR

Deliberations:

Introductory Remarks by Co-Chairs

1. Dr. Suresh welcomed members of TG and gave a quick outline of the workshop on ‘Technology in Higher Education’ held on February 7, 2015, congratulated the TG as well as University of Mysore for excellent support extended in organizing the workshop in Mysuru and was indeed a great success with involvement and support from numerous groups to make it happen. The education sector is evolving with nature defining speeds towards new ways of teaching and learning. The metamorphosis is brought out by advent of technology in education. Smart mobile devices, social networking, virtual classrooms, identity management systems, faculty evaluation systems, data analytics and array of educational technologies have taken education to all new heights—both within and outside the classrooms. Assisting these learning methods is a multitude of smart devices, which were earlier considered as distractions for students. But the very devices are now leading way for immersive learning. Teachers are distributing learning contents to all the students’ devices and roam across the class instructing and helping individuals with doubts. As it has been discussed in earlier meetings of TG, the group is contemplating to have its second workshop in association with Bangalore University with the service providers of Education technologies and obtain inputs.
2. While mentioning about the workshop held at Mysuru, Dr. Sheety said the the TG is overwhelmed by the positive response to the Workshop on ‘Technology in Higher Education’ and expecting the same from the second workshop scheduled at Bengaluru. TG intended to understand the present level of technology usage, including EduSat, in higher education institutions in Karnataka, learn from best practices, experiences and case-studies where challenges and gaps in usage of technology can be studies and obtain inputs on way forward for most suited technology usage and for satellite-based education in Karnataka from Mysuru workshop, where in the focus of the workshop at Bengaluru will be entirely different from Mysuru workshop, as it has designed to obtain actions for assimilation/embedding the technologies into the present education system and to determine suitable systems, including packaging a standardized suite for universities across the State.

Remarks by members

3. Prof. S. Sadagopan opined that technology is also helping the institutions to better cater to student’s idiosyncrasies, through data analytics. The historic academic data is analyzed with respect to student’s social background, their interests and the current trends in education to guide them towards the best courses and colleges available and also help design best teaching methods to suite their learning abilities. With universities growing in size, establishing various branches and offering online education, it becomes necessary to securely manage student and staff data, ensure strict and smooth authentication processes and manage identities. All these needs are catered by identity, student and faculty management systems. There are array of such technologies that are changing education landscape for good. Now the teachers have better instructional tools, administrators have better management tools and students have better learning tools. Behind the scenes are group of companies that are fueling this educational transformations through their innovative technological solutions.

Adobe educational software is offering students and educators affordable access to industry-leading tools for expressing ideas, help students to develop the skills to communicate in a variety of media and succeed in their professional careers. It is also supporting educators with instructional resources and professional development programs. He also mentioned that Cisco Enabled Education Development is a comprehensive integrated and open learning platform designed to leverage collaboration and live content video to enable teaching and learning. This platform enables a real time interactive environment between instructors and students located in remote areas. Both parties can see each other in real-time, can interactively raise and answer questions using the classroom equipment (Screen, Digital Projector, Speakers, Microphone and On-line Digital streaming Camera) provided by Cisco. Through this solution, the instructor can teach several classes in different locations at the same time on the same subject using the specially developed course curriculum/educational aids and tools. If a supervisor is present at the rural school then the instructor can be assisted by the supervisor in the classroom to increase the levels of interactivity. This solution ensures that all rural schools can offer all subjects with the same level of expert teaching, that a student in a city or a metro gets access to.
4. Dr. Dasgupta said that the technologies that live inside the classroom to technologies that inspire learning outside the classroom; from physical devices to mobile applications. Technology decisions are becoming more democratic, and the pervasiveness of Internet-connected devices is helping to lead a revolution. We are reaching a point in time where technology is empowering people toward a path of personalization, and almost every new technology in the education technology space today fills a cog in that wheel. Now more than ever, education technology vendors are moving from application maker to platform provider. In the process, many are opening their doors to foster collaboration – not only among end-users, but cross-platform. This vendor collaboration and openness encourages rapid innovation and content sharing that ultimately benefits all stakeholders. It also begins to open new distribution models for new companies looking to gain scale quickly, and new business models for those with widespread scale and reach. Vendor collaboration and cross-platform integration is important for education and will continue to be a big trend.

**Agenda 1: Adoption of the minutes of the second meeting**

5. The minutes of the second meeting of TG was considered and adopted unanimously by the members.

**Agenda 2: Draft Report of Workshop on ‘Technology in Higher Education’ held at University of Mysore**

6. Dr. Viraj Kumar gave a quick snapshot and has brought out excellent analysis of the workshop held at University of Mysore. The gist of the analysis is as follows:

6.1. He mentioned that the workshop was attended by 375 participants and 183 feedback forms were collected, out of which 58 contained good-quality feedback.

**6.2. Feedback related to policy:**

6.2.1. The role of technology in Higher Education:
- Extend GoK schemes to private/private aided institutions
- Extend to successful Higher Education schemes to Secondary Education as well
- Consider conducting online exams for common subjects

6.2.2. Satellite-based education:
- EduSat should be made available to B.Ed./teacher’s education programmes, private/private aided institutions
- Programme details needs wider publicity either through TV advertising or early morning radio bulletins
- Provide CDs of live lectures, or make them available for download (e.g., via DHE/DCE website)
6.3. Feedback related to the workshop:

6.3.1. The participants strongly felt that such workshops are great need of the hour and one day is too short to discuss as theme of the workshop is very important for the education sector.

6.3.2. The workshop could have been more hands-on, with special emphasis on:
- Using technology that is “rural friendly”, and does not require too much understanding of English
- Ensuring quality of e-content, and in-class audio/video
- Using virtual classrooms effectively
- Examining content from other disciplines (e.g., basic sciences, History)

6.3.3. Critical need: Teacher Training
- The need to pay special attention to senior faculty
- The need for training to be periodic (given the high faculty turnover), and therefore the cost of training should be low

Agenda 3: Plan of workshop at Bangalore University with Industries/Service Providers

7. Dr. Suresh mentioned that the workshop is mainly to get necessary feedback from all stakeholders. The outcome of the workshop has to generate the factual information relating to the Information and Communication Technologies and Satellite-based Education. Technology/service providers will be consulted in the Bengaluru workshop to get to know the education technologies packages. He said that the government/private educational institutions, selective colleges affiliated to BU, selective representatives who have provided very good responses in the Mysuru workshop and VTU representation to be included in the workshop.

8. Prof. Sadagopan mentioned about digital ‘paperless’ system where in each student will be provided with a digital exam pad in which he/she can write their examinations akin to writing on a paper. Students will write their answers using a digital pen on the pad. They can write not only objective type answers but also descriptive type answers. The answers can be saved and later transferred to the computers of their teachers. There are plenty of technologies/applications/computer programs for examination process. The application may be a standalone (desktop) program optionally enriched with multimedia content and other features like time measurement or a choice of questions in a random manner. Due to the rapid development of internet technology, e-exams are more and more often implemented as distributed applications that use public telecommunication network, with web browser based user interface. He suggested to extend a standard e-exam application to the form of a real exam, with open tasks. It requires
introducing artificial intelligence and computer recognition, for instance OCR/ICR (optical character recognition / intelligent character recognition), expert systems and image understanding.

9. Dr. Dasgupta mentioned that the performance outcomes, skills and knowledge required to analyse a range of technology-enabled assessment (e-assessment) options that are available for the design, delivery and administration of required assessment activities in an education sector. It also develops the advanced theoretical and technical knowledge required to evaluate e-assessment processes to ensure that they are fair, flexible, valid and reliable. He also suggested to take one page of note from each company on their product to check the credentials in terms of business, their profile, type of content, service by the company, activities specific to Karnataka centric and their collaborations with their partners. One hour display or demonstration from these companies of their product to be welcomed.

(Action: Dr. Viraj Kumar to draft a survey form for companies and forward the same to TG members for their inputs)

10. Prof. Raja said that the startups are providing cost effective, end-to-end solutions, such companies to be included in the list of invitees. Startups in the field of education are found to be promising and investing in them is considered safe and doesn’t involve a lot of risks.

11. TG decided to convene this workshop on April 27 and 28 as the pre-decided date (April 6 and 7) for the workshop gives a very short time to organize and also to send notices to the industries.

(Action: Ms. Jayashri to co-ordinate with the Bangalore University for arrangements for the workshop and modified (with regard to the dates) invitation letter of Dr. B. N. Suresh and Prof. Thimmegowda, Vice-Chancellor, Bangalore University to be sent it to the list of companies provided by Dr. Viraj Kumar)

12. Based on the suggestions/discussions raised by the TG members, the outline of the workshop was chalked out which is as follows:

<table>
<thead>
<tr>
<th>Time</th>
<th>Sessions</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00-10.00</td>
<td>Registration &amp; Tea/Coffee</td>
<td></td>
</tr>
<tr>
<td>10.00-11.00</td>
<td>Inaugural Session &amp; Introduction to Conference Themes</td>
<td>Dr. B. Thimme Gowda, Vice-Chancellor, Bangalore University Dr. B.N. Suresh, Dr. P.B. Shetty, Co-Chairs of TG ET-EUR</td>
</tr>
<tr>
<td>11.00-12.30</td>
<td>Panel 1: Content Generation &amp; Management</td>
<td>Focus on easy-to-use tools for authoring &amp; editing e-learning content.</td>
</tr>
<tr>
<td>12.30-12.45</td>
<td>Open Discussion</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Activity</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>12.45-1.30</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>1.30-3.00</td>
<td>Panel 2: Educational Content Delivery Technologies</td>
<td>Focus on delivering e-content (a) in classrooms (blended), and (b) directly to students</td>
</tr>
<tr>
<td>3.00-3.30</td>
<td>Tea/Coffee</td>
<td></td>
</tr>
<tr>
<td>3.30-4.30</td>
<td>Selected Product Demonstrations</td>
<td>Related to Panels 1 &amp; 2</td>
</tr>
<tr>
<td>4.30-4.45</td>
<td>Open Discussion</td>
<td></td>
</tr>
</tbody>
</table>

**Tuesday, April 28**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00-10.00</td>
<td>Registration &amp; Tea/Coffee</td>
<td></td>
</tr>
<tr>
<td>10.00-11.30</td>
<td>Panel 3: Technology for Examinations &amp; Administration</td>
<td>Focus on Creating &amp; Evaluating examinations, other administrative tools</td>
</tr>
<tr>
<td>11.30-12.30</td>
<td>Selected Product Demonstrations</td>
<td>Related to Panel 3</td>
</tr>
<tr>
<td>12.30-12.45</td>
<td>Open Discussion</td>
<td></td>
</tr>
<tr>
<td>12.45-1.30</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>1.30-3.00</td>
<td>Panel 4: Interactive Learning Environments (Virtual Labs &amp; Classrooms)</td>
<td>Demonstrations of products</td>
</tr>
<tr>
<td>3.00-3.15</td>
<td>Open Discussion</td>
<td></td>
</tr>
<tr>
<td>3.15-4.00</td>
<td>Wrap-up Session</td>
<td>Dr. B. Thimme Gowda, Vice-Chancellor, Bangalore University and senior KJA/TG representatives</td>
</tr>
<tr>
<td>4:00-4:30</td>
<td>Tea/Coffee; Completion of Survey Forms</td>
<td></td>
</tr>
</tbody>
</table>

13. The list of the companies to be invited for the workshop was discussed in detail. It was decided to forward the list to Prof. S. Sadagopan to verify the background of the companies which is best suitable for the education technology workshop.

*(Action: Dr. Viraj Kumar to send the list of companies to Prof S. Sadagopan to check the background of the companies)*

**Agenda 4: GoK schemes related to Education Technology**

14. Sri. Francis was asked to provide the list of the schemes to Dr. Viraj and Dr. Viraj to be in touch with the Department to get detailed information on ET.

*(Action: Sri. Francis and Dr. Viraj Kumar)*

**Agenda 5: Draft structure of TG report**

15. TG felt to derive at the tentative draft structure for its report to reflect democratic and transparent system wherein the template would be of great use to facilitate discourse to GoK dealing with cross-cutting public policies regarding education technologies.
16. The tentative draft structure of the TG report is as follows:

- Introduction
- Present schemes of GoK and GoI
- Present state of Technology usage in Institutions
- Review of Institution needs
- Review of full spectrum of technologies available
- Satellite-based educational technologies
- Study of cost effectiveness, implementability and usability
- Recommendation for GoK (keeping in mind scalability)
- Scheme oriented action plan and implementation strategies

17. Mr. Francis suggested that the recommendations of the Committee should be in the policy/scheme framework along with specific actions which are implementable by the Govt. The framework should also contain actionable/probable budget.

**Agenda 6: Any additional issues with the permission of the co-chairs**

18. It was decided to hold a meeting on April 8, 2015 (between 3.00 PM to 4.00 PM) at KJA office with the Co-chairs and Member Secretary of the TG to take stock and to discuss any pertaining to the workshop, it was suggested to invite Vice-Chancellor, Bangalore University or the reference person for the workshop suggested by VC of BU for the meeting.

19. It was also determined to have next workshop in affiliation with Visvesvaraya Technological University (VTU), Belgaum on May 25 and 26 wherein the affiliated colleges of VTU to be invited to assess and evaluate the state of educational technologies, challenges/gaps in usage of technology and obtain inputs on way forward for most suited technology usage.

20. The meeting concluded with a Vote of Thanks by Dr. B. N. Suresh at 1.30 PM.

(Dr. Viraj Kumar)
Member Secretary, TG on ET-EUR
With support from
Ms. Jayashri, Convenor, TG on ET-EUR
(March 24, 2015)

To,
- All Members of TG

Copies to:
- Chairman, KJA for kind information
- Member Secretary, KJA for kind information
Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)
Government of Karnataka

Minutes of the Fourth Meeting of the Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ETEUR)

Date: July 8, 2015
Venue: Room No. 422, IV Floor, Vikasa Soudha, Bengaluru
Time: 1400 PM

Members Present:
1. Dr. K. Kasturirangan, Chairman, KJA
2. Sri. S. V. Ranganath, Vice-Chairman, Karnataka State Higher Education Council
3. Dr. Mukund Rao, Member-Secretary, KJA and Member, TG ET-EUR
4. Dr. B. N. Suresh, Co-Chair, TG ET-EUR
5. Dr. P. Balakrishna Shetty, Co-Chair, TG ET-EUR
6. Prof. S. Sadagopan, Member, TG ET-EUR
7. Prof. K. S. Rangappa, Member, TG ET-EUR
8. Dr. D. P. Kumar, Dept. of Education, University of Agricultural Sciences (On behalf of Dr. H. Shivanna, VC, UAS)
9. Prof. Manoj, Azim Premji University (On behalf of Sri. Anurag Behar, VC, APU)
10. Sri. A. Narayana Prasad, Nodal Officer, Dept. of Collegiate Education (DCE) (On behalf of Commissioner, DCE)
11. Dr. Viraj Kumar, Member-Secretary, ET-EUR
12. Dr. Aparna Lalingkar, Research Associate, IIIT-B
13. Ms. Jayashri, Convenor, TG ET-EUR

KJA Secretariat:
14. Dr. B. S. Padmavathi, SRA, KJA
15. Mr. Deepak, SRA, KJA
16. Dr. Anuradha, SRA, KJA

Background of the Meeting:
Chairman, KJA and Members of KJA reviewed the status of TG activities in 4th KJA meeting held on July 4, 2015. KJA satisfactorily noted that the TG has progressed well. It was also discussed to undertake a pilot-project for demonstrating the technology usage and its impact on the whole chain of education system. A pilot study involving IIIT-B technological base and faculty/students from Siddhartha University, Tumkur will be involved in the demonstration process and will also be obtaining inputs from key institutions on technology upgradation and faculty involvement process. It was also felt strongly to have a review
meeting by Chairman, KJA with the TG group to analyze the initiatives and plan-ahead activities of group.

Deliberations:

A. WELCOME

1. Dr. Mukund Rao welcomed the members to the review as well fourth meeting of the TG. He shared that the activities and progress of the TG is very well received by the Members of KJA. He also mentioned that the two-consultation meetings and pilot project of demonstration of technology was discussed in detail in the 4th KJA meeting.

B. REMARKS BY CHAIRMAN, KJA

2. While welcoming the Members for the meeting, Chairman mentioned that the TG has successfully organized two-workshop at Mysuru and Bengaluru which in turn helped the TG to understand ways in which faculty is using and perceiving technology usage in higher education institutions in Karnataka. He mentioned that the pilot project should be to prove the proof of concept and should aim at following objectives – one, demonstration of innovative need-based technologies for making education sector better and two, strengthen the interface between the inter and intra universities/academic institutions of the State. The pilot project should result in significant benefits in terms of raising the quality level of the education concerned, salient merits, utility and efficiency etc. It must also suggest the TG about the products in order to convince the stakeholders that the product is a worth buying.

C. Introductory Remarks by Co-Chairs

3. Dr. Suresh in his remarks said that Technology solutions for enhancing education provide a way of improving the quality of education to a widespread community by the use of standard computers in addition to the associated hardware and software designed for making the learning process more efficient for the teacher and for the pupils. Examples for this are interactive whiteboards, multimedia content, education response systems and digital schoolbooks, exam systems etc. Dr. Suresh gave a quick update on the activities of the TG. So far, TG had three meetings and two consultation meetings. The TG intends to promote successful policy model and strategies of Technology integration, with special emphasis on removing barriers to participation. He also mentioned that there are a wide range of technologies available, the goal of the TG is to be to see present education technologies is best adapted/assimilated to effectively modernize and improve the education system in the state at the university level. The TG is all set path for drafting its report, the tentative draft report will be reviewed and would like to organize a consultation meet on the report with all concerned stakeholders to incorporate any mid course-corrections which in turn provide right direction to the TG to proceed further.
4. Dr. Shetty emphasized that technology should be implementable sustainable and inclusive. He gave example of Technologies, which crumpled in no time, basically because it was not sustainable and acceptable to the stake holders. Basic technology like sustainable Power and Internet is the need of the hour in Higher Education Institutions and that is where we need to invest our time, money and energy at this time without any delay. He opined that instead of enforcing the technology on the students, we should provide this facility from next Academic year itself and allow our students to access Local, National and Global Educational contents on their own. He also felt the contents which they access should be a part of the curriculum/ examination, which need to be approved by Higher education Council.

D. BRIEF PRESENTATION ON TG BY MEMBER-SECRETARY, TG

5. Prof. Viraj briefed on the activities of TG and presented experiences of the workshop. (PPT attached)

E. DISCUSSION ON THE PILOT PROJECT ON TECHNOLOGY DEMONSTRATION

6. Mr. Narayana Prasad shared that the teaching-learning processes through technology integration is being achieved by establishing smart class rooms and virtual classes in Government First Grade Colleges, under Dept. of Collegiate Education. The Smart Class Room concept enables the faculty to use state-of-the-art ICT facilities like projectors, audio systems and computers for accessing on-line content, use multimedia like video, audio, animations and images in class room for making teaching more effective and lucid. The Virtual Class is a computing platform where the video lectures stored in the media server are accessed on-demand for Live-streaming. A gamut of e-contents in the form of video lectures, e-Books, audio books and lecture notes pertaining to the undergraduate course syllabi, extra-curricular programmes and personality development modules available online as open courses are being pooled in for invigorating teaching and learning in Government First Grade Colleges. He also shared that the DCE is facing two problems mainly – theft of solar panes at colleges and power cuts.

DCE has prepared nearly 1000 hours of content in digital mechanism of all subject on trial basis and started virtual classrooms in 565 colleges. These e-learning materials are for imparting quality education at college level and are provided to colleges in hard-disks. Since one year, they have started giving placement assistance in Government colleges across Karnataka. For about 1 lakh students every year mock interviews, tests, Group Discussions etc are conducted. We are having MOUs with TCS and other leading Companies. In preparing e-learning content professors across Govt colleges are being called to prepare lectures and methods to solve problems which are being asked in competitive exams. The faculties are being exposed to technology whenever they are called for recording the subject classes. This enables them to continue and spread this adoption. 1500-4500 are being picked by Companies as part of placement initiatives. There are 55 colleges in Virtual Classroom Mode.
7. Dr. Rangan said that the experience of DCE should be made available to the TG as it is being done with the technologies being evaluated by the TG-EDUTECH including EDUSAT for connectivity. Between 11am-12noon & 4pm -5pm there would be classes on the online class platform. Accommodating all students is one of the challenges as there is limited capacity. The Virtual Classroom mode is being used for engaging students who cannot attend the on-line classes.

8. Mr. Ranganath mentioned that the rural BPOs are changing lives for the village youth, but on the other hand the rural call centres are failing mainly because of the failure or interruption of power supply.

9. Dr. Rangan suggested that VSAT could be one of the solutions to the access of internet. VSAT networks are entirely independent of terrestrial infrastructure and they can be expanded with great ease and fast as necessary. This makes it possible for a VSAT network for schools begin at an initial pilot stage connecting only a small group of schools and then expand to a large scale network encompassing many thousands of schools. He also said that the VSAT-enabled institutions take all effort to replicate a traditional classroom over and above its technology-oriented offerings like 2D image, animations, PowerPoint presentations and so on. The pedagogy is designed keeping in view hassle-free information dissemination, interspersed with online assessment of assignments, mock tests and time-bound quizzes. The biggest advantage of VSAT system is that you can archive each session/lecture, which can be accessed anytime.

10. Dr. Shetty suggested that the schools must find way to use energy as efficiently as possible, not only to set an example for their students and communities, but also to save on the bottom line. The renewable energy is a cost effective and environmentally friendly way to generate energy. Install a renewable energy source especially in Hyderabad Karnataka is great need of the hour.

11. Dr. Suresh shared that Prof. Thimmegowda, Vice-Chancellor of Bangalore University did mention in the workshop of ‘Assessing of Technologies for Higher Education’ that the colleges must have internet facilities and all attempts should be made towards enabling them with these facilities.

12. Sri. S. V. Ranganath mentioned that the TCS is having excellent e-learning and education solutions to provide customized e-learning and education solutions to help students/faculties to enhance their performance. TCS’ e-learning Center of Excellence is dedicated to provide trustworthy advice in strategizing learning programs and align them to the curriculum.

13. Prof. Sadagopan said that the challenge is to design appropriate systems which will provide and enable appropriate teaching-learning systems which enable to equip the faculties and their experiences in terms of use of education technologies. The key to meeting this challenge is an appreciation of the role of ET as an agent of change in the classroom, which includes not only the teacher and the teaching-learning process but also systemic issues like reach, equity, and quality.
14. Prof. Rangappa suggested to consider two-faculties from each colleges/academic institutions for the pilot project is ideal. Providing faculty training for educational technology must include pedagogical instructional methods and how institutions can incorporate such strategies into faculty educational technology training.

15. Prof. Viraj stated that the teachers of the few education institutions are having good access to education technologies but they are not actively engaging themselves in delivering teaching-learning process. Some educators and parents have reservations about the potential changes in teacher-student interaction that can stem from the utilization of technology in the classroom. These concerns often center on the perception that teaching across computers might decrease the frequency of one-on-one student-teacher communication or increase the amount of time that teachers spend at their work.

16. Chairman suggested that the detail proposal on the pilot project to be made in ten days and also requested the TG to discuss in detail with the Vice-Chairman, Karnataka State Higher Education Council.

(Action: Convenor of the TG must facilitate for the meeting of TG with the Vice-Chairman of Karnataka State Council for Higher Education)

17. Mr. D. P. Kumar said that the University is having an exclusive cell for distance education on different aspects to diffuse technical know-how to the literate farmers, to disseminate information at the convenient time and place of the farmers, to teach farmers who are residing at remote places and to provide selected technologies for the target group of farmers. ICAR guidelines are being followed for adoption of technology in UAS. UAS has TRIPAD system, where professors have to teach in class, go to fields and teach in extension centers. There have been regular deputations to HRD workshops and training centers in adoption of technology. Now all notes are in e-learning websites of university because International Students – Afghanistan, Africa, who find it difficult understand classroom teachings Meeting of Dr. Rangan with Dr. Iyappan of ICAR and Vice-Chancellor, UAS needs to be arranged.

18. Dr. Rao suggested to incorporate/consider one person from DCE for the pilot project with about 30 faculty with 60 participants. He brought this point and obtained consent from Chairman, KJA and Sri. S V Ranganath to fund this project by KJA. It would be a Proof of Concept. He proposed for 3-4 Agriculture University faculty to be deputed for this Pilot. Education network which is education purpose under a cloud and is only available for Education purpose. The word Internet connectivity is the crux of the problem. To avoid this, a dedicated Cloud network for education needs to setup to achieve the objective of accessing and imparting quality education which can be called as EDUNET.

19. Dr. Aparna expressed and congratulated KJA for considering education technology as a prime area. She suggested to block unproductive websites at colleges/academic institutions and must allow faculties to have access to internet.
20. Dr. Rangan said that the E-learning is referred to the use of networked information and communications technology in designing, delivering, selecting and extending learning. It is the convergence of learning and the Internet. The universalisation of education has become the top priority, especially for the developing countries. But the extension of quality education to remote and rural regions becomes a Herculean task for a large country like India with multilingual population separated by vast geographical distances. Satellites can establish the connectivity between urban educational institutions with adequate infrastructure imparting quality education and the large number of rural and semi-urban educational institutions that lack the necessary infrastructure. He suggested Karnataka to have its own EduSat to impair education through satellite technology as an essential part of education system.

21. Prof. Manoi mentioned that the recommendations of the TG on technology tools should not only restricted to the examination and evaluation process, it should support both teaching and learning, must increase student engagement and motivation; and accelerates learning.

22. The meeting concluded with a Vote of Thanks by Dr. B. N. Suresh at 1400 PM.

(Dr. Viraj Kumar)
Member Secretary, TG on ET-EUR
With support from
Ms. Jayashri, Convenor, TG on ET-EUR

To,
• All Members of TG

Copies to:
• Chairman, KJA for kind information
• Member Secretary, KJA for kind information
KJA-IIITB-PES Pilot Study

Meeting 1

Opportunities for technology usage
Suggested Pilot Studies

• Digital Lectures (labs?):
  • Creation: Adobe Captive 8, Microsoft Camtasia Studio/Office Mix
  • Curation: XRCI TutorSpace (PES + others pilot)

• Classroom infrastructure
  • Smartboard vs. smart projector vs. none of the above

• Remote SME interaction
  • Satellite receive + internet return, local caching (capability study)

• In-class interaction
  • Clickers, questions banks for in-class practice
Karnataka Jnana Aayoga  
(Karnataka Knowledge Commission)  
Government of Karnataka

Minutes of the Fifth Meeting of the Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ETEUR)

Date: July 20, 2015  
Venue: Room No. 422, IV Floor, Vikasa Soudha, Bengaluru  
Time: 1430 PM hrs

Members Present:  
1. Sri. S. V. Ranganath, Vice-Chairman, Karnataka State Higher Education Council  
2. Sri. Bharat Lal Meena, Principal Secretary, HED  
3. Dr. B. N. Suresh, Co-Chair, TG ET-EUR  
4. Dr. P. Balakrishna Shetty, Co-Chair, TG ET-EUR  
5. Sri. K. S. Dasgupta, Director, Indian Institute of Space Science and Technology,  
6. Sri. S. A. Kori, Executive Director, KSHEC  
7. Dr. D. P. Kumar, Dept. of Education, University of Agricultural Sciences (On behalf of Dr. H. Shivanna, VC, UAS)  
8. Sri. A. Narayana Prasad, Nodal Officer, Dept. of Collegiate Education (DCE) (On behalf of Commissioner, DCE)  
9. Dr. Viraj Kumar, Member-Secretary, ET-EUR  
10. Ms. Jayashri, Convenor, TG ET-EUR  
11. Mr. Deepak K, Co-Convenor, TG ET-EUR

Deliberations:

A. WELCOME

1. Dr. Suresh welcomed the members for the fifth meeting of the TG. He shared that the activities and progress of the TG was reviewed by Dr. Kasturirangan, Chairman, KJA on July 20, 2015. The pilot project on Technology Demonstration was also discussed in detail. The pilot project will be the proof of concept and aiming for accomplish following objectives - one, demonstration of innovative need-based technologies for making education sector better and two, strengthen the interface between the inter and intra universities/academic institutions of the State. He hoped that the outcome of the pilot project would reach significant benefits to the concerned stakeholders of the education Sector. He requested Prof. Viraj to present the ideation and details of the project.

B. PRESENTATION ON PILOT PROJECT

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2. Prof. Virajkumar briefed on the pilot project on Technology demonstration to the meeting. *(Presentation on the pilot project is attached)*

C. OPEN DISCUSSION

3. Mr. Das Gupta mentioned that the rapid technological changes, the rapid expansion of available information and the diverse of people demand and conditions, have created new opportunities and challenges to provide nontraditional learning delivery systems and institutions. In the past, technology focused on the infrastructure and hardware, such as how to wire/connect universities or whether to install computers in the classroom or a separate lab. Today the field has matured sufficiently to focus on how to use the technology to improve teaching and learning. Technology may make learning available to a wider target groups and has the power to promote more equal access to learning for as large and diverse group as possible. He suggested that the TG must arrive/derive at the selection criteria/parameters to measure the compatibility which can be ultimately used in selecting educational technologies; if the technology is related to exams, the criteria/parameters would help the TG to evaluate the pre-exam and post-exam results which can be used as guidelines when creating and improving programs use educational technology which in turn helps policy makers to decide on what sorts of technology programs they want to create or adapt, what sorts of implementation mechanisms to be considered and what sort of assessment to verify its effectiveness and persuasiveness.

4. Mr. Meena said that the GoK has contacted the top academic institutions such as Ramaiah, VTU, PES, UAS in all disciplines who have agreed to share their e-contents at free of cost for the use and dissemination to GoK colleges. But the major hurdle in sharing these e-content is dissemination as many of the socio-economic factors are involved such as rural connectivity, communication skills etc. He opined that the main concern is on delivery of content rather than on content generation. So, the TG must look into how the technology can be leveraged and make accessible to the last mile. As far as the pilot demo is concerned, the end-to-end simulation would be a good exercise but the focus has to be on identifying cost-effective technologies which could be recommended. He mentioned that the estimated budget (Rs. 45 lakhs) for the pilot may be looked into and pruned effectively.

5. Mr. Ranganath expressed that the educational institutions must have satellite connectivity as students are getting a better quality of education due to the influence of satellite technology. The TG must also explore satellite technology which is playing an important role in connecting students to the materials that enable them to better prepare for the future. As of now in Karnataka, DCE as well as VTU have satellite educational programs which are serving as the access solution for those educational institutions in rural and remote areas and these programs are progressing significantly over the last few years. But, there is still a long way to go as far as the quality of terrestrial connectivity services to the rural areas. Apart from this, the TG must also look at the cost related to technology. The cost information should be one of the first criteria to understand cost-effectiveness.
and selection of technology which in turn provide analytical support to TG as well as to KJA in terms of new approvals and the recurring cost involved in it. He mentioned that he supported the pilot project concept as it covers students, faculty-focus, evaluation and simulated the “full chain” of activities.

6. Dr. Suresh responded that the TG will proceed in a phased manner. He said that the faculty must recast their traditional teaching methods to benefit from the new instructional model that combines technology and class room interaction with the students. He sought opinions from the members on involvement of faculty in using of content/hybrid content which are already available.

7. Mr. Dasgupta elucidated that the teachers must tap in to a variety of online resources such as MIT courseware, micronotes to create a highly personalized, integrated online learning experience to each student’s needs which actually empower teachers and teachers must also think that they are contributing to dynamic learning resources. Many of open contents/materials which are available must be mixed and matched to the expectation of the students.

8. Dr. Shetty said that the technology in urban areas is influenced to a greater extent than rural one. So much more could have been done to bring the revolution in technology enabled learning process in rural areas. To reach rural areas, first of all study material can be distributed to the students through online and online videos/interactions can be made available to the teachers wherein the online teaching creates extended classroom communities for discussions, virtual classrooms and for interaction.

9. Mr. Meena said that NKN and KSWAN are state-of-the-art networks for all knowledge related institutions. NKN has already connected to 400 institutions which are actively engaged in generation and dissemination of knowledge in various areas. But still the state is facing knowledge gap in terms of quality and accessibility, so, it is necessary to bridge the existing knowledge gap in the State. He suggested that the content repositories are an essential component for using and sharing digital learning objects which provide opportunities to the faculty to share their ideas and discuss.

10. The Members unanimously endorsed the concept of the pilot project and suggested following points for consideration by TG/IIIT-B:

   a. The available repositories could be vetted by the group of experts as also creation of subject content by specific faculty using specific technologies.

   b. Identify a suitable cluster of institutions from where the TG can draw faculty and students for pilot study instead of targeting/drawing 2 faculties from selected colleges/academic institutions.

   (Action: Prof. Viraj to obtain a list of cluster of institutions from Dr. Kori, KSHEC and a list of colleges equipped with virtual classrooms from Mr. Narayana Prasad, DCE)
c. It was suggested that help and support of KSHEC in the process of selection of institutions and overall initiatives of TG. Both Mr. Ranganath and Dr. Kori agreed to extend its support to the pilot project and activities of TG.

11. In conclusion, Members suggested that the revised proposal could be formally circulated and submitted to KJA for further consideration.

12. The meeting concluded with a Vote of Thanks to Mr. Ranganath, Members of TG and officers from DCE and UAS by Dr. B. N. Suresh at 1630 hrs.

13. The minutes of the meeting issues on the approval of the Member-Secretary, KJA.

(Dr. Viraj Kumar)
Member Secretary, TG on ET-EUR
With support from
Ms. Jayashri, Convenor, TG on ET-EUR
(July 27, 2015)

To,
• All Members of TG

Copies to:
• Chairman, KJA for kind information
• Member Secretary, KJA for kind information
Pilot Studies

**Aim**: Test proposed technology usability with selected faculty & students

**Proposal**: KJA-IIITB-PESU Educational Technology Faculty Fellowship

**Outline** (full proposal by July 15):
- 30 faculty (Arts, Science, Commerce/Mgmt, Education, Engg, Medical, PG)
- 6 sessions over approx. 4 months (initial results → Final TG Report)
- Each session: Thursday, Friday, Saturday facilitated by IIITB & PESU experts
  - Each Saturday session: 60 students from Bangalore; mock “exam”
- Remote mentoring/monitoring on weekly basis; individual write-ups

**Approximate budget**: Rs. 45L
- Rs. 1L per faculty (laptop+WiFi dongle; travel/board/lodging/no pay)
- Rs. 3L for tech solutions, Rs. 3L for experts, Rs. 1.5L for students
Short-listed Vendors/Technologies

- Adobe (Captive 8 & Presenter): Creating content from scratch
- TeleVital (VitalStream): Editing existing software/hosting video content
- Xerox Research (TutorSpace): Curating/hosting content
- Radix: Evaluating programming assignments
Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)
Government of Karnataka

Minutes of the Meeting with Principal Secretary, HED to discuss on Pilot Study on Technology Demonstration – An initiative of TG ET-EUR

Date: August 20, 2015
Venue: At the Office of the PS, HED, M S Building, Bengaluru
Time: 1500 PM

Members Present:

1. Sri. Bharat Lal Meena, Principal Secretary, Higher Education Department
2. Dr. B. N. Suresh, Co-Chair, TG ET-EUR
3. Dr. Balakrishna Shetty, Co-Chair, TG ET-EUR
4. Prof. Viraj Kumar, Member-Secretary, TG ET-EUR
5. Mr. Deepak, Co-Convener, TG ET-EUR

Deliberations:

1. Prof. Viraj Kumar presented the concept of the Pilot Study on technology demonstration. He said that the pilot study will assess the usability and the likely impact of promising educational technologies shortlisted by the KJA Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (TG ET-EUR). An analysis of student and instructor activities and feedback will be the output of this pilot study, and will be submitted to the KJA ET-EUR as input to their report to the Government of Karnataka. Specifically, this study will assess how instructors and students make use of technology tools for the following:

1.1. Course Design: Instructors will be trained on easy-to-use software for identifying relevant existing content, creating new content (if required/necessary) to fill in gaps, and create modules and lessons keeping in mind learning competencies for each modules (as per the Washington Accord).

1.2. Content Delivery: Instructors will be instructed on methods to deliver modules to students. It is also contemplating to conduct a few follow-up visits to colleges to see how these modules are actually being delivered to students and how students are using them.
1.3. Assessments: Instructors will be trained on tools for designing tests based on competencies identified earlier and students will be trained on tools for taking test. The aim will be to assess the quality of assessments created by instructors and the learning outcomes of the students.

He briefed that the duration of the project would be of two-months (mid-September to mid-November) and the workshop will be convened at IIIT-B over 5-Saturdays. About 40 instructors will be selected from Bangalore and nearby rural areas which will comprise of 4 groups – Arts, Science, Engineering, Medicine, with about 8-12 instructors per group. They will be given honorarium, food, travel allowance and a ‘KJA-IIIT-B-PESU Fellowship’ certificate at the end of the pilot study. About 80 students will be chosen from Bangalore and will be provided with a Participation Certificate. He also presented the budget of the pilot study which cost about ₹ 21.9 lakhs.

2. Dr. Suresh said that instead of purchasing laptops, it will be hired wherein IIIT-B will process this through its vendors. He also said that the pilot implementation based on the outcome of this study project would be done in the cluster identified by Prof. Kori and the cost associated with this is to be met out of funds provided to KJA. Part of the cost will be absorbed by respective institutions.

3. Sri. Bharatilal Meena concurred with the general structure of the pilot study, budget and other details of the pilot project and he also made few suggestions which have to be incorporated into the detail proposal which are as follows:

3.1. Rename the pilot study as ‘KJA-IIIT-B Pilot Study in Association with PES University’ and rename the teacher certificate to ‘KJA-IIIT-B Faculty Fellowship’.

3.2. The contents which are available from few top universities/academic institutions are made accessible in the website of Higher Education Department, developed by NIC, which could also be integrated. He promised to give access to it shortly.

3.3. The pilot project has to list out expected outcomes which must also include the examples of how teachers’ teaching styles change over the training period.

3.4. The practices developed in the pilot study should be presented to HED as training modules to be used in subsequent roll-outs.

3.5. Outcomes should be scalable so that good practices could continue.

3.6. Existing ICT initiatives already taken be made use of whenever possible.
Action Items:

4. Before vetting the proposal, the Co-Chairs and Member-Secretary of TG must meet Sri. S. V. Ranganath, Vice-Chairman, Karnataka State Higher Education Council in the first week of September to obtain his inputs and suggestions on the same.

5. The detail proposal of the pilot study on Technology Demonstration to be formally submitted to KJA in a prescribed format of KJA and must route through the procedures of KJA.

General:

6. The meeting concluded with vote of thanks at 1600 hrs.

7. The minutes of the meeting issues with the concurrence of Principal Secretary, HED and on the approval of the Member-Secretary, KJA and finally by Chairman, KJA.

(Jayashri. M)  
RA, KJA

Copy to: 
Invitees of the Meeting

Copy for kind information to:  
1. Chairman, KJA-TC  
2. Chairman, KJA-MC
Karnataka Jnana Aayoga  
(Karnataka Knowledge Commission)  
Government of Karnataka

Minutes of the Sixth Meeting of the Task Group for Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ETEUR)

Date: November 23, 2015  
Venue: Room No. 422, IV Floor, Vikasa Soudha, Bengaluru  
Time: 1030 AM hrs

Members Present:

15. Sri. S. V. Ranganath, Vice-Chairman, Karnataka State Higher Education Council  
16. Sri. Bharat Lal Meena, Additional Chief Secretary, Higher Education Department  
17. Dr. Mukund K. Rao, Member-Secretary, KJA and Member, TG ET-EUR  
18. Sri. Chakravarthi Mohan, Commissioner, Dept. of Collegiate Education  
19. Dr. B. N. Suresh, Co-Chair, TG ET-EUR  
20. Dr. P. Balakrishna Shetty, Co-Chair, TG ET-EUR  
21. Dr. B. B. Kaliwal, Vice-Chancellor, Davanagere University (Invitee)  
22. Dr. D. P. Kumar, Dept. of Education, University of Agricultural Sciences (On behalf of Dr. H. Shivanna, VC, UAS)  
23. Sri. R. Srikanth, Nodal Officer, DCE  
24. Dr. Viraj Kumar, Member-Secretary, ET-EUR  
25. Ms. Jayashri, Convenor, TG ET-EUR

Deliberations:

1. The 6th Meeting of the Task Group was convened to discuss and to obtain inputs from the members of TG as well as from Sri. S. V. Ranganath and Sri. Bharatlal Meena on the draft report.

2. A brief presentation on the draft report of the Task Group on Educational Technology for Higher Education in Karnataka and EduSat utilization Review was made by Dr. Viraj Kumar (Presentation attached). After his quick presentation, he sought inputs/suggestions from the members.

3. Following are the inputs suggested by the members which has to be incorporated by the Member Secretary of TG:

   3.1. Academics and teachers must increasingly involve in e-content creation; foster efforts by academic institutions to create and make accessible standards-driven open education
resources. Teachers must extensively involve themselves in creation of content and online-publication. Integration of digital content as part of the instructional framework of the institutions. Driven by changes already happening at various education levels and need to prepare students for the future, which in turn has to provide the institutions with a variety of ways to address student needs.

3.2. Blending learning is a major challenge and it has to be touched upon as it gives students the benefits of both online learning and in-person instruction which allow students to work independently and at their own pace online, but still have access to the personal attention of a teacher. On the other hand, it also allow teachers to spend less time giving whole-class lessons, and more interaction with students to help them with specific concepts, skills, questions or learning problems.

3.3. Every classroom in each higher education institution must require at least 1kw of uninterrupted power to operate basic equipment with 8hour of battery backup.

3.4. As emphasis on digital classrooms growing, education department is eager to find and implement tools which will help transform the learning experience. While the potential value of educational technology tools is high, the way in which tools are implemented can drastically impact the actual value provided to the classroom.

3.5. To achieve maximum technology potential, it must be harnessed and implemented properly which requires that the facilitator, the teacher, possess a certain set of knowledge and skills to understand how and when various tools best support their curricula. Teachers must be provided proper training like pre-broadcasting training and post-broadcasting training before handling new tools. To access to the materials, new work books could be brought out to the teachers.

3.6. e-Notes must be detailed and must contain elaborated descriptions for accessing to classroom resources, lesson plans, practical information and for professional support.

3.7. The power constraints in the institutions could be covered under the budgetary allocation of RUSA. To start with, colleges which comes DCE could be considered which could cost around INR 200 crores. Over 3-4 years this issue could be addressed and budget could be allocated under BESCOM and RUSA as well.

3.8. As sufficient bandwidth has already available with DSERT, SIRD and VTU connectivity could be utilized. So, it could be recommended to have a local Media server store with wi-fi connectivity and every content could be made available through satellite and give offline option could be provided.
3.9. Annual Maintenance Costs need not to be annually, it could be for a longer term or for some prefix period.

3.10. Opportunities must be created to the state universities and foreign universities in technology aggregation to allow access to a broader range of complementary technologies.

3.11. Some of the aspects such as smart classes, language labs, future online exam system and recommendation on the same to be considered.

3.12. The report of the TG must provide leverage to use best of technologies which could be implemented in a phased manner with adequate resources in a fast track manner and it must also provide end-to-end solution and human interface should be minimal.

4. In conclusion, it was suggested the Prof. Viraj Kumar to have detailed discussion meeting with ACS, HED to obtain his views on the draft report on November 25, 2015 at 1700 PM at his office.

5. The meeting concluded with a Vote of Thanks to Mr. Ranganath, Members of TG and officers from DCE and UAS by Dr. B. N. Suresh at 1300 hrs.

6. The minutes of the meeting issues on the approval of the Member-Secretary, KJA.

Dr. Viraj Kumar
Member Secretary, TG on ET-EUR
With support from
Ms. Jayashri, Convenor, TG on ET-EUR
(November 27, 2015)

To,
• All Members of TG
• Invitees of the Meeting

Copies to:
• Chairman, KJA for kind information
• Member Secretary, KJA for kind information
ANNEXURE III
Annexure III

Report of

WORKSHOP ON TECHNOLOGY IN HIGHER EDUCATION

February 7, 2015

Prepared by

Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review

In cooperation with

University of Mysore

Karnataka Jnana Aayoga
(Karnataka Knowledge Commission)
Government of Karnataka
Task Group on Educational Technology and EduSat Utilization Review

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FOREWORD

Karnataka Jnana Aayoga (KJA) has been constituted by Government of Karnataka and is a body of experts and professionals in various fields who, together, bring a wealth of knowledge and expertise through news ideation, extensive brain-storming and wide consultations on important and relevant issues for the state’s governance and development. To address various issues, KJA has established number of smaller and dedicated groups or teams of experts – who address specific issues of education, sports, policies, arts, skill etc. These task groups/teams interface with relevant GoK departments and would come out with specific recommendations.

One such group that KJA has established is on Education Technologies and EduSat Utilisation Review. This group looks the issue of using advanced education technologies in Higher Education and reviewing of the current EduSat Utilisation in the State – with a view to recommend specific technological steps for higher education, including satellite based education.

This TG has taken on the important task of assessing the usage of education technologies and challenged thereof and determine the most suitable, effective and efficient technology – suite that can mesh with the existing educational system in the State. The TG has envisaged wide consultation/dialogue with faculty/principals/experts as a major step in this first-step analysis. The consultations are core to determine the present state and include the views/opinions of the education system for arriving at recommendations.

The first workshop was convened in association with University of Mysore and was held on February 7, 2015 at Mysuru. The workshop brought together ~150 faculty and experts and debated the present state and future needs of the education system in the state – thus, obtaining valuable inputs from “grass-root” faculty experts–which has been well-documented in this report of the workshop. The report includes summary of the presentations as well as panel discussion and finally records the key recommendations. I am sure that this report will be a core input to TG for finalising its recommendations, along with other inputs/reports that TG may utilise. I would like to express my gratitude and thanks to Dr. B. N. Suresh and Dr. P. Balakrishna Shetty–Co-Chairs of the Task Group; to Prof Rangappa, Vice-Chancellor of Mysore University; to Prof. Viraj Kumar, Member-Secretary of the TG and also to all the KJA TG Members who took up this initiative in a successful manner. On behalf of KJA, I would also like to thank and acknowledge Mysore University–its faculty and many others for a well-organised workshop. Thanks to all participants for providing valuable inputs.

June 18, 2015

(Mukund Kadursrinivas Rao)
Member-Secretary
Karnataka Jnana Aayoga (KJA)
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PREFACE

Providing the efficient and effective education is the need of the hour. Towards that, education through the usage of information and communication technologies (ICT’s) and satellite based technologies play a pivotal role. While the technology options are several, it is important to identify the most suitable technologies which can complement the existing educational systems in the State. It is also important to recognise the role of faculty and the existing formal class education before the identification of advanced technologies. Considering these factors Karnataka Jnana Ayoga (KJA) in consultation with the Higher education Department of Karnataka constituted a Task Group with the mandate to prepare a blue-print for suitable educational technologies and to generate an action plan for implementation in the State of Karnataka.

The Task Group deliberated these matters in great detail and decided to undertake the consultation process with some of the prominent Universities in Karnataka. Accordingly the first Workshop was organised by Mysore University at Mysore with the main objective of reviewing the usage of the advanced technologies already available in several colleges, to assess their experience, expectations and to identify the gaps and issues in the usage of these technologies. One day Workshop on “Technology in Higher Education” was held on February 7th 2015. More than 375 participants from various colleges representing the Principals, technology resource persons, faculty members, librarians etc. participated.

These years are known for greatest accomplishments in technology, “Mangalayan” being on the top. Even the developed countries are looking towards India for technology. “Every student, Every Technology” is the vision and mission of KJA. To meet this objective wider consultations with all stakeholders are very essential and beneficial too. The deliberations and discussions at Mysore workshop were on a wide range of issues like the present practices, the need for advanced technologies, satellite based education and many other related areas. This report summarises the details of the workshop, technical sessions, their experiences in the usage of technologies and provides appropriate recommendations for further actions.

The task group is planning two more similar workshops, one specifically to address the educational technologies which are presently available by inviting the technology Institutions and the other to firm up the requirements of advanced technologies for
education by embedding the experience of both earlier workshops. At the end of these three workshops the task group is proposing to finalise the recommendations, by consolidating all aspects of technologies and come out with the specific action plan for the State of Karnataka. We earnestly hope that these recommendations by the task group would greatly assist the Government of Karnataka to utilise the technologies in enhancing the quality of higher education in the State.

Dr. B. N. Suresh  
Co-Chair, Task Group

Dr. P. Balakrishna Shetty  
Co-Chair, Task Group
MESSAGE

Technology is at the core of virtually every aspect of our daily lives/work and everyday living itself is becoming technologically more and more complex. In fact, all facets of society are becoming knowledge dependent. Moreover, participation in a modern technological world necessitates a significant level of scientific and technological understanding. Different kinds of technologies have the potential to contribute to different facets of educational development and effective learning: expanding access, promoting efficiency, improving the quality of learning, enhancing the quality of teaching, and improving management systems.

Technology should be a tool to help educators to meet the educational needs of all. As such, technologies cannot function as solutions in isolation but must be thought of as key ingredients in making it possible for education institutions to address core educational challenges. A great deal of the responsibility for successful integration of technology inevitably falls upon educational institutions and teachers. The most critical element in technology use is the preparedness and skill level of those who employ it. Teachers, for example, need high-quality professional development that leads to a professional community centered around the integration of technology into the curriculum.

To assess the usage and evaluate the education technologies in the educational institutions, KJA Task Group on Educational Technology in Higher Education and EduSat Utilisation Review in association with Mysore University organized one-day workshop at University of Mysore. The responses of the workshop were extremely good and indeed a great success which in turn provided view of the issues concerning the present levels of technology usage, including EduSat in Higher Education Institutions in Karnataka.

The report of the workshop has greatly benefited from the contributions of many individuals. The Stakeholders of the workshop provided considerable help in shaping the ideas/views of the TG and propose policy recommendations. I sincerely hope that the proposed recommendations of the workshop would in turn converted into the robust set of policy guidelines for the whole higher education sector.

(K.S. RANGAPPA)
VICE-CHANCELLOR
KJA Recommendation
on Educational Technologies and Satellite based Education
for Higher Education in Karnataka

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1. INTRODUCTION

Karnataka Jnana Aayoga (KJA) (www.karnataka.gov.in/jnanaayoga), at the behest of Higher Education Department, Government of Karnataka, is looking into the issue of improving education quality and outreach using advanced education technologies in Higher Education and review of the current EduSat utilization in the State. KJA needs to assess gaps/issues in current education technology deployment and recommend actions required for enhancing educational outcomes in the State with improved educational technology usage.

In order to prepare an action plan and to bring out a comprehensive actionable report, KJA has constituted a Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ET-EUR) under the co-chairmanship of Dr. B. N. Suresh, Former Member, Space Commission and Former Director, Indian Institute of Space Technology and Dr. P. Balakrishna Shetty, Member, KJA and Vice-Chancellor, Sri Sidhartha Academy of Higher Education. One of the important aspects in this direction is to assess the usage of education technologies and challenges thereof and determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the State. Therefore TG ET-EUR proposed to undertake wide consultations/dialogue with faculty/experts of higher education institutions and generate the necessary inputs by organizing workshops. The first workshop on Technology in Higher Education organized by University of Mysore in association with KJA on February 7, 2015 at Senate Hall, Manasagangotri Campus, University of Mysore.
2. RELEVANCE OF THE WORKSHOP

Technology plays an important promoting role in quality education. It provides basic guarantee for carrying out quality education. Teaching through Distance education seeks to upgrade the knowledge and understanding continuously which could also be the part and parcel of it and complement the Educational Technologies. Online degree programmes and distance learning have gained a firm foothold in universities around the world. What was once considered a niche channel for the delivery of educational content has rapidly become mainstream, creating wider access to education, new markets for content and expanded revenue opportunities for academic institutions.

With technology, education has taken a whole new meaning that it leaves us with no doubt that our educational system has been transformed owing to the ever-advancing technology. Technology and education are a great combination if used together with a right combination and vision. There are many views on modernizing education and making it technology aided and therefore he requested the members to give their opinions/views on improving education quality and outreach through usage of advanced education technologies and how present education technologies are seamlessly integrated to effectively improve and modernize the education system in the State especially Higher Education sector. A roadmap needs to be followed for matching technological tools to learning outcomes, so that technology can be used to get students to interact with course content in an engaging and productive fashion.

Visvesvaraya Technological University (VTU) and Dept. of Collegiate Education (DCE) implemented some effective solutions and educational initiatives are worth investigating. VTU implemented EDUSAT based e-classes for technical education and teaching-learning processes through technology integration are being achieved by establishing Smart Class by DCE. EDUSAT network could be used for administrative purposes and even for conducting online examinations and evaluations. There is an existence of possibility to upgrade technology to enable interconnectivity between national and regional beams of EDUSAT for conducting classes across the country.

To study the challenges in integrating technology; to explore the technology practices across the state; to discuss on technology infrastructure needed and to learn the best practices are quite essential for the activities of TG. The above concepts became the core topics for the workshop and accordingly the program/discussions were worked out by the Task Group.
3. OBJECTIVES OF THE WORKSHOP

The main aim of workshop was to assess the usage of education technologies and challenges thereof and determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the State.

Given the background for the conduct of the workshop, the objectives were defined as:

- Understand the present levels of technology usage, including EduSat, in higher education institutions in Karnataka.

- Learn from best practices, experiences and case-studies where challenges and gaps in usage of technology can be studied.

- Obtain inputs on way forward for most suited technology usage and for satellite-based education in Karnataka.

- Status of EduSat Utilisation in the State and to learn successful deployment EduSat program.

Based on these objectives, it was decided to invite key speakers who can talk on these lines and to understand the gaps in education system with reference to use of suitable technologies. The suggestions/inputs would be documented and used as supportive materials for preparation of action plan and suggest suitable and modern education technology packages.
4. DETAILS OF THE WORKSHOP

The program for the workshop is appended as Appendix A. The workshop was witness for a large presentation on Educational Tools and Satellite Connectivity in Institutions. A note worthy participant in the workshop who spoke in the session of Successes, Challenges and Opportunities was representation from VTU which has created e-learning facility through satellite using Ku-band Multimedia Based Data Dissemination System. The varied deliberations of the workshop have generated inputs and suggestions were indeed a great success.

4.1 Inaugural Session

1. Inaugural session began with the invocation by students of University of Mysore (UoM) and concluded with lighting of lamp by dignitaries..

2. Prof. Rangappa, in his presidential address, said that an academic revolution has taken place in higher education in the past half century marked by transformations unprecedented in scope and diversity. There has been a profound and pervasive disconnect between the capabilities of new technologies and leveraging them to enhance quality. But major change is taking place, and it is one of the key parts of the academic transformation of the 21st century. While technology can significantly contribute towards efficient and effective education at university level, the importance of teachers/faculty and formal class education systems also must be recognized, in the larger contest of the education environment in the State. He also mentioned that one of the important aspect is to assess the usage of education technologies and challenges thereof and determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the State. He also said that this workshop is a space for higher education professionals to share ideas, future-gaze and streamline technology decision-making.

3. Dr. B. N. Suresh delivered his introductory remarks. He said that the modern educational technology and other means of practices plays a significant role in promoting the modernization of education, which will also have a significant
impact on ideas, forms, process, methods, teaching and management of education. Application of modern education technology in continuing education will be a driving force to continuing education innovation. Technology and education are a great combination if used together with a right combination and vision. There are many views on modernizing education and making it technology aided and therefore he requested the participants to give their opinions/views on improving education quality and outreach through usage of advanced education technologies and how present education technologies are seamlessly integrated to effectively improve and modernize the education system in the State especially Higher Education sector. He also reiterated that a roadmap needs to be followed for matching technological tools to learning outcomes, so that technology can be used to get students to interact with course content in an engaging and productive fashion. He said that the workshop is a unique opportunity to interact with you all to share a common interest. He requested participants to fill feedback format which was provided at the time of registration wherein the suggestions and criticisms are extremely useful for the Task Group (TG).

4. Sri. Bharat Lal Meena, in his keynote address (delivered live from Bangalore, via internet broadcast), urged workshop attendees to seriously consider how technologies could be used to lead to effective educational outcomes in their respective institutions. He pointed out that the Draft for finalization Draft Minutes of Mysore Workshop Government of Karnataka was prepared to support educational institutions in using technology to raise standards, and highlighted some of the existing policies and schemes that were already available for institutions to take advantage of. He reiterated the rationale for creating the KJA Task Group to assess the needs of the education community, and to recommend policies that would be effective when deployed.

5. Prof. Sadagopan in his inaugural address said that he was delighted for this opportunity to address the workshop. He said that there is an enigmatic paradigm shift in higher education, which opens up the possibilities of educational technology to be more transformative. He urged/requested workshop attendees to provide views/suggestions so that the KJA could turn
ideas generated in the workshop into recommendations and take it to the level of implementation in collaboration with the policy makers/HED.

6. Dr. P. Balakrishna Shetty was requested to give his closing remarks for inaugural session. In his remarks, he solicited inputs from the participants on each panel discussion which in turn is very useful for the TG to take it to the KJA to implement them.

a. Technical Sessions

SESSION I:

A. Educational Resources: Access and Usage of IT tools and OER – Successes ad Challenges

Speaker 1: Sri C R Francis

7. Sri. C. R. Francis described about Rashtriya Uchchatar Shiksha Abhiyan (RUSA)/National Higher Education Mission which aims at strategic funding and support to the State higher education system in order to achieve the goals of equity, access and excellence. The mission authority delineate the overall policy, planning and approve programmatic norms within the overall framework of the scheme. RUSA is having completely new approach towards funding higher education in state universities; which is based on key principles of performance-based funding, incentivizing well performing institutions and decision-making through clearly defined norms. A management information system will be established to gather essential information from institutions. RUSA is aiming to provide greater autonomy to universities as well as colleges and have a sharper focus on equity-based development, and improvement in teaching learning quality and research. It is a new flagship scheme of the government that will pave the way for far reaching reforms at the state level. The key objectives of RUSA are to improve access, equity and quality in higher education through planned development of higher education at the state level. Such planning will include creating new academic institutions, expanding and upgrading the existing ones, developing institutions that are self-reliant in terms of quality education, professionally managed, and characterized by greater inclination towards
research and provide students with education that is relevant to them as well the nation as a whole.

8. Mr. Francis mentioned that many of the problems in the state universities are linked to the archaic systems and regulations that govern them. Without bringing about reforms in the existing governance and regulatory systems, it will not be possible to unleash the potential of the state universities. The reforms initiated under RUSA will build a self-sustaining momentum that will push for greater accountability and autonomy of state institutions and impress upon them the need to improve the quality of education.

9. He also briefed on National Mission on Education through ICT (NMEICT) - It is a momentous opportunity for all the 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 generation, research in critical areas relating to imparting of education and connectivity for integrating knowledge with the advancements in other countries attempted. For this, what is needed is a critical mass of experts in every field working in a networked manner with dedication. As of now, it contains 45-50,000 lecturers. MIT courseware, materials from Khan Academy are able to access to the teaching community which could be utilized. He also said that Karnataka State Wide Area Network (KSWAN) established to cater to the needs of the various departments across the state which offered data services, video conference services and voice services, but it failed to meet the expectations of the education department.

Speaker 2: Dr. Leena Wadia

10. Dr. Leena Wadia explained about the efforts of different players on Open Educational Resources across. The talk described some of the important lessons that can be learnt from existing projects relating to online educational resources, both national as well as international. It also discussed sustainable business models that could be used to achieve scale and made recommendations for involving software professionals to develop quality software that can support quality education.
OPEN DISCUSSION

11. Individual libraries purchase and subscribe to thousands of externally published electronic journals, electronic books and research databases. Most of these electronic resources are available to use both on-site and outside, but restricted to authorized users at an institution. Due to the terms of license agreements, access to these electronic resources is controlled by a system of authentication and this may depend on the publisher or service provider of the resource. It was suggested to improve the access of e-library and to e-books, for instance by creating a centralized virtual library. Sri. Francis mentioned that a proposal along these lines was under discussion.

12. Ideally, libraries should be accessible to all potential users without regard to any disabling condition. People with hearing impairments often discover that communication difficulties can be a serious barrier to their using the library to its full potential. Access to the full range of library services available to the general public with special provisions made to assist hearing impairment persons and adapt these services so that they can make effective use of library services. It was suggested to develop software and a library system across the state for hearing impaired.

13. Create Education Curriculum Development videos in a KPoint Kapsules as it is a cloud-based multimedia learning and sharing solution that provides as easy-to-use way to deliver content using video, voice, written text, documents and desktop. These videos could be captured as kPoint Kapsules for learning within an organization or delivered live in a meeting with participants’ joining from various locations over the internet.

14. In general, the purpose of a Virtual Library is to underpin learning and acquisition of knowledge, to provide a more solid basis for education and to enhance quality of life by drawing on digitally available (preferably on-line) books, materials and journals via ICT-based tools. A Virtual Library provides remote (on-line or CD-ROM-based) access to a variety of national and international content (e.g. curricula, learning materials, books, journals, magazines, newspapers), services traditionally offered by libraries and other information sources. Virtual Libraries
thus combine materials in electronic format with an electronic network which ensures access to and delivery of those materials. To become an effective educational tool in the public service, it must respond to the needs of and provide affordable access for prospective users - students, teachers, researchers and academics. Emphasis should be given to building up collections that are in the public domain and that are accessible through, e.g., applications of free software on the basis of affordable Internet tariffs.

### B. Satellite Connectivity in Institutions: Successes, Challenges and Opportunities

#### Speaker 3: Dr. Vikram Desai

15. Dr. Vikram Desai made a brief presentation on the Tele-Education Mission/EduSat. He mentioned that the new areas which need a special attention include linking of schools, colleges/universities, educational institutions, continuing education and up-gradation of professionals (e.g. doctors, lawyers, etc.) The thrust will be on reaching the unreached in remote areas. Objectives of Education Satellite System are to meet the challenges of number and quality of education through (a) providing effective teachers' training, (b) supplementing the curriculum based teaching, (c) greater community participation and monitoring, (d) providing access to quality resource persons (higher & professional education), (e) strengthening the distance education efforts initiated by various agencies (f) taking education to every nook & corner of the country, and (g) providing access to new technologies.

16. Dr. Desai highlighted that the EDUSAT is specially configured to have multiple beams covering different regions of India. In the first phase of pilot projects, a Ku-band transponder on board INSAT-3B, which is already in orbit, is being used. In Karnataka, Visveswaraiah Technological University (VTU) is the main beneficiary of this pilot project. Under this pilot project, all engineering college of VTU. Dr. Desai also presented usage data for the EDUSAT network for the state of Karnataka as a whole, for the Mysore region, and for other areas of the country by way of comparison.
17. Dr. Desai also presented the elements of tele-education network; its configuration, its applications used in the Higher Education Sector both at the national as well as the state scenario were covered. He also said that the ISRO is proposing a new concept of tele-education which is still under consideration, but is ‘future proof’ for at least five years.

**Speaker 4: Dr. K. Raghuveer**

18. Dr. K. Raghuveer presented Satellite Connectivity in Institutions: its successes, challenges and opportunities. While mentioning about e-learning platforms, he mentioned that many institution in the world started dissemination of their curriculum through electronic channels. E-learning supports following objectives such as Course materials using text, animation, movies, quiz etc. and also provide discussion among students and enable them to communicate their idea effectively around themes specific to a course. He also explained the mechanism which is followed by National Institute of Engineering in offering distance education. Lectures from the central sites are synchronously transmitted, via satellite based communication system to the various remote centers and a typical classroom consist of 30-40 students viewing lectures which are projected onto a large screen – such environment provides to interact students to each other. IT technology courses registered 1000 participants for a semester long courses and 500 students for short term courses. Around 1200 students are benefitted from the above courses.

**Speaker 5: Dr. R. Dattakumar**

19. Dr. Dattakumar shared the experiences of Satellite based Multimedia Broadcasting at VTU. He briefed that the main objectives of VTU-EDUSAT Project are to create distance education/e-learning facility through satellite using Ku-band Multimedia Based Data Dissemination System (MBDDS) Collect, process and disseminate content developed by the faculty drawn from both academia and industry Interaction/ feedback/guidance tools to learners and act as a facilitator between the experts and the students, supplement the conventional system of training and education and bring uniformity in technical education, explore the possibility of using the network for administrative purposes and other activities
of the VTU are its other objectives. Depending on the particular style in which the content is available or taught, the courseware includes material such as lecture notes, course outlines, reading lists and assignments/quizzes including industry-related courseware.

20. Referring to CXO Speaks programme, Dr. Dattakumar said that the objective of this initiative is to provide awareness and understanding of industry trends, requirements and critical success factors to students using EDUSAT network. Under a novel program called 'VTracU' the final year students of VTU will be put through employability test and their scores made available online to companies who have tied up with the university. VTracU offers companies not just employability scorecards to vet prospective recruits, but it also offers "a wider talent pool to choose from".

21. As far as low utilization of the EDUSAT network by VTU was concerned, Dr. Duttakumar conceded that there were problems that needed to be addressed, and he shared data on a “dipstick survey” conducted by VTU on the state of EDUSAT infrastructure at 40 VTU colleges, which provides an interesting and actionable insight into the issues at hand, and how these could be resolved.

Speaker 6: Dr. Nagalakshmi Rao

22. Dr. Nagalakshmi Rao spoke about the status of EduSat and its usage in the Dept. of Collegiate Education. She said that currently the State of Karnataka is provided with one EDUSAT Hub and is allocated with 2 "one-way Audio and Video" Receive-Only-Terminal (ROT) Channels and 2 "Two-way Audio and Video" Satellite Interactive Terminal (SIT) Channels. DCE, together with the Department of Technical Education, uses one of the ROT Channels for EDUSAT network. A total of 335 Government First Grade Colleges across the state are in DCE's EDUSAT program network. She also mentioned about JNANA THARANGA – EduSat based academic program - a special program for interaction between heads of the department and the college staff is conducted.

23. Dr. Rao also said that with the intent of taking this skill development programme to a new level, a novel initiative titled ‘Naipunya Nidhi’ was conceptualised during
2013-14. This program is aimed at crafting new opportunities, improving the self-image and imparting employability skills to the students, a sizeable number of who are from the disadvantaged socio-economic background. Naipunya Nidhi is an inclusive training module for all students of undergraduate program. Naipunya Nidhi has training programmes rich in content, delivered using novel teaching tools like EDUSAT.

OPEN DISCUSSION

24. Prof. Raju Gowda shared that the satellite-based Expert Centre, established by the University of Agricultural Sciences (UAS), Bangalore, has been receiving good response from farmers in many of districts. The Centre has not only enhanced their negotiating power against price-fixing middlemen, but also improved crop knowledge. The interactive sessions between experts and farmers have helped identify the information requirements of the farming community.

25. To provide access to quality education, particularly for far flung/remote location school, link EduSat to DTH and bunch all Broadcast channels into a single DTH bouquet. Sri. Vikram Desai responded to it and said that the new proposal of tele-education contains and covers the above objective.

26. Tele-education is very effective and has a lot of potential since there is a dearth of quality teachers. However, it is not a substitute, it is just a supplement. It supplements the curriculum-based teaching, imparting effective teacher training, providing access to quality resource persons and new technologies.

27. Students prefer blended teaching methods which incorporate both lecture recordings and live lectures, and often do not view recorded lectures as a replacement for attending live lectures. Students largely use recorded lectures to catch up on missed lectures and as a revision tool for exams and assessments, and often find recorded lectures to be a useful learning tool.

28. Administrators should recruit qualified faculty or instructors for their online education programs. It was also noted that to effectively deliver online courses, faculty must promote student-to-student interaction with minimal faculty
intervention, engage students in regular assignments, cultivate students' self-directed abilities, and then provide specialized attention to students who lack self-directedness.

29. Energy access remains a central challenge for digital education in rural areas. Most rural schools will not have enough power to run computers due to several reasons: no back up, poor quality back up, not enough power from grid to charge batteries, or inefficient computers (such as old CRT monitors and CPUs). Thus, rural education currently lacks multimedia content due to lack of adequate technology, theft and power cuts.

30. The following were suggested – extend tele-education to private education institutions and working modalities to be discussed; Creation of education video content repository and Karnataka Edu Content Repository centre is great need of the hour.

### SESSION II:

#### C. Technology Infrastructure needed in Institutions

**Speaker 7: Dr. K. R. V. Raja Subramanian**

31. Dr. Raja gave a quick snapshot on implementing blended, technology-enabled, high impact programs in selected colleges in Karnataka. He mentioned that the top class infrastructure is a necessary condition for the institution includes collaborative platform, satellite connectivity, high-speed internet, access to hardware facilities, access to software resources and access to educational and research resources. He reiterated that there is a need of non-disruptive, medium-term, faculty development on Technology & Pedagogy; empower disadvantaged students from rural engineering colleges through employability enhancement and other such programs would create high impact on stakeholders of educational system.

32. Dr. Raja suggested to train 5000 faculty in first year which focuses on technology pedagogy and the program could be of 1 year with the focus on teaching skills
towards student transformation. Such program facilitates technology enabled learning and practice for heterogeneous students and leverages the power of technology for empowering slow learners.

**Speaker 8: Dr. Ramesh Reddy**

33. Dr. Reddy briefed about ICT initiatives in the Department of Collegiate Education. While referring to the ICT infrastructure, he pointed out that the over 90% of the colleges have basic internet connectivity; 185 Colleges have Broadband Internet connections provided under NMEICT scheme; 185 Colleges have Broadband Internet connections provided under NMEICT scheme and Over 250 colleges have been supplied with Laptop Computers and UPS systems. As a outcome of the ICT training for faculty, around 67% of the faculty know how to use Computers; 58% of the Faculties have email IDs where in only 46 % use email communication regularly and over 89% of the younger generation Faculty have email IDs. Over 2000 faculty have been trained on use of ICT in teaching and learning.

34. Dr. Reddy mentioned that some of the class rooms are with facilities for multimedia presentations wherein over 45 colleges have Smart Class Rooms and 50 colleges to be provided with Smart Class Rooms with following class room projector, netbook computer, white ceramic marker board cum project screen, power podium and Amplifier-speaker with microphones and 1 KVA and UPS.

35. Dr. Reddy said that the Virtual Classes are intended to supplement the traditional teaching methods and enable students to access useful OpenCourseWare content offline. He also mentioned that the Department has over 1200 video lecture downloaded from NPTEL and other OpenCourseWare web portals. The following are the subjects/topics covered in the first phase of virtual class setup: Commerce and Management, History, Economics, Physics, Chemistry, Botany, Spoken English, Environmental Science and Computer Fundamentals.

**OPEN DISCUSSION**

36. There has been growing interest in moving beyond traditional measures of teacher assessment. A key problem is that current measures for evaluating
teachers are not often linked to their capacity to teach. Performance based evaluation of faculty could also leverage improvements in practice and professional learning opportunities.

37. Modern technologies to be used to attract students to science and give them better understanding of it. Through technology, students can explore science content in a way that wouldn’t otherwise be accessible. Not many videos and visualization are available in science area. The only bigger source of educative videos is Khan Academy.

38. Design-based learning approaches have also been found to be particularly successful in developing pre-service and in-service teachers’ pedagogical skills, especially around integrating technology appropriately into practice. There is a need of a platform to develop and deliver lessons and units that connect the most essential concepts and skills students need to know and do; this means avoiding teaching disparate, unconnected facts that could inhibit the development of critical thinking, problem solving and other 21st century skills. Research on pedagogy could help to upgrade the method of teaching.

D. Using ET tools for academic process and examinations: Opportunities and Challenges

Speaker 9: Prof. S. Ravi

39. Prof. Ravi briefed that the term of 'Open content' and 'Open courseware' are sometimes used to mean the wide range of resources to support learning and teaching, one is fairly broad and the other very specific. We have chosen to use the term Open Educational Resources (OER) as this relates to resources that are specifically licensed to be used and re-used in an educational context. Whilst purely informational content has a significant role in learning and teaching, it is helpful to consider learning resources by their levels of granularity and to focus on the degree to which information content is embedded within a learning activity: digital assets, information objects, learning objects, learning activities and learning design.
40. Prof. Ravi mentioned that the student enrolment at university level and at collegiate level is increasing manifold. The management of examination data of the large number of students is a very tiresome and a complex job involving different types of data by different administrative line branches. By automating the examination system, minimize human intervention by adopting ICT since the technology promises compact storage, speedy retrieval of data and untiring diligent work. It also helps to generate different question papers for different students in thousands and can also generate answer keys.

Speaker 10: Prof. Viraj Kumar

41. Prof. Viraj drew the attention of the participants by sharing his three personal experiences in using of ET tools. The first example was one where technology can achieve tasks that are beyond a human’s capabilities, but can nevertheless impose additional demands on the faculty. Probably every instructor of a programming course has been concerned about possible plagiarism in the program solutions turned in by students. Instances of cheating are found, but traditionally only on an ad hoc basis. To check automatically for evidence of copying, MOSS (Measures of Software Similarity) makes it possible and easy to examine, but requires additional effort on the part of the instructor. A second example concerned empowering the local instructor to add his/her own content to videos created by domain experts, such as nother such tool is the corpus by NPTEL (National Programme on Technology Enhanced Learning) which empowers the local instructor. It provides e-learning through online web and video courses by providing free online courseware. Finally, he gave the example of He also shared an extension to JFLAP software which is widely used for Java formal languages and package of automaton, which can be used to automatically generate examination problems of varying degrees of difficulty.

OPEN DISCUSSION

42. Students are outsourcing their projects/assignments/dissertation work and there has been an explosion in sites where one can download pre-written assignments. It has to be addressed and has to come out with mechanisms that allow cross-
referencing essays to identify. Ethical use of technology both in and out of colleges has to be emphasized.

43. Software Tools to be developed for social science disciplines as there is pool of software tools are available for science and engineering stream.

44. There has to be an authoritative platform for managing and sharing data of India/State, cover broad spectrum of disciplines helps in providing comprehensive, authoritative and consistent data.

45. There has been a manifold increase in the scope of technical knowledge, leading to a heavy demand for technical education. Technology Enhanced learning, with particular reference to NPTEL and its annotations are extremely useful and good, but there has to be some kind of mechanism to validate and verify with regard to quality, services, content, pedagogies, research and extension.

**E. Inclusiveness in Higher Education**

**Speaker 11: Prof. P. B. Shetty**

46. Dr. Shetty highlighted the need for inclusive education practices in technology. The introduction of technologies into the learning environment offers educators another opportunity to rethink their teaching and learning practices. He mentioned that the evidence suggests that ET can support inclusive practice in a variety of ways, including motivating learners and deepening their engagement in the learning process. He suggested Participative Leadership in Education and Student Empowerment (PLEASE) – with a view to solve the problem of teacher deficiency in rural public schools of Karnataka especially from 5th to 10th standard. He proposed to involve Post Graduate students in teaching core subjects at school level – especially in rural areas and also in urban areas. This could be a state-wide mission programme where, for at least 4 weeks, such an activity can be taken up. This would also empower post graduate students for rural development and also imbibe teaching skills. Dr. Shetty stressed on the following: provide advanced technology and include students to think and learn as they have become exam writing robots; inclusion of students into technology centres/classrooms and provide freedom to use and enjoy technology; instead of one-way of teaching, exhaustive PPTs, increase answer first, discuss next (Z-A)
methodology; stimulate students intellectual energy by encouraging social entrepreneurship modules like NCC, NSS and PLEASE projects; enhance student research by providing time, incentives and faculty support and audit the utilization of existing technology by the students.

Wrap-up session

47. Dr. Nazeer Ahmed, in his closing remarks, stressed the need to consider two important factors. First, the need to examine local-level solutions (not necessarily centralized solutions), since these tend to be more focused and robust. Second, where centralization is deemed necessary, to utilize big-data processing to learn about issues afflicting specific regions or institutions, and to react accordingly. He clarified that technology enabled both these approaches, and these two factors had the potential for drastically improving the quality of education in the state of Karnataka.

48. Dr. Shetty, Dr. Mukund Rao, Dr. Nazeer Ahmed, Prof. Raja, Sri. C. R. Francis and Sri. Vikram Desai formed a panel to evaluate the effectiveness of the workshop in achieving its objectives, to discuss follow-up plans and to share closing thoughts and impressions. Chosen for their diverse perspectives, each panelist discussed their comments on the workshop proceedings, and what some next steps might be. The panel comments were followed by an open discussion period when all workshop participants were given the opportunity to respond to the panelists and raise additional issues.

OPEN DISCUSSION

49. Like most philosophies, Buddhism attempts to frame the complexities of human existence in a way that reassures us that there is, in fact, some underlying order to the universe. Buddhism is an ethical system – a way of life – that leads to a very specific goal and that possesses some as of both religion and philosophy. It was advised to infuse/incorporate some of the aspects of Buddhism to the knowledge initiatives of Aayoga.
50. While responding to the above, Dr. Mukund Rao suggested to come out with the list of specific issues to be sent by email or by letter to the Commission or the proposal with the specific issue and clearly mentioned objectives could be submitted to the Commission.

51. Modifying traditional teaching techniques to incorporate technology is not easy. It takes time, which teachers often lack. Lack of released time to learn how to use computers and the Internet was one of the most frequently reported barriers to public school teachers using computers and the Internet in instruction. Training, preparation, and work environments also play roles in a teacher’s readiness to use technology.

52. Development of an Indian sign language education and recognition platform for hearing impaired students. The system can substantially help in the primary/vocational/higher education of hearing impaired students and people of Karnataka.

53. For the effective utilization of EduSat project, it was suggested to constitute a Society under the Chairmanship of Principal Secretary of Higher Education Department with the similar lines of Punjab, Gujarat and Haryana as these states are doing extremely well.

MAJOR INPUTS OBTAINED FROM THE DISCUSSIONS

- One should encourage schools to use technology in more creative ways by permitting more flexibility in instruction and by providing incentives that support technology-enriched programs. More ways should be found to motivate the most experienced educators to use technology through better training and more curriculum-related opportunities.
- There are array of such technologies that are changing education landscape for good. Now the teachers have better instructional tools, administrators have better management tools and students have better learning tools.
- The quality and technology driven education i.e. smart classes, virtual class rooms, tele-education, satellite based education etc could be provided to the mass or to reach more students which is great need of the hour
- Creating a fully wired State, with easy availability of access to the internet, students becoming net savvy and teachers/faculty being trained to use technology. This single investment will give the greatest return in achieving the vision in the shortest possible time.
5. ANALYSIS OF FEEDBACK

TG has developed a simple questionnaire/feedback format which was circulated to the participants to fill. The filled response from the participants was analysed. The summarized basic statistical information from the feedback forms highlighted the important points made by participants, which will be taken on board by the TG.

5.1. Train the Teachers

The single most important feedback given by participants was the need to train teachers in properly using any technology that is implemented to improve the teaching-learning process. Specifically, the following key points should be kept in mind:

5.1.1. Many faculty members have limited time available, since they are engaged in numerous administrative roles/committees. Thus, the technology should be simple enough to use so that a single focused training session is sufficient for most teachers to make good use of the technology.

5.1.2. Training should pay special attention to the needs of Senior Faculty, many of whom are unfamiliar with basics that younger faculty and students know how to use. As a result, an accessible training resource should be made available to all faculty members who need a refresher on how to use the technology.

5.1.3. Given the high faculty turnover at many institutions, training must be periodic. Therefore, any undertaking to implement a particular technology must budget for the cost and time necessary for repeated training.

5.2. Government of Karnataka Educational Schemes and Policies

The two presentations of current schemes by Departments of Higher Education and Collegiate Education were well received, and numerous comments pertained to these schemes:

5.2.1. Most schemes presented applied to Government and Government aided colleges. Recognizing the value of such schemes, there were requests from principals of private institutions to avail of similar schemes. Similarly, there were requests to extend such schemes to Secondary Education as well.
5.2.2. An important point was raised with regards to available infrastructure. For instance, some faculty members pointed out that although digital projectors were available in their institutions, the projector screens were torn or otherwise unusable. Hence, bare walls had to be used to project content, which was not always ideal for students. The take-away point here was that some infrastructure (such as projector-screens, projector bulbs, etc.) are subject to wear and tear, and schemes for installing this infrastructure must include provisions for replacing these items as needed.

5.2.3. It was pointed out that although the concept of digital content available over campus Wi-Fi networks and accessible through smart devices (including mobile devices) was a good idea, most campuses currently prohibit students from using mobile devices in college, because of their tendency to distract students. However, attendees felt that such access could work well for faculty members.

5.2.4. Another policy-related matter concerned examinations that were common for many disciplines, such as the “core” subjects in the early semesters. It was felt that while online (multiple-choice based) examinations were unsuitable for higher-level classes, such examinations would be more appropriate for the foundation courses. Furthermore, since enrollment in these courses tends to be extremely large, automated evaluation would ensure accuracy and consistency in the evaluation, which is currently extremely difficult to achieve.

5.3. Satellite-based Education

There was mixed feedback from faculty on the effectiveness of the EduSat programme for satellite-based education. On the one hand, some faculty members stated that the training they had received did not prepare them for occasional hardware failures, and as a result the system was often in an unusable state. On the other hand, some faculty members and Principals expressed happiness with the content and functionality of the EduSat programme, stating that it was functioning effectively at their institution. Even so, several suggestions were given to improve operations:

5.3.1. EduSat content could be extended to specifically cover B.Ed./teacher’s education programmes, thereby directly addressing future teachers. This idea has the
added attraction of familiarizing the next generation of teachers with satellite-based education, including its challenges and strengths.

5.3.2. There were calls from private/private aided institutions to make EduSat facilities available to them as well, since current policies do not offer these institutions subsidized rates on hardware, etc. This request hints at latent demand for EduSat content.

5.3.3. Some faculty suggested that the upcoming schedule for EduSat content could be publicized on TV/radio, so that faculty were made aware and focus on the appropriate chapters in their own classes.

5.3.4. For a variety of reasons, it is sometimes impossible for an EduSat class to be conducted normally. In such circumstances, faculty requested that the content should be made available for download (e.g., via the Department of Higher Education website, or on CDs).

5.4. **Hands-on Exposure to Technologies**

The final set of comments received from workshop attendees concerned hands-on exposure to the kinds of educational technologies that were being referenced by several speakers during the Workshop. A number of participants felt that a single-day workshop was insufficient, and that they had hoped to be exposed to usage of some of these tools, in order to understand how to use them effectively.

In recognition of these excellent comments, the TG has undertaken the following action plan:

5.4.1. To understand the full range of educational technologies available, by conducting an Industry Workshop in Bangalore. This event will be held on June 16th and 17th, in partnership with Bangalore University.

5.4.2. Based on the above Workshop, a short-list of candidate technologies will be identified, and a more hands-on Workshop will be conducted in partnership with VTU (Belgaum). This latter Workshop is planned for July, 2015.
6. RECOMMENDATIONS

It is evident from the presentation made in the technical sessions of the workshop that the Educational technology holds the promise of substantially improving outcomes for K-12 students, but there are significant challenges in bringing new educational technology products for this population. The spread of broadband Internet and Common Core State Standards have improved the landscape for educational technologies, but these factors alone are likely insufficient. Based on the discussions, the following points can be considered as recommendations:

6.1. Provide assistive technologies for hearing impairments equal access to public information and entertainment to help them to increase classroom opportunities and enhance reading instruction for students with hearing loss.

6.2. Delivery of educational content by DTH is a cost effective way and has the potential to revolutionise educational delivery across the length and breadth of the country.

6.3. To cater to a wide range of interactive educational delivery modes, provide and support tele-education networks which connect to schools, colleges and higher level of education to supplement the curriculum based teaching, imparting effective teacher training, providing access to quality resource persons and new technologies.

6.4. Setting up of Karnataka Edu-content Repository to create exemplary collection of Open e-learning/video content repositories where teachers and students can access to the materials which engages educators and students in sharing their best teaching and learning practices.

6.5. Introduce content library which is a central repository of all the content uploaded and access to the learners. To start with create and manage content library on the lines of NPTEL, which could be initiated by Dept. of Collegiate Education or VTU

6.6. Need for pedagogy research as curriculum, pedagogy and assessment are considered to be fundamental for quality in higher education. They go hand-in-hand and are largely determined by the faculty, students and the type of the
institutions. Assessment reforms are central to curricular and pedagogic practices in higher education.

6.7. Implement plagiarism checkers for the assessment of students’ work/projects which helps in saving of time taken to scan students’ submission, motivate students to produce original works and also benefits while they work on their assignments. Being able to check the originality of one’s materials is invaluable and has direct effect on students’ productivity.

6.8. Emphasize on the ethical use of technology both in and out of colleges as students are outsourcing their projects/assignments/dissertation work and there has been an explosion in sites where one can download pre-written assignments. It has to be addressed and has to come out with mechanisms that allow cross-referencing essays to identify.
Annexure IV

Report of

ASSESSING TECHNOLOGIES FOR HIGHER EDUCATION

June 16 and 17, 2015

Prepared by

Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review

In cooperation with

Bangalore University, Bangalore

Karnataka Jnana Aayoga
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Education is on top agenda for society and all round efforts are being made in Karnataka state and the nation to further enhanced and advanced education goals. Effective adoption of advanced technologies in Higher Education in Karnataka has received highest attention. In order to prepare an action plan and to bring out a comprehensive and actionable report, Karnataka Jnana Aayoga constituted Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (TG ET-EUR) to assess the best of education technologies and address propose a scheme-oriented input that can be recommended for implementation to GoK.

One of the important aspects in this direction the KJA TG took up was to assess the usage of education technologies, and challenges thereof, to determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the state. TG has emphasised the importance of faculty and teachers in this overall scheme and stress for faculty orientation and involvement is given top priority. The TG convened a series of consultation meetings/dialogue with faculty/experts of higher education of the State and generated necessary inputs. One such consultation meeting was successfully held in Mysore in Feb, 2015.

As part of continued consultation, KJA has now collaborated with Bangalore University in organizing a 2-day Workshop on ‘Assessing Technologies for Higher Education’. The workshop brought together ~300 faculty and experts and discussed on the various educational technologies – class-room technologies, self-learning technologies, evaluation technologies etc. The workshop also discussed the status of existing usage of technologies in BU.

The report of the workshop has been prepared by the KJA TG and Bangalore University and includes discussions and presentations, as well as panel discussions, with key recommendations. KJA hopes that this report will be a core input to TG for finalising its recommendations, along with other inputs/reports that TG has referred. KJA is happy to bring this 2nd consultation report.

I would like to express my gratitude and thanks to Dr. B. N. Suresh and Dr. P. Balakrishna Shetty – Co-Chairs of the TG; to Prof. Thimmegowda, Vice-Chancellor of Bangalore University; Prof. Viraj Kumar, Member-Secretary of the TG and Dr. Prabhakar, Director, IQAC, Bangalore University – specifically for organising the workshop and for steering the discussions with specific recommendations as outcome. I also would like to thank all the KJA TG Members who participated and involved fulsome in this initiative to make it successful. On behalf of KJA, I would also like to thank and acknowledge Bangalore University – its faculty and many others for a well-organised workshop. Thanks to all participants for providing valuable inputs.

September 30, 2015

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PREFACE

With the advancement of technologies, education has taken a whole new meaning and there is no doubt education coupled with the right combination of technology would enhance the quality of education. The main aim of the Task Group constituted by the Knowledge Commission of Karnataka is to recommend suitable technologies for improving the present education quality and outreach. It therefore becomes imperative to integrate seamlessly the present education system with the advanced education technologies. These efforts certainly would lead to effective improvement and modernization of the education system in the State especially in the Higher Education sector.

Technology has great potential to enhance the education qualities since it enables the interactivity, multimedia operations and many other services to educators. But how best they are utilized by the educators for teaching and learning is very important. Considering this factor the second workshop was convened by the Task Group in association with Bangalore University to explore many salient features of the technologies and the experience of the educators who have been utilizing the same. The objective of the workshop was to get necessary feedback from all stakeholders and to generate the factual information relating to all educational technologies including the Satellite-based education. Many prominent technology/service providers were invited to present a range of technologies available for education.

The Workshop spread over two days provided very valuable inputs in respect of various technology tools, content creation tools, content delivery methods, automation of the examination processes and creation of the interactive environments (virtual labs/classrooms). This report presents the entire proceedings of the workshop, summary of various presentations, outcome of the workshop and recommendations.

The Task Group is in the process of completing its consolidated report and finalizing the recommendations. The two workshops at Mysore and Bangalore, the various presentations by the subject experts, discussion and interaction with all stakeholders have helped vastly to finalise the recommendations of the task group on the educational technologies for the higher education Institutions. We earnestly hope that the recommendations of the task group would greatly assist the Government of Karnataka to implement Task Group recommendations for the benefit of higher education in the State of Karnataka.

Dr. B. N. Suresh
Co-Chair, Task Group

Dr. P. Balakrishna Shetty
Co-Chair, Task Group
MESSAGE

The term “Technology” refers to advancement in the method and tools we use to solve problems or achieve a goal. The advancement of education and educational techniques have to follow the progression of time. The development of ICT and its emergence as a new social communication tool has impacted all sectors of the economy/society. In educational sector, application of technology in the form of next generation web based learning, digital curriculum, and open learning, competency based and personalized learning, e-learning modules, has already changed the way the teaching and learning should proceed. Technology and education are a great combination if used together with right reasons and vision. Technology improves education to a great extent. It has now become a need for revolutionizing education for the better.

Karnataka Jnana Ayoga has taken a right initiative by conducting Workshops in order to prepare an action plan and to bring out a comprehensive report towards improving education quality and outreach using advanced education technologies in Higher Education in the State.

I hope the recommendations made in this report would bring out revolutionary changes in teaching-learning process in higher education in Karnataka.

(B. THIMME GOWDA)
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1. INTRODUCTION

Karnataka Jnana Aayoga (KJA) (www.karnataka.gov.in/jnanaayoga), at the behest of Higher Education Department, Government of Karnataka, is looking into the issue of improving education quality and outreach using advanced education technologies in Higher Education and review of the current EduSat utilization in the State. KJA needs to assess gaps/issues in current education technology deployment and recommend actions required for enhancing educational outcomes in the State with improved educational technology usage.

In order to prepare an action plan and to bring out a comprehensive actionable report, KJA has constituted a Task Group on Educational Technology for Higher Education in Karnataka and EduSat Utilisation Review (ET-EUR) under the co-chairmanship of Dr. B. N. Suresh, Former Member, Space Commission and Former Director, Indian Institute of Space Technology and Dr. P. Balakrishna Shetty, Member, KJA and Vice-Chancellor, Sri Sidhartha Academy of Higher Education. One of the important aspects in this direction is to assess the usage of education technologies and challenges thereof and determine the most suitable, effective and efficient technologies that can mesh with the existing educational system in the State. Therefore TG ET-EUR proposed to undertake wide consultations/dialogue with faculty/experts of higher education institutions and generate the necessary inputs by organizing workshops. The TG has conducted its first workshop on “Technology in Higher Education” on February 7, 2015 at Senate Hall, Manasagangothri Campus, University of Mysore with educational institutions to understand the gaps in education system with reference to use of suitable technologies. Now, TG along with Bangalore University convened its 2nd consultation workshop on “Assessing of Technologies for Higher Education” at Jnana Jyothi Auditorium, Central University Campus, BUB.
2. RELEVANCE OF THE WORKSHOP

Technology is significantly contributing towards efficient and effective education at university level, the importance of teachers/faculty and formal class education systems; this must be recognized, in the larger contest of the education environment in the State. Application of modern education technology in continuing education will be a driving force to continuing education innovation. Technology and education are a great combination if used together with a right combination and vision.

Smart mobile devices, social networking, virtual classrooms, identity management systems, faculty evaluation systems, data analytics and array of educational technologies have taken education to all new heights—both within and outside the classrooms. Assisting these learning methods is a multitude of smart devices, which were earlier considered as distractions for students. But the very devices are now leading way for immersive learning. There are array of such technologies that are changing education landscape for good. Now the teachers have better instructional tools, administrators have better management tools and students have better learning tools. Behind the scenes are group of companies that are fueling this educational transformations through their innovative technological solutions which need to be utilized and addressed and make utilize for betterment of education sector is great need of the hour.

To study and to assess the available technologies for content generation and management, effective educational content delivery technologies and also explore interactive learning environments is very important for the TG to prepare a blue-print for education technologies – action plan for Karnataka which will help in standardizing the use of most appropriate technologies across the state in universities, actions for assimilation/embedding the technologies into the present education system. The above concepts became the core topics for the workshop and accordingly the program/discussions were worked out by the Task Group.

3. OBJECTIVES OF THE WORKSHOP

The main aim of workshop was to assess/evaluate the various educational technologies available and their efficacy and to deliberate on future methods of technology assimilation, including satellite based education and IT.
Given the background for the conduct of the workshop, the objectives were defined as:

- To address the educational technologies available in the market place and determine the relevance for higher education in the State
- Review technological tools to learning outcomes to be used to get students to interact with course content in an engaging and productive fashion
- To analyse range of technology-enabled assessment (e-assessment) options that are available for the design, delivery and administration of required assessment activities in an education sector
- To create a platform which enable real time interactive environment between industries and teacher community which can interactively raise and answer questions using educational technologies
- To foster collaboration not only end-users, but cross-platform which encourage rapid innovation and content sharing to ultimately benefits all stakeholders
- Obtain inputs on way forward for most suited technology upgradation and faculty involvement process

Based on these objectives, it was decided to invite key speakers who can talk on these lines and to understand the gaps in education system with reference to use of suitable and appropriate technologies. The suggestions/inputs would be documented and used as supportive materials for preparation of action plan and suggest suitable and modern education technology packages.
4. DETAILS OF THE WORKSHOP

The workshop was witness for a large presentation on Educational technologies which are available in the market-place and witnessed for a detailed discussion. The varied deliberations of the workshop have generated inputs and suggestions were indeed a great success.

4.1. INAGURAL SESSION

1. Inaugural session began with the invocation by a staff of Bangalore University, Bangalore (BUB) and concluded with lighting of lamp by dignitaries.

2. Dr. B. Thimmegowda welcomed the dignitaries – Sri. R. V. Deshpande, Hon’ble Minister for Higher Education and Tourism, Sri. S. V. Ranganath, Vice-Chairman, Karnataka State Higher Education Council, Sri. B. N. Suresh, Co-Chair, TG and Sri. Balakrishna Shetty, Co-Chair, TG. He expressed that technology and education are a great combination if used together with a right reason and vision. Technology improves education to a great extent and it has now become a need for revolutionizing education for the better.

3. Sri. R. V. Deshpande, Hon’ble Minister for Higher Education, in his Inaugural address, said that he is extremely delighted that KJA has organized this consultation workshop in education technologies which is timely and most urgent need in the state. He mentioned that KJA has taken up some challenging tasks – the development of a holistic Karnataka State Education Policy – an all encompassing policy for forward-looking and futuristic education encompassing school, college and professional level and research and innovation development with an aim of making Karnataka have a state-of-art education system in a quest to further the cause of creating a knowledge based society which is again based on access, equity and quality. One really needs to critique the present educational system from a policy perspective and identify critical areas of development. Studying and looking at some of the advances that other nations and states have planned in education sector is important. This will ultimately lead to policy and plans for the improvement, growth and delivery of the education system – addressing technological, human resources, regulation, institutional and
legal frameworks for a futuristic education system with student centricity. Special emphasis to be placed on public Vs private education systems and faculty development and encouraging/motivating teachers – as good teachers are fulcrum to a good education system.

4. Karnataka being a Knowledge capital, situations in the education sector needs to be remedied and drastic action has to be taken if Karnataka has to regain rightful place in India and elsewhere – which can only be done by increasing the GER, improving the quality of education, low dependency on the human resources and overall greater investment by the State in higher education. Karnataka was one of the first few states that established a satellite based Edusat network in 2007 – with a hub and connectivity to various colleges/institutions. While the Edusat network has been in operation, current Edusat utilisations in state has gaps/issues and recommend actions required for increasing usage of satellite communications for education activities in the state. Given this status, Karnataka aspires to rise to greater heights so that its future generations can be assured of a high-quality education that will prepare them for an effective role in state and national development processes. Development is the need of the hour in the state and in the nation. It is recognised that holistic development of school, collegiate and professional education - inter-linked with skill-based education, research and innovation, integrating analytical and technical skills for research and innovation is extremely important.

5. Information and Communication Technologies (ICTs) and Satellite-based Education need to be extensively utilised for imparting education. There are a wide range of technologies available – in the form of Audio and video technology; Computers, tablets and mobile devices; edu-conferencing, dedicated Satellite-based Education, high-speed computer networks for students/faculty etc; Whiteboards; Screen casting; Satellite Virtual classroom and many others. There are also operational examples of self-instructional digital materials, Audi/Video digital instructional materials, Learning Management Systems, Learning Content Management System, Computer-aided assessment and Electronic performance support systems (EPSS) and other classic applications for education. Recently, we have started and initialised Smart Class teaching facilities successfully.
6. While technology can significantly contribute towards efficient and effective education at university level, the importance of teachers/faculty and formal class education systems also must be recognised, in the larger context of the education environment in the state. A technology-drive must not and cannot be the main solution; at same time resistance and non-acceptance to modernisation also cannot become a limiting factor for the future generation of students. The goal must be to see how present education technologies is best adapted/assimilated to effectively improve and modernise the education system in the state at the university level.

7. A plethora of technologies are available, it is important to utilise the most suitable, effective, efficient and progressive technologies that can mesh with the existing educational system in the state. I am sure the wide range of technologies available in market will be discussed in detail in the workshop. He pointed to address many of these points in the discussions/inputs of the workshop. He also is that he will look forward to the recommendations and deliberations on future methods of technology assimilation including satellite education and for a most visionary Policy for Education.

8. Dr. B. N. Suresh delivered his introductory remarks. He shared that the Higher Education Department, GoK requested KJA - for the need for improving education quality and outreach using of advanced education technologies in Higher Education in Karnataka and requested for a review of the current EduSat utilization in the State, including assess gaps/issues in current education technology deployment and recommend actions required for enhancing educational outcomes in the State using educational technology. In order to prepare an action plan and to bring out a comprehensive and actionable report, KJA constituted TG on ETEUR to address the above requests of HED and ultimately propose a scheme-oriented planning output to GoK. He also shared that the TG convened its first consultation workshop on ‘Technology in Higher Education’ in Mysuru and it was indeed a great success. He also said that the TG is seeing how present education technologies is best adapted/assimilated to effectively improve and modernize the most suitable, effective and efficient technologies that can mesh with the existing educational system in the state. He requested the invitees/attendees to give their opinions/views on improving
education quality and outreach through usage of advanced education technologies and how present education technologies are seamlessly integrated to effectively improve and modernize the education system in the State especially Higher Education sector.

9. Sri. S. V. Ranganath brought out salient features of international studies on ‘Challenges of Education’ where Dr. Janques Delor, Former Chancellor of European Union says Knowledge is fundamental driving force. He also emphasized that the neglected community of the society should be given important in the access to quality education. Gross Enrolment Ration of Higher Education is 17-18% which needs to be increased and is also a worry that a lot of dropouts happen. With regard to deployment of technology in education, he mentioned that Massive Online Open courses are technology intensive, imparting best quality education through universities, minimizing the presence of teachers, improving enrolment ratio, enhancing focus on innovation, reducing the role of teacher where human intervention is not required, promoting self learning, peer group learning and experiential learning. Use of technology in pedagogy by teachers/school enhances Quality and Effectiveness of teaching and governance in education system.

10. Dr. P. Balakrishna Shetty was requested to give his closing remarks for inaugural session. In his remarks, he solicited inputs from the participants on each panel discussion which in turn is very useful for the TG to take it to the KJA to implement them.

a. TECHNICAL SESSIONS

SESSION I:

F. Technologies for Content Generation & Management

Speaker 1: Sri. Ramesh Srinivasaraghavan, Adobe

11. The speaker gave an overview of Adobe Captivate and Adobe Presenter. Adobe Captivate 8 software reimagines the way interactive eLearning is created for a
multi-device world. Develop any-screen mobile learning without programming using all-new responsive authoring. Now use an intuitive UI to transform PowerPoint presentations into engaging eLearning using actors, voices, interactions, and quizzes. Leverage best-in-class HTML5 publishing to deliver any content to mobile devices, the web, desktops, and leading LMSs. The software help to create rich, interactive distributed learning experiences.

12. With the help of Adobe Connect 8, one can easily create and deliver compelling self-paced courses, conduct highly interactive virtual classes, and efficiently manage training programs using Adobe Connect software.

13. Adobe Presenter 10 software lets you create HD video lectures for classroom teaching, distance learning, flipped learning and MOOC sessions. Simultaneously capture your screen content along with your webcam video or turn your PowerPoint slides into interactive eLearning with out-of-the-box assets and eye-catching quizzes. Leverage HTML5 publishing to deliver courses to tablets. Track content consumption and learner performance with the built-in analytics dashboard or through integration with leading LMSs. Adobe presenter helps you to create studio quality video lectures by capturing your screen content along with your audio or video, right from your desktop. Use a simple 3-button interface to easily edit and publish your videos, convert your PowerPoint slides to engaging eLearning content. Add quizzes and out-of-the-box assets, and publish as HTML5 for access using desktop and mobile browsers. Track learner performance using leading LMSs and it will Use built-in analytics to track content consumption and identify learners who need course correction. Track learner performance, and report key performance metrics without having to invest in an LMS.

Speaker 2: Mr. Uday Kranti, NIIT

14. Speaker talked about common issues and solutions of technologies for content generation and management. The content lifecycle covers four macro stages: the strategic analysis, the content collection, management of the content, and publishing, which includes publication and post-publication activities. The lifecycle is in effect whether the content is controlled within a management
system or not, whether it gets translated or not, whether it gets deleted at the end of its life or revised and re-used. The analysis quadrant comprises the content strategy. The other three quadrants are more tactical in nature, focusing on the implementation of the content strategy. Assigning the activities and decisions throughout the lifecycle would create an iterative process.

15. The speaker said that the NIIT is providing education solutions to academic institutions, utilizing appropriate technology as the backbone and encompasses all the possible components which are required to render service to the present and future learning needs of schools. The solutions consists of Interactive Classrooms, the Continuous and Comprehensive Evaluation Training Program for teachers, Math Lab, Mobile Science Lab, IT Wizard, Learning Lab for Students and Quick School, an Education Resource Planning solution. He talked about common issues and solutions for technologies for content generation and management. He mentioned that the content management system is a set of automated processes – Create, Maintain, Reuse and Retire that support some of the features such as definition of workflow tasks, import and creation of documents and multimedia material, ability to track and manage multiple versions of a single instance of content etc. He shared 4 case studies such as Centralized Content Generation must augment and present/pass through locally to fulfill the needs of the target groups; Flipped classroom draws active learning, student engagement, hybrid course design and course podcasting. The value of the flipped class is in the repurposing of class time into a workshop where students can inquire about lecture content, test their skills in applying knowledge and interactive with one another in hands-on activities. During class sessions, instructors function as coaches or advisors, encouraging students in individual inquiry and collaborative effort; MOOCs and maintenance of the contents.

SESSION II:

G. Educational Content Delivery Technologies

Speaker 3: Dr. Vikram Desai, DECU, ISRO

16. The speaker presented the Tele-Education Networks in India – 26 states and 3 UTs covered under EduSat Utilisation Project. ‘EDUSAT’, India’s first thematic
satellite dedicated exclusively for educational services, was used extensively to
cater to a wide range of interactive educational delivery modes like one-way TV
broadcast, video conferencing, computer conferencing, web-based instructions,
etc. EDUSAT had manifold objectives - to supplement the curriculum-based
teaching, imparting effective teacher training, providing access to quality
resource persons and new technologies, thus finally resulting in taking education
to every nook and corner of India. EDUSAT provided connectivity to schools,
colleges and higher levels of education and also supported non-formal education
including development communication. EDUSAT Programme was implemented in
three phases: pilot, semi-operational and operational phases. Pilot projects were
conducted during 2004 in Karnataka, Maharashtra and Madhya Pradesh with 300
terminals. The experiences of pilot projects were adopted in semi-operational
and operational phases. During semi-operational phase, almost all the states and
major national agencies were covered under EDUSAT programme. The networks
were expanded under operational phase with funding by respective state
governments/user agencies.

17. The networks implemented under EDUSAT programme comprise two types of
terminals, namely, Satellite Interactive Terminals (SITs) and Receive Only
Terminals (ROTs). A total of 83 networks have been implemented connecting to
about 60,051 schools and colleges (4,790 Interactive classrooms and 55,261
ROTs) covering 26 States and 3 Union Territories of the country. About 15 million
students are getting benefited through EDUSAT programme every year.

18. As a part of implementation of Tele-Education network, a TV Studio/Teaching
end in each state is deployed for live telecast of programmes and creating
content as per their need/curriculum. DECU is providing training on Content
Generation to resource person for making programmes to be telecast on
respective tele-education network and also organized script writing workshop
and teachers’ orientation. DECU also generated few demo programmes for Std
10th and 12th of CBSE and distributed to few states for broadcast. In case
studio/teaching end is not physically located at Hub site, it is connected to hub
using 2 Mbps back haul link. He also shared the challenges and issues in tele-
education.
19. Mr. Desai said that the ISRO has proposed the new concept of tele-education which is having the configuration of 6-Ku-band independent Broadcast hubs, minimum 1 channel, 11 M hub. The interactivity is through GSM and backhaul link between teaching end & hub. It consists of additional features like recording, storage and playback classroom. The new concept is consisting commercially available, reduces dependency on single vendor, low capital and maintenance cost, user friendly and requires minimum licensing requirements. He also shared the comparative analysis of present network, internet based technology and new concept/GSM based technology.

Speaker 4: Sri. R. Subramanium, Hughes

20. The speaker said that the Hughes Global Education, is a premier interactive onsite learning through satellite based education and training service initiative by Hughes, for corporate and working professionals/ Students. It has live, interactive, real-time, two way video, voice and data classes, and spread across 155 classrooms in 75 cities. Hughes Global Education platform has redefined the next generation of education i.e. real-time Interactive Onsite Learning. The platform offers interactivity similar to a live classroom session, where a student sitting in any part of the country, at any given point in time, can interact freely with the professor, raise questions, queries, etc. making the interaction as spontaneous and natural as in a regular classroom. There is extensive use of two video, voice and data. The pedagogy is highly interactive. It consists of a judicious blend of lectures, real life case studies, quizzes, assignments, etc.

21. He also shared the activities of Educational Content Delivery Infrastructure of the Hughes. He shared that the core of the work is the Studio which is fully equipped with all required audio, video and computer systems that allow the instructor to teach and interact with students who could be spread across the country. The platform is very advanced that combines the critical aspects of verbal and visual communication – two-way video and audio synchronized with rich content, collaboration, discussion groups, application sharing and live interaction. The communications platform reaches large numbers of people in real-time. With this platform, live sessions become highly intuitive and effective, as video and rich...
interactive content are delivered directly to the desktop of the student. This demonstrates that this platform meets the most stringent performance criteria when delivered over the Hughes system. Very small aperture terminal (VSAT) is a communications technology that enables reliable two-way transmission of data via satellite using comparatively small antennas. The platform is a scalable application that combines quality video with two-way audio and data transfer to enable live delivery. It offers live collaboration tools such as application sharing, whiteboard annotations, discussion groups, chats and guided browsing. The platform shares a common user interface for live interaction, which incorporates the foundations of dialogue – high quality video for face-to-face interaction, clear audio, and rich supporting visuals and virtual collaboration. This interface includes integrated multiple video windows, application and data sharing, chat, questions, whiteboard and recording capabilities, all of which are designed to enable a feeling of virtual classroom even as students are geographically dispersed.

**Speaker 5: Sri. Sagar Betageri, McGraw Hill**

22. The Speaker talked about one of the initiative of McGraw Hill – Connect. McGraw-Hill Connect is a digital teaching and learning environment that saves students and instructors time while improving performance over a variety of critical outcomes. Connect is a highly interactive learning solution which helps professors in devoting more time towards teaching & less for managing the class and students in studying more effectively. Connect is a web-based assignment & assessment platform that helps Professors connect with their students anywhere, anytime. The paradigm shift from manual to digital helps the Professors in creating assignments faster & better and assessing the students more efficiently and effectively. With Connect one can –

22.1. Create assignments from a vast repertoire of content – in built and your own
22.2. Select the questions on basis of learning objectives or topics or difficulty level
22.3. Streamline lesson planning, student progress reporting & assignment grading
22.4. Create/conduct Homework, Practice test, Quiz or Exam
22.5. Assign practice materials to students as & when needed
22.6. Improves student learning & retention through engaging media & study resources
22.7. Get auto graded scores and feedback
22.8. Access Connect anywhere, anytime
22.9. Go paperless and contribute to the environment

23. The speaker said that McGraw-Hill Education conduct in-depth research to create a new learning experience that meets the needs of students and instructors today. The result is a reinvented learning experience rich in information, visually engaging, and easily accessible to both instructors and students. Connect offers a number of powerful tools and features to make managing assignments easier, so that one can spend more time teaching. With Connect, students can engage with their coursework anytime and anywhere, making the learning process more accessible and efficient. The Connect Instructor Library is course creation hub, which provides all the critical resources. It also assigns eBook reading and draw from a rich collection of textbook-specific assignments and access to ready-made PowerPoint presentations. It also helps to create and deliver assignments easily with selectable end-of-chapter questions and test bank material to assign online. It also assists to streamline lesson planning, student progress reporting and assignment grading to make classroom management more efficient than ever. Connect also helps students learn more efficiently by providing feedback and practice material when they need it, where they need it. It automatically score assignments, giving students immediate feedback on their work and side-by-side comparisons with correct answers, access and review each response, manually change grades or leave comments for students to review and also reinforce classroom concepts with practice tests and instant quizzes.

24. Students learn better when they’re actively engaged with the material. Lecture Capture of Connect offers new ways for students to focus on their coursework, both in and out of class. It actually records and distributes class lecture with a click of button, records and indexes PowerPoint presentations and anything shown on your computer so it is easily searchable, frame by frame, offers access to lectures anytime and anyplace by computer, iPod or mobile device and also
allow students to focus less on note-taking and more on class discussion, so they can listen more intently and participate.

Speaker 6: Sri. Bhushan Sharma, Pearson

25. Representative of Pearson shared the learning platforms of Pearson – Open Class, Equella and learning Studio. Open Class is designed for educators, institutions, students and content creators. Open Class is cloud based wherein one can easily create and edit courses, access to course materials and check assignments anywhere, anytime. It allow one to import existing materials like curriculum, content, and student information from other Learning Management Systems like Blackboard, Angel, and Moodle and it is easy to collaborate with fellow teachers, students, open to world-class content from publishers and individuals and it is easy to rate content and read and write reviews in the idea exchange completely cloud-based.

26. Equella is pearson's premier digital content repository, provides a central solution to meet an institution's learning, research, media and library needs. Faculty, instructional designers and academic technologists can easily search in one location for all of their learning content – video, custom eBooks, presentations, lecture captures and more – all tagged by metadata such as learning outcomes, grade level and relevant keywords. Equella is currently in use in a wide range of schools, districts, universities, community colleges, state systems and departments of education, government agencies, and corporations worldwide.

27. Pearson Learning Studio is built on a fully-hosted platform that is optimized to scale effortlessly as your program grows. And as more students access the platform, you can be assured that they will stay connected via Learning Studio's mission-critical services.

Speaker 7: Sri. Punya Mishra, Professor, Michigan University

28. The speaker talked about TPACK – Technological Pedagogical Content Knowledge. TPACK attempts to capture some of the essential qualities of
knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted, and situated nature of teacher knowledge. At the heart of the TPACK framework, is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). TPACK is a conceptual framework for educational technology by building on Shulman’s formulation of “pedagogical content knowledge” and extend it to the phenomenon of teachers integrating technology into their pedagogy. This framework is the result of 5 years of work on a program of research focused on teacher professional development and faculty development in higher education. It attempts to capture some of the essential qualities of teacher knowledge required for technology integration in teaching, while addressing the complex, multifaceted, and situated nature of this knowledge. Thoughtful pedagogical uses of technology require the development of a complex, situated form of knowledge. In doing so, one posit the complex roles of, and interplay among, three main components of learning environments: content, pedagogy, and technology. It offers to discussions of technology integration at multiple levels: theoretical, pedagogical, and methodological. Effective technology integration for pedagogy around specific subject matter requires developing sensitivity to the dynamic, transactional relationship between all three components. A teacher capable of negotiating these relationships represents a form of expertise different from, and greater than, the knowledge of a disciplinary expert (a mathematician or a historian), a technology expert (a computer scientist) and a pedagogical expert (an experienced educator). The speaker also putforth some of the key points – MOOCs misses creativity and insight; content must be in a disciplined manner; technology usage is about three main key challenge – Technology change adoption, how to teach, what to teach and finally technology makes ‘Good Teacher better or a Bad Teacher Worse’.

**HIGH LEVEL PANEL DISCUSSION**

29. Sri. S. V. Ranganath opined that there should be high level of encouragement for use of technology in education sector as the present Century is Information and Communication Technology driven. He mentioned that as Education sector would be prime mover of technology and innovation, incentivizing users of technology is very vital to build India’s future generation. In the use of technology there is need
to pay attention to responsibility allocation as technology can be disruptive; the main aim of adopting technology should be to improve delivery and quality of education. This workshop should deliberate and provide road map to the state on utilisation of technology in improving education system.

30. Dr. B N Suresh in his brief remarks said that the important factor under consideration in the workshop is technology for teaching. It is to be noted that upgrading technology frequently is costly and is very important factor for adoption of technology, therefore financing becomes very vital and requires highest consideration. There is also need for changes in the mindset of Government and stakeholders for giving great impetus to Technology in Education Sector. The Online courses and distance education courses imparted using technology by Open Universities / Distance Education Institutions are to be recognized Degrees on par with regular degrees issued by regular universities as this move thrusts on adoption/acceptability among Employers/Students/Teachers/Stakeholders.

31. Dr. Mukund Rao said technology has made in-roads into all spheres of life, in one way or the other. In education, technology has a significant role to play as quality, access and affordability can be ensured by adoption and deployment of suitable, simple & scalable technology interventions at appropriate levels. Also, Institutions should be allowed to choose the technologies as per their needs. While we discuss on the technology, it is very important to note that the societal changes where one could witness transition period in the technology adoption/intrusion – people born pre80’s are grappling with technological advancements and are struggling to cope with the present technological scenario, whereas people born after 1980’s have no problem to adopt and absorb technology as part of their life. It is very important to note that Education is Teacher dependant and there is urgent need to enable teachers to adopt technology in their teaching and assessment activities. It is very vital to ensure flexibility & independence to teachers to choose technology as part of their teaching methodology. The technology can be great tool to reduce and eliminate rural-urban divide in access to quality education.
32. Prof. Punya Mishra said that technology based learning brings a feeling of Mastery and sense of autonomy in students. But it brings no sense of autonomy among teachers while they learn to adopt to technology in their teaching and evaluation methodology. This is the reason for reluctance and slowness in teachers for employing technology. Therefore, it is very important to incentivize teachers for bettering their talent/skill using technology, rather than imposing technology on them. It is important to give them freedom to choose technology and adopt them.

33. Prof. Sridhar said different segments of education community like Institutions, Teachers and Students have different types of approach to learn and adopt technology in their spheres of life. Therefore, policy of funding the technology inclusion determines degree of adoption of technology. The Government should devise the policy on decision of using funds for adoption of technology to Universities / Institutions. There should not be a policy decision to apply same technology on everyone. There is a need to identify a road map on rolling out technology through needs and ways to implement them.

34. Sri S V Ranganath responding to Prof. Sridhar’s point on issue of funding said that the challenge lies in arriving at right amount to reach to reach last mile in the education delivery mechanism. Adopting technology is necessary to reach the last mile as there is no other solution available to meet this challenge. In general, technology is a cost effective solution but challenge lies in determining cost-benefit ratio. There is a need to make teacher’s most effective by leveraging technology; there can be no headway in adopting technology until it is made acceptable and teachers who adopt to technology should get encouragement for their efforts. In the current setup innovation is not promoted, therefore there is need to challenge people to innovate. One size fits all is not the solution. High quality mind should gravitate from the young age. Technology shall aid this.

35. Dr. Prabhakar said that the technology adoption should be driven by the interest of the learner (child/student).
SESSION III:

H. Technology for Examinations and Administration

Speaker 8: Dr. Ningegowda, Registrar (Evaluation), Bangalore University

36. While sharing the genesis of Bangalore University, the speaker mentioned that the Bangalore University established in the year of 1964. Today, it is one of the largest Universities in the country and in Asia with about 714 affiliated colleges. Currently, the University is offering 37 degrees – Under graduate 16 and Post-graduate 27. He also shared the IT initiatives which BU is following – 1985 Bachelor of Engineering course was computerized using Cobol on Unix Operating System and phased manner computerization of all the courses was implemented in the University. As of now, Examination Branch conducts two examination in a academic year – with the help of technology 2,55,961 students registered themselves for the examinations for the year of November 2014, 15,44,856 answer scripts evaluated and 3,59,010 results were successfully announced.

37. The University is extensively utilizing technology for all the administration process. For pre-examination process, University obtains online student enrollment data from colleges along with photo, student admission fee generation, collection of consolidated fees from the college, submission of student documents to the university approval, generation of Unique Register Number, online student registration for examination and download of admission ticket of the students by the colleges. For post-examination process, central college campus is the evaluation centre for all UG courses. The campus is under camera surveillance. Coding of Answer scripts is done by scanning – 18 answer scripts packet and generation of OMR with unique code number for the script and printing of the corresponding code on answer script. The evaluator will mark the marks awarded on the OMR, which is scanned and register number decoded after evaluation all the scripts. The data after valuation of all answer scripts of the course/semester will be uploaded. Results will be processed and results of the students will be declared online. Result sheets college-wise will be generated in PDF format, where in the colleges can download the result sheets. Finally he mentioned that the University results of final semester of all courses were
announced within a fortnight. University is spearheading to make the valuation digital and even to digitalize marks card. Further e-verification is one the cards and will be implemented very soon. Over Bangalore University is pioneer University in adopting the latest information technology to examination section to make it more students friendly.

**Speaker 9: Sri. Om Deshmukh, Xerox Research Centre India**

38. The speaker talked about Tutorspace - Multimodal Analytics of Xerox Research Center India. Quality education is one of the pressing needs of the emerging markets, particularly India. technology-enabled Massive Open Online Courses (MOOCs) and Open Education Resources (OERs) can be utilized to provide personalized educational experience based on students’ background, their learning behaviour and performance. Xerox Research Centre India (XRCI) is working towards building personalized recommendation systems that automatically create such customized video and/or text-based content. He introduce Tutor space a product of XEROX provides Formal and informal learning programs and software and services. It provide textbook – like navigation capabilities in video and one can search, clip, annotate and share video content and can also hyperlink with the video for efficient consumption and navigation. Tutorspace would lead to following driven actionable insights – Descriptive, Predictive and Prescriptive. Descriptive would drive to an aggregate and pre-learner content-usage and content-interaction pattern – predictive would predict learner performance, engagement and topic relevance and prescriptive prescribe remedial interventions it could be group and/or learner-specific. He also expressed the XRCI would like to join hands to pilot the system in college/university, improve student graduation rate, performance and employability and improve teacher efficiency.

**Speaker 10: Sri. B. S. Lokesh, Canon**

39. Speaker shared one of the initiatives of Canon which is being used to enhance education process – Managed Document Services. Canon Managed Document Services is a unified offering for organisations’s total output and document solutions management. It actually control print costs, enhance productivity and
efficiency and innovate and optimize work flow processes. It provided end to end services to achieve goals for cost reduction, improve serviceability and value driven solutions for continuous education process improvements to ensure that the objectives are being met. He presented three case studies – one is on, In house printing for question paper, marks sheet printing and certificates; second is Charge Back Model – Making printouts for lecture and project work are daily necessities for all students at the institutions and third is students’ record management which helps in organizing document management system results in faster retrieval records, its digital storage offers expandable capacity without impacting office space.

Speaker 11: Sri. B. V. Deepak, JIL Information Technology Limited

40. Speaker talked about Digital Onscreen Evaluation system which is developed by JILIT. While thinking of technologies, evaluation is also becomes important to grade a student with quick response in declaring the results. The physical copies to be handed over to evaluators, there may be risk of lost in transit ad there is every change of malpractices in evaluation. The manual copies are to be verified again for tabulation of result, which challenges in terms of accuracy. The solution has been developed/implemented with background of these concerns and with the interest of minimizing the time and effort.

41. He also shared some of the features of DOES such as secrecy will be maintained in coding the copies of answer books, randomly allot of answer books based on the specialization of the evaluators specialization, can be viewed question paper related to the Answer book, summary of scores will be displayed before submitting and generation of PDF files of evaluated copies. Activities of the DOES involves of scanning, digitization of answer books and each page is converted to image, preparation of master information like list of evaluators, list of paper codes and list of courses and branches, training to all the evaluators, automatic and random allocation by system to evaluators, evaluation of evaluators, enter marks, tabulate result and generate into PDF files.
Speaker 12: Sri. B. V. Deepak, JIL Information Technology Limited

42. Speaker also shared some of the solutions developed such as Q-genie, OLT, Campus Lynx, DOES and Online Examination Record Verification.

43. Q-genie is a web enabled question paper generator solution for Teachers, Tutors, Parents, Students, Schools and Coaching Institutes across classes and subjects. The software allows generating a question paper based on parameters like learning objectives, types of questions, competency level and difficulty level. In Qgenie, emphasis has been given to tag each question with its learning objectives. The repository of questions allows teachers to select a variety of questions from the bank. The teachers have the flexibility to generate class tests, terminal tests, and final tests. Setting a balanced question paper is a complex and demanding process. Generally most of the teachers set learning objectives while making lesson plans but they give less importance to transform these learning objectives into assessment objectives while setting question papers. This peculiar feature of linking each question with its learning objective allows teachers to focus on the testing of desired outcomes of the learners. Qgenie enable users to generate the question paper within a few minutes. It is therefore a very user friendly software solution. Question Paper can be downloaded 24x7 and the user has the option to print / store in a Word/PDF format at any time during the year. Qgenie can help enable students to get conceptual clarity, rational thinking ability and analytical skills through scientifically designed questions.

44. On-line Test is a unique software solution aimed at eliminating paper based exams and marking costs. This web application is a fully automated, secure online test tool with centralized controlling. All the features of On-line Test are customizable as per individual needs which can be accessed anywhere and anytime. Administrators load the questions into the database and the test is generated automatically. The question can be edited, deleted and re-used (question bank) anytime for a quick and rich online test. Online test can be given through any browser. Online Test is internet/intranet enabled website which makes test process easy, interactive, accurate and secured within a defined schedule. It is a robust and generalized product which can be used by any institute, college, coaching institutes, business firms/organizations,
placement/recruitment agencies etc for test or practice. It generated question paper as per specified question paper pattern. Administrator has a choice of defining parameters/patterns for the same and result of test can be instantly viewed.

45. Campus Lynx is a highly modular and scalable IRP (an Institutional Resource Planning) Solution specifically developed in line with the operational requirements of the present day Universities and Colleges integrated with state of the art smart card technology. Campus Lynx has been implemented and is running successfully in many reputed institutions, since real time data has flown into the system, undergone rigorous testing, has proved its success and functionality in various types of colleges and university spread throughout the country. It can be implemented within a short timeframe and any additional requirements specific to a university can be incorporated as the solution has a modular framework. This allows the university to benefit from implementing a solution such as this in the shortest possible time, compared to a solution that is created from scratch. Campus Lynx has integrated most of the complex processes adopted by professionally managed educational institute right from the stage of inviting admission applications till the passing out of the student to maintaining his history. Campus Lynx performance, unparalleled ease of use, flexibility, integration, comprehensiveness, speed, reliability and low cost make it a powerful tool, which empowers the growth of an institute and its students.

SESSiON IV:

I. Interactive Learning Environments (Virtual Labs/Classrooms)

Speaker 13: Sri. Sundar Suman, Elucido Media Networks

46. Speaker introduced Elucido CONNECT is a software product for enabling enhanced multiparty collaboration using Tablets, Smartphones and Laptops. CONNECT offers HD video and full duplex audio along with simultaneous whiteboard writing and document capabilities for all participants. Main features below:

46.1. Simultaneous writing and annotation on documents & Images
46.2. Upload and manage personal documents, presentations, spreadsheets and images (all participants) for use during collaboration sessions

46.3. Download whiteboard writing and document annotation done during the collaboration session as one PDF document at the end of the session

46.4. Supports multi-environment collaboration (between groups in conference rooms and individuals using mobile devices & laptops)

Speaker 14: Sri. Sudhi Subramanian, Televital

47. Speaker mentioned that the Televital solution offers syllabus based electronic educational content along with innovative and user-friendly ways to access e-content with bidirectional features to greatly enhance the quality of education. Based on decade of long experience in providing services in remotest parts in India and in Africa, Televital developed a state-of-the-art digital solution known as “Virtual Classroom” for the students to access syllabus based e-content in schools with limited Internet connection or no Internet connection and also with frequent power failures. This solution consists of a highly reliable local server with power backup providing e-content streaming on a local Wi-Fi network to Android or Windows laptops and/or desktops. These end terminal laptops/desktops don’t have any hard disks thereby enhancing the reliability and reducing the downtime significantly. Fully charged laptops can sustain up to 8 hrs. The students can not only stream the content recommended by their teachers on touchpad laptops and desktops, but can also answer the e-questions that the teachers have entered which pop up at predefined times during the streaming. This unique solution is one of the most innovative, reliable and economical solution helping the students to access the digital content in these virtual classrooms.

48. The education system is changing rapidly. Use of technology for making learning interesting and fun for students is increasing. Imagine a science teacher explaining how a DNA replicates, a history teacher teaching a class about the Mourya Empire, or a geography teacher teaching how Block Mountains are formed. The best of teachers take pains to explain the concepts largely
depending on their own abilities. The students listen to the teachers, try to decipher the figures drawn on the blackboard and read from their text books, take notes and try hard to visualize how it happens and remember. At the end of the class, the teacher asks a few random questions to assess how the class fared. Invariably a few hands (mostly of the same set of brightest students in class), go up, the answers are given and the class ends.

49. Virtual Classroom brings about a complete transformation in classrooms. The Science teacher while explaining how a DNA replicates is able to show the class a 3D animation of the DNA replication process on a large screen. Teacher can explain the fine points of the process, zoom in to show the relevant visuals, pause and explain when and where she needs to emphasize. Similarly the History teacher shows the class a virtual walk through of the Harappan Civilization. Uncovering the relevant parts step by step as a part of her lesson plan, while the Geography teacher shows a virtual Block Mountain being formed, all with engaging animations, colors, music, sounds and voice. The teachers gain complete attention and interest of every child in the class. Every child gets a visual input on how it happens and the concepts are well understood and internalized.

Speaker 12: Dr. S. G. Sreekanteswara Swamy, Executive Secretary, KSCST

50. The speaker said that the KSCST is an autonomous science and Technology organization under Department of Science & Technology Government of Karnataka. Under the Special Development Programme of GoK, DST-GoK, KSCST has implemented Virtual Laboratories at 10 high schools in the backward talus of Karnataka for use by the students for self learning, complementing classroom teaching. The objective of this initiative is to improve the quality and effectiveness of education by interactive self learning process and compliment/supplement classroom teaching through IT gadgets; to pool academic resources thereby improving access to teachers and students; to increase and improve the accessibility of educational resources and to enable students to independently view specific topics and breakout sessions allow teachers to divide the students into groups to discuss a specific topics or to work on a group assignment. So far, KSCST has set up Virtual Laboratories in 10 districts of Karnataka. Local server with syllabus based e-content and general
content for high schools in both English and many Indian languages. Content streaming will be done from the server to Android laptops/desktops with HDMI touch screens and also to a large HDMI television on a wi-fi network. UPS power backup for the server is also extended and fully charged laptops can run for 6+ hours. Along with this, teachers can also add their own requirements and additional pictures and information to the existing e-content and teachers can also create/add additional content to improve student’s general knowledge. Answers from students and statistics on the usage are archived in the database in the local server to measure the progress and also to measure the quality of education. With optional internet/satellite connection, local server will be periodically upgraded and also statistics from the local server will be uploaded to the server in the cloud. Centralized dashboard on this cloud provides feedback on the total usage as well as parameters to measure the overall quality.

4.3. OPEN DISCUSSION OF THE SESSIONS

51. It was suggested to digitize the lecture notes as most professors and teachers write their lecture material with a word processor, it is commonly distributed as regular handouts. This can be troublesome if any miss a lecture, and there will be limited number of handouts.

52. It was also discussed on video creation tools for lectures. Open Educational Resources are freely accessible, open documents which is useful for teaching, learning and accessing for different purposed which could also be used to develop and promote the educational content.

53. Many of the faculties suggested that the content should be local specific, user friendly and quality of material.

54. The content must also ensure to increase the Gross Enrolment Ratio of the State as well as the focus must also be on rural education.

55. It was also felt that the Patent considerations are particularly important to online educational resources.

56. Great strides have been made in infusing technology into schools and into the instructional process. Although schools have made progress in bringing
computers and the Internet to students and staff, greater access is still needed in order for technology to become a reliable tool for teaching and learning.

57. Teachers are role models creating trust and inspiring students in an environment where learning occurs – technology alone cannot offer these skills.

58. Teachers do not simply impart information and knowledge; teaching is not merely about systems, facts, figures and certainly does not exist to promote insularity and lack of social interaction. Education is much more complex than that. It is about the trust and bond between a teacher and students that creates the environment where learning can occur and grow. Virtual learning simply cannot do that.

59. State Universities must also have its own Digital repositories to help the target groups.

a. WRAP-UP SESSION

60. The wrap-up session was presented by Prof. B.C. Prabhakar, Director, IQAC, BUB; Dr. B. N. Suresh, Co-chair, Task group; Dr. P. Balakrishna shetty, Co-chair, Task group, KJA and Dr. B. Thimme Gowda, Vice Chancellor, Bangalore University. The session sought major inputs for the workshop from the invitees.
MAJOR INPUTS OBTAINED FROM THE DISCUSSIONS

- The workshop consists of a legion of valuable information and useful tools. Recommended to convene similar kind of workshops in near future.

- Academic Institutions/Authorities must list out the requirements before going to software vendors. In fact, the software vendors must customize the product according to the need and never go with the product what they have built already, since it may not blend with the existing system.

- Develop the requisite conceptual, critical, and philosophical skills necessary to take a leading role in guiding social and cultural discussions of the radical and transformative possibilities that are, and increasingly will be, afforded by technological intervention in the physical bases of human life.

- Actively encourage and train faculty in the use of educational technology in teaching and learning and use technology to assist overall student productivity and in particular, to help support a student’s own individual learning activities and plan curriculum activities to accomplish with the technology.

- Academic institutions must not view technology as a one-time investment but must budget for maintenance, upgrading and replacement costs. Available technology must be suited to the educational goals for which it is intended. Investments should not be made in technology for its own sake, but because it facilitates or extends instruction. This requires that a well-defined instructional vision should precede the technological one; teacher involvement in defining this vision is essential.

- The emergence of new technologies - computer related, multimedia, telecommunications - are presenting new challenges and opportunities to teacher education. Although some integration of computer applications within methodology and curriculum courses occurs in mainstream teacher education, each wave of new technologies, such as multimedia and telecommunications introduces a new wave of 'experts' from outside traditional teacher education backgrounds and training. How to work with these 'competing' teacher educators, from both institutional and conceptual perspectives, is an on-going challenge for teacher education professionals.
• To sensitize teachers about new concepts of teaching and assessment methods, develop knowledge and skills required for performing the role of competent and effective teacher and to update knowledge, faculty development programmes must be convened in order to enable faculty members to avail modern education technology for teaching.

• Technology vendors must come out with a package including software maintenance and care must be taken so that the technology vendors shall not dictate terms after technology implemented in the system.

• Pilot basis implementation of technology must be done in cluster of Institution which comprises of both rural and urban colleges together to understand how the implementation is working in the system.

• Institutions must make Educational Technology Training mandatory which also enable teachers to obtain credit hours.
5. ANALYSIS OF FEEDBACK

TG has developed a simple questionnaire/feedback format which was circulated to the participants to fill. The filled response from the participants was analysed. Basic statistical information from the feedback forms highlight the important points made by participants, which will be taken on board by the TG.

5.1. Comments regarding the need for content creation tools:

61. A number of faculty members expressed a willingness to create customized lecture materials if given easy-to-use tools. This enthusiasm was not just restricted to videos, but suggestions for enhancing existing content (and creating new content) included pictures, graphics, concept maps, etc. Existing tools such as PowerPoint or OpenOffice support most of this functionality, but it was promising to see interest among faculty members to stamp their own distinctive style to course materials and content.

62. Furthermore, faculty members opined that sharing high-quality notes would be helpful, especially since faculty are often under severe stress to “cover the syllabus”. A counter-argument to this, however, was that make notes available easily to students may create a problem of absenteeism. Of course, any teacher who can be replaced by his/her notes is unlikely to be a high-quality teacher in the first place.

5.3. Comments regarding content delivery methods:

63. Teachers strongly endorsed the need for two-way communication in class. Several respondents indicated that they had tried showing “one way” videos (including EduSat or NPTEL content) in class, but students quickly became disengaged. Hence, the need for a live faculty member would always remain.

64. One of the ideas demonstrated – providing content on smartphones – was viewed by several faculty as especially promising. To exploit this optimally, some faculty members opined that campuses should provide students and faculty members with WiFi access, at least for such content.
5.4. Comments regarding automating the examination processes:

65. Students identified this as the key session, since “in our education life, Examination part is most important”. As mentioned during the discussions, the issue of security and privacy were concerns when dealing with online examination systems.

5.5. Comments regarding interactive environments (virtual labs/classrooms):

66. Some faculty, including a few at Arts Colleges, stated that they had successfully been using smart boards for some time (with one institution making “full use” of them since 2010). However, many respondents felt that smart boards often seem like a good idea, but "unless good training and maintaining is provided, it will not work".

67. One extremely promising suggestion was given by principals of teachers’ colleges, who stated that they would be willing to work with government/industry partners to create content for virtual labs and classrooms.

5.6. Other comments:

68. The two primary concerns which were voiced repeatedly by almost all respondents concerned (1) infrastructure, namely power supply, backup and high-speed internet connectivity, and (2) cost for acquiring and maintaining the technology solutions suggested. Two interesting points were raised in this regard. First, vendors who provide online tools should also make the technology “somewhat workable” in offline mode, so that core system features can be used even if the network connection fails (as it sometimes does). Second, the government should actively encourage creation of open-source tools, and some faculty stated their interest in developing such tools.

69. Finally, one extremely interesting comment pointed out that none of the technologies demonstrated exploited teachers who actively use social media. The respondent pointed out that such social media tools could be extremely useful in helping faculty peer-learn and inculcate best practices involving the use of educational technologies.
6. RECOMMENDATIONS

6.1. Need of educational technologies that simplify the process of creating good-quality digital notes, lecture videos, adding additional content to existing videos, creating standard digital content of particular topic and allowing for local customization which benefits to students, instructors and institutions by availing digital lecture notes

6.2. Emphasis on sustainable solutions and provision of dedicated infrastructure to access digital content, including internet (either terrestrial or satellite-based), power (e.g. solar), projector, sound-system, smartboard (or smart projector)

6.3. Access to two-way (interactive) functionality to Receive-Only-Terminals (RoTs) for instructors

6.4. Promote classroom interaction greatly by interspersing lectures with problem-solving technologies i.e. clickers which are suitable for MCQs and database of solved and unsolved questions from previous years exams

6.5. Suitable software technology for automatically create exams from existing question banks and also based on digital content and customize software to perform exam scheduling/conducting/issuing grade to avoid fake grades

6.6. Create and broadcast educational content more targeted to the needs of local specific communities and as a result have a greater flexibility to employ local languages

6.7. State Universities to have their own digital repositories of scholarly works, teaching tools and other literature produced by the University community. Contents include articles, conference presentations, working papers, online journals, newsletters and syllabi to access to the student and other community

6.8. During technology planning, purchase decisions, and deployment, consider the accessibility needs of students. Weaving accessibility into the overall technology plan rather than adding accessibility as an afterthought could reduce overall technology costs.
ANNEXURE V: GOVERNMENT ORDER OF KARNATAKA JNANA AAYOGA

PROCEEDINGS OF THE GOVERNMENT OF KARNATAKA

Subject: Reconstitution of Karnataka Knowledge Commission


Preamble

Karnataka is emerging as a Knowledge State in the country and needs to take on the global challenges in terms of innovation, conservation of heritage knowledge, generation of new knowledge, application of knowledge in every sphere of life, skill development, enhancement of competencies, creation of better human capital to create new knowledge economy besides creation of a more humane society. Keeping in line with the setting up of National Knowledge Commission, the Karnataka Knowledge Commission was constituted in 2008, vide Government Order No: ED 110 URC 2008, dated 5/9/2008, under the guidance and Chairmanship of renowned Space Scientist Dr. K. Kasturirangan. After completion of three years term, the Commission was reconstituted and the term was extended till June 30, 2012. Recognizing the important role to be played by the Commission in making Karnataka a Knowledge State and a knowledge economy, it is proposed to reconstitute Karnataka Knowledge Commission.

The Government has considered reconstitution of Knowledge Commission for another term with the focus on institution building, policy innovation and excellence in the field of education, health, science and technology, industry, entrepreneurship, research and innovation, traditional knowledge, agriculture, e-governance, rural development, etc., and other relevant areas in the context of Karnataka. In view of the above, the Government has decided to reconstitute the Karnataka Knowledge Commission. Hence, this order.

GOVERNMENT ORDER NO. ED 462 URC 2013
BANGALORE DATED: 28/12/2013

In the circumstances explained above, the Government is pleased to reconstitute the Karnataka Knowledge Commission in the State with the following eminent persons as Chairman and Members.

<table>
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<tr>
<th>Sl. No</th>
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| 1     | Dr. K. Kasturirangan,  
Member (Science), Planning Commission, Government of India,  
Director, National Institute of Advanced Studies, Bangalore. | Chairman |
| 2     | Dr. Sudha N Murthy,  
Chairperson, Infosys Foundation, Infosys Towers, No 27, JP Nagar,  
3rd Phase, Bannerghatta Main Road, Bangalore – 560076 | Member |
| 3 | **Prof. M.R. Satyanarayana Rao,**  
Ex-Director, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Jakkur, Bangalore – 560064 | Member |
|---|---|---|
| 4 | **Dr. Nazeer Ahmed,**  
Advisor, World Organization for Research Development and Education, Ex-Scientist, NASA, No. 4, 9th Cross, Jayamahal Main Road, Jayamahal Extension, Bangalore – 560046 | Member |
| 5 | **Mr. B.V. Naidu,**  
Chairman & CEO, Sagitaurs Ventures India Pvt. Ltd, Unit G – 02, Ground Floor, Prestige Terminus-II, 901 Civil Aviation Road, (Old HAL Airport Exit Road), Konena Agrahara, Bangalore - 560017 | Member |
| 6 | **Prof. Sunny Tharappan,**  
Director, C.L.H.R.D, Valencia Circle, Mangalore – 575002 | Member |
| 7 | **Prof. G. Padmanabhan,**  
Former Director of IISc, Emeritus Professor, Department of Biochemistry, Indian Institute of Science, Bangalore – 560012 | Member |
| 8 | **Dr. Gayatri Saberwal,**  
Institute of Bioinformatics and Applied Biotechnology, Biotech Park, Electronics City Phase I, Bangalore – 560100 | Member |
| 9 | **Prof. S. Sadagopan,**  
Director, IIIT-Bangalore, 26/C, Electronics City, Hosur Road, Bangalore – 560100. | Member |
| 10 | **Dr. Venkatesh Valluri**  
Chairman, Ingersoll – Rand (India) Ltd., Plot No 35, KIADB Industrial area, Bidadi, Bangalore – 562109. | Member |
| 11 | **Dr. Devi Prasad Shetty,**  
Heart Specialist, Narayana Hrudayalaya, 258/A, Bommasandra Industrial area, Anekal Taluk, Bangalore – 560099 | Member |
| 12 | **Dr. S. Rajashekar,**  
Director (U.S.M), Jawaharlal Nehru Medical College, JNMC Campus, Nehru Nagar, Belgaum – 590010 | Member |
| 13 | **Dr. B.M. Hegde,**  
Ex-Vice Chancellor, Manipal University, Manipal | Member |
| 14 | **Dr. P. Balakrishna Shetty,**  
Vice Chancellor, Sri Siddhartha Deemed University, Agalakote, B.H. Road, Tumkur – 572107. | Member |
| 15 | **Dr. B.S. Sherigara,**  
Ex-Vice Chancellor, Kuvempu University, Shankaraghatta, Shimoga. | Member |
| 16 | **Dr. Sudha Rao,**  
Ex-Vice Chancellor, Karnataka State Open University, Mysore  
**Member Secretary, KJA vide GO:** ED 462 URC 2013 dated 28/12/2013 from 28/12/2013 to 12/08/2014  
**Member, KJA vide GO:** ED 318 URC 2014 dated 13/08/2014 from 13/08/2014 | Member |
KJA Recommendation
on Educational Technologies and Satellite based Education
for Higher Education in Karnataka

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<tr>
<td>17.</td>
<td>Sri. Mohandas Pai, President, Manipal Global Education, Bangalore. <strong>Nominated as Member vide GO : ED 462 URC 2013(p-5) dated 07/05/2014</strong></td>
<td>Member</td>
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<tr>
<td>18.</td>
<td>Sri. P.G.R. Sindhia, Former Minister, GoK, <strong>Nominated as Member vide GO: ED 527 URC 2014 dated 02/01/2015</strong></td>
<td>Member</td>
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<td>19.</td>
<td>Dr. Mukund Kadursrinivas Rao, NIAS, Bangalore <strong>Nominated as Member Secretary vide GO: ED 318 URC 2014 dated 13/08/2014 from 13/08/2014</strong></td>
<td>Member Secretary</td>
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**Members below the age of 45**

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<tr>
<td>1.</td>
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<td>4.</td>
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<td>5.</td>
<td>Sri. Srinivas Valluri, Head of Technology at M Health Ventures, Hyderabad.</td>
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<td>6.</td>
<td>Sri. Manish Sabharwal, Co-Founder and Chairman, Team Lease Services, 6th Floor, BMTC Commercial Complex, 80 Ft Road, Koramangala, Bangalore – 500095.</td>
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<td>7.</td>
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<td>8.</td>
<td>Smt. Nandita Gurjar, Member, Executive Council and Group Head of Education and Research, Infosys, Plot No. 44, Hosur Road, Electronics City Phase I, Bengaluru - 560100</td>
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</table>
9. **Dr. P.N. Rangarajan**, FASC, FNASC, 
Prof. of Biochemistry, Department of Biochemistry, 
Indian Institute of Science, Bangalore– 560012 
Member

10. **Dr. Mohan Alva**, 
Chairman, Alva Education Society, Vidyagiri, Moodbidri, 
Dakshina Kannada Dist. – 574227 
Member

### Ex-Officio Members

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<th>Sl. No</th>
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<td>Principal Secretary, Higher Education Department, 6th Floor, 2nd Stage, MS Building, Bangalore – 560001</td>
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<td>2</td>
<td>Principal Secretary, Health and Family Welfare Department, # 105, 1st Floor, Vikasa Soudha, Bangalore – 560001</td>
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<tr>
<td>3</td>
<td>Principal Secretary, Primary and Secondary Education Department, 6th Floor, 2nd Stage, MS Building, Bangalore - 560001</td>
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### Terms of Reference:

The Commission shall strive to give recommendations in the following areas.

1. To focus on institution building, policy innovation and excellence in the field of education, health, science and technology, industry, entrepreneurship, research and innovation, traditional knowledge, agriculture, e-governance, rural development, etc., and other relevant areas in the context of Karnataka.
2. Build excellence in the educational system to meet the knowledge challenges of the 21st century and increase Karnataka’s competitive advantage in the fields of knowledge.
3. Promote creation of knowledge in all formal and non-formal educational, scientific and knowledge institutions of Karnataka.
4. Improve the leadership and management of educational and knowledge institutions of Karnataka.
5. Promote knowledge applications in agriculture, rural development, health, industry and other areas.
6. Enhance the use of knowledge capabilities in making government an effective service provider to the citizen and promote widespread sharing of knowledge to maximize public benefit.
7. Promote inter sectoral interaction and interface with the objective of preservation, access, new concepts, creation, application, dissemination, outreach and services relating to knowledge.
8. Develop appropriate institutional frameworks to strengthen the education system, promote domestic research and innovation, facilitate knowledge application in various sectors.
9. Leverage information and communication technologies to enhance governance and improve connectivity and reduce digital divide.

10. Device mechanisms for exchange and interaction between knowledge systems in the global arena.

11. Conserve indigenous and heritage knowledge in Karnataka for better utilization of time tested concepts and knowledge by society.

By Order and in the name of the Governor of Karnataka

Sd/-
(S.R. Revanna)
Under Secretary to Government
Higher Education Department (Universities)

To,
The Complier, Karnataka Gazette -for publication in next issue of the Gazette.

Copy to:
1. The Principal Secretary to Hon’ble Chief Minister, Government of Karnataka, Vidhana Soudha, Bangalore.

2. PS to Chief Secretary / Additional Chief Secretaries / Development Commissioner to Govt., of Karnataka, Vidhana Soudha, Bangalore.

3. All Principal Secretaries/ Secretaries, Govt. of Karnataka, Bangalore.

4. Dr. K. Kasturirangan, Member (Science), Planning Commission, Government of India. Director, National Institute of Advanced Studies, Bangalore.

5. Vice Chancellors/Registrars of All Universities.

6. Executive Director, Karnataka State Council for Higher Education, Bangalore

7. Dr. Sudha N. Murthy, Chairperson, Infosys Foundation, Infosys Towers, No. 27, JP Nagar, 3rd Phase, Bannerghatta main road, Bangalore – 560076.


10. Mr. B.V. Naidu, Chairman & CEO, Sagitaur Ventures India Pvt. Ltd., Unit G-02, Ground Floor, Prestige Terminus-II, 901 Civil Aviation Road, (Old HAL Airport Exit Road), Konena Agrahara, Bangalore – 560017.


12. Prof. G. Padmanabhan, Former Director of IISc, Emeritus Professor Department of Biochemistry, Indian Institute of Science, Bangalore – 560012.

| 14. | Prof. S. Sadagopan, Director, IIT-Bangalore, 26/c, Electronics City, Hosur Road, Bangalore – 560100. |
| 15. | Dr. Venkatesh Valluri, Chairman, Ingersoll-Rand (India) Ltd. Plot No 35, KIADB Industrial area, Bidadi, Bangalore – 562109. |
| 17. | Dr. S. Rajashekar, Director (U.S.M), Jawaharlal Nehru Medical College, JNMC Campus, Nehru Nagar, Belgaum – 590010. |
| 18. | Dr. B.M. Hegde, Ex-Vice Chancellor, Manipal University, Manipal |
| 19. | Dr. P Balakrishna Shetty, Vice Chancellor, Sri Siddhartha Deemed University, Agalakote, B.H. Road, Tumkur – 572 107. |
| 20. | Dr. B.S. Sherigara, Ex-Vice Chancellor, Kuvempu University, Shankaraghatta, Shimoga. |
| 21. | Dr. Sudha Rao, Ex-Vice Chancellor, Karnataka State Open University, Mysore. |
| 25. | Sri. Vikram Sampath, Young Author, Mysore. |
| 27. | Sri. Manish Sabharwal, Co-Founder and Chairman, Team Lease Services, 6th Floor, BMTC Commercial Complex, 80 Ft Road, Koramangala, Bangalore – 560095. |
| 28. | Mr. Sangeeth Varghese, World Economic Forum, Founding Curator, Global Shapers, TF9, Lotus Crest, Phase-1, Brook Fields, Mahadevapura Post, Bangalore-560048. |
| 29. | Smt. Nandita Gurjar, Member Executive Council and Group Head of Education and Research, Infosys, Plot No. 44, Hosur Road, Electronics city Phase I, Bengaluru- 560100. |
| 30. | Dr. P.N. Rangarajan, FASC, FNASC, Prof. of Biochemistry, Department of Biochemistry, Indian Institute of Science, Bangalore– 560012, India. |
| 31. | Dr. Mohan Alva, Chairman, Alva Education Society, Vidyagiri, Moodbidri, Dakshina Kannada Dist – 574 227. |
| 32. | The Commissioner, Dept. of Collegiate Education, Bangalore. |
| 33. | The Commissioner, Public Instructions, Bangalore. |
| 34. | The Director, Dept. of Technical Education, Bangalore. |
| 37. | Dr. Mukund Rao, Adjunct Faculty, N.I.A.S, Bangalore – 560012 |