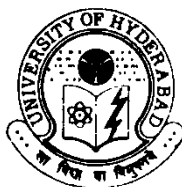


**INFORMATION COMMUNICATION TECHNOLOGY FOR
EDUCATION (ICT4E) TOWARDS KNOWLEDGE SOCIETY:
TRANSLATION IN UNIVERSITY OF HYDERABAD AND TEZPUR
UNIVERSITY**

*A thesis submitted during (Year) 2014 to the University of Hyderabad in partial
fulfillment of the award of a Ph.D degree in Department of Communication,
Sarojini Naidu School of Performing Arts Fine Arts and Communication*

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CERTIFICATE

This is to certify that the thesis entitled **“Information Communication Technology for Education (ICT4E) towards Knowledge Society: translation in University of Hyderabad and Tezpur University”** submitted by Machunwangliu Kamei bearing Reg. No 08SNPC03 in partial fulfillment of the requirements for the award of Doctor of Philosophy in Communication is a bonafide work carried out by her under my supervision and guidance which is a plagiarism free thesis.

The thesis has not been submitted previously in part or in full to this or any other University or Institution for the award of any degree or diploma.

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DECLARATION

I Machunwangliu Kamei hereby declare that this thesis entitled **“Information Communication Technology for Education (ICT4E) towards Knowledge Society: translation in University of Hyderabad and Tezpur University”** submitted by me under the guidance and supervision of Professor B.P. Sanjay is a bonafide research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodganga/INFLIBNET.

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Abstract

The growing importance of knowledge, research, innovation and evolving perspectives on expertise with the usage of Information Communication Technologies (ICT) are changing the sociology of knowledge in the globalized world. Universities are the major institutions involved in the production and dissemination of knowledge. This research looks at ICT for education initiatives taken up towards building a knowledge society as emphasized in National education policy regimes for encouraging knowledge generation, knowledge acquisition, knowledge diffusion, and the exploitation of knowledge. The research examines the present practice of ICT adoption in an existing framework of University of Hyderabad (UOH) and Tezpur University (TZU) through intensive case study. The research attempts to analyze issues of knowledge, governance and access using ICT; the application of communication technologies in Higher Education Sector that helps in fulfilling the goal of Knowledge Society; the communication process and strategies in the networking of higher education into Knowledge Society; existing 'digital divide' and the implications. Stakeholder's perspective further highlights the advantages and the challenges faced in the actual implementation of ICT4E. The study shows that both the universities have a strong commitment towards ICT for education. The introduction of ICT innovations have opened up opportunities for accelerating the flow of knowledge. TZU and UOH are in the process and need to further exploit traditional knowledge, taking full advantage of new developments in ICT. Extent of integration of ICT into the curriculum, changes in curriculum delivery using ICT, and ICT taught as a subject is department and school specific. TZU owing to its location faces greater challenges in terms of connectivity. On-campus settings for course activities are the main learning setting in both the Universities, though TZU and UOH are looking at variations in learning of where and how students participate in courses. Based on the study conducted, the research offers recommendations for management, human resources, processes and institutional culture in ICT4E implementation.

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to all those who have contributed to this thesis and supported me in one way or the other during this amazing journey.

First of all, I am extremely grateful to my Supervisor, Professor B.P. Sanjay, for his guidance and all the constructive discussions and brainstorming sessions, without which this thesis would not have been completed. His deep insights helped me at various stages of my research. I would also like to thank my Doctoral committee members, Professor Vinod Pavarala and Professor Sheela Prasad for their valuable comments and suggestions. My heartfelt gratitude to our HOD, Dr. Usha Raman and Professor B. Anandhakrishnan, Dean Sarojini Naidu School of Arts & Communication for their continual support at all stages of my research and to Dr. Kanchan K. Malik for her encouragement. Thank you University Grants Commission for the UGC-JRF/SRF scholarship in supporting this study.

I would especially like to thank Tezpur University where I spent almost one semester collecting data and convey my sincere gratitude to all the respondents both in Tezpur University and University of Hyderabad who have contributed to this research.

A special thanks to Jehovah Nissi, my family and friends for supporting me and inciting me to strive towards my goal.

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LIST OF COMMON ABBREVIATIONS

Abbreviation	Full form
1. ANT	Actor Network Theory
2. CT	Communication Technology
3. DOI	Diffusion of Innovation
4. EDUSAT	Education Satellite
5. EU	European Union
6. ERP	Enterprise Resource Planning
7. HEI	Higher Education Institutes
8. ICT	Information Communication Technology
9. ICT4E	Information Communication Technology for Education
10. IP	Internet Protocol
11. IPR	Intellectual Property Rights
12. IT	Information Technology
13. IS	Information System
14. ITU	International Telecommunication Union
15. INFLIBNET	Information and Library Network
16. IGML	Indira Gandhi Memorial Library
17. JAWS	Job Access With Speech
18. MHRD	Ministry of Human Resource Development
19. MOU	Memorandum of Understanding
20. NKC	National Knowledge Commission
21. NKN	National Knowledge Network
22. NPTEL	National Programme on Technology Enhanced Learning
23. OECD	Organization for Economic Co-operation and Development
24. OPAC	Online Public Access Catalog
25. SWOT	Strengths, Weaknesses, Opportunities, and Threats
26. TZU	Tezpur University
27. UOH	University of Hyderabad
28. UGC	University Grants Commission
29. UN	United Nations
30. UNDP	United Nations Development Programme
31. UNESCO	United Nations Educational Scientific and Cultural Organization
32. WSIS	World Summit on the Information Society

Chapter 1

Introduction

Abstract: This chapter introduces an overall view of the research. It begins with defining Information Communication Technology (ICT) and then progresses to discuss the concept of Knowledge Society and ICT in Higher Education. The Indian Scenario with particular focus on National Knowledge Commission (NKC) to develop a knowledge society with the integration of ICT is also mentioned. The chapter further covers the research background, the rationale and issues for the research, problem statement and questions, the research scope, objectives and outline of the thesis.

Defining Information and Communication Technology

“Information Technology (IT) is originally a technology of storing and retrieving knowledge or data – i.e., on computers. Communication technology (CT) is a technology of both/either as a process [or transmission], by which A sends a message [data] to B upon whom it has an effect and/or as a negotiation and exchange of meaning, which is widely known or separately evolved as broadcasting or mass communications and telecommunications. The very critical technology to realize such a convergence is the advent of Internet, which enables to transmit, record, store, retrieve knowledge, data, images (e.g., broadcasting) and even voice (e.g., telecommunication), particularly worldwide on an instant or real- time base as two-way communications for both a one-to-one and one-to- multiple” (Kim 2002, p1). Rijsenbrij (1997) puts it as, “ICT can be seen as the technologies that support the

communication and co-operation of human beings and their organizations and the creation and exchange of knowledge”.

ICT enables sharing of best practices and best course content in related fields which can enhance pedagogy. It allows universities to reach disadvantaged groups and new international educational markets. Some believe that democratization of education can be achieved by ICT enhanced education which calls for skilled labor force (Agarwal, 2006). Socio-economic, cultural, time and geographical barriers are main challenges faced in pursuing higher education (Bhattacharya and Sharma, 2007). Innovative use of ICT can help in filling this chasm. Economy and social development of a country depends a lot on its education sector (Cholin, 2005; Mehta and Kalra, 2006). ICT has the potential to boost the education sector of a country by providing cost effective, quality education by overcoming human resources; time and distance barriers. (McGorry, 2002). In developing countries like India, education is regarded as an important bridge of social, economic and political mobility (Amutabi and Oketch, 2003).

In the present Knowledge society, the concept of lifelong learners has developed as the shelf life of information has reduced. ICT gives access to latest knowledge and information (Plomp, Pelgrum & Law, 2007). Education in the long run increases the productive skills and earning power of a person. (Kozma, 2005). ICT used in education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audiocassettes and CD ROMs etc can facilitate learning in this context (Sharma, 2003; Sanyal, 2001; Bhattacharya and Sharma, 2007). ICT becoming

techno-centric, emphasizing on production and creation of knowledge and not on people who use it; ICT leading to centralized decision-making; acting as a political tool, strengthening the existing power balance are the debates surrounding the use of ICT. Van der Velden (2002) talks of ICT becoming a tool of oppression as it can increase inequalities between people owing to differences in socio-economic impact of in use of ICT.

He further criticizes that “ICT-based knowledge systems in a development setting are often non-responsive: not designed for or adapted to the specific information and communication needs of users; and inflexible: static and centralized systems that do not support the creative and democratic needs of users. These ICT applications and solutions are biased towards the transfer of existing knowledge, for example the so-called best practices and lessons learned from other countries and situations, over the creation of new knowledge. Secondly, they favour the management of explicit knowledge, the information that fits databases, forms and other formats used to manage knowledge”.

“Another view point states the role of ICT in a knowledge management culture as mainly that of capturing, re-using, and distributing existing knowledge. Cultivating knowledge by creating new, profitable knowledge is a costly proposition and, not affordable for most developing countries because of the huge amount of financial and educational investment needed. As such some fear that knowledge society based on the commoditization of knowledge may thus well be a scenario in which developing countries restructure their economies to adapt to the needs of western knowledge economies, becoming more dependent on ‘western’ scientific and technical knowledge.

The conceptualization of knowledge as commodity however is a limited and limiting perspective”.

The concept of Knowledge Society and ICT in Higher Education

Robert E. Lane (1966) coined the term ‘knowledgeable society’ a society having its roots in epistemology and the logic of inquiry. Knorr-Cetina (1999) states that “it is a society permeated with knowledge cultures, the whole set of structures and mechanisms that serve knowledge and unfold with its articulation”. Knowledge industries are recognized in the field of education, research and development, communication media, information machines and services. Clark (1983) maintains that social dynamics in higher education is dependent on the expansion of knowledge. The role of higher education is seen crucial in the development of global information societies.

Various debates in academic fields and policy related documents give interesting arguments in this regard. It has been noticed that there is a shift from the linear models of communication (sender – message – channel – recipient) towards more collective and reciprocal approach. It is no longer a hierarchical ‘sender’ to ‘recipient’ order, but rather there is role reversal in the communication process and both add to the content and meaning of the message. In ICT enabled communication process, the message does not remain fixed, but changes as it flows among different actors as each comprehend and respond to the message in different ways. This shift in communication loop in the Information network is an indicator for the research/policy link. A message may be picked up or missed by actors depending on how each actor

relates to it. “Although most ideas in the information age are communicated in written form, often electronically, the interpersonal aspect of communication is still extremely important. Even electronic communication is based on the notion of interpersonal relations. The research/policy link is in the advantageous position of being able to draw on both micro and macro perspectives of interpersonal communication and advocacy, as its field ranges from individual output and opinions to macro concerns for the distribution of ideas, power and resources on a global level” (cf. Hudson, in Lewis and Wallace, 2000).

Communication and knowledge transfer systems are ingrained in cultural and social context, and technology is ‘translated’ in different ways between contexts (McMaster et al., 1997 on actor network theory). This implies that the cultural and social associations will influence the way ICT are understood and accepted (Peterson, 1998). In turn, this has measureable effects on the way policies are translated.

Wolf (2001) and Drori et al. (2003) identify Universities as the main players in the knowledge society as they generate and diffuse knowledge. They supply human capital for the economies that are ever more dependent on knowledge. Universities need to coordinate with knowledge intensive industries.

Indian Scenario

“The first step in India for utilizing ICT potential towards promotion of education and research in the country was through ERNET- a Society under the Ministry of IT&C in the Department of Information Technology. The National

Knowledge Commission (NKC) focused on five key areas of enhancing access to knowledge, reinvigorating institutions where knowledge concepts are imparted, creating a world class environment for creation of knowledge, promoting applications of knowledge for sustained and inclusive growth and using knowledge applications in efficient delivery of public services. NKC a high-level advisory body to the Prime Minister of India had the objective of transforming India into a knowledge society. In its endeavor to transform the knowledge landscape of the country, the National Knowledge Commission submitted around 300 recommendations on 27 focus areas during its three and a half year term. While the term of the NKC has come to an end, the implementation of NKC's recommendations is currently underway at the Central and State levels". (National Knowledge Commission, 2008) NKC has five focus areas:

1. Access – easy access to knowledge
2. Concepts – all levels and forms of education
3. Creation – effective creation of knowledge
4. Application – of knowledge systems
5. Services – for better delivery.

NKC Impact - follow up on NKC recommendations: The final Report of NKC (2009) contains the recommendations submitted by the Commission.

“Higher and technical education: To expand capacity and improve quality of higher education, the Government has sanctioned the setting up of 15 new Central Universities and 14 new Universities based on world-class standards. The Government is in the process of setting up eight Indian Institutes of Technology (IITs), 10 National Institutes of

Technology (NIT), 20 Indian Institutes of Information Technology (IIITs) as far as possible in the Public-Private Partnership mode, three Indian Institutes of Science Education and Research (IISERs), seven Indian Institutes of Management (IIMs) and two Schools of Planning and Architecture (SPA)". "The Committee for Rejuvenation and Renovation of Higher Education has been set up for the review of UGC/AICTE. The Science and Engineering Research Board Bill 2008 has been introduced in the Parliament. The National Mission on Education through Information and Communication Technology (ICT) has been launched to leverage the potential of ICT in the teaching learning process with an aim to enhance the GER in Higher Education by 5 percentage points by the end of the XI Plan. Under this Mission 20,000 institutions of Higher Education and nearly 10,000 University Departments will be provided connectivity, beginning with a minimum of 5 Mbps for each one of them. The Central Government will bear 75 per cent of the connectivity charges for 5 years, even for institutions not belonging to it. The estimated cost of the Mission is Rs. 4612 crore".

"Integrated national knowledge network: During 2008-09 Rs. 100 crore has been allocated for the National Knowledge Network (NKN) which proposes interconnecting all knowledge institutions in the country with gigabit capabilities, for sharing resources and research.

Translation: The Government has approved the setting up of a National Translation Mission (NTM) with an outlay of Rs. 75 crore".

“Libraries: Based on the recommendations of NKC, the Department of Culture (DoC) proposed setting up a National Mission for Libraries (NML) in the XI Plan as a Central Sector Scheme. The NML will cover libraries under the DoC and the activities under it will include: National Census of Libraries; Modernization including networking of Libraries under DoC; establishing Knowledge Centres and Digital Libraries”.

“Intellectual Property Rights: The IP Office has put the relevant acts, rules, manuals on its website and there is no restriction on access to these materials. Digitization of all patent records is underway. Forty-five thousand patent records are already on the website. An IP Appellate Board has been set up for trademarks, geographical indications and patents. DIPP is examining the issue of sui-generic legislation for protection of traditional knowledge. Process is underway to revitalize and reform polytechnics through industry linkage and teacher development, establish 210 community colleges and 700 polytechnics; and to strengthen Open Universities and reform statutory bodies; scale up SAKSHAT as the education portal for 50 crore people”.

“The National Knowledge Network (NKN) aspires to interconnect all universities, all technical institutions, all medical institutions, all agricultural institutions, all related Research and Development institutions, all libraries and all Universities for optimal utilization of resources to give a major push to research and spread of quality education. A budget allocation of Rs. 502 crores was made in 2008-

09 for the National Mission on Education through ICT. The attempt is to pool all teachers and experts in the country to bring 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 our knowledge with the advancements in other countries is to be attempted. The NKN comprises of an ultra-high speed CORE (multiples of 10 Gbps), complimented with a distribution layer at appropriate speeds. Participating institutions at the Edge will connect to NKN seamlessly at speeds of 1 Gbps or higher. Advanced applications in areas such as Health, Education, Science and Technology, Grid Computing, Bio informatics, Agriculture, and Governance will be an integral part of NKN. The entire network will seamlessly integrate with the global scientific community at multiple gigabits per second speed”.

“Another initiative, National Programme on Technology Enhanced Learning (NPTEL) is a Ministry of Human Resource Development (MHRD) initiative to promote quality engineering education in the country through video and web based learning material. The seven Indian Institute of Technology (IITs) and Indian Institute of Science (IISc) Bangalore had been entrusted to produce web-based and video based courses in 5 disciplines of Engineering (Civil/ Mechanical/ Electrical/ Electronics & Communication/ Computer Science and Engineering) as well as in Sciences, Humanities and Social Sciences, Management areas. A total of 120 web-based courses and 115 video-based have been produced in these disciplines in the first phase of the project. These courses are being used as supplementary material, and also for training teachers in any institution. The broad aim of the project NPTEL is to

facilitate the competitiveness of Indian industry in the global markets through improving the quality and reach of engineering education. The operational objective of NPTEL is to make high quality learning material available to students of engineering institutions across the country by exploiting the advances in information and communication technology. The target group for this project consists of students and faculty of institutions offering undergraduate engineering programmes in India”.

“MHRD also set up Yashpal- Committee for Advise on Renovation and Rejuvenation of Higher Education. The Committee in its 2009 report covered issues of universities/higher education including admission of students to faculty evaluation, research work linked to national/social concerns to networking of universities, R&D Labs and industries. The report mentioned that the prevailing environment does not emphasize on application work. Yashpal- Committee stresses on the importance of both theoretical and applied learning. It recommends the use of local data and resources to make learning from curriculum more applicable and interesting. The report also promotes the idea of a university as a meeting place of all knowledge through inter-disciplinarily learning. The committee stresses the importance of integrating teaching with research and research with teaching”.

ICT for Education (ICT4E) – the Problem zone

Considering the stress made on Knowledge network through ICT in various policies, policy-makers and stakeholders in Higher education need to examine the challenges and constraints of integrating ICT4E. Information is considered as the main capital for knowledge societies wherein ICT is expected to be the catalyst in

Higher Education. ICT infrastructure alone does not fulfill the vision and policies as highlighted in policies. ICT4E would require a shift in instructional paradigm. Castells (2000), highlights the knowledge gap “the use of the Internet, both in school and in professional life, could amplify the social differences rooted in class, education, gender and ethnicity”.

The issue Castells mentions is that digital divide leading to knowledge gap is rising because of the manner in which technology diffusion is taking place. “Key urban centers, globalized activities, and the higher-educated social groups are being included in the Internet-based global networks, while most regions and most people are switched off” (Castells, 2000). Higher education institutes need to instill in their students not just ‘operationalism’ but deeper understanding of their social and cultural context. There is the “fear that understanding, insight, wisdom and critique are being supplanted by skill, outcome, information and flexibility” (cf. Barratt, 1979; Midgley, 1989). ICT is associated with empowerment (D’Allesandro and Dosa, 2001), enhancing social connectivity accessibility to education, public and government services (Katz et al., 2001).

Higher education institutions are not only contributing in knowledge advancement but are also reliant on the information network and subject to the restrictions of ICT. “Both students and teachers need to re-assess their notion about learning and instruction” (Hasenbegovic et al. 2006). Therefore, the issues around ICT4E are not only oriented to technology but are also towards attitude in pedagogy and culture of the institutes (Laurillard 2004). ICT in education necessitates trained support staff to aid in pedagogy (Rhoades 1998). As much as ICT is reconstituting

the higher education scenario and its stakeholders and its delivery mechanism, there are arguments about the role of higher education in this juncture. A school of thought supports the notion of universities being industry oriented (Eggleston 1994, Kohli and Health 2001, Liu and Jiang 2001, Roberts 2000).

But Williams (2000) writes that “universities are already too focused on employment and industry, which is detrimental to their teaching and research”. Reffell and Whitworth (2002) have attributed ICT education being unsuccessful owing to its technocratic stance and lack of local and real world problems contextualization.

Rationalized and modernistic approach not suitable for a country can cause disruptive tensions between local and foreign academics (Kelegai and Middleton, 2002). However, ICT skills are considered equally important to reading, writing and arithmetic (Bohme 2002). The impact of ICT in higher education can be seen in terms of the extent to which technology use enables individuals of these institutes to participate and be a part/ node in the networked knowledge society. As Haddon (2000) would put it: ‘the extent to which ICTs enhance our abilities to fulfill active roles in society, or being without them constitutes a barrier to that end’. “Understanding the actual functions of knowledge society requires scholars, policymakers and the public to recognize contemporary models for deployment of knowledge and distribution of technologies”.

(UNESCO, 2003) Universities through the usage of ICT have to lead higher education:

“In access: distance and virtual institutions allow for growing numbers of students to access higher education, in more remote areas and at any time of day and night.

In teaching and learning: whose efficiency, many agree, is increased by ICTs. Courses are enriched by videos and various other multimedia devices. Students’ learning experience is considerably enhanced because they live the situation from different view points and can compare data online. Moreover, learning being learner-centred rather than teacher-centred (self-tuition), they are able to match the learning they receive with their individual learning styles, capacities and speed

For academic staff: with the use of educational software, teachers may be seen as serving as guides rather than lecturers and transmitters of knowledge. It is also believed that ICTs are a great time saver for teachers. However, this is controversial as, even if fewer academic staff is needed, they have to be trained to use ICTs and work with technology specialists: more technical, specialized staff should, therefore, be hired.

In matters of costs: although investment in equipment and in initial course development is more costly, it is believed that teaching will eventually become cheaper, as it will in the long run attract more students, necessitate less administration, less teaching staff, less travel, etc.”

Assessment is required to understand educational policies towards increasing ICT connectivity for education and towards the systematic integration of ICT.

Research Questions

The discussion leads to the following questions:

1. “What would be the demands from the knowledge economy for changes in the organization of higher education and the way knowledge is managed within the education system using ICT?” “Can higher education institutions become a more prominent and integrated part of the knowledge society?”
2. How can research and knowledge be developed more productively? What are the possibilities of higher education institutions playing a more important role in shaping knowledge-driven communities and hence in the knowledge-driven economy in India?
3. “Does exposure to abundance of Information using ICT change the way knowledge is being formulated? Do virtual sharing systems enable a new or different kind of knowledge system? What about the issue of Digital Divide within these educational networks?”
4. How are we to understand the knowledge mission of the university? If, by definition, knowledge is produced more or less universally across the knowledge society, what might characterize the knowledge activities of the individual university?
5. Are the students in the Universities actually using ICT to fulfill the plans laid by the education policies? What are the conditions that facilitate knowledge creation? To what extent can ICT enhance knowledge creation? How can knowledge be productively transplanted using ICT?
6. “How do individual higher education institutions participate in the discourse about the knowledge society? What are the issues which are looming but have not been analyzed in the public debate?”

Having delineated the context of investigation with the above questions, the probe is further narrowed down to:

1. “What are the changing social roles of higher education in India and how are these changes connected to changes in knowledge production in universities?”
2. What are the usage and role of ICT in Higher Education and its effect on Higher Education policies and vice versa?
3. What are the existing networking patterns in Higher Education? To what extent have ICT been overlaid in networking practices? What are the strengths and weaknesses?

The above questions are designed to help the research focus on the key elements of usage of ICT in Higher Education. This does not mean, however, that the research is in any way restricted to the above questions. In being part of the phenomenon being investigated, the researcher modified some of the above questions in the light of observations and of what was learned about the situation.

Research Scope and Objectives

The research examines the present practice of ICT adoption in an existing framework of select Central Universities in India. It identifies key factors that directly influence an adoption and using these factors Universities can analyze and assess the potential of ICT adoption.

This thesis aims to achieve four main objectives:

1. An assessment of existing application of ICT in higher education institutions in order to give an indication of the existing gap, if any.
2. Appropriateness of ICT to achieve the functions and goals highlighted in National Knowledge Commission (NKC) in particular to increase the efficiency of education delivery and adequate response to the new learning paradigm.
3. Adequacy of the ICT for research and development in the light of globalization. Steps to be taken to ensure that Universities can perform the roles expected of them in ICT innovations. Necessity for institutional ICT policy, plans and strategies for implementation.
4. Recommendations for successful use of ICT4E management involving human resources, processes and institutional culture from the experiences gathered from the case studies.

The following Three research Questions will form the focus of research Activities.

The First question acts as the basis upon which to rationalize research activities prior to field work.

The Second question forms the core of the research questions around which data collection activities are prioritized.

The third question leads to the assessment of the initial questions raised and the analysis focuses on the derivation of the research work.

1. What are the ICT policies in India that help Universities move towards a knowledge society?
2. How are Universities, as demonstrated in the case studies participating in the discourse and implementation?
3. What are the debates, activities and concerns arising from the introduction and integration of ICT and what do these issues suggest about the ICT policies?

Structure of the Thesis

The research work is divided into following chapters.

Chapter 1: Introduction

This chapter introduces an overall view of the research. It begins with defining Information Communication Technology (ICT) and then progresses to discuss the concept of Knowledge Society and ICT in Higher Education. The Indian Scenario with particular focus on National Knowledge Commission (NKC) to develop a knowledge society with the integration of ICT is also mentioned. The chapter further covers the research background, the rationale and issues for the research, problem statement and questions, the research scope, objectives and outline of the thesis.

Chapter 2: Knowledge society and ICT in Education narrative

The chapter begins with the knowledge society narrative, its concept's, the taxonomy of knowledge society by several writers. This further leads to review of higher education policies for the knowledge society at work in the regional level like the Arab Human Development Reports, Europe, Africa and Southeast Asia. The chapter also covers the initiatives taken in some countries. An analysis of literature on ICT in the context of education and ICT assimilation is also made. The chapter ends with questions and debates on how ICT acts as an actor in higher education institutions to participate in the discourse about the knowledge society; development of internal institutional policies in connection with the knowledge society talk and the impact of ICT on curriculum, research and outreach.

Chapter 3: Methodology and Selection of Cases

The chapter begins with the basic understanding of philosophical perspective leading to the usage of interpretive case study in the context of the proposed research. Theoretical approaches in terms of the social and technical determinism are discussed for the purpose of contextualization of theoretical framework to guide the research work to be undertaken. The basis of choosing Tezpur University and University of Hyderabad for case study is discussed. This is followed by the Research Design where the initial questions that figured at the starting of the research are mentioned and the Objectives of the research are highlighted. The Case study protocol referring to the Levels of decision and choices made along with the Unit of analysis, data sources for the ICT variables and Organizational subunits are mentioned. Methodological triangulation which involves the use of multiple qualitative and quantitative data collection methods used in the study is elucidated. The chapter ends with a brief discussion on the potential for generalization of the research.

Chapter 4: ICT for Education (ICT4E) Translation in Tezpur University

This chapter begins with an Institutional overview of TZU. It discusses ICT integration in TZU which includes ICT infrastructure Resources and Practices, ICT Governance, ICT Workforce leadership, Institutional Data Management, ICT Services Sourcing, Networking, Messaging and Communications, Wireless Data Communication, ICT Funding, ICT Engagement in Research and Status and Use of ICTs in Libraries. It analyzes the issues and responses of ICT4E from the view point

of different users in TZU. Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis from different stakeholder's perspective further highlights the advantages and the challenges faced.

Chapter 5: ICT for Education (ICT4E) Translation in University of Hyderabad

This chapter begins with an Institutional overview of UOH. It discusses ICT integration in UOH covering ICT infrastructure Resources and Practices, ICT Governance, ICT Workforce leadership, Institutional Data Management, ICT Services Sourcing, Networking, Messaging and Communications, Wireless Data Communication, ICT Funding in Higher Education, ICT Engagement in Research and Status and Use of ICTs in Libraries. It analyzes the issues and responses of ICT4E from the view point of different users in UOH. Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis from different stakeholder's perspective further highlights the advantages and the challenges faced.

Chapter 6: Scenarios of learning with ICT in UOH and TZU

“This chapter investigates which scenarios are emerging with respect to the use of ICT in higher education and how future developments can be predicted and strategic choices can be based on that. It seeks to answer issues on: strategic responses made by the institutions UOH and TZU with respect to the use of ICT; external conditions and developments influencing these choices; external and internal conditions and measures are taken in order to achieve strategic targets; the implications for technology use, teaching and learning processes and staff”.

Chapter 7: Conclusions, discussion and recommendations

The chapter summarizes the research findings that relate directly to the questions posed by the research; the issues, challenges and responses. It also mentions limitations of the research and recommendations for management, human resources, processes and institutional culture in ICT4E implementation based on the study conducted.

Chapter 2

Knowledge society and ICT in Education narrative

Abstract: The chapter begins with the knowledge society narrative, its concept's, the taxonomy of knowledge society by several writers. "The policies of the UN and its agencies (UNDP, UNESCO), the World Bank, OECD are mentioned". This further leads to review of higher education policies for the knowledge society at work in the regional level like the Arab Human Development Reports, Europe, Africa and Southeast Asia. The chapter also covers the initiatives taken in some countries. An analysis of literature on ICT in the context of education and ICT assimilation is also made. The chapter ends with questions and debates on how ICT acts as an actor in higher education institutions to participate in the discourse about the knowledge society; development of internal institutional policies in connection with the knowledge society talk and the impact of ICT on curriculum, research and outreach.

The Knowledge Society Discourse

The growing importance of knowledge, research, innovation and evolving perspectives on expertise with the usage of Information Communication Technologies (ICT) are changing the sociology of knowledge in the globalized world. The terminologies associated are Knowledge Society, Knowledge Economy, Information Society, Learning Society, Network society. Nico Stehr states that

Lane (1966) first used the term Knowledge Society in the early 1960s as science making a society of scientific reasoning. Drucker (1969), cites knowledge "as the foundation of economy and social action". Robin Mansell and Stehr further

developed this concept in the 1990s. Knorr Cetina (1997, 2001) considers knowledge society as one in which the culture of knowledge permeates to the society as a whole and not one in which production and flow of knowledge is limited to a few privileged. Machlup (1962) defines knowledge as the ability to apply human intellect in drawing meaning from various information sources. Peters (2007) mentions the dispute in terminologies and ideologies associated (Knowledge Society by sociologists, Knowledge Economy by economists and Learning Society by educators) taking place in the policy regimes. The terms ‘Information society’ and ‘post industrial society’ appeared with the works of Bell (1973), Machlup (1962), Portat (1977) and Rubin et al. (1986). Castells (1998, 2000, 2001), Melody (1987), Melody and Mansell (1986), Mosco and Wasko (1988), Stehr (1992, 2002), Sussman (1999) and Webster (2002a, 2002b) have contributed to the ideation of information or global knowledge society have further developed this concept in the context of sociology and political economy.

Knowledge and change in society are connected to Learning Society and Knowledge Economy. Knowledge in this case is applicable to all spheres of societies with very less distinction between formal and non-formal education (Hutchins 1968; Huse'n 1974). Lifelong learning for advancing one's career by learning how to learn becomes a requisite. Learning is not the privilege of an elite class anymore (UNESCO, 2005). Machlup (1962) traced the economic essence of knowledge production to 1960s. In his consolidated structure of knowledge industry he subscribed to education as the most important sector. Knowledge industries are identified in the field of education, research and development, communication media, information machines and services.

Harold Adams (1951) says that communication technology drives history. “A medium of communication has an important influence on the dissemination of knowledge ... and it becomes necessary to study its characteristics in order to appraise its influence in its cultural setting”. He talks of communication revolution leading to “digital age” and an “information society.” Societies and cultures according to him would be influenced by the communication processes and the associated institutions. “The literature on the Information Society reflects its fragmentation and a continued instability that denotes a still developing field. This is apparent in a lack of consensus on basic terminology and in fluid and disparate research agendas reflecting for example, technological, political, economic, social or educational perspectives on the Information Society. There are also differences between those who would view it as representing epochal-type change and perceive the emergence of different types of networked informational societies, and those who maintain that there is no novel, post-industrial society and that changes in occupational structure and related developments simply reflect continuity with the past. Moreover, for all those who proclaim the Information Society as providing the answer to social inequality, poverty and unemployment there are others who would regard it as likely to widen the gap between information haves and have-nots and to maintain existing socio-economic disparities” (Sarker, 2001).

Some pertinent questions which arise from these discussions are:

1. “Does the Knowledge Society confirm the existence of a knowledge community whose members share a common stock of knowledge and more or less similar experiences?”
2. What are Communications Models for Knowledge Creation and Knowledge Society?

Higher education and knowledge society policies: the global level

ICT in Higher education policies of major international organizations promoting knowledge society projects with a global scope are seen at work in United Nations (UN) and its agencies (UNDP, UNESCO), the World Bank, OECD, the International Association of Universities, World Summit on the Information Society (WSIS), International Telecommunication Union (ITU). The Arab Human Development (AHDR), several of South East Asia models and European Union's (EU) overarching strategy to cope with the challenges of globalization reflect policies at work in the regional level. The policy need and requirement however are contextual and region specific. The gap between those able, and those unable, to participate in the global information society is currently termed as the "digital divide". Unfortunately, this digital divide is evident within a country like India as well as several other developing countries.

The UNESCO has come up with "ICT in Education Policy" for Asia-Pacific region where the main emphasis is to reduce the digital divide while improving the education quality at the same time. The major trend seen in global education scenario is to shift the focus from teacher oriented learning to student oriented learning with the use of ICT. The emphasis is also on problem solving skills of the students where they actively control and engage in their own learning. Knowledge construction with easy access to information is emphasized rather than just replicating knowledge source. This has/can be facilitated with different forms of ICT as reflected in various policy documents hence giving more choice to policy makers. (UNDP, 2003) report

for the Arab World with a higher education sectors characterizes the region as knowledge consumer rather than knowledge producer. Absence of scientific research in higher education is attributed to seclusion of these academic institutes from the academic global community. Contextualized ICT education policy in relation to the country's need should help in solving this issue.

Governments have linked nation's economic development with universities having access to latest technologies (Gibbons et al. 1994, Nowotny et al. 2001 and Etzkowitz et al. 2000). Gibbons et al. (1994) talks of new Mode 2 form of knowledge production replacing the traditional one, Mode 1. Mode 1 knowledge is academic discipline oriented, Mode 2 knowledge is application oriented. It is interdisciplinary and more socially relevant. Etzkowitz and Leydesdorff (2000) further mention the "Triple Helix" of university, government and industry where academic, economic and wider networks of social actors together constitute the triple helix knowledge dynamics. Etzkowitz et al. (2000) says that internal changes in academia, state and industry will lead to transformation in production, exchange and use of knowledge. "The university is a hybrid organization incorporating economic development together with scientific research and education. The problem with this assumption is, however, the leap of abstraction that infers 21st century universities are 'entrepreneurial universities' is an irresistible, unavoidable development" (Etzkowitz 2002 in Tuunainen, 2005). Clark (1998) states that universities in the knowledge society need to become more entrepreneurial. Midgley (1989) cites that due to the emphasis on operationalism of learning terms such as understanding, insight, wisdom and critique are being replaced by skill, outcome, information and flexibility. The challenges faced by higher education institutions in this light are:

1. Traditional academic university versus commercialization and academic capitalism (Slaughter and Rhoades, 2004; Bourdieu, 2004; Ylijoki, 2003; Marginson, 2006). Academic cultures in different disciplines varies in terms of their social applicability (Becher and Trowler, 2001; Slaughter and Rhoades 2004).
2. Does higher education with the modern technological networking have the ability to call forth particular modes of thinking and acting in the society in which it operates? Do the cognitive requirements stemming from these higher education institutes contribute to the development of a more rational society?

Universities have to address the issue of academic accountability to its various stakeholders which includes academics and governments, industry, professional associations, students etc. This would mean not just incorporating the technical requirements of new circumstances but seeing its relevant utility in the social and cultural context. Today's knowledge society requires its learners to have the 21st century skills. According to Partnership for 21st Century Skills, "People in the 21st century live in a technology and media-suffused environment, marked by various characteristics, including: 1) access to an abundance of information, 2) rapid changes in technology tools, and 3) the ability to collaborate and make individual contributions on an unprecedented scale. To be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills related to information, media and technology" (Partnership for 21st Century Skills, 2009).

Giddens (1990) mentions individuals networking in greater information milieu constructed by specialized people and later using that information in their local context. “In the new, informational mode of development the source of productivity lies in the technology of knowledge generation, information processing, and symbol communication” (Castells, 1996). Castells traces network society to the 1980s where global society was restructured to create network society through the use of ICT. Castells and Himanen (2001) consider networks the social structure of information age. It is in this context that Mansell and When (1998) stressed on ICT as being pivotal in the growth of Knowledge Society. ICT is considered an empowering tool (D’Allesandro and Dosa, 2001), it can lead to wider social dealings and engagement enabling enhanced access to education and its subsequent networks of public and government facilities as well as facilitate easy and widespread access to education and other public and government services. (Katz et al., 2001; Servon and Nelson, 2001). Based on the above discussion, the subsequent paragraphs discuss the higher education scenario in different regions.

Southeast Asia region: Following the global trend, Southeast Asian countries are geared towards deployment of in ICT higher education. (SEAMEO, 2010) gives a “report of status of ICT integration in education in Southeast Asian Countries” based on these different stages of development. The countries are categorized into three groups.

“Group 1 countries are Brunei Darussalam, Malaysia, and Singapore. These countries are at the infusing and transforming stages for most of the dimensions of ICT in education. In this group, Malaysia and Singapore are

well-ahead on the ICT in education journey than Brunei, especially in the dimensions of teaching and learning pedagogies and community/partnership”.

“Group 2 countries are Indonesia, Philippines, Thailand, and Vietnam. They are mainly at the infusing stage for most of the dimensions and most of them already have developed ICT plans and policies in education. But due to the rural-urban gap and different levels of access to ICT infrastructure, there are still some parts of the dimensions that are in the applying and even emerging stage. Among the countries in this group, Thailand and Vietnam are in more advanced stages of ICT in education than Indonesia and Philippines”.

“Group 3 countries are Cambodia, Lao PDR, Myanmar, and Timor Leste. Although each of these four countries has either started to develop and implement ICT in education plans and policies or implemented ICT in education projects on a small scale, all of them are still at the emerging stage for most of the dimensions. The main concern of these countries is access to ICT infrastructure, hardware and software. In this group, Cambodia and Myanmar are at more advanced stages of ICT in education than Lao PDR and Timor Leste”.

Arab Human Development Reports: Arab Human Development Report (AHDR, 2003) states the five pillars that could support the building of an Arab knowledge society:

1. Guaranteeing the key freedoms of opinion, speech and assembly through good governance bounded by the law. [...]
2. Disseminating high quality education for all. [...]
3. Embedding and ingraining science, and building and broadening the capacity for research and development in all societal activities.

[...] 4. Shifting rapidly towards knowledge-based production in Arab socioeconomic structures. [...]

5. Developing an authentic, broadminded and enlightened Arab knowledge model.

“To fill the gap of absence of scientific research in higher education, Qatar and the United Arab Emirates are initiating the development of R&D sectors in higher education. Qatar Foundation for Education, Science and Community Development, Qatar has Education City, the Qatar Science and Technology Park (QSTP) and the Qatar National Research Fund (QNRF). United Arab Emirates in creating free zones such as Knowledge Village in Dubaito link academia to industry. Major investment in ICT has been made in this regard”.

Europe: In European higher education, one of the most interesting processes related to knowledge society discourse is the Bologna Process. It seeks to build European Higher Education Area (EHEA) on the basis of international cooperation and academic exchange.

“The Bologna Process is named after the Bologna Declaration, which was signed in 1999 by ministers in charge of higher education from 29 European countries. The envisaged European Higher Education Area will facilitate mobility of students, graduates and higher education staff; prepare students for their future careers and for life as active citizens in democratic societies, and support their personal development; offer broad access to high-quality higher education, based on democratic principles and academic freedom. Work is also undertaken in areas of broader societal relevance, such as the links between higher education, research and innovation; equitable participation and lifelong learning” (Bologna, 2009).

“DANTE (Delivery of Advanced Network Technology to Europe Ltd.) organizes, manages and provides international advanced data network services for the research community. TERENA (the Trans-European Research and Education Networking Association) are levels of operation in European ICT network have proved to be very successful. In ICT related educational innovation, European higher education institutes functions on collaboration by creating structural and functional relationships”.

Africa: The Association of African Universities emphasizes on development and application of ICT in higher to bridge the digital and economic gap. Associations of African Universities, Inter-University Council for East Africa, and partnerships with foreign universities assist in the development of ICT policies in African universities. Established universities further take up the leadership role in implementing national ICT policies. Agence Universitaire de la Francophonie (AUF) and Partnership for Higher Education in Africa have provided networking with France, Canada, US and some other countries. The objective of these tie-ups is to use ICT to enable all-inclusive modernization and growth of universities. Development Partnerships in Higher Education programme (DELPHE) initiated by the UK Department for International Development (DFID) is another such endeavor. “Three Rwandan universities (the National University, the Kigali Institute for Education, and the Kigali Institute for Science and Technology) and the University of Nairobi have partnered with Google to improve access to Web-based communications for staff and students” (infoDev, 2007).

“Higher education policies for knowledge society at work: the national level”

India’s education policies at work for knowledge society have been covered in the preceding chapter. The following section discusses national scenarios in some countries where ICT initiatives in the context of globalization have brought about changes in the higher education sector.

USA: The US Government has initiated “adoption of market based policies in its higher education sector in order to make universities more efficient and effective. ICT has enabled cross border academic programmes for both conventional universities and internet based distance learning providers”. Specific educational policies are developed by each state; however the emphasis on 21st century skill set is seen in the education scenario. ICT focus now is on the processes and major investments are in the area of digital curriculum and instruction. Importance is also given on providing flexibility to learners with the use of ICT. Funding is the main component of US ICT R&D ecosystem. Andersen and Coffey (2011) in U.S. ICT R&D Policy Report stated that “Networking and Information Technology R&D Program (NITRD) is the primary vehicle for the coordination of U.S. federal investment in ICT research. While the NITRD program’s funding has increased in recent years, the problem is that much of the funding dedicated to ICT research is not actually being used for ICT research”. On the networking front National Lambda Rail (NLR) owned and managed by a consortium of US universities and private companies has been providing greater autonomy over research projects of the universities.

UK: British government is committed to a ‘knowledge economy’; there is heavy investment on ICT infrastructure and support in the higher education sector. The stress is also laid on virtual and lifelong learning system facilitated by ICT. Universities are trying to incorporate flexibility of learning for its students. Dearing Report (1997) made recommendations for training and staff development, quality assurance arrangements, the challenges of ICT, institutional management and governance for the British higher education sector as a ‘Learning Society’. Laurillard (2002) mentions that Dearing Report emphasizes on individual personal development; importance of teaching and research in knowledge society; and the cultural and political value of higher education all of which points at the importance of relevance of higher education in society. White Paper The Future of Higher Education (2003), National Professional Standards Framework (2006) developed by the Higher Education Academy are other policy documents designed to bring out major changes in British higher education sector to widen education and to meet the skills requirement of global knowledge economy. (Williams, 2002; Rainbow & Sadler-Smith, 2003; Saunders & Klemming, 2003; Jelfs & Colbourn, 2002; Garland & Noyes, 2004) cover ICT in pedagogy instances where they have been used to facilitate greater flexibility in teaching and learning process by either aiding the traditional face to face learning or by bringing about change in methodology by supporting part time learners. ICT resources have also been used individual academic departments and for building consortia. (Kaul, 2006) states that “The mainstay of the British Universities today are their 270,000 foreign students (not including EU) who pay an international fee which is substantially higher than that of local students and collectively contribute \$1.8 billion a year in fees...The market for foreign students is considered to be worth £30 billion in fees alone. Further, this market is expected to grow exponentially as

incomes in developing countries increase. Within the next 15 years, the demand for seats by foreign students will treble from 2 million to about 5-8 million in 2020, with most of the demand coming from Asia. Today, Britain ranks next to the US in popularity". Gibbs (2001) covers Learning and Teaching report published by higher education institutions in England. The study showed 48% of institutions stressed on 'development of flexible learning'; 47% targeted 'improved access to learning resources' and 81% wanted to make best use of ICT as pedagogical tool.

Australia: Australia's approach of emphasis on Vocational Education and Training (VET) in higher education has led to an influx of foreign students. In order to expand their reach, Australian universities have also tied up with countries in Asia and Gulf to establish their campuses in these countries. "Australian Vice- Chancellors Committee and Australian National Training Authority (ANTA) have developed credit transfer arrangement in different fields of study. VET sector had 1.9 million students in 2012. Commonwealth has sanctioned \$1.8 billion in 2013-14 for VET sector through National Agreement for Skills and Workforce Development and supporting national partnerships" Australian Government, 2013). The Australian Council for Educational Research (ACER) has laid the emphasis for ICT development to enhance research along with the guidelines laid by the National Assessment Program. Australian Curriculum integrates ICT to increase access, knowledge building and communication. The emphasis is also on using ICT for problem solving skills and collaborative learning with relevance to society in the local and global context. The Melbourne Declaration on the Educational Goals for Young Australians (MCEETYA, 2008) states that "in a digital age, and with rapid and continuing changes in the ways that people share, use, develop and communicate with ICT,

young people need to be highly skilled in its use. To participate in a knowledge-based economy and to be empowered within a technologically sophisticated society now and into the future, students need the knowledge, skills and confidence to make ICT work for them at school, at home, at work and in their communities”.

China: In response to global trend, China has also come up with several Schools of learning in higher education especially in the field of sciences to attract foreign students. Various foreign universities have also set up their campuses in China. “China has also placed emphasis on distance and virtual learning through the use of ICT to bridge the gap in education and access to information. Chinese Central Radio and TV University (CCRTVU) in collaboration with the regional universities has come up with video lessons for the students and also provides distance training for teachers in distance mode. Over 80,000 hours of TV courses have been prepared in consultation with subject specialists”. “China’s satellite TV education programme planned to cover 70 per cent of the country with educational TV stations or relay stations” (Sanyal, 2001). Chen Xiangming (2000) mentions that China was facing the challenges to achieve the objective of 9 year compulsory education for the entire country because of inaccessibility in certain regions and ethnic diversity. However ICT has enabled education to reach majority of its population.

Singapore: In Asia, Singapore has evolved as an educational hub for higher education attracting students from over 60 nationalities. In order to create a knowledge based society, Singapore places emphasis on international collaboration in education and industry linkage. This has been possible with the presence of over 7000 multinational companies which enables students to have industry experience and the

existence of Private tertiary educational organisations (PEO). For quality assurance “Singapore has set up a Care Trust awarding and Singapore Quality Clan (SQC) benchmarks”. “National University of Singapore (NUS), Nanyang Technological University (NTU) and Singapore Management University (SMU) have developed into centres of excellence. 14 of the world’s leading international universities including University of Chicago, Graduate School of Business and INSEAD have set up centres of excellence in education and research in Singapore” (Kaul, 2006). Ministry of Education, Singapore has come up with its “third Masterplan for ICT in Education (2009-2014)”. The first Master plan was laid in 1997. “The strategies of the third Masterplan for ICT in Education are to strengthen integration of ICT into curriculum, pedagogy and assessment to enhance learning and develop competencies for the 21st century; to provide differentiated professional development that is more practice-based and models how ICT can be effectively used to help students learn better and to to improve the sharing of best practices and successful innovations” (MOE Singapore, 2008).

Information Communication Technology (ICT) Interface

The above discussions show that ICT integration in Education is considered indispensable in the approach to be taken by universities and government policies if they are to develop a Knowledge based society. ICT developments will result in cost effective, efficient transmission, retrieval and analysis of information. Quah (2002) claims that knowledge in the global economy is used as both an input and an output; “Digital goods are bitstrings, sequences of 0s and 1s, that have economic value. They are distinguished from other goods by five characteristics: digital goods are nonrival,

infinitely expansible, discrete, aspatial, and recombinant". ICT offers the tools for active participation in the society adding to Marshall McLuhan's global village. On a similar line, Castells (2001) discusses how global civil society, government regulation, and economic development can be influenced by information technologies. Harold Adams (1951) discusses that ICTs signify an interface of mind and matter. Hence changes they create in communication environments would lead to changes in "collective *mentalité*"; bringing about unavoidable changes in society and culture.

Heeks (2002) lays emphasis on 'iDevelopment not eDevelopment' using ICT and has come up with various suggestions for policy building. (Gundrey, Murphy and Rao ,1993; Rubinyi 1989) talk about internet facilitating a wider interactive communication and network which can impact individuals/organizations. World Summit on the Information Society (WSIS, 2003) stated that the issue of exploiting the full potential ICT to bring access and support sustainable development. The types of knowledge activity taken up by universities have been described by Huff (2000) as one in which epistemic tradition in specific disciplines continues and another which is interdisciplinary and more relevant to the industry. Some scholars believe that with current ICTs, the later type of knowledge can be applied where required. This has led to the emergence of entrepreneurial model of academic research which can influence the economic growth of society (Etzkowitz, 2002 *ibid*).

(Stoll, 1995; Talbott, 1995) along with other scholars have commented on ICT being over hyped. Researches show that indiscriminate uses of ICT do not lead to knowledge societies. (Melody, 2006, 1996c) commented that often time ICTs are

based on corporate needs; interventions in telecom policies is vital. Knowledge society development is unique to each country where telecom facility system and ICT services according to Melody play the crucial role. ICT enable educational change and improve the quality of education; they prepare individual for the global economy and knowledge society (Kozma & Wagner, 2005; UNESCO, 2002) thereby impact the education sector and economy of a nation. Hence their linkage to national policies is necessary to address the constraints faced in developing countries (Oliver et al, 2001; Sibiya, 2003). Kaino (2004) highlights ineffective ICT policies leading to underutilization.

Balasubramaniam et al.(2009), Jaffer et al.(2007) mentions how ICT is also used for scholarly community engagement, and administration in higher education. Universities are subject to the limitations of ICT one such challenge is updating to the latest technological advances. Other challenges are in terms of pedagogical thinking and organizational structures (Laurillard 2004). Rhoades (1998) mentions that such advancements call for trained professionals in both its technical and pedagogical units. ICT is changing the way universities function and is crucial for “tackling the impacts of massification, diversification, internationalisation and marketisation in higher education” (International Association of Universities, 1998; Thune & Welle-Strand, 2005). It cannot be detached from educational, administrative and logistic concerns; ICT needs to be implemented in institutional policy documents.

ICT for education and Institutional policies

Paisley(1985), mentions the first revolution in information technologies brought by films, radio, television and satellite broadcasting; and the second revolution brought by telecommunications and microcomputers. The third revolution brought by integration of telecommunications and microelectronic technology in computing has enabled an individual to interact in a network of worldwide electronic community (Papagiannis et al, 1987). The fourth revolution has the term ‘globalization’ associated with it. Globalization is ascribed to bring about interconnectedness through international exchange and transnational interaction, dissolve economic borders and make the world a single global society (McGrew, 1992; Dolan, 1993; Wallerstein, 1995). The impact of ICT in higher education can be seen in terms of the extent to which technology use enables individuals of these institutes to participate and be a part/ node in the networked knowledge society. As (Haddon, 2000) puts it: “the extent to which ICTs enhance our abilities to fulfill active roles in society, or being without them constitutes a barrier to that end”. Policies need to look at current patterns in information usage and ICTs used in this process. Studies conducted have proved that just a mere increase in infrastructure does not entail for successful deployment of ICT.

Kozma (2005) discusses how policy makers have recognized potential of ICTs to restructure organizations, advance collaboration, increase democratic participation and enhance the social integration of individuals with different abilities and groups of different cultural background. Current trends in ICT enhanced encourage collaborative learning and knowledge building (Fuks, 2000). Kennedy (2001) states

that ICT shifts education from just elite learning to mass learning as it provides greater accessibility. Inspire of its potential, the high rate of failures result from poor ICT implementation (Wong, 2002). Chatterje et al. (2002) emphasize that for ICT to be successful, it has to assimilate in an organization wherein ICT diffuses across organizational work processes and becomes a regular and essential part in the activities associated with those processes.

Roger's Diffusion of Innovation theory tries to explain assimilation of ICT in an institution in three stages: initiation stage, assimilation stage and post-adoption stage (Rogers, 2003). (Tornatzky & Fleischer, 1990) came up with TOE framework where technology, organization and environment variables affect ICT assimilation in an organization. Scott (2007) discusses the importance of technically capable ICT staff in an organization who can adapt with the users' requirements and also the technological and environmental needs. Organizational culture and change process according to Scott further affect the assimilation process. Orlikowski (1991) came up with the Structuration Theory of Technology Assimilation which gives interpretive flexibility. It looks at the relationship between humans and technology and the context in which technology is developed and used. Technology assimilation will depend on technology, human agent, and institutional properties. Human agents create and use technology; and "technology causes the human agents to change their routine practices. Both act as mediators in the ongoing process" (Orlikowski, 1992). Web Assimilation model developed by Chatterjee et al (2002), top management championship, strategic investment rationale, and extent of coordination effect the assimilation of technologies. Clark et al (2008) discusses that since ICT assimilation involves different actors, there is a need for shared value for the new innovation.

ICT implementation requires infrastructure and human resources; technology has to be user friendly; and an organization requires support staff to guide the users in skills to implement Internet-related applications (Kevin, 2006; Matthews, 2007; Zhu and Kraemer, 2006). The emphasis laid here is on ICT human resource termed as ‘translators’ (Paul and Berranger, 2002). They are the link between the users and the technology; they increase the organization’s learning capability. (Lucas, 1975; Kling, 1980; Markus and Robey, 1988) objected the overemphasis on technology and technocrats driven changes in ICT adoption; they stressed the need to focus on the process driven changes brought about by technology. And this process involves various social actors (Robey and Bourdreau, 1999). Orlikowski (1992; 2000) mentions how such changes brought about by ICT challenge existing cultures, structures and power relations in an organization. Different contexts and different users assign varying meanings to ICT and its change process (Orlikowski, 1992; Linderoth, 2007). Hence often time there is a difference in interpretation of ICT from its assigners, developers and users (Ciborra 1996; Hanseth & Braa 1998).

On the basis of above discussions the following questions arise in the context of ICT implementation in higher education towards the larger goal of knowledge society:

1. Can higher education institutions become a more prominent and integrated part of the knowledge society? How do the higher education policies affect the communication process in a knowledge society?
2. What would be the demands from the knowledge economy for changes in the organization of higher education and the way knowledge is managed within the an institution? How can research and other knowledge be harnessed more efficiently and how can ICT help in establishing a scientific knowledge base in these activities?

3. Does exposure to profusion of Information using ICT change the way knowledge is being created? Do virtual sharing systems enable a new or different kind of knowledge system?
4. How are we to understand the knowledge mission of the university? If knowledge is produced universally across the knowledge society, what characterizes the knowledge activities of the university?
5. Networking in higher education - where does a network begin or end? Where do networks become visible? Where or does the network branch out unofficially to form 'critical discussion within societies'?
6. Are the students in the Universities actually using ICT to fulfill the plans laid by the education policies? What are the conditions that facilitate knowledge creation?
7. How can knowledge be effectively transferred using ICT? What are the inhibitions towards knowledge acquired from internet sources? What about the issue of Digital Divide within these educational networks?
8. What are the role of on line learning and distance education in the Universities?
9. How do individual higher education institutions participate in the discourse about the knowledge society. What are the salient issues that the higher education in different regional context (e.g. Northeast India) is likely to face in the near future?

These questions serve the underlying current for the research work.

Chapter 3

Methodology and Research Approach

Abstract: The chapter begins with the basic understanding of philosophical perspective leading to the usage of interpretive case study in the context of the proposed research. Theoretical approaches in terms of the social and technical determinism are discussed for the purpose of contextualization of theoretical framework to guide the research work to be undertaken. It is further concluded that the Diffusion theory (which can be considered as a socio-technical approach) and the Actor-Network theory (which can be the social construction of technology) and Grounded Theory for analysis will be followed in this research. The Triangulation approach is also used to add validity to the study. The basis of choosing Tezpur University and University of Hyderabad for case study is discussed. This is followed by Research Design and Objectives based on the initial questions that figured at the starting of the research. The Case study protocol referring to the levels of decision and choices made along with the Unit of analysis, data sources for the ICT variables and Organizational subunits are mentioned. Methodological triangulation which involves the use of multiple qualitative and quantitative data collection methods used in the study is elucidated. The chapter ends with a brief discussion on the potential for generalization of the research.

Case Study Research

The epistemology which guides this research is Interpretive Case Study which is suitable for studying information systems in organizations. Interpretive studies help in analyzing the phenomena by focusing on meanings constructed by people through

the context of information system and evidence sources viz. “documents, archival records, interviews, direct observation, participant observation, physical artifacts” (Walsham, 1993; Yin, 2002). (Jones and Nandhakumar (1993); Orlikowski and Baroudi (1991) and several other researchers had applied interpretive case study analysis in studying the use of technology in organizations. ICT can be considered socio-technical because it involves people and their institutional structure. Interpretivism in this case is a suitable research approach to study how social reality is constructed through assigning meanings to actions. Orlikowski and Baroudi (1991) “studied 155 articles on information systems and highlighted three main research methodologies: positivist, interpretative and critical. The authors divide each of the three research perspective into:

Ontology: Beliefs about Physical and Social Reality

Epistemology and methodology: Beliefs about Knowledge

How the researcher relates to the subject under study: Beliefs about Knowledge Beliefs about the Relationship between Knowledge and the Empirical World”

Theoretical approaches: the social and technical

Technological determinism and Social determinism are theories seen as two extreme forms. In the former view, technological systems are regarded primarily as technical wherein problems regarding technology are technically complex and can be solved by using sophisticated technical solutions. Technological determinism is often guided by autonomy of technology and importance of technical constraints (Constant, 1989; Hickman, 1990; Ropohl, 1983; Wilkinson, 1964; Winner, 1977). Technology

becomes a distinct system with its relationship to society expressed in terms of impacts (Chandler, 1995). Hales and Snyder (1981) come up with the terms “input, processes, output, and feedback” indicating a linear direction that technology takes. Technological determinism has been criticized for its limited perspective in ascribing an autonomous character to technology. In the latter view, technological systems are believed to be social systems that are technically implemented; “They serve as the agent for significant social interactions, which implies their connection to human communication through the medium of language” (Hirschheim, Klein et al. 1995). Social constructivists highlight “relevant social groups” and “interpretive flexibility”; technology represents a social construction and ‘social shaping’ of the actors involved (Brey, 1997). This approach has also been criticized for its shallow emphasis on political and social interests.

Socio-technical approaches: The socio-technical perspective is a balance between the above mentioned two approaches. It sees technology reliant on both social factors and the technical qualities of technology itself (Markus and Robey, 1998). Markus and Robey mention an interactive approach where use of technology depends both on human choice and technological characteristics. This perspective of understanding technology represents both social and technical aspect comprising of heterogonous networks of human and non-human actors (Avgerou, 2002; Law, 1992).

Both the technical and social perspective are influential. The diffusion theory (which can be considered as a socio-technical approach) and the actor-network theory (which can be the social construction of technology) will be followed in this research.

Hence, the research approach is interpretive and case study is the appropriate method for this research.

“Diffusion theory, Actor- Network theory and Grounded Theory as a theoretical framework for analysis”

Diffusion theory: “Everett Rogers’ work ‘Diffusion of Innovations’ (Rogers, 1995) states that diffusion is a process through which an individual passes while adapting to a new technology. It has five stages viz. knowledge, persuasion, decision, implementation, and confirmation. Analysis of these stages explains the adoption or non-adoption of an innovation. Various studies and extension of Diffusion theory have come up with factors such as innovation characteristics, organizational characteristics, characteristics of the environment and characteristics of the communication channel and networks which could affect the adoption process”.

“Diffusion theory has been criticized for having a strong bias towards assuming that a technological innovation is positive and for charging the poor adoption on adopting individuals and organizations, rather than on systems or situations. It does not look at community- and population-level dynamics” (Drazin and Schoonhoven, 1996). Despite its limitation, diffusion theory is still helpful to investigate the adoption process of technologies. This theory will be used as a starting point of analysis in the research. Then we further use the actor-network theory to gain deeper understanding and to move beyond a operational perceptive of assessment.

“Actor-network theory: Actor-network theory (ANT) follows networks made up of both human and non-human actors” (Callon 1986; Law 1992). Law and Callon (1988) states “Our object, then, is to trace the interconnections built up by technologists as they propose projects and then seek the resources required to bring these projects to fruition.” ANT applies qualitative approaches as in ethnography which is relevant in studying Information systems (Suchman, 1987; Zuboff, 1988). The main translation followed in ANT research are given in the following figure.

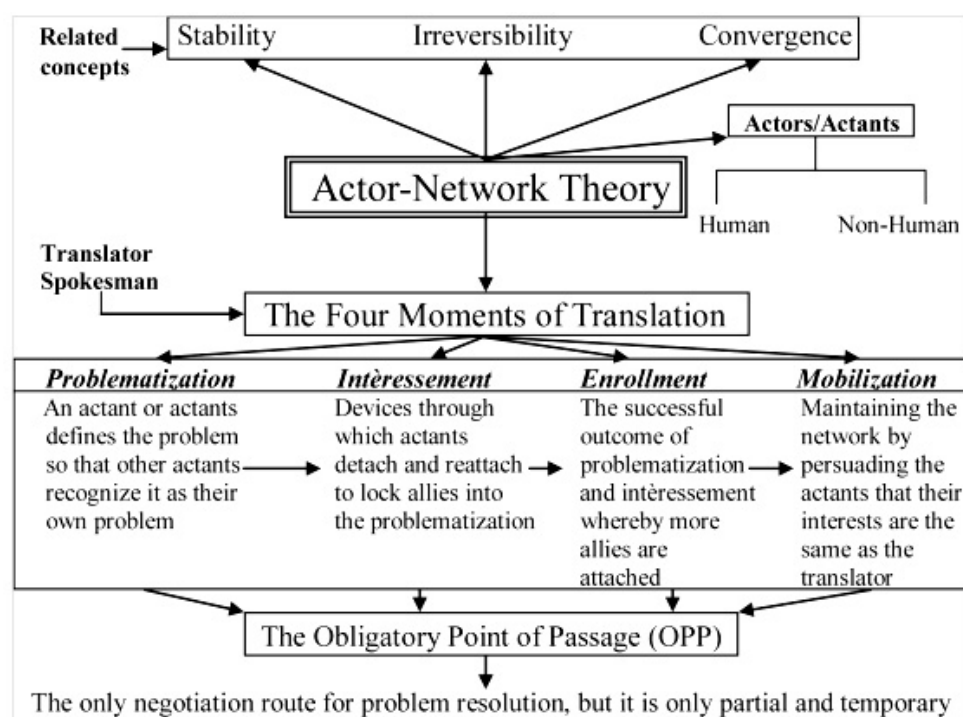


Figure 1: ANT Key Concepts and Translation Moments

(Adapted from Hassard, Law, & Lee, 1999; Callon, 1991, 1999; Latour, 1987 by Jo Rhodes, 2009)

To be able to follow ANT methodology the research gathers the following information (Callon, 1986):

“Identify and describe the purpose, needs, and benefits of ICT (problematization).

Develop a list of key actants (actor-networks or stakeholders) and define their interests, needs, and requirements.

Map relationships of actants and identify centrality of relationships, strong and weak ties, structural holes, and sources of resistance.

Engagement of the key actants and translation of their interests into visions, objectives, plans and roles (interessment).

Map Enrolment, mobilization, empowerment, and coordination of actants as translators, i.e., creating chains of translators, and dealing with resistance.

Devise strategies for expansion and continuance of the network, e.g., for creating centers of translation for expanding and perpetuating the network and effecting the desired change”.

Radder (1992) cites the limitations of ANT for focusing only on case studies and empirical observation; values and norms may be overlooked. Walsham (1997) further states that following ANT may lack political analysis and result in poor explanations. To remedy this, further exploration into the concept of translation with the help of Grounded Theory is required. Translation calls for an interpretive approach to study the socio-technical nature of ideas and behaviour.

Grounded Theory: Grounded Theory (Glaser & Strauss, 1967) data analysis involves searching out the concepts looking for codes, concepts and categories. Grounded Theory is "an inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data" (Martin and Turner; 1986). “The three characteristics of grounded theory--inductive, contextual, and processual; it attempts to come up with a a context-based, process-oriented

description of the phenomenon (Orlikowski and Baroudi, 1991). Grounded theory leads from codes to concepts to categories to theory and helps in investigating the connections at each stage”.

“The theoretical framework of DOI and ANT will act as sensitizing device (Glaser & Strauss, 1967; Glaser, 1978) in the first stage of analyzing which will take the form of ‘open coding’ (Strauss, 1987). Diffusion theory will help in locating the links between cause and effect; ANT approach will help the research in locating how actor-networks (people and things) are created, strengthened and weakened. ANT offers some key terms that emerge from empirical investigations, but the theory is designed to dissolve once the descriptive phase of field work is over. Therefore techniques from Grounded Theory will be adapted in order to conduct data analysis (Glaser & Strauss, 1967). ANT and Grounded Theory are complementary theories, firstly because they both place empirically grounded data collection at the heart of research and secondly because they are designed to sensitize the researcher to different aspects of field work process. Grounded Theory does not offer the researcher a philosophical basis upon which to conceptualize empirical work but it does offer clear guidelines for data analysis”.

Selection of Institutes for the Case Study

“India's higher education system is the third largest in the world, after China and the United States. Central Government is responsible for major policy relating to

higher education in the country. It provides grants to University Grants Commission (UGC) and establishes central universities in the country. There are 39 Central Universities under the purview of the Ministry of Human Resource Development, created under the Act of Parliament. Out of them 15 new Central Universities have been established w.e.f 15.1.2009. The ordinance has since been replaced by an Act of parliament, namely, Central Universities Act, 2009. While 38 of these are getting maintenance and development grants by the Central Government through the UGC; IGNOU, New Delhi is funded directly by the Ministry of HRD”.

List of 15 new Central Universities:

1. University of Bihar
2. University of Gujarat
3. Central University of Haryana
4. University of Himachal Pradesh
5. University of Jammu & Kashmir
6. University of Jharkhand
7. University of Karnataka
8. University of Kerala
9. University of Orissa
10. University of Punjab
11. University of Rajasthan
12. University of Tamil Nadu
13. Guru Ghasidas Vishwavidyalaya, Bilaspur
14. Dr Harisingh Gour Vishwavidyalaya, Sagar

15. Hemwati Nandan Bahuguna Garhwal University, Srinagar

Affiliating Universities

1. Rajiv Gandhi University , Itanagar
2. Assam University, Silchar
3. The Indira Gandhi National Tribal University, Amarkantak
4. Central Agricultural University, Imphal
5. Manipur University, Imphal
6. North Eastern Hill University, Shillong
7. Mizoram University, Aizawal
8. Nagaland University, Nagaland
9. Pondicherry University, Pondicherry
10. Sikkim University, Gangtok
11. Tripura University, Agartala
12. Aligarh Muslim University, Aligarh
13. University of Allahabad, Allahabad
14. Babasaheb Bhimrao Ambedkar University, Lucknow
15. Banaras Hindu University, Varanasi
16. Delhi University, Delhi

Non-affiliating unitary Central Universities:

1. Hyderabad Central University, Hyderabad, became central university
1974.

2. Maulana Azad National Urdu University, Hyderabad, became central university 1998.
3. The English and Foreign Languages University, Hyderabad, became central university 2007.
4. Tezpur University, Tezpur, became central university 1994.
5. Mahatma Gandhi Antarrashtriya Hindi Vishwavidyalay, Wardha, became central university 1997.
6. Vishwa Bharati University, Shanti Niketan, became a central university in 1951.
7. Jamia Mallia Islamia University, New Delhi, became central university 1988.
8. Jawaharlal Nehru University, New Delhi, became a central university in 1969.

Out of the 39 Central universities, for the purpose of selection of cases, the 15 new universities and 16 affiliating universities were eliminated. That left 8 Non-affiliating unitary Central Universities which can be categorized as under:

1. Younger Central Universities: Tezpur University (1994), Mahatma Gandhi Antarrashtriya Hindi Vishwavidyalay (1997), Maulana Azad National Urdu University (1998), The English and Foreign Languages University (2007).
2. Older Central Universities : Vishwa Bharati University (1951), Jawaharlal Nehru University (1969), University of Hyderabad (1974), Jamia Mallia Islamia University (1988).

Taking the above classifications into consideration, Tezpur University and Hyderabad Central University are chosen for the purpose of case study. They are chosen on the following basis:

1. To see the level of ICT for education (ICT4E) translation and interpretation made by a young university like Tezpur University (TZU) and the ICT4E translation by an older university like University of Hyderabad (UOH)
2. To look at the regional issues and challenges faced by TZU which is situated in a remote location in Northeast of India and to assess the issues and challenges faced by UOH which is located in a metropolis Hyderabad known for its IT and IT Enabled Services

Research Design

Based on the Problem discussed in the Introductory chapter, the research attempts to analyze issues of Knowledge, Governance and Access using ICT; the application of communication technologies in Higher Education Sector that helps in fulfilling the goal of Knowledge Society; the Communication process and strategies in Higher Education networking; existing 'digital divide' and the implications.

The Research objectives are:

1. An assessment of existing application of ICT in higher education institutions in order to give an indication of the existing gap, if any.
2. Appropriateness of ICT to achieve the functions and goals highlighted in National Knowledge Commission (NKC) in particular to increase the efficiency of education delivery and adequate response to the new learning paradigm.
3. Adequacy of the ICT for research and development in the light of globalization. Steps to be taken to ensure that Universities can perform the roles expected of them in ICT innovations. Necessity for institutional ICT policy, plans and strategies for implementation.
4. Recommendations for successful use of ICT4E management involving human resources, processes and institutional culture from the experiences gathered from the case studies.

Case Study Protocol

Table 1- Case Study Protocol: Levels of decision and choices

Level of Decision	Choice
Epistemological and Ontological Assumptions	Interpretive
Research Strategy	Descriptive-exploratory case study
Research Techniques	Observations, semi-structured interviews, interpretation of documents, Questionnaires
Organisation	University of Hyderabad (UOH) Tezpur University (TZU)
Sub-units of Analysis	National and Institutional Education Policy documents about ICT Administrative Information System Institutional (Users) perspective
Timeline (field work)	August 2010 – March 2012
Subject Theoretical framework	Translation of ICT4E in TZU & UOH Diffusion Theory Actor Network Theory Grounded Theory

Table 2 - Unit of analysis and data sources

Unit of analysis	Description	Data Source
Objectives of University efforts	Motivation for ICT integration	• Institutional policy documents
Capital Infrastructure	Status of Servers, bandwidth, ICT systems, networks as well as working conditions for students and staff	• Interviews of Administrative and middle management • Audits and Observation
Usage (and reasons therefore)	Who uses facilities, for what purposes, where and when? Motivators and hindrances?	• Survey of the University Staff and Students

“Methodological Triangulation”

“Methodological triangulation involves the use of multiple qualitative and quantitative data collection methods in the same study” (Denzin, 1970; Kimchi et al., 1991; Mitchell, 1986). “It helps in elimination of bias and contradictory explanations (Denzin, 1978; Webb, Campbell, Schwartz, & Sechrest, 1966)”. “Dzurec & Abraham (1993) mention that qualitative and quantitative studies are designed to understand and explain behavior and events, their components, antecedents, corollaries, and consequences”. Methodological triangulation allows the best representation of both worldviews (Lincoln & Guba, 2000).

Methodological Triangulation has been used in this research. The research started in the year 2008 with initial study of ICT4E international/national policies and institutional documents study. Following the Actor Network Theory and the Grounded theory, Key Actors and themes were identified. Based on these premises the Actors and their Networks were identified and observations were made. This was followed by semi-structured interviews of different actants. Based on review of literature and several studies conducted by many groups including the European

University Information Systems organization (EUNIS) the EDUCAUSE Center for Applied Research (ECAR) standard sets of variables were further identified for ICT for education implementation. Questionnaires were then formulated for the different Organizational units.

Table 3 - Key policy questions

Conceptual domains	Policy questions	Mapping of information requirements
Visions and Statutes	What are the policies and incentives that constitute an enabling environment for ICT integration?	National and institutional ICT implementation strategy
Infrastructure	What is the extent of support for ICT in pedagogy and research?	Quantity and quality of ICT facilities and resources
Teaching staff development	To what extent are faculties equipped for ICT integration?	Training of teachers to use ICT4E; Staffing policies
Curriculum	Are Universities introducing changes in their curriculum delivery using ICT?	Extent of integration of ICT into the curriculum
Access	What are the nature and intensity of ICT use?	Access to ICT by stakeholders
Skills and output	What are the structural changes?	Stock of learners trained in basic computer skills and/or graduates in ICT-related fields of study
Outcomes and impact	Are ICT remodeling education system in: • improving conventional teaching and learning processes? • enhancing the quality of student performances? • expanding new skills supply for labour market? • enlarging lifelong learning opportunities? • managing educational institutions/ e-Governance?	- Effects on curriculum delivery and contents. - Effect on students learning. - Increase in the number of computer literates and the range of ICT-related fields of study graduates. -Increased enrolments in ICT-enhanced courses outside the traditional courses. -Increased presence of computers in educational administrations

“The Questions probed into: ICT Infrastructure - for understanding of how leading-edge IT resources for research, scholarship, creative activity, and teaching and learning are utilized, provided, and funded. ICT Governance – how the said universities makes high-level decisions about the use of ICT and how effective respondents think IT governance is in helping institutions achieve key objectives. ICT Services Sourcing - the range of options the said universities have for providing technology services or operating technology functions. Institutional Data Management - the policies and practices by which TZU and UOH collect, protect, and use digital information assets to meet academic and business needs. ICT leadership – to lead to the understanding of the issues and concerns of current ICT staff; ICT for communications - to understand how technologies for communications are utilized and where do they fit in institutional strategies; Networking – to understand the components, management, and support of data networking, as well as what future plans; ICT Funding - to understand how ICT funding priorities are established and implemented. ICT Engagement in Research - to understand the roles of information technology in research at universities. ICT in Libraries - this survey focuses on ICT Facilities; Hardware Resource Availability, Hardware Specifications (plans); Software; Library Automation; Internet Connectivity; ICT Support and Staff Skills; and barriers to Usage of ICTs”.

All the Schools and Departments in both UOH and TZU were administered School Technology and Readiness (STaR) developed by “U.S. Secretary of Education, and experts in the teacher education community, the CEO Forum”. “The STaR Chart offers an explicit tool to determine current standing and future direction. It provides a visual display of key factors for the integration of technology. STaR

Chart has three levels: Early, Developing, and Advanced Tech. Each category also has a Target Tech indicator which sets a goal for the overall implementation” (CEO Forum, 2000). This tool was used to get direct input and analysis of the institutions’ ICT position from the Deans and Heads of the two universities. Based on their first hand experiences, Actors/Stakeholders in UOH and TZU were also asked to give inputs on ICT4E SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to help understand the situation better. Incisive Case Studies of some faculties from the two Universities were picked up to identify detailed understanding of ICT4E translation in pedagogy. Based on review of literature and several studies conducted by many groups including the “European University Information Systems organization (EUNIS) the EDUCAUSE Center for Applied Research (ECAR) standard sets of variables” were further identified for ICT for education implementation. Questionnaires were then formulated for the different Organizational units.

A survey on Students’ perspective on ICT was conducted for students across different disciplines in the two universities. The aim was to understand how students in Tezpur University and Hyderabad University use ICT in their studies and to collect their views about the enablers and obstacles in ICT for education. Similarly a survey of Teacher’s Perspective on technology was conducted to study how teachers in Tezpur University and Hyderabad University use ICT in their teaching and to collect their views about the enablers and obstacles in ICT for education. Considering the importance given to 21st century skills in Knowledge society policies questionnaires were also administered to students and faculties of both the universities to test the responses regarding students’ level of preparedness in these skills.

The actual field work started in August 2010 and ended in March 2012. The researcher being a resident student in Hyderabad University got a good opportunity for participation observation of the different actors within the campus. To gain a similar understanding the researcher resided in Tezpur University campus for more than half a semester (February 2011 – May 2011). Considering the distance of Tezpur from Hyderabad, other queries and questions were administered via phone calls and emails.

Potential for Generalization

The research does not use the case study to validate a theory or hypothesis, but it does have the potential to arrive at generalizations. It has representativeness in that it addresses the broader aspects of ICT usage in a Higher Education system; explanations to account for why actors behave in the ways that they do and the identification of casual relations in such a setup.

Chapter 4

ICT for Education (ICT4E) Translation in Tezpur University

Abstract: This chapter begins with an Institutional overview of TZU. It discusses ICT integration in TZU which includes ICT infrastructure Resources and Practices, ICT Governance, ICT Workforce leadership, Institutional Data Management, ICT Services Sourcing, Networking, Messaging and Communications, Wireless Data Communication, ICT Funding in Higher Education, ICT Engagement in Research and Status and Use of ICTs in Libraries. It analyzes the issues and responses of ICT4E from the view point of different users in TZU. “Strengths, Weaknesses, Opportunities, and Threats (SWOT)” analysis from different stakeholder’s perspective further highlights the advantages and the challenges faced.

Tezpur University (TZU): Institutional overview

“Tezpur University was established by an Act of Parliament (Act.No. 45, 1993) in 1994. TZU is situated at Napaam, Assam, India. The University has 2013 students and 171 teachers. There are four Schools of study: Engineering, Humanities and Social Sciences, Management Sciences, Science and Technology; and 18 departments which offer a total of 32 programmes. The objectives of TZU as envisaged in the statutes, are that it shall : (a) strive to offer employment oriented and interdisciplinary course, mostly at postgraduate level, to meet the local and regional aspirations and the development of the state of Assam; (b) offer courses and promote research in areas which are of special and direct relevance to the region and in the emerging areas in Science and Technology; (c) promote national integration and study

of the rich cultural heritage of the region and in particular, the diverse ethnic, linguistic and cultural heritage of the state; (d) utilize distance education technique and modern communication technologies to provide Access to higher education for large segment of the population, and in particular the disadvantaged group such as those living in remote and rural areas; to upgrade the professional knowledge and skill of in-service personnel, in particular schoolteachers, medical personnel and extension staff, and to provide opportunities for lifelong learning for adults; and (e) provide an innovative system of university level education flexible in regard to methods and space of learning and encourage excellence in new fields of knowledge”.

Table 4 - Total number of departments and the course offered by them (based on UGC Statistical Data Fact Sheet of Central Universities Input From Tezpur University)

Name of the department	Number of students admitted per year		Number of Research Scholars	Number of faculty (As on 19.01.2012)			
	UG	PG		P	AP	Asstt. Prof.	O
Business Administration	13	46	24	4	4	5	Nil
Chemical Sciences	-	33	42	6	3	4	Nil
Civil Engineering	20	-	-	0	2	3	Nil
Computer Science & Engineering	52	87	42	5	5	8	Nil
Cultural Studies	-	17	19	2	2	6	Nil
Disaster Management	-	-	-	0	0	1	Nil
Electronics & Communication Engineering	52	48	15	4	3	8	Nil
Energy	-	28	17	3	2	2	Nil
English and Foreign Languages	15	47	17	5	2	7	Nil
Environmental Science	-	28	22	2	2	5	Nil
Food Engineering & Technology	7	24	11	2	2	6	Nil
Hindi	-	-	-	1	1	1	Nil
Mass Communication and Journalism	-	39	4	0	3	8	Nil
Mathematical Sciences	-	56	22	3	6	6	Nil
Mechanical Engineering	52	-	-	0	3	7	Nil
Molecular Biology and Biotechnology	-	59	35	3	4	8	Nil
Physics	-	59	35	3	5	7	Nil
Sociology	-	30	4	1	2	5	Nil
TOTAL				44	51	97	

Actor-Network in TZU:

As discussed in the introductory chapter, Problematization which lays the purpose, needs, and benefits of ICT in the case of the two Universities occurred with the overall direct and indirect impact of International educational policies having a push factor on National educational policies which is also reflected in the Institutions' visions and policies to incorporate ICT in its governance and academic structure. The Actor Network involves several human and non-human actors. "Mapping of relationships of actants and centrality of relationships, strong and weak ties, structural holes, and sources of resistance; Engagement of the key actants and translation of their interests into visions, objectives, plans and roles are discussed in the subsequent sections".

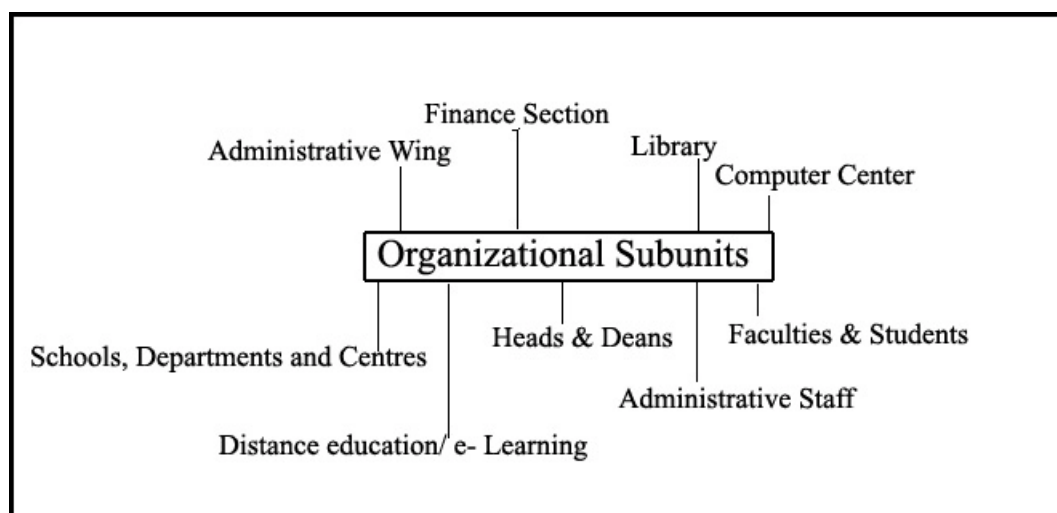


Figure 2: Organizational Subunits in UOH and TZU

“Administration”

“The Vice-Chancellor exercises general supervision and control over the affairs of the University and gives effect to the decision of all the authorities of the University. The Statutory authorities are: the Board of Management, the Finance Committee, the Academic Council, the Planning Board, the Board of Studies and the

Building Committee. Since its inception, the University has placed emphasis in ICT infrastructure to support its academic activities as well as in the administration”. Out of the total budget ICT funding amounts to 10%. According to Prof. A. Choudhury, Pro Vice-Chancellor, ICT layers in Tezpur University involves basic implementation in day to day, teaching learning process; implementation in research level- new knowledge generation; and to reach out to stake-holders e.g. parents etc. to the society, communicating TZU’s findings and research output to spread knowledge. Between Policies and Implementation the administration feels that earlier awareness was not there, but once the awareness is created and if the fund is available (which generally is the case in Central Universities), if there are good proposals it gets funded and more so in the case of Northeast. Since there always is a concern for Northeast there has been a good support from the center. “Information on latest technology takes time to reach here. But now ICT itself helps in bridging that gap, it is helping in closing the gap”. ICT in TZU is acting as an actor in implementing ICT.

ICT vision statement is explicitly linked to institution vision. The institution’s ICT infrastructure is recognized as an important institutional asset. The leadership at the institution understands the value of ICT. TZU “has a reputation for being forward-thinking” in the use of ICT in the Northeast region. Campus information technology stakeholders view the central ICT team as indispensable to their success. Senior leaders at the institution regularly consider the ICT implications of institutional decisions. Planning, reporting performance are important activities closely linked to the budget allocation process. The Institution’s top administrator (i.e. Vice-chancellor) has been in his current role for five years, the organizational climate is stable. The Vice - chancellor is characterized as a strong supporter of ICT

implementation in the institute. The top ICT leader is the Head of Computer Center which is chosen on a rotational basis. The annual operating budget of the central ICT organization is Rs. 2 Crore. The ICT strategic plan greatly influences the day-to-day operations of the central ICT organization. However, the institutional ICT strategic plan is seldom updated. The administration feels that TZU has been able to document significant achievements based on the implementation of its ICT strategic plan.

“Computer Centre”

“Computer Centre (established in 1997) plays a main role in catering to the academic programmes as well as for maintenance of the other computing resources in the university. A campus LAN with optical fiber backbone connecting the academic as well as administrative departments spreads over the University campus of 241 acres. Internet connectivity is provided throughout the campus with 10Mbps OFC Link (UGC-INFONET), a 2Mbps Leased Line Link and a VSAT link of 512Kbps. Wireless LAN has also been set-up to extend the LAN connectivity to the Hostels and the residential areas. The Computer Centre Committee consists of one representative from each of the user departments with the Vice-Chancellor as the chairman and the Professor in charge of the centre as its convener. The committee meets at least once in a semester to review the functioning of the Centre and to take major operational and policy decisions. Accommodating the requirements of different departments in the time slots of central computer centre is becoming difficult with time. Moreover, the distance of the central computer centre from many of the user departments is also becoming a hindrance to the use of the centre. As a result the centralization of the computing facilities is viewed as a major drawback by a section of the user community. This has led to a trend of procuring computers for general use by

different departments of the University and setting up computer laboratories of their own. Maintenance of these computing resources has become a cause for serious concern over the years. With the increase in the size of the computing resources in the University a need has also arisen for streamlining the process of procurement, maintenance and disposal of the computing resources in the University. A policy document in this regard has therefore become necessary in the University”.

Table 5 – Computer Centre Cluster I and II in TZU

Computer Centre	
CLUSTER-I	CLUSTER-II
Academic Building-II (Ground Floor)	Energy Building (First Floor)
60 units	31 Units

“The computing resources policy includes Services to be provided by the computer centre; Addressing the problem of accessibility of the computer centre; Departmental computing facilities; Procurement of computing resources; Maintenance of computing resources; Networking; Development and maintenance of the software required in the administration of the University; Printers and printer usage; Upgradation and disposal of obsolete or unusable computing resources; Access control and usage monitoring according to internal policy as well as government policy. The Computer Centre maintains the common computing facility for use by the students of the different academic programmes; provides computing resources to the Faculty Members, Departmental Offices, Library and the Administration; develops, procures and maintains software required for administrative and other purposes of the university; Set-ups and maintains the Campus LAN; Provides Internet, email, database services etc. to the users; Maintains the University website; Provides and maintains the MMPs in the common auditoriums/ conference halls and in 25% of the class-rooms in each department; Assists the Administration in the process of Selection

and Procurement of Computing Resources; Organizes training programmes for the faculty and staff from time-to-time; Runs extension programmes like computer training programmes for unemployed youth and Maintain the Intercom facility of the University”.

“To address the problem of accessibility of the computer centre the Computer Centre (CC) has set up some computer laboratories at different academic buildings in the University. The objectives of having these laboratories are making resources available nearest to the user departments; Providing services, like email, Web service, File service etc, to the users through the terminals available in the nearest Unit of the CC; Conducting computer lab sessions of user departments at the nearest Unit of the CC; Organizing lab sessions for Refresher Courses and Workshops for the user departments at the nearest unit. The Units of the Computer Centre normally remains open from 7-00 hrs. to 24-00 hrs. Sufficient numbers of personnel are employed on shift duty for this purpose. Students Assistants with appropriate remuneration may also be engaged to man the laboratories beyond office hours and on holidays”.

Table 6 – Number of free prints per year for students in TZU

Category	Free prints per year
Research Scholars	100
PG students	50
Final Year UG students	50
UG students	30

“There is a four member committee comprising the Professor Incharge of the Centre, a Faculty Member of the Department of Computer Sc. and Engineering, a Computer Engineer, and the Assistant Registrar (Stores and Purchase) to assess the

status of the computing resources. A member of the concerned department is a special invitee. The Professor Incharge of the Computer Centre Chairs the Committee. The committee assesses the status of the resources periodically and is empowered to declare a computing resource as obsolete and to recommend its disposal. The obsolete resources may be given to Hardware Labs, exchanged with updated systems under buy-back options. The University may also decide to donate such systems to organizations such as schools, if the organization finds them usable”.

“ICT is used for most of the administrative work. ICT is also used for exchange of notification and other information through email. There is a designated Software Team (ST) comprising the System Analysts, the Junior Programmers and two Faculty Members of the Department of Computer Science and Engineering. They look into the software requirement for new software, upgradation of existing software or maintenance, and the stipulated time frame for the service. ST uses oracle and web based softwares for some specific areas e.g. payroll, employee’s information system, student’s information system, accounting. For in-house tasks the ST members may directly carryout the task, or engage other TZU members, including students. Optionally, external professionals may also be hired for in-house software tasks. A Software Quality Assessment Committee (SQAC) oversees the quality of the in-house work as well as procured software and service. The ST is also responsible maintaining the University Website. One of the ST members acts as the Web Master”.

“TZU has Open Source Software which keeps record of each individual who accesses different resources, whether they are legitimate or not; how much do they download, depending on that the users are blocked; some for 30 days in the case of

extremely violating users. In hostel network is 512kbps fixed speed for each user. TZU uses keyboard filtering mechanism and URL filtering mechanism. Sometimes some key words within a string match, then there is accidental block. Users have to send the request then they are unblocked. Some websites which are high bandwidth usage are also blocked”. As per Computer Center record in May 2011, most visited websites according to computers in Computer Centre are:

1. Google (search engine)
2. Face Book (social networking site)
3. Orkut (social networking site)
4. Gmail (email)
5. Alter Bridge (American Rock band website)
6. You Tube (video sharing website)

The usage of software as of now is more focused towards ICT governance rather than for teaching and learning purpose. The Computer Centre Head feels that everybody should be encouraged /trained to start using ICT resources. There is also a need for attitude change to start using ICT. As far as infrastructure is concerned, there is a need to make as many terminals as possible available for connectivity. In the curriculum, some portions are devoted to ICT and Basic Skills. The study also highlights the fact that Asynchronous ICT4E which facilitates offline material beyond the limitation of time and space will be more suitable than synchronous online ICT4E material. NKN as per the policies will train the users; TZU is waiting for NKN to be fully operational.

Table 7 – SWOT Analysis by Computer Centre respondents

SWOT Analysis by Computer Centre respondents	
Strengths:	Self managed ICT services, tuned to the best of users needs, without relying on external parties; Cost effective adoption methodology, use of open source e-mail, proxy and web servers; Flexibility in adopting to technological changes; Investment optimization use of voice and data convergence; Use of state-of-the art technologies and Good work culture.
Weaknesses:	Insufficient budget and lack of free flow of funds for ICT Funding; absence of separate plan for ICT Funding (the main bottleneck). Data storage plan insufficient; No disaster recovery plan till date; Insufficient manpower for ICT support, at present there are only 8 technical staff to look after around 800 + official PCs and 1000+ individual PCs; Delayed decision making and lack of ICT policy framework.
Opportunities:	Cloud computing, grid computing etc. with high speed connectivity; Collaborative and multi-institutional research; Increase in network intensive ICT research and services; Ultimate aim for paperless office; Nationwide 1 GBPS network backbone under NKN; Video conferencing, virtual classroom, digital repository are the future opportunities.
Threats:	Use of anonymous open proxies, Spam, System hacking and intrusion; Virus/worms and malware growth are the major threats that the Computer Centre faces.

“Based on the methodology described in Chapter 3, the following sections cover engagement of the key actants (human and non-human) and translation of their interests into visions, objectives, plans and roles (interestment)”.

ICT infrastructure Resources and Practices

Tezpur University has an officially designated Research and Development Centre for research. However, it was noticed that the institution does not have an advisory body that deals primarily with ICT issues related to research, teaching and learning. Moreover, the central ICT organization “does not have a distinct unit with

the explicit mission of supporting faculty, students, or other researchers with their research needs”. This section covers responses on five sets of technologies viz.

“High Performance Computing

Cyber infrastructure applications and tools

Data storage management and resources

Advanced network infrastructure resources

Resources for collaboration within virtual communities”

The study showed that these technologies in TZU are used occasionally by a few personnel in the institution. Researchers use campus central ICT resources and resources available to them through collaboration with other higher-education institutions to a moderate extent and use resources available to them through governmental or private source/s to a large extent. These technologies are funded to a moderate extent by research funds awarded to the researcher or lab, funds awarded to the institution and campus central ICT organization funds. A large extent of funding comes from funds made available through collaboration/s with other higher-education institution/s.

Level of importance of these technologies at the institution can be seen maximum in the case of “research in Science and Engineering”. It is not applicable in the case of research in other disciplines such as arts, social science etc. The respondents mentioned that the usage is to a moderate extent in Teaching and learning.

The Head of the Computer Center mentioned that TZU has documented inventory of “High Performance Computing, Cyber infrastructure applications and tools, Data storage management and resources, advanced network infrastructure resources and Resources for collaboration within virtual communities”.

The respondents feel that increased funding for central ICT infrastructure and central ICT services; “greater inclusion of researchers in institutional ICT governance bodies” would most help the central ICT organization support more effective research use of these resources.

The stakeholders mentioned that TZU’s research/ teaching and learning activities, the overall “importance of data storage and management resources; cyber infrastructure applications and tools are expected to greatly increase in the next three years. Collaboration within virtual communities is expected to increase moderately; High Performance Computing and advanced network infrastructure resources are expected to remain more or less the same”.

Information Communication Technology Governance

Accountability and Integration: ICT governance at Tezpur University is managed by the Computer Center. The Head of Computer Centre is accountable for and has the authority needed to meet his/her responsibilities for providing sufficient storage for research data, providing security for “research systems, providing space and environmental support for research ICT resources owned by campus entities other than central ICT, providing support services for research ICT systems, such as system

administration, identity management, and help desk; enforcing the research community's compliance with national regulations regarding privacy of data; providing sufficient network bandwidth for research; providing sufficient network bandwidth for teaching and learning; providing ongoing maintenance and support for ICT resources obtained with one-time research funds".

Status and Alignment: ICT governance processes are monitored and measured. The Head of Computer Centre mentioned that a documented institutional plan and ICT strategic plan is under development that outlines strategic priorities for the institution as a whole. The ICT strategic plan addresses institution-wide ICT issues and initiatives.

Primary drivers for pursuing formal ICT governance at Tezpur University involve encouraging/collecting community input; empowering users/process owners and transparency in decision making. The study shows that the primary barriers to pursuing formal ICT governance are lack of adequate funding, lack of guidance from institutional strategic objectives and difficulty developing campus policies and procedures. In the past two years there have been no formal changes in the institution's ICT governance decision-making process.

Structures and Processes: TZU does "not" have a top-level ICT steering committee (or ICT strategy committee, executive committee, council, etc.) for oversight of major ICT policies and initiatives.

The primary reasons why the institution does not have an ICT steering committee is because of preference using ad hoc committees as needed, relevant decisions are made at executive level and ICT governance process is not sufficiently formalized. The Vice- chancellors, Administrative officers, senior institutional ICT leader Deans/HODs, Faculty, Students are permanently represented, directly or through delegates, on the ICT related meetings. It was mentioned that ICT governance at the institution does not participate in institutional budgetary processes. Library leaders do not participate directly in the ICT governance processes. The stakeholders feel that communication about ICT governance processes and decisions is not clear. Decision to review ICT related project differs case to case.

ICT Governance Performance Assessment: “Cost-effective use of ICT, effective use of ICT to enhance teaching and learning research and administrative processes are important at the institution”. Respondents stated that skills/personalities of key individuals, informal relationships among concerned parties, inclusion/participation of stakeholders are typically most responsible for successful ICT governance outcomes at TZU.

ICT governance structure comprises of a standing academic committee which advises on ICT policy and programs. The senior ICT leader determines ICT policy and programs after informal discussions with others. The senior ICT leader makes independent decisions about ICT policy and programs.

Communicating/ Implementing ICT Priorities and Performance: The results of ICT initiatives are regularly communicated to key stakeholders. Members of the central

ICT staff are able to accurately articulate the institutional ICT vision and ICT priorities. ICT organization communicates its priorities and performances through focus groups, regularly scheduled meetings, e-mail. Institutional ICT priorities are tied to institutional budgetary procedures. The top three triggers for changes to ICT priorities in TZU are:

1. changes in institutional funding for ICT
2. new institutional leadership
3. new demands for ICT services

Implementation of ICT initiatives is guided by a formal, institutional priority-setting process. Objectives are clearly documented when ICT initiatives are approved, included with nearly every ICT initiative, funding for ICT initiatives is allocated when initiatives are approved. The ICT implementation plans include project schedules, resource requirements and intended outcomes. ICT initiatives often result in sustainable and positive cultural change. The institution publishes performance expectations for network reliability, help desk response, institution-wide (enterprise) systems performance, academic technologies support, application development schedules/deadlines, telephony services and other ICT services. Computer Centre reports on the progress of goals that are stated in ICT plans on an ad hoc basis.

Stakeholders mentioned that ICT planning has had considerable impact on aligning technology with other institutional priorities, building alliances with key decision-makers, identifying opportunities to differentiate the institution competitively, orienting a new leader to the state of ICT at the institution, securing financial and other resources, enhancing ICT service levels, documenting institutional

ICT priorities, keeping an eye on the leading edge, identifying new service requirements, improving communications with users, identifying internal improvement opportunities and increasing top management support. Top three reasons for measuring ICT in the institution are to compare the institution's performance with past years' performance, to educate ICT staff about service level responsibilities and to inform decisions about new services.

ICT Workforce Leadership

At Tezpur University, ICT is centralized. The current overall organizational climate according to the ICT leader is considered Dynamic wherein change is continuous, orderly, planned, and navigable. The ICT leader mentioned that attending conferences focused on higher education ICT, attending general ICT conferences, formal technical training classes, formal management development programs, independent reading of current ICT news/developments and independent reading of current higher education news/developments contribute most significantly to professional growth and development. In TZU the ICT leader uses formal professional development plan to help select development activities sometimes. The senior ICT leader feels that the central ICT organization is "perceived as delivering high-quality services. It is also felt that there will be a shortage of skilled ICT workers in the next five years and ability to meet future institutional technology objectives would be significantly threatened by a shortage of skilled workers. Outsourcing systems and services, expanded professional development opportunities will be most important to the ICT organization's ability to maintain an ICT workforce adequate to meet institutional needs in the next five years".

Institutional Data Management

In TZU institutional data for “Administrative systems data, Video/audio content available online, Institutional web (domain.edu) content, E-mail, Research data, Library digital content available online has increased in the past 12 months. Implementation is in progress for enterprise directory (i.e., an institutional directory service that has the capability to include all persons affiliated with the institution and to be used by multiple applications). There is no observable demand from the leadership in improved institutional data management capabilities but the users are demanding improved institutional data management capabilities”. Primary drivers for investing in data management are to:

1. improve ICT operational efficiency
2. support new applications/systems
3. improve user access to data.

Primary barriers cited to investing in data management are:

1. lack of funds
2. “decentralized/informal institutional culture”
3. “decentralized nature of the data to be managed”

“Data Integrity and Quality: Major data element, refers to data items essential to conducting basic business and academic operations, such as student name or address, student transcript information, employee status, pay rate, etc. Processes are in place to assure data quality at the point of capture/origin (e.g., data entry). Automated systems are in place to validate data across enterprise systems and data stores”.

“Processes are also in place for documenting and reviewing all identified data quality issues. Improved reporting/analytics, application system implementation/upgrade and data warehouse or data mart implementation/upgrade were factors in causing the institution to undertake the data quality initiative. The institution's data quality initiatives have resulted in process changes that improve data quality throughout the data life cycle, rather than just fixing bad data”.

“The institution does not have a formal process for classifying institutional data by risk or sensitivity level. A little amount of data has been classified at this time. The institution has a governance structure for setting data access policy. In the past 24 months, zero to 30 % breach incidents have occurred at the institution that required notification of affected parties”.

Data Analytics: The primary use of Data Analytics at TZU today is for extraction and reporting of transaction-level data. The most active users of Data Analytics tools are “Central admissions/enrollment management staff, Central business/finance/administrative staff and Central academic/student services staff (e.g., registrar, financial section). The institution uses its reporting, modeling, analysis, and decision support capability to usually monitor operational performance such as budget to actual data; to monitor students who may be at risk academically; to alert an appropriate official when an academic intervention with a student is warranted and to model the potential impact of strategic decisions. There are plans to significantly upgrade its reporting, modeling, analysis, and decision support capability in the next two years. This would require the institution to provide effective training to users of Data Analytics”.

Content and Records Management: “There is no enterprise solution for enterprise management of digital content, only local/departmental solutions for particular content types are available. Three years from now, an integrated enterprise content management solution that manages the widest possible range of content is anticipated in the institution’s environment for enterprise management of digital content. The Computer Center has the primary responsibility for determining the look and feel of the institution’s primary website (domain.edu homepage and subordinate pages). In the next three years, video streaming/download, audio streaming/download and videoconferencing will be the most important to add or enhance within the institutional web environment in order to meet constituent expectations. Faculty, Staff, Students often use extra-institutional web-delivered (cloud) services in preference to institutionally delivered equivalents. The Computer Centre estimates that in three years, Faculty, Staff, Students will use extra-institutional web-delivered (cloud) services in preference to institutionally-delivered equivalents only sometimes. TZU has a group responsible for overseeing electronic records management. Documented electronic records retention schedules are available for student records, course-related records, human resource records, staff e-mail and faculty e-mail”.

Research Data Management: “In the past three years use of high-performance networking has greatly increased. In the next three years, use of high-performance networking will increase more than use of high-performance computing and amount of research data storage. The Schools/ Centers / departments are responsible for research data storage, data backup and recovery. The major responsibility is that of individual investigators, labs, or teams. The Computer Center provides the technical

backup and the library has a moderate role to play in supporting research data in TZU. The institution does not have a documented policy defining ownership of research data but it has documented policies regarding research data security. Respondents mentioned that to support the long-term preservation of research data, TZU has the necessary expertise, funding mechanisms, institutional commitment but not the infrastructure. Policies and procedures also need to be worked upon”.

ICT Services Sourcing

TZU’s goal for ICT is “to provide reliable ICT infrastructure and services at the lowest possible cost”. Some staffs within the central ICT organization are part of collective bargaining agreements. The institution’s executive leaders’ general view of outsourcing any function or service is Strategic i.e. it is the institution's preferred option where possible. Respondents feel that the pressure to contain ICT costs and to reduce energy consumption at the institution is moderate.

Attitudes toward Alternative ICT Sourcing Strategies: In general, executive leaders at the institution believe that alternative ICT sourcing strategies reduce ICT costs, improve service. ICT sourcing alternatives are well understood by executive leaders. It is a topic of discussion frequently initiated by executive leaders and a priority for IT head in-charge. The respondents feel that in the next three years, adoption of alternative ICT sourcing strategies will be limited owing to technology issues, data security concerns, regulatory compliance concerns and ability to manage and enforce contract terms. Readiness for technical architecture, adoption of open standards, knowledge of current ICT costs, knowledge of current ICT service levels, contract

negotiation skills within the ICT organization and contract management practices within the ICT organization to support the expanded use of alternative ICT sourcing strategies is rated Medium by the respondents. The institution uses open-source software and the use is likely to increase in the next three years.

Institution's Use of Alternative ICT Sourcing: Alternative ICT sourcing strategies at Tezpur University are used for some technology services and functions. The most significant factors that have led TZU to elect to self-operate all ICT functions and services are Cost-effectiveness of self operation; Data privacy risks and security risks. In the future, TZU is more likely to employ alternative ICT sourcing strategies if competition for skilled ICT workers intensifies and more institutional consortia form to provide ICT services; if providers offer better evidence that they can secure institutional data; third-party contract terms become more amenable to institutional concerns; and if the ICT budget is cut significantly; energy costs continue to rise; if integration of data across disparate applications becomes easier and offerings in the market become more mature.

TZU's adoption of alternative ICT sourcing strategies for enterprise applications, learning technologies is likely to increase in the next three years; Infrastructure and User services and support is expected to stay the same. The performance of the outsourcing arrangement in achieving reduced ICT costs, improved ICT services, making technology more reliable, bringing technology up-to-date, enabling ICT staff to focus on higher priorities, reducing risk, gaining access to greater technical expertise and gaining access to greater management expertise is rated as fair. In the next three years, the University intends to implement a change to

self-operation. Contract with a third party to provide network design is currently employed for alternative ICT sourcing. At present the TZU uses alternative ICT sourcing strategies for Telecommunications, Training; Project management; Cabling; Desktop hardware repair and Training.

Stakeholders mentioned that the best alternative ICT sourcing is Technology/service delivered via the Internet or "cloud". The best provider of this alternative ICT sourcing is government source. However the respondents also feel that if this service or technology were to fail, it would have a moderate impact on the institution. The most significant barriers TZU had to overcome in order to implement an alternative ICT sourcing strategy for this technology service are cost-effectiveness of self-operation, data privacy risks and security risks. The decision to use an alternative ICT sourcing strategy resulted in some staff redeployed to new responsibilities. The performance of the alternative ICT sourcing provider in the areas of improved access to technical or managerial expertise, reduced risk, increased access to greater management expertise, reduced energy consumption, reduced ICT costs, enhanced user satisfaction, making technology more reliable, bringing technology up-to-date is rated as satisfactory.

E-Mail: This section studied institution's plans and experience regarding the outsourcing of faculty, student, and staff e-mail. The Central ICT organization hosts primary student, faculty/staff e-mail system. The primary reasons the institution has elected not to outsource its primary student e-mail are being more confident in own ICT capabilities, data security and privacy concerns. Performance of the hosted e-mail in reducing ICT costs, enhancing user satisfaction, bringing technology up-to-date,

making technology reliable, enabling ICT staff to focus on higher priorities, improving access to technical or managerial expertise, securing data, maintaining data privacy and reducing risk is considered very satisfactory. It is unlikely that a third party will be used to host primary faculty/staff/student e-mail system in the next three years. The institution's use of consultants and contractors to support the routine delivery of ICT functions and services in the past three years has stayed the same and is expected to stay the same in the next three years. The primary reasons for central ICT organization not using any consultants and contractors as part of the central ICT staff are because it increases ICT costs and it's easier to hire an institutional employee. Contractors and consultants are typically more skilled than institutional employees. However, it is effective to use contractors and consultants to accomplish discrete projects and to access scarce skills. Central ICT organization uses contractors and consultants to support the routine delivery of ICT functions and services to add required skills and when it's difficult to find qualified institutional employees. The central ICT organization is not empowered to recruit sufficient numbers of ICT staff.

Networking in Higher Education

This section seeks to understand the “components, management, and support of data networking, as well as what future plans exist. The central networking organization provides local area network support to all departments and schools”. Wired network access of is available for all administrative and faculty offices, Labs/research facilities and Libraries. But classrooms do not have connections. Wireless network access is available to a certain extent in hostels and some outdoor spaces. “The total bandwidth available from the commodity Internet is 4.6 to 12

Mbps. The institution physically connects to providers of Internet (commodity and advanced) services through Leased circuits directly to ISP location and Private fiber connection. TZU connects to University system wide network and rations its internet bandwidth to different areas. No remote access is provided by the institution. There are no plans to replace the use of wired networking with wireless anyplace on campus. The primary reasons for not replacing wired networking with wireless are wired network provides adequate coverage to these areas as of now, interference (e.g. from building or nearby equipment) , cost, insufficient performance and security concerns. TZU has implemented and is considering further implementation of converged services [data, voice, and/or video using the same network infrastructure] to combine infrastructure and support staff and to provide enhanced services (e.g, VoIP, video streaming)”.

The institution has achieved cost savings from converged network in some aspects. There is no documented strategy for implementing converged network services. The primary barriers in considering implementing converged services are that the stakeholders don't see an acceptable Return on Investment; “unwilling to discard investment in legacy technologies at this time; network infrastructure cannot support converged services. TZU has implemented VoIP on its network”.

Network Access: “Login to an authentication server is required for access to network resources and services via Wired and Wireless network. Jacks in public places (classrooms, conference rooms, libraries, etc.) are always active, but those in private areas (offices, dorm rooms) must be activated by request. Jacks are controlled by local authority (department, school, building, etc.) The central networking group

can remotely deactivate a port when an issue is detected with the device connected to the port (e.g. virus infection)".

Network Support and Management: "The institution's network management tools are Standalone products supplied by a variety of vendors. Network support is centrally available to users at the institution during working hours. Network support levels vary by constituent group (e.g. 24x7 support is available for faculty, but not for students)".

Networking Practices: "TZU restricts/blocks access to selected (Transmission Control Protocol)TCP/IP ports; access to certain web sites is blocked due to their content being objectionable, dangerous (virus, spam, etc.) and relaying of e-mail. The actions taken to minimize the impact of P2P (peer-to-peer) file sharing tools or other bandwidth consuming applications on network performance include blocking the use of P2P applications on the network, selective blocking based on content, the use of P2P applications on the network; separated residence halls from the rest of the network to limit impact on academic and administrative network usage; monitored/restricted the amount of bandwidth consumed by each user. There is no user restriction on devices or applications on the network".

Planning and Current Issues: TZU's goals for its network can be best described as to "provide reliable performance and services at the lowest possible cost. The top three drivers of the institution's continued investment in networking technologies are adherence to a strategic ICT plan/strategic networking plan, need for additional bandwidth and obsolescence of existing technology. The top three consumers of network bandwidth at the institution today are communication applications (e-mail, instant messaging, etc.), Web traffic and non-academic student usage (P2P file

sharing, online gaming, etc.) .The Computer Centre has estimated that the top three consumers of network bandwidth in three years time will be communication applications (e-mail, instant messaging, etc.), Web traffic and video streaming. Leadership considers the network to be a strategic resource for the institution and a critical infrastructure. The network is an essential resource for most members of the institutional community to perform their daily”.

The “top three barriers faced in the delivery of networking services” are:

1. Inadequate funding
2. Technology issues
3. Enforcement of policies.

Policies, Procedures, and Decision Making: TZU does not have a disaster recovery plan, “formal policies and procedures that cover networking issues. The overall success of the institution’s networking initiatives is considered fairly successful by the stakeholders. Network-related metrics which are tracked include network uptime, network capacity utilization, network latency, packet loss, actual network speeds and user satisfaction. TZU has not experienced an unplanned network outage of significant length in the past two years. The primary sources of funding for central data networking operations are annual ICT budget allocation, student technology fee and grants. The primary sources of funding for central data networking upgrades/improvements are annual data networking budget, annual contributions to a reserve fund and grants. The institution will make its largest investments in networking during the next three years on network components and software, wireless networking and user support”.

Messaging and Communications

Enterprise Communications: The Central Computer Centre assessed that for meeting faculty members' messaging and communication needs, the importance of the following technologies at TZU in the next three years will change as follows:

“Institutionally provided e-mail services, Outsourced e-mail services, PBX-based landline telephony, Learning management system, Conference/classroom videoconferencing, Social networking websites such as Facebook, MySpace, etc. will greatly increase.

There will be no change in VoIP-based landline telephony.

RSS feeds, Blogs, Wikis, Campus portal, Desktop video conferencing will Increase”.

For meeting staff members' and students' messaging and communication needs, the importance of the following technologies in the next three years are anticipated as:

“Great increase in institutionally provided e-mail services, Outsourced e-mail services, PBX-based landline telephony, Learning management system, Conference/classroom videoconferencing, Social networking websites such as Facebook, MySpace, etc.

There will be no change in VoIP-based landline telephony.

There will be increase in RSS feeds, Blogs, Wikis, Campus portal, Desktop video conferencing”.

Overall, respondents feel that the official information of the institution which disseminates electronically is accurate, timely, reaches its intended recipients and

accomplishes its communication goals. According to Computer Centre Head, the institution's current messaging and communication infrastructure meets the institution's current needs and will meet the institution's needs over the next three years. The faculty members and students do not pay a flat-rate technology fee that includes messaging or communication services. The central ICT organization understands the communication preferences of its constituents. There is no written policy in place to deal with e-discovery requests such as subpoenas and court orders.

E-Mail and Calendaring: Each member faculty, staff, student is required to have an institutional e-mail account. The institution automatically forwards messages from an institutional e-mail account to a student-specified account when requested by a student. The central ICT organization hosts the institution's primary faculty/staff/student e-mail system. The primary faculty/staff e-mail system was developed by an open source software provider. There is a written policy for electronic records management of faculty/staff e-mail and institution's electronic records management policy specifies how long faculty/staff e-mail records should be retained. The institution's electronic records management policy has been enforced somewhat consistently for faculty/staff e-mail. 25% of e-mail arriving at the institution is spam. An effort at reducing the volume of spam carried by the institution's e-mail system(s) has been somewhat effective. In the next three years, the overall volume of e-mail transiting the system will greatly increase. Only certain individuals (roles) are allowed to send official e-mail messages over the Internet to large groups of recipients. Institution's policy at limiting who sends official e-mail messages over the Internet to large groups of constituents has been somewhat ineffective.

Mobile Communications: The institution does not use SMS text messaging as a medium for official, non-emergency communications. Mobile communication at institutional level does not exist.

Crisis Communications: TZU as of now does not have a crisis communication plan.

Wireless Data Communication: TZU has already implemented limited wireless data communication. The institution implemented wireless capability in 2004. The scope of the institution's current wireless data communication implementation is Campus wide and this implementation includes outdoor use. The primary barriers to adopting wireless data communication are cost, unproven/technology not developed enough, have other ICT priorities, no benefits/application and security concerns. 30 % of the campus geographic wise is covered by wireless networking (define geographic area as the area encompassing all academic, administrative, residential buildings). In 24 months from now, 50 % of the campus geographic wise would be covered by wireless networking. Building(s) that is (are) primarily used as research center (s) and Hostels residence currently have wireless capability. Students in the institution are not required to have notebooks /laptops though most of the students use laptops.

Same help desk that supports wired network provides support to end users of wireless network. Computer Center helpdesk maintains the wireless ICT infrastructure in the institution. Computer Center department and the administration initiated the process of wireless data networks and are highly involved in the planning process. The level of co-operation among the groups involved in the implementation is high. Implementing wireless data networks in terms of the institutions overall ICT strategy is important but other initiatives have higher priority. 5 % of institution's

overall ICT budget sources funding is for wireless implementations. Approximately the wireless network serves 500 students/faculty/staff. Improved student and faculty access to network anytime; savings compared to installing and operating wired network were important in terms of the institution's decision to implement a wireless network. End- user support is the key challenge faced in implementing wireless data network. Respondents mentioned that overall the wireless data network so far has fallen short of expectation.

Information Communication Technology Funding

In TZU the senior ICT leader reports to Vice- chancellor, Chief Finance officer and other administrative officer. The senior ICT leader is not a member of the institutional committee that develops the annual operating budget. All revenues are collected centrally and expenses are allocated to each department. It was noted that the senior ICT leader does not have much influence on expenditure decisions for data communications, desktop computing, networks within campus buildings, expenditure decision for instructional technologies, expenditure decisions for academic/research technologies, and expenditure decisions for web support services. In the last FY, the institution's approximate central ICT budget amounted to 10% of the total budget allocation. The approximate percent change in the size of the institution's central ICT operating budget in the past 3 years is starting at 15%

It has also been observed that there has been no significant decline in central ICT budget since FY01 nor is any decline in the institution's level of one-time investment in technology foreseen in the next three years. The institution has made

significantly higher levels of one-time investments in technology in the three fiscal years prior to the year 2000 than in the last three fiscal years. Largest one-time investments during the period of last three years have been made in academic/research computing, administrative systems, data center/computer operations, desktop/user support services, ICT security, network services and web development/hosting. The most important investments have been for academic/research computing, administrative systems and data center/computer operations. Second in list are investments on desktop/user support services, ICT security, network services, web development/hosting. Investments on instructional technologies, media services, print services and telephone services have been less important. The fastest growing components of the ICT budget in the last three years have been hardware purchases, network equipment, software purchases, hardware and software maintenance contracts and staff training. According to the administration, the fastest growing component of the ICT budget in the next three years will be same as above.

Approximately 10% of FY central ICT budget is committed to contractual payments to vendors to support and maintain existing technologies. According to the Finance Section, the central ICT budget contains adequate funds to maintain critical ICT operations reliably, to keep current with vendor mandated upgrades, to research and experiment with emerging technologies, to respond to new user needs and interests, to implement the institution's stated strategy for technology. The base ICT operating budget always increases sufficiently to maintain new technology. The budget allocated to technology once it has been implemented, is maintained through separate annual budget request and included in the project budget. The cost of major upgrades to vended software is funded from existing ICT operating budget, funds

obtained via the normal ICT project funding process and from specific funds set-aside for this purpose. 5% of ICT budget is viewed as a fixed cost (e.g., committed to full time employee compensation, multi-year contractual commitments or other expenses that would be difficult to discontinue in less than one year). TZU is pursuing an explicit strategy to increase the flexibility of the ICT budget by moving more costs from fixed to variable. Remaining budget balances are fully carried over into the next fiscal year. Reallocation of funds from their original budgeted purposes to new areas during a fiscal year happens partially.

There is no plan for annual expenditures in the current FY for consulting firms (excluding independent contractors). Consultants and independent contractors are never used. Planned annual expenditures in the current FY for independent contractors is Rs. 40 crores for other construction activities. External software development firms are not hired by the institution. The Finance officer mentioned that it has not been easy to identify the cost of major activities (e.g., software development, network maintenance, etc.). The annual ICT budget does not always anticipate all the costs of providing central ICT services. However, it is easy to identify costs by program area (e.g., library information systems, administrative computing, learning technologies etc.) The ICT organization rarely requests supplemental funding for items not included in its original budget. The central ICT budget process helps align ICT priorities with institutional priorities and it is institutionalized (not person-dependent).

Use of Charge-backs and Student Technology Fees: ICT services covering administrative systems – transaction systems operations (finance, HR, student

information); administrative systems – application development (finance, HR, student information); desktop/user support services and print services are charged back to other budget units on campus. Rates for charge-back services are set through cost of the service plus an additional charge to support the cost of running other centrally provided technology services. Charge-backs are used as it rations scarce ICT resources, supplements the ICT department budget, provides users options as to how much service they buy, mandated by central administration and institutional policy permits it. The Finance Officer mentioned that charge backs in the next three years will stay the same as today. The rates charged for ICT services accurately reflect the cost of providing the service. Overhead is always included in the cost charged for an ICT service. The presence of charge backs makes users more likely to comply with institutional ICT policies. The finance officer feels that use of charge-backs does not make users less willing to adopt new technology. The time spent negotiating charge-backs does not serve as a significant distraction to the ICT organization. The institution collects a student technology fee. The student technology fee does not fully cover the cost of the technology services it supports. The institution's student technology fee is not likely to rise in the next three years.

Emerging Financial Strategies: The Finance Officer mentioned that TZU does not face any increased pressure to reduce the costs of ICT services. The need to reduce central ICT costs is driven by general institutional budget climate calls for cutbacks in all expenses, reduction in general state budget allocation and need to create financial flexibility to invest in new ICT priorities. ICT cost containment strategies include decrease funds available for equipment renewal and replacement, use of open source technologies, consortia or shared purchases with other institutions and shared

implementations of technology with other institutions. TZU is most likely to implement strategies to reduce ICT costs through consortia or shared purchases with other institutions and shared implementations of technology with other institutions. Respondents consider that Centralized management of technology is more cost effective than decentralization. They also feel that TZU is receiving substantial value for its investments in information technology and that ICT initiatives support new revenue opportunities for the institution. The institution is working to increase the resources available to fund technology by expanding the use of charge-backs, increasing technology fees to students, providing services externally to raise revenues, pursuing grant funding. Regular meetings with stakeholders, quantitative evaluations of the actual benefits realized and qualitative evaluations of the actual benefits realized have been found to be the most effective for assessing ICT value.

Table 8 – SWOT Analysis by Finance Section

<i>SWOT Analysis by Finance Section</i>	
Strengths:	Skilled ICT staffs of the university, TZU being full residential technical university.
Weaknesses:	Staff being slow in picking up ICT and their non adaptability to switch to ICT.
Opportunities:	availability of technically qualified students and faculties who can be associated with ICT infrastructure development.
Threats:	Competition from other Hi-tech institutions, Technology dependence.

ICT in Research

“Research and teaching are both primary missions, and they are equally important for faculty and institutional success. The leadership has made overall reputation for research an explicit and funded priority. Current overall organizational climate at the institution is dynamic where change is continuous, orderly, planned, and navigable. The University has a Research and Development Centre with the Dean responsible for its functioning. In the past three years, computation-intensive research at this institution has increased. Tezpur University places high priority on research, use of information technology for research, on recruiting faculty who will do research; high priority on inter-disciplinary research and multi-institutional research”.

Prof. Nasreen S. Islam (Dean Research and Development) mentioned that TZU is making efforts in providing region specific programs to tap the regional/traditional resources and knowledge in an organized way. Emphasis is laid on innovative research, focusing on the societal aspect and also on intra-department collaboration for sharing of expertise. TZU has signed MOU for collaboration with:

1. University Politechnica of Bucharest
2. Centre for Development of Advanced Computing (C-DAC),
Kolkotta
3. Indian Statistical Institute (ISI) , Kolkotta
4. Rajiv Gandhi University, Arunachal Pradesh
5. Guwahati Neurological Research Centre (GNRC), Assam
6. North Eastern Space Applications Centre (NESAC),
Meghalaya

7. University of Nottingham, UK

Institutional Perspectives on ICT Support for Research: “Eight ICT full time staffs are currently assigned to the support of research. In the past three years, the number of central ICT staff who support research has stayed the same but it is expected to increase in the next three years. Discussions with the stakeholders in TZU highlighted the fact that improved collaboration, governance, and decision-making over total (central and departmental) ICT spending for research would lead to significantly higher quality research. Ad hoc consultations on an as-needed basis arrangements are made by central ICT organization in it’s engagement with researchers around the ICT aspects of their work. TZU does not engage in long-term planning exercises to determine researchers’ needs for ICT infrastructure and support services. The two strongest drivers for the institution’s overall investment in ICT related to research are current demand for research support from the faculty and projected demand for research support from the faculty. In the past three years, Interdisciplinary and multi-institutional research; number of faculty engaged in research; use of remote instrumentation, high-performance computing and networking; use of online library resources at the institution have increased. Amount of data storage has stayed the same. In the past three years, Engineering, Computer sciences and Business Administration disciplines have displayed the fastest growth in demand for central ICT infrastructure and support services for research. These disciplines regularly provide the central ICT organization with input and guidance on their research-related ICT needs for infrastructure and support services. Central ICT is always consulted in the pre-award process of contracts and grants to identify ICT needs and resources”.

ICT Infrastructure and Support for Research: “Scholarly journals, Archive services such as JSTOR, Government databases content is routinely provided to researchers by the institution through INFLIBNET. Almost all responsibility for the following ICT infrastructure elements related to research viz. Networking, High-performance computation, Data storage lies with the Computer Centre. Researchers are satisfied with the ICT support services provided by the central ICT organization(s) for their research activities. However they feel that ICT infrastructure provided by the central ICT organization(s) for their research activities needs to be enhanced”.

External Relationships and Consortia: The institution directly connects to University system wide network and Regional gigapop. “The greatest benefits cited from participating in a consortium, partnership, or shared services arrangement for ICT research infrastructure and services as stated, are that it’s cost savings and gives access to greater range of expertise in ICT related to research”.

Library in TZU

“The library holds 47755 volumes of print documents and subscribed 1011 titles of current journals (print 233, online 778) and one databases through INDEST-AICTE Consortium and other publishers. The UGC-Infonet Consortia of INFLIBNET Center is providing access facility to 6624 e-journals and ten databases. The library also holds 81 VCDs and more then 1200 CDs scattering to different thought contents. Specific services are generated on demand to meet the specific needs of patrons in the category of faculties and those involved with specific research projects running under them. Such services includes: Compilation of bibliographies; Channelizing the book

order and supply chain; Article alert service against specific titles of print journal (limited way); and Selective Dissemination of Information Service. The library at present is facing the challenge of maintaining a logical and reasonable balance between electronic and traditional resources. Library is providing personalized services like research support service section to assist researchers with their information requirements. There has been a decrease in the number of physical library users. Through ICT, the library is trying to increase the number of virtual users. We now have an approximate of 60% of virtual users and only 40% of actual people using the library”.

In an interview Dr. Mukesh Saikia, Deputy Librarian highlighted the issue that the number of qualified staff is very less in Library Information System using ICT. Orientation programs are conducted department wise when the new semester begins. It is separate for Research Scholars and for new faculties when they join. Whenever latest ICT facility related to library is introduced, the research scholars are taught how to use it. Dr. Mukesh mentioned the need to organize some more pro active services for the Research scholars. The library is working on projects with computer science department using INFLIBNET. “We have asked all the research scholars to submit their papers and thesis for sharing of resources. After successful implementation of this we will give access to other institutes”. The Shodhganga project of INFLIBNET “which provides a platform for research students to deposit their Ph.D. thesis and make it available to the entire scholarly community in open access” has been very helpful. Knowledge resource management is just at the initial stage. The library is serving as a knowledge source by extending it’s services to internal users and outsiders. Neighboring colleges (around 10 colleges within the Sonitpur district) can

come and use library facilities. They are given temporary password so that they use the e- resources.

TZU created a webpage in the library portal. And resource discovery tool link was provided there. They discovered the user's statistics was very poor. The library then consulted the Research scholars department wise and provided a separate reading area for the research scholars as the research support service section. Publishers and service providers were asked to come and give live demo on how to use Library Information Services. Research Scholars were further trained. Because of this personalized service, library usage has increased. "Earlier they used to waste lots of time in information search. Now they know there are specific resource discovery tools available (eg SCOPUS)". TZU is trying to follow the knowledge management recommendation in this regard.

"25 number PCs are available to users. Operating Systems, Linux (red hat) operating system(s) are installed on the computer servers in the library. Windows XP operating system(s) are installed on the workstations in the library. Application (Client) Software, Microsoft Office applications- Word, Excel, Access and PowerPoint software is available for users (staff and general library users) and on 100% of library computers. As of date there is no plan to add more computing facility. The library started using an automated library system for its functions in 1997. The library is using an integrated system Lill system (v.4 sel. 5.0) for all the functions. The library automation project is financed by Government funding. Acquisitions and budgets, Cataloguing, Circulation control, Serials administration and Library catalogue are automated". "The library offers access to CD ROM database

mount in Library system. The library uses its own Internet server connected by LAN/WAN with bandwidth connectivity of 10 MBPS. This bandwidth is shared with other users. There are controls on Internet access, certain Web sites are barred. User's behaviour of networked resources is monitored (e.g. tracking of visited URLs, observation of users, authentication of users, etc. to prevent misuse of internet". The library has its own Web site which is maintained directly by library staff: <http://www.tezu.ernet.in/Library/>

"Library opening times, access the library OPAC, links to electronic library resources (databases and electronic journals, etc), documentation and support materials for using library resources, events and announcements and statistical count of users visiting library webpage are pieces of information/services is/are available on the library Web site. Library has in-house ICT support staff and receives ICT support from parent organization's ICT staff. A little amount of support and technical trouble shooting is available from non-ICT specialized library staff. Non-ICT specialized library staff and their ability to deal with minor and day-to-day ICT related problems is rated as Poor. Non-ICT specialised library staff have to deal with minor troubleshooting problem ICT support issues on a day-to-day basis".

ICT Expenditure in library is listed as under-

- a) Hardware: Expenditure on computers and equipment, network components and telephone systems; Purchase, hire or lease; Installation and maintenance is Rs. 10 lakhs
- b) Software: Purchase/hire/license fees for usage or development of software is Rs. 3lakhs

- c) ICT services: Service and consulting services, purchasing and funding of staff training – central facility, charges are not applicable
- d) Communications: Usage and other charges for network and Internet access/bandwidth it's - central facility, charges are not applicable.

“The library does not have an ICT strategy. There are no changes and/or developments to the library strategy planned in the next 12 months. Inadequacies of existing ICT resources, lack of budget for ICT, lack of ICT qualified staff in the library, library lacking updated ICT strategy, difficulties in training library staff in appropriate ICT skills are barriers listed on the library’s usage of ICT in general. Dr. Mukesh Saikia feels that with the coming of ICT, it is a struggle for the library to remain relevant for a researcher. “Some of the researchers have submitted their thesis without coming to the library. This is possible now. Importance of library is decreasing; number of users is decreasing, from our part we are trying to increase the virtual users even if the number of physical users are decreasing”. He further expressed the concern that Vidhya nidhi is there for thesis level but they do not have a common data base for dissertations at the Master’s level to cross check to avoid repetition. Other requirement includes the need of consortia among libraries of Northeast region. Dr. Mukesh Saikia also mentioned the need of some system for retrieval. “What if the license agreements suddenly changes? If something goes wrong/ fails there will be nothing with us”. He further feels that people are not aware of ICT4E policies and that information literacy is not there, ICT4E is underutilized”.

The study of TZU library highlights the need for Monitoring progress, Search for existing problems in implementation, Provide personalized solution and Monitoring progress again.

Table 9-SWOT Analysis by Library

Library SWOT Analysis
Strengths: University ICT infrastructures and automated library services; Investments are cost effective, TZU always cross checks investment and returns of ICT. Most of the library staff are computer literate and “have positive attitude towards use of ICT” in library.
Weaknesses: Users not making full use of ICT; remote location of TZU; lack of dynamic attitude of authority towards library modernization, lack of sound ICT policy in the library, insufficient expertise of library staff to implement modern library facilities and services.
Opportunities: good funding for upgrading ICT facilities
Threats: The challenge to maintain a logical and reasonable balance between electronic and traditional resources in the library and its services.

Distance Education Programme

The Distance Education Programme in TZU is yet to be launched. To start with TZU plans to go with some of the Management and Social sciences courses. The Programme will be across disciplines in due time. TZU plans to offer innovative Diploma courses which will give some kind of cutting edge skill to the learners e.g PG in Retail management, Investment management, Human Resource Management,

with some new value added component to each of the program. Professor Debabrata Das Director of the Distance Education Programme mentioned that TZU conducted a survey, studied the market where the skill is required to be developed, where the gap is – the supply and demand gap. Where the work force is there and where the supply is lacking behind to come up with its courses. Faculties are required for development of courses, TZU will be pooling in experts from the country; and plans to have a panel of experts and resource persons from different universities to take their help from time to time. TZU is thinking of building collaboration with the corporate so that product of the University can be absorbed by the industry. ‘We want to produce learners who can be easily absorbed by the industry’. The University plans to use eLearning mode soon to cover geographical boundaries. It is starting with print material and will slowly blend it with online mode. Some courses will later be totally online. In future TZU plans to address the need of physically challenged people, to bring education at their door by introducing customized courses. TZU is also trying to give flexibility in learning by giving PG diploma courses, so that those who complete these courses can go for Master level program at a later stage. As of now TZU is interested in skill building programs in distance mode. Professor Debabrata Das cites that the main challenges here would be since people are more used to classroom form of teaching, TZU needs to train the teachers in developing the course material both print and audio video material as e Content. Capacity building is also required for program delivery using VSAT/ Teleconferencing. Change of mindset, small but important challenge. Making people understand the importance of developing of right study materials in the right medium, to have an open Mind towards the changing concept of Knowledge is the main challenge.

The Core committee in the University is the regulatory body as of now. At a later stage TZU plans to have an advisory committee headed by the VC, and people from Distance education Council (Delhi) which is the regulatory body for all Distance Education Courses. So this body will be giving the guidelines and help in evolving the policies to be implemented. ICT is the main component of Distance education. TZU plans to put up e-Content of courses in the institution's website. "We are also going to start Community radio so that learners can have access to the classes through that. We would also want to have a TV channel like IGNOU (though right now it may sound very high sounding); have phone in programs etc." By Universal learning in Distance Education program TZU would like to provide customized learning, an alternative means of learning for learners if they have difficulty in learning from a given set pattern. TZU plans to work towards inclusive education by also incorporating cross disciplinary practices.

"Deans and Head of Departments"

"Deans and HODs are responsible for looking into the overall functioning of their respective Schools and Departments. Permission for setting-up of computing laboratories facility is given by the Vice Chancellor on recommendation by the concerned School Board on receiving proper justification from a department. Such specialized Labs may be funded by other funding agencies through research projects, or through departmental plan grants. Such Labs are maintained either by technical staff of the department, third parties, or by personnel employed under the concerned projects. Interviews and discussions with Heads and Deans from across several Schools and departments in TZU highlighted the fact that ICT4E in response to the

new knowledge paradigm differs from department to department. Some are content with the infrastructure, irrespective of its actual usage. Some have pointed out the gaps- lack of awareness, ICT being underused, lack of coordination between policymakers, inhibitions, lack of proper channelization of funds etc. Some feel globalization of education is a threat because students would prefer to go elsewhere. It has also been observed that ICT is still understood from the technocratic stance by people whose usage of ICT is limited. Policies need to be developed so that ICT can be seen from the socio-technical perspective”.

TZU is gaining the idea of the Knowledge Society paradigm. Most of the departments which are doing research have a focus on the Northeast (NE). “If you are talking about conservation of knowledge on NE, about NE and generated from within NE, substantial amount of it is happening. Research grants expect researches being conducted to enrich the knowledge about and from the region. The university is adding up to contributing to the knowledge capital”. For connectivity to the global trend, faculties are travelling abroad to share knowledge, TZU has organized quite a few international seminars. Exchange of ideas is happening; there are collaborative papers of research work undertaken. ICT’s role may not be actually at the level of knowledge generation here, but in providing information, sharing, networking and facilitating communication. As of now this level of collaboration is more for the faculties and researchers rather than the students at the Master’s and Bachelor’s level. Some feel that one of the major challenge for Tezpur University or any organization is that there are certain rules that one needs to follow for exams, routines, how to take classes. Therefore 100% freedom to adapt any of these newer means is not there. “Flexibility is limited because there are certain rules and patterns. There are certain

bindings which will not allow you to go all ICT. There is a need for looking at the rules and regulation for any organizations and making provision for bringing in ICT there. Without that it would not be as flexible as we would want, as we are not able to utilize the full potential. We can incorporate bits and pieces of ICT4E but we cannot go completely because we have to follow the system. UGC, Central government, university is pro ICT, but at implementation level, in our region because of the cultural and schooling background, most of the students are coming from rural areas unlike metropolitan area. Even this background influences the use of ICT”. But here lies the responsibility of the university to empower the users by training and motivating them. TZU has a school board where people can suggest changes. Faculties and students put up proposals/suggestions. Suggestion comes through the school board to the controller and reaches the Computer Centre.

As elucidated in the methodology chapter, the STaR Chart (CEO Forum, 2000) was administered to TZU. Responses generated from the Deans and Heads of different schools and departments are shown in the following tables.

Table 10- Technology Readiness in TZU in terms of Policies and Infrastructure
Scale of 1 to 4 where 1 = Minimal; 2= some; 3= Mostly; 4 = Great extent

Item	Average score
Strategic planning incorporating technology	2.67
Funding for technology	2.28
Technology is appropriately integrated in courses in all departments	1.89
Campus wide faculty development and technical support	1.89
Strategic planning incorporating technology	2.28
Funding for technology internally and via fundraising	2.28
Hiring, tenure, and promotion of faculty with technology research and teaching expertise	1.94
Faculty development	1.56
Program guided by national policies on technology integration standards	1.67
Partnerships with peers around/using technology	2.06
Access to advanced technologies in campus wide facilities	2.28
Access to advanced technologies and facilities in the departments	2.28
Technical support	2.22
Coursework that integrates technology to enhance learning	1.56
Use of online resources to support learning opportunities	1.44
Technology in field experiences and student teaching	1.89
Understanding and use of technology to enhance teaching and research	1.90
Understanding and use of technology by students to maximize learning	1.28
Connect with the relevant industry/market for continuous growth	1.78
Technology for a academic communication with the department/school/institute	2.89

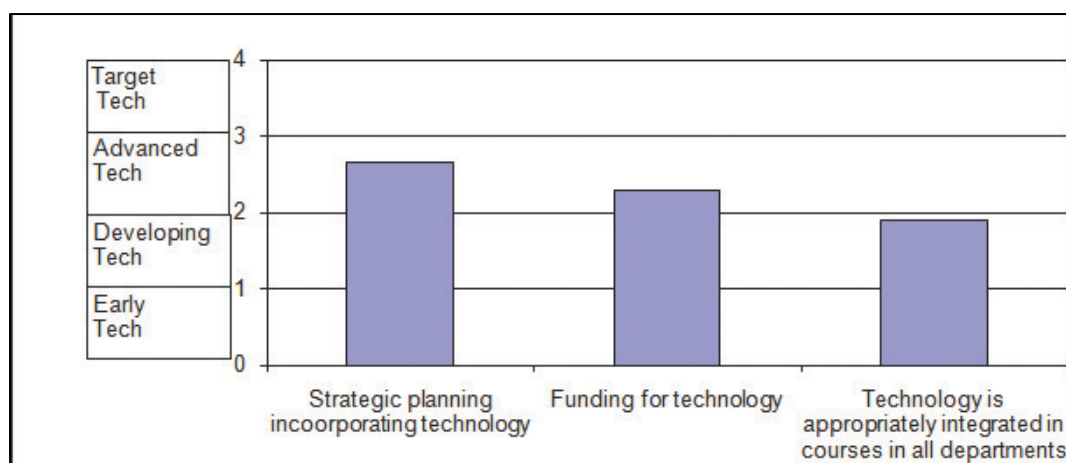


Figure3 – Technology Readiness in TZU with respect to Campus Leadership

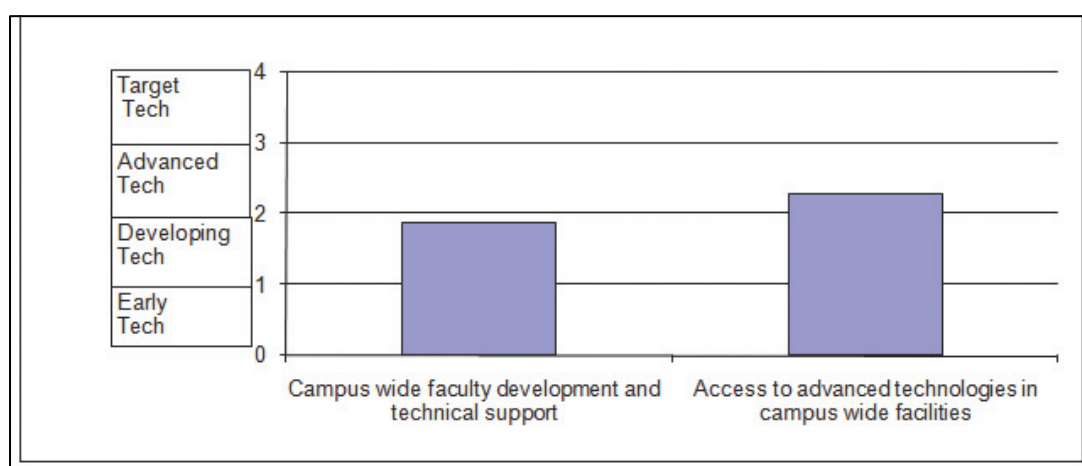


Figure 4 – Technology Readiness in TZU with respect to Campus Infrastructure

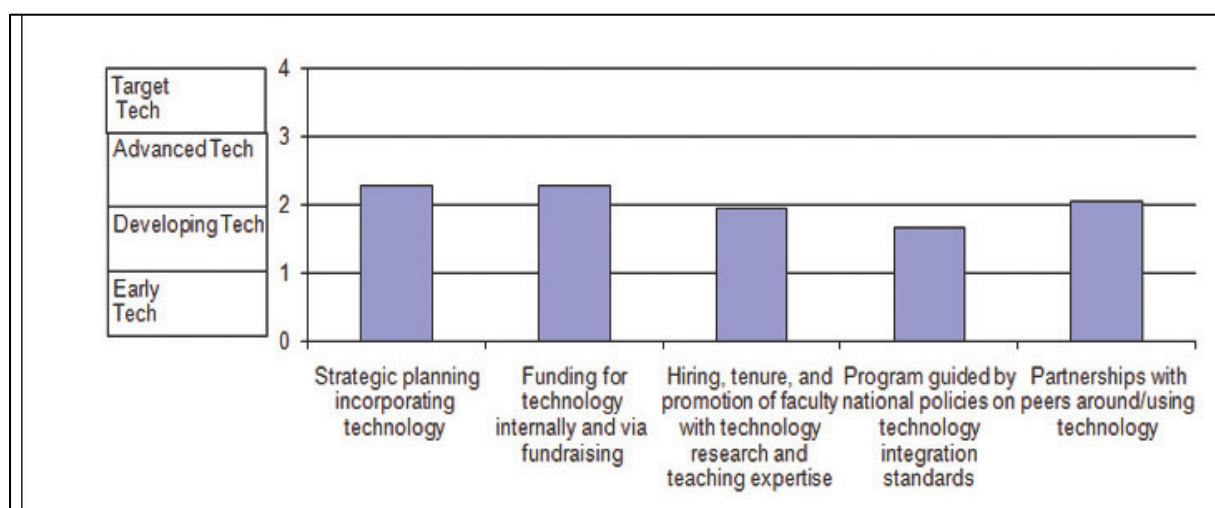


Figure 5 – Technology Readiness in TZU with respect to Schools/Departments

leadership

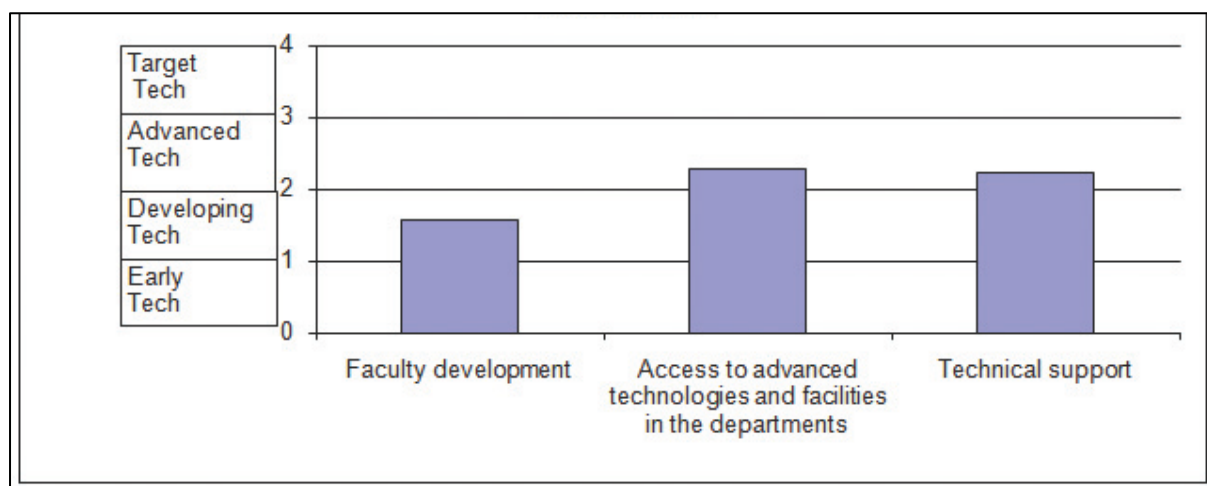


Figure6 – Technology Readiness in TZU with respect to Schools/Departments

Infrastructure

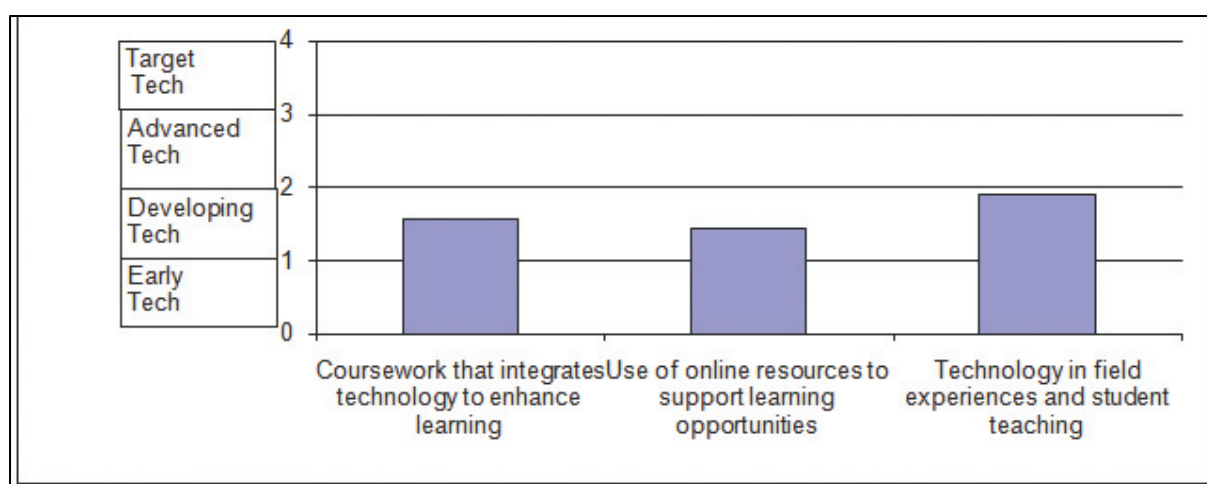


Figure 7 – Technology Readiness in TZU with respect to Schools/Departments

Curriculum

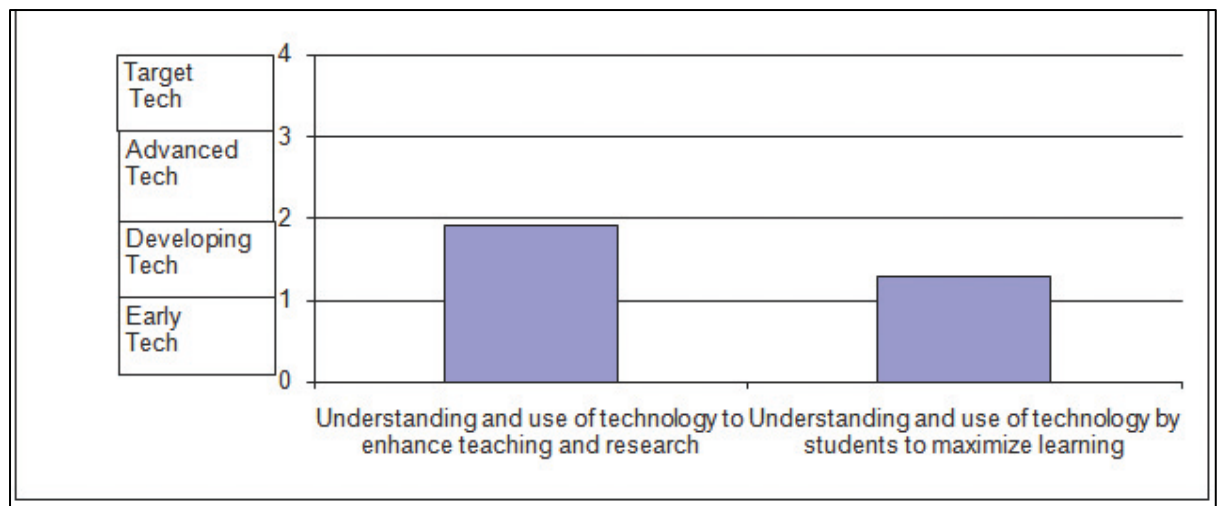


Figure 8 - Technology Readiness in TZU with respect to Competence and Use

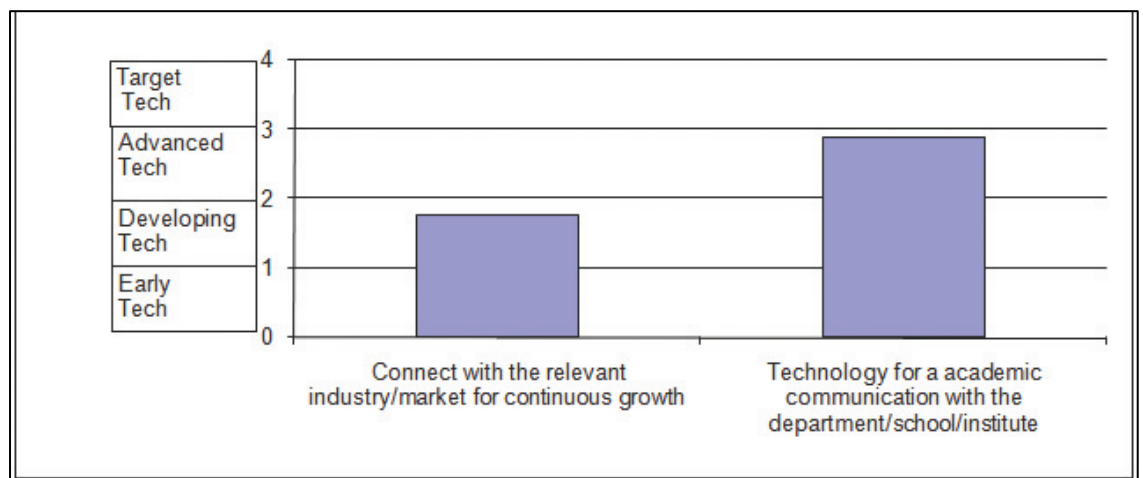


Figure 9 - Technology Readiness in TZU with respect to Connections

Table 11- SWOT Analysis by the Heads and Deans of different Schools and Departments in TZU

SWOT Analysis by the Heads and Deans of different Schools and Departments in TZU
Strengths- ICT is a priority in the policies of the University; Funding agencies are ready to support ICT initiatives; good image/accomplishments of the University having created favorable impression in the society; favorable ICT policy of the Government of India. Faculties are technology savvy, Desktop with internet connection is provided for all the faculties; E-resources subscription is high, Network connectivity (LAN) is good; Almost all sections are computerized; Faculty and students awareness is high; good human and infrastructural backup; most of the teachers are skilled in use of ICT, Adequate and continuously upgraded ICT infrastructure, Large number of aspirants to select the students from; Collaboration with external experts in place to strengthen ICT use in education. Collaborative teaching and research (interdisciplinary); Moderate level of sophisticated equipment; Extensive provision and use of computers with internet connectivity; Being residential university, there is regularity in teaching and evaluation as well as continuous and prolonged lab resources for research; good backup from the Computer Science department. In terms of Northeast region, TZU is quite well equipped because of the curriculum, which creates the opportunity for ICT incorporation, curriculum is flexible and up-to-date.
Weaknesses – lack of technological up gradation; End user technical support is poor; VSAT speed is inadequate at present; Technical infrastructure is inadequate. Awareness is not uniform; Inadequate support staff to take care of the infrastructure, Inordinate delay in administrative procedures related to ICT infrastructure building and maintenance; Non-

uniform ICT skill across departments; Remoteness of location of the University. ICT is underutilized; Impersonal approach. Location disadvantage: As of now in terms of recruitment, industry academia linkage, the biggest problem that TZU has to encounter is connectivity and location.

Opportunities- Good amount of technical students available; Good mixture of all stream of knowledge; Supportive students and faculty, institution is ICT pro; Capable and quality human resource generation, Speedy knowledge dissemination. ICT will/is enabling teaching and research targeting state and regional matters and problems, targeting vastness of bio-resources Treasure chest of traditional knowledge of more than 100 tribes and communities.

Threat: Unauthorized material, unverified contents (IPR issues) creating knowledge erosion; Copy –paste culture increasing; Classroom and face to face interaction may be disrupted; Expert visit may be hampered; Stereotype learning may increase, Less human interaction. Improper misuse due to inadequate training and awareness; Requirement of substantial investment to create and maintain ICT infrastructure, Potential misuse of ICT; Unrealistic expectations of students/guardians/funding agencies regarding ICT facilities being provided to students; Technology obsolescence; not being public participatory, Image of superiority, Being more general and international, limited use of local resources and facilities. Lack of focus, Refusal to see the future, bureaucratic bottleneck; May blunt interactive spirit; Unwarranted use at times e.g. excessive use of social networking; Sabotage threat.

Teachers: ICT Usage, Attitude, Barriers and Challenges

“Categories of ICT users among the teachers in Tezpur University include teachers who have prior exposure to ICT and those who are trying to pick up through assistance of technical staff and/or colleagues. Depending on the understanding of ICT, teachers from different disciplines have administered the usage of ICT4E at different levels. Though the infrastructure availability has served as a major push factor, incorporating ICT4E is still an individual enterprise. ICT is being used in terms of multimedia teaching aids in classrooms and usage of Word processing for routine task related to teaching and research; access to Knowledge Base through various E-Resources which are facilitated by the university administration, under the broader framework of the UGC policies, e journals are being accessed through INFLIBNET. ICT is used for communicating and sharing of information via emails. A more advanced usage by very few teachers includes uploading of lesson materials and providing other resources in their homepages through the university website. ICT is helping in communication, knowledge sharing and networking though innovative use of ICT is still nonexistent. Curriculum is another driving factor for the usage/non-usage of ICT. We change curriculum every three years- changes are based on feedback from the students, student’s placement/job, developments and changes happening in curriculum in the subject in different places. ICT skills required is also considered, which may reflect about 20% requirement”.

“Though most of the teachers have a positive attitude towards ICT, they are not sure as to how it can be incorporated in pedagogy. We are using it. ICT is there, but how to make use of it? Some mentioned that ICT is facilitating but ICT can also

be intimidating. Many have mentioned that faculties who don't use ICT are not using it not because they are unwilling, but because they are uncomfortable. It is observed that ICT is still understood from the technocratic stance by teachers whose usage of ICT is limited. Policies need to be developed so that ICT can be seen from the socio-technical perspective. If we are technology dependent, there will some gaps in learning... Speed of teaching increases, it facilitates but at the same time students might find it hard to catch up since they have been more used to traditional form of teaching since their schooling. The teachers feel that ICT has helped them in filling up the location disadvantage by connecting them to the rest of the world; helped in networking with the industry and collaborating with other institutes nationally and globally. I completed my PhD from UK by communicating with my guide using ICT, I have students working in Germany now doing their Master's there, and I guide them from here. A faculty in School of engineering mentioned that the school has all the videos under NPTEL, and there is also the video streaming facility. Students are also using freely available web resources from Massachusetts Institute of Technology (MIT). This has enabled them to have better Knowledge exchange and construction. However it has also been observed that even within the school of engineering, all the faculties are not aware about NPTEL or other such projects, hence its usage depends on the teachers who are aware. ICT has also helped in the preservation of and contribution of indigenous knowledge. We are archiving/documenting (films, uploading on the website), digitizing and making indigenous knowledge available on the web – our contribution to the knowledge pool”.

“The study revealed that in spite of the number of initiatives taken by the National policies with regard to ICT4E, there are very few teachers who are aware of

the Policies and benefits associated. Using ICT4E requires extra time and effort as the teachers have not received any training on ICT for pedagogy. I had attempted to create a Blog, upload my lessons for students to be able to access lessons that they missed, or other teaching material which I have to distribute in class, for students to come back and refer and also to post their problems (attempt to provide Flexibility that ICT gives). Ultimately it did not happen because our network, there are certain restrictions Blogging etc. to a certain extent are restricted. So when I faced a little bit of trouble, I gave up that idea – Extra effort and extra time. Fear of the type of knowledge created in pedagogy by the students (plagiarism) and teachers is an obstacle/barrier in adoption of ICT. ICT cannot take the place of good pedagogy, because ICT is just a tool. A bad teacher can sometimes use ICT to cover up. Some mentioned that fear of technology is always there among the humanities people. I am scared of making mistakes in the classroom while using that, and taking up a lot of time in trying to fix that and loose/waste time.”

“As per the computer usage policy of the university, accessing undesirable websites using the University computing resources is prohibited. Hence, each user is tracked and access to certain websites are blocked which might be containing certain string of words. Youtube and Orkut were blocked earlier. You tube is now partially open. This regulatory measure is considered a hindrance by many. Certain restrictions are there which does not look into the extended social sciences frame work of looking into new media, of researching and working on new media. For a University like TZU which has a stated objective towards being a Science and Technology University, for social science and humanities disciplines like ours where we believe that YouTube and other sites are an academic resource, we have problems”.

“However for certain websites which are blocked but are required for academic purpose, the faculty in charge can write a request form to the Computer center so that a particular URL can be accessed. Another factor observed is that there is a split in understanding between ICT as a technology and teachers using ICT in pedagogy. Faculties from different streams also mentioned the requirement of subject specific software and statistical packages. Some mentioned the problem in connectivity that the University needs to provide LAN connection to the residential quarters as the Wi-Fi provided now gives lots of problems. In the department the ICT facilities are satisfactory. The University has been pro ICT right from the initial stage. This has helped in every aspect of ICT integration in curriculum as far as faculties in MBA courses are concerned. Some also mentioned that ICT has many advantages but it requires proper guidance in its usage otherwise it limits the students’ thinking. ICT is now the major source of information for faculties and students. Faculties in technology oriented departments mentioned that all infrastructures are available to some extent and it is up to the individual to take the class to ICT supported one”.

A survey using stratified random sampling representing faculties across all the department in different schools in Tezpur University was conducted (4 Schools; 17 Departments and 5 Centres). Tezpur University had a total of 171 faculties, at the time the survey was conducted (as on 2011).

Professors = 40

Associate Professors = 43

Assistant Professors = 88

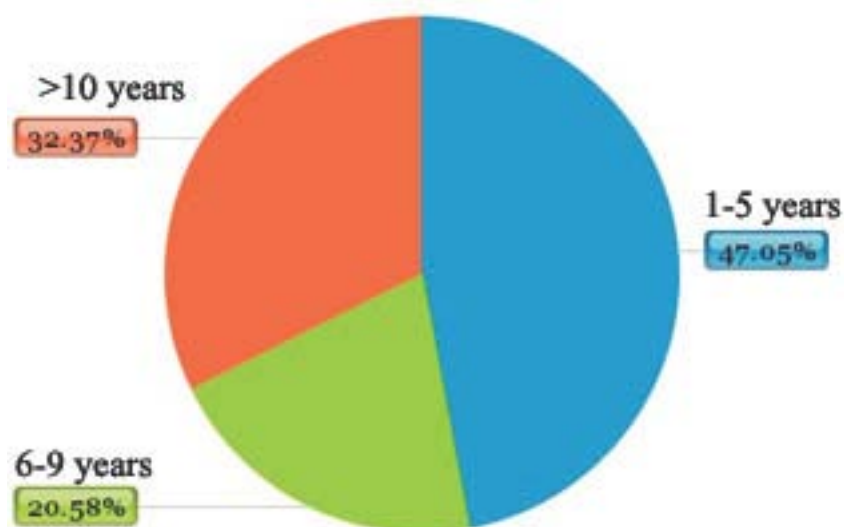
Total = 171

This survey aimed to understand how teachers in Tezpur University use ICT in their teaching and to collect their views about the enablers and obstacles in ICT for education. The questionnaire had fourteen sections. Each is described in the following section. The result of the data collected “was analyzed using SPSS (Statistical package for social science) Version 10”. The following section show the result gathered:

Table 12 - Respondents’ main domain(s) of teaching

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Science & Technology	23	67.6	67.6	67.6
Humanities	6	17.6	17.6	85.3
Social Sciences	5	14.7	14.7	94.1
(including Business)				100.0
Total	34	100.0	100.0	

Figure 10- Years of teaching experience:



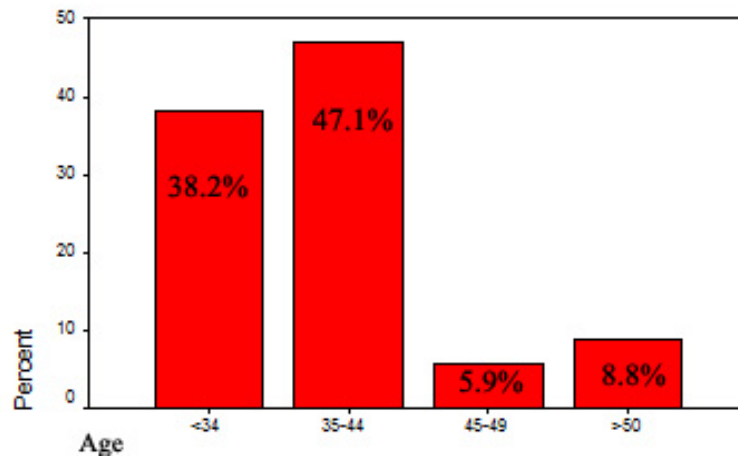


Figure 11 -Demographic profile: the category of current age of respondents

The survey of faculties in TZU shows that place of most frequent usage of computer/Internet is in the department. Most of the faculties' usage of computer for academic purpose is more than 15 hours per week (24.2% use 15-25hrs and 39.4% use more than 25hrs). Most of the faculties use computer/internet in the department (79.4%)

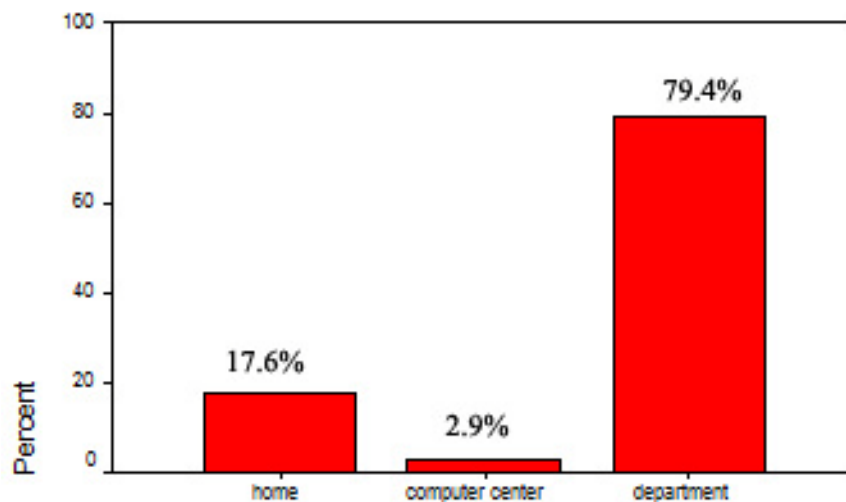


Figure 12 - Place of most frequent usage of Computer/ Internet by faculties

Table 13- Hours per Week (On an average) of usage of Computer for academic purpose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	2.9	3.0	3.0
	2-5 hrs	4	11.8	12.1	15.2
	6-15 hrs	7	20.6	21.2	36.4
	15-25 hrs	8	23.5	24.2	60.6
	>25 hrs	13	38.2	39.4	100.0
	Total	33	97.1	100.0	
Missing	System	1	2.9		
Total		34	100.0		

Purpose and degree of ICT usage by Faculties in TZU

The faculties' degree of ICT usage at different levels based on the survey is given below:

“Informative: 79.4 % faculties use ICT to find, acquire and use information

Functional use of ICT: 70.6 % faculties use ICT

ICT for Creating Knowledge: 73.6% faculties use ICT to compose, compile, produce new information (write papers, drawing, programming, make PowerPoint presentations, give oral presentations, prepare newsletter, create own website, etc.)

ICT for Communication: 64.7% faculties use ICT to exchange and to transmit information with other students, teachers and others using email and Internet; to join discussion forum and chats.

ICT usage for Collaboration: 64.7 % faculties use Web design tools, multimedia, e-mail, discussion boards, E journals, use technology to simulate research and collaborate with other colleagues (even those situated in different geographical location) and also using Web resources and productivity tools to communicate, search for information, and create new products”

Most of the faculties (41.2%) learned to use ICT through Trial and error method. 85.3% have not received “any training in information and communication technology (ICT) over the past 3 years while only 5.9% have received some training. For 64.7 % of faculties”, ICT is not a part of curriculum in their domain of teaching.

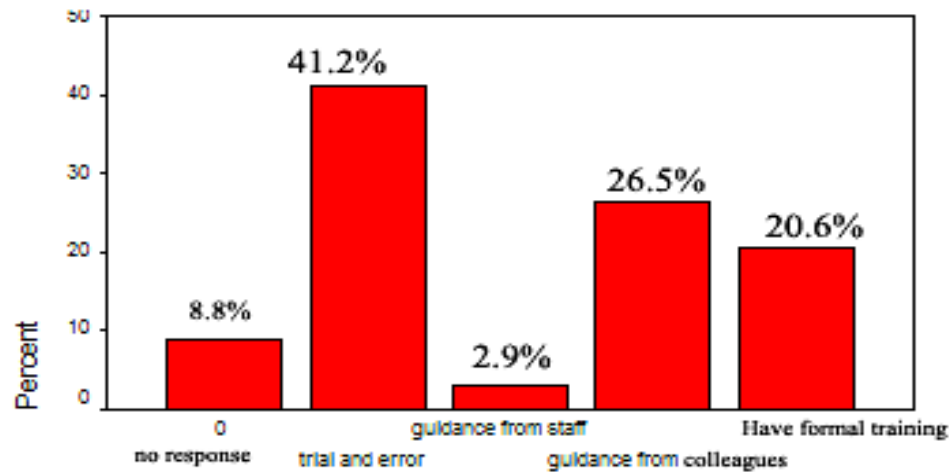


Figure 13- How faculties learned to use ICT

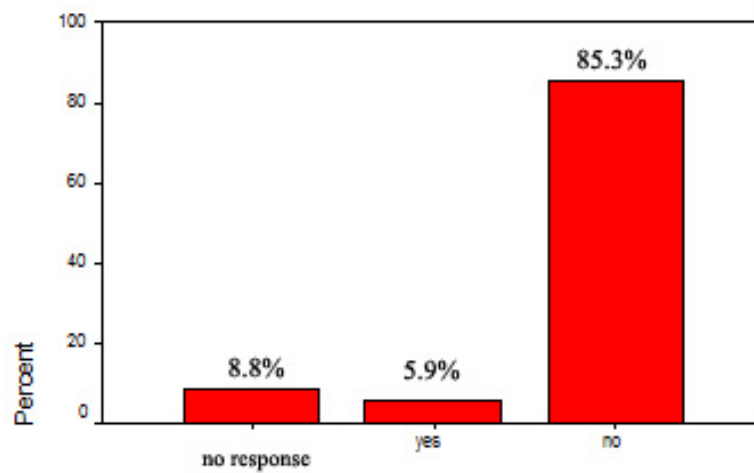


Figure 14- Faculties response on any training in ICT over the past 3 years:

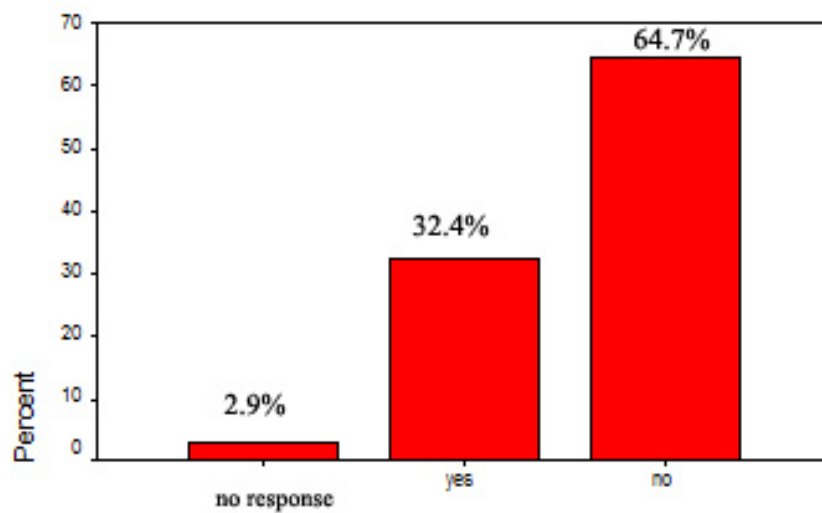


Figure 15- Faculties response on if ICT is part of curriculum in their domain of teaching

Skills and Output

The following responses were gathered from TZU faculties in relation to their ICT skills.

“Basic Skills – Simple use of ICT applications for Purposes both inside and outside the classroom”

- 73.5 % showed confidence in using Word processing software
- 41.2% of faculties are confident in using Spreadsheets
- 76.4% are confident in Presentation tools (PowerPoint) skills
- 91.2% are confident in Basic E-mailing skills
- 84.1% are confident with Internet browsing for information search skills
- 12.1% showed confidence in Web page designing skills
- 23.6% showed confidence in use of chat platform skills

“Intermediate skills – faculties’ use of existing applications for learning both inside and outside the classroom- use of digital learning resources”

- 36.4% of faculties are confident in use of applications (word processing, spreadsheets, etc.) in classroom learning of specific subjects
- 50% of faculties are confident in use of various applications for doing assignments and lessons, managing administrative data about my students
- 44.1% of faculties are confident in E-mailing for telecollaboration/online collaborative projects, exchanging assignments and lessons, commenting on papers used in class
- 44.1% of faculties are confident in use of Internet resources to prepare research, lessons, or for collaborative class projects. Interestingly 26.5% of faculties chose not to respond to this section.
- 14.7% showed confidence in “developing basic and static webpage for class”

“Advanced Skills – faculties’ use of ICT to create and develop new applications, Contents, learning materials, etc.”

- 23.5% of faculties are confident in use of statistical tools for developing formulations and Packages
- 26.5% of faculties are confident in Programming, Database development and management
- 23.5% showed confidence in use of various applications/Learning Management system e.g. Moodle for doing assignments and lessons
- 14.7% showed confidence in “Advanced website designing, maintenance and use for teaching/learning”

- 14.7% showed confidence in Use of Free and Open Source Softwares (FOSS), Open Education Resources (OER) to support Class Room teaching
- 14.7% showed confidence in “developing and operating e-learning or online learning platforms”
- 29.4% showed confidence in “setting up and moderating discussion groups and chats”
- 14.7% showed confidence in use of Web 2.0 services (e.g. Flicker, You tube, Face Book, My Space) to take lessons beyond the traditional class room set up
- 11.8% showed confidence in use of ICT to collaborate projects with the industry in relation with my subject area

“Overall the faculties showed greater level of skills in Basic skills for simple use of applications for purposes both inside and outside the classroom and the use of basic E-mailing and Internet browsing for information search. The faculties were also comfortable with Intermediate skills for use of existing applications for learning both inside and outside the classroom which includes use of digital learning resources. The survey also showed that faculties were confident in use of various applications for doing assignments/lessons, managing administrative data about their students and in E-mailing for telecollaboration/online collaborative projects, exchanging assignments and lessons, commenting on papers used in class. However, they were not comfortable in Advanced skills in use of ICT to create and develop new applications, Contents, learning materials, etc”.

“Perceived Usefulness and Perceived Ease of use toward ICT”

“Over all the faculties has a positive attitude towards perceived usefulness of ICT that it improves the quality of education” (88.2% agree). 91.2% of the faculties mentioned that using ICT improves their research and administrative tasks and 85.3% feel that using ICT facilitates new forms of learning in their courses. They also consider that using ICT increases students’ motivation and engagement (67.7% of the faculties) and that using ICT transforms the learning environment into one that is learner-centered (78.4%). The survey also showed that 73.5% of faculties think using ICT is expanding new skills supply for labour market.

Majority of the faculties gave a positive response to ease of learning to use ICT(73.5%); making choices with respect to when and how to use ICT in teaching-related work(85.3%); ICT use being less time consuming(76.5%) and use of ICT becoming a normal part of the way in doing teaching-related work (70.6%).

“Teaching styles of teacher educators: The following figures show responses of faculties regarding knowledge transfer and knowledge construction with ICT”.

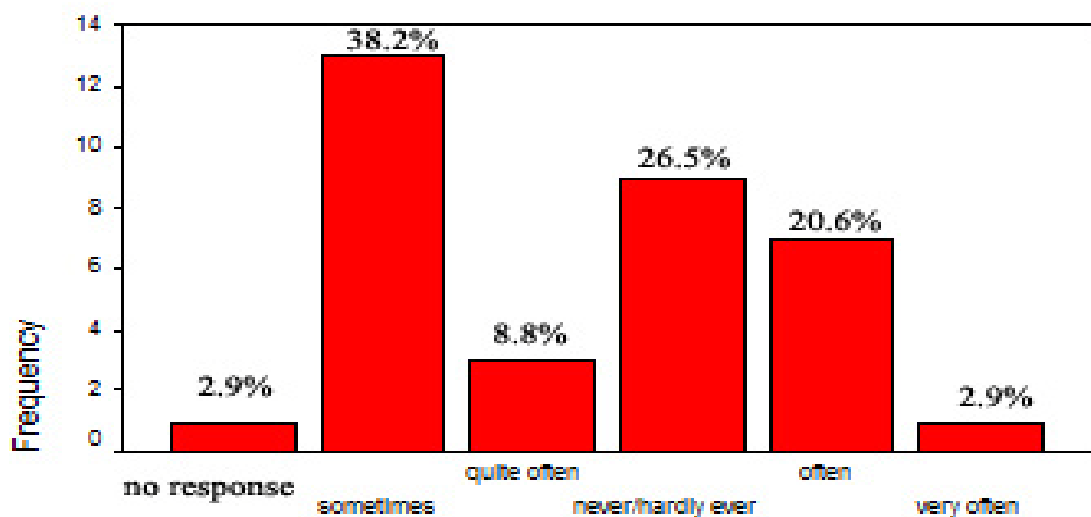


Figure 16- “Knowledge transfer with ICT: I have my students test their mastery of the learning contents by computer”

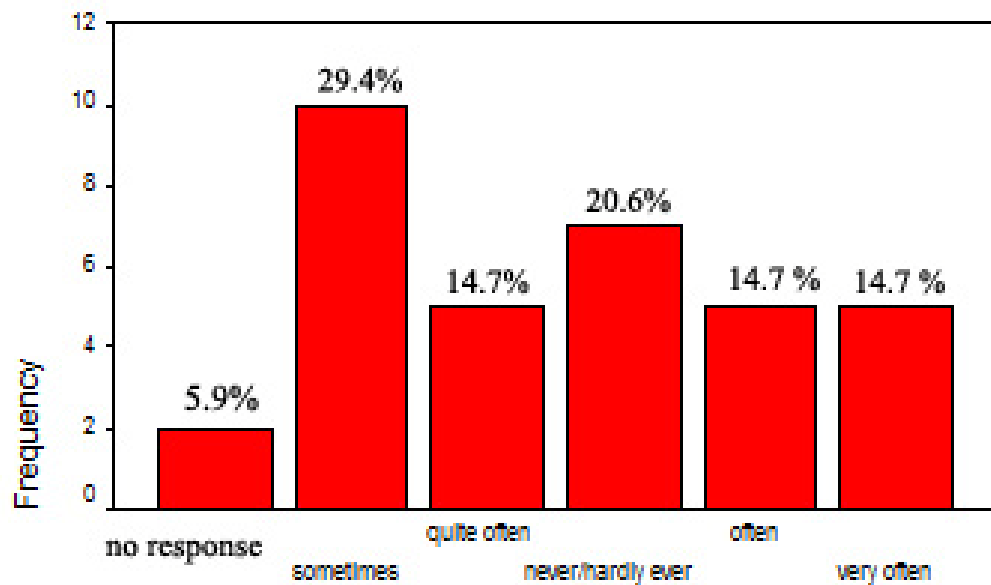


Figure 17 - Responses to: “ I have my students practice learning contents by using the computer”

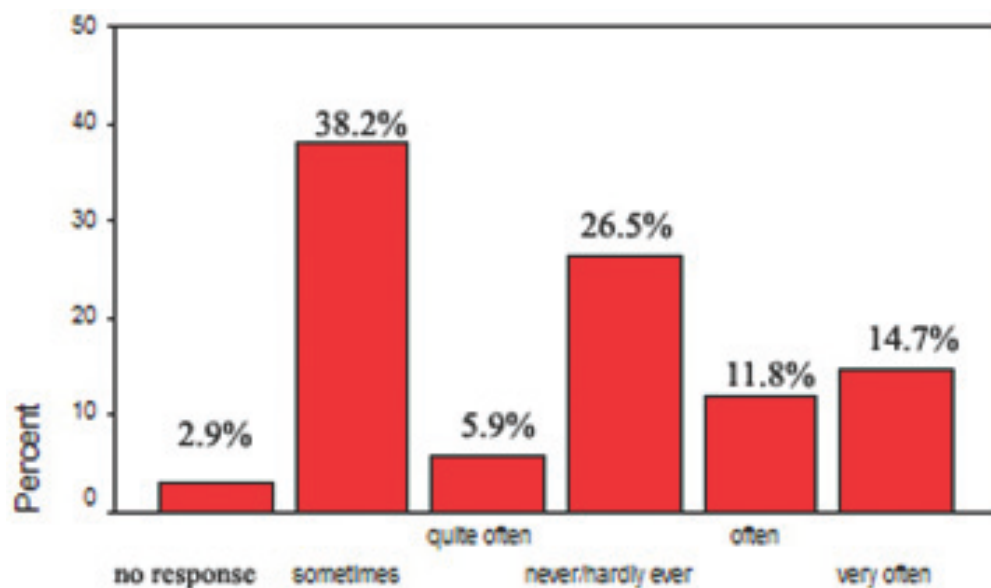


Figure 18- Responses to: “I have my students use subject specific educational software”

“Knowledge construction with ICT”

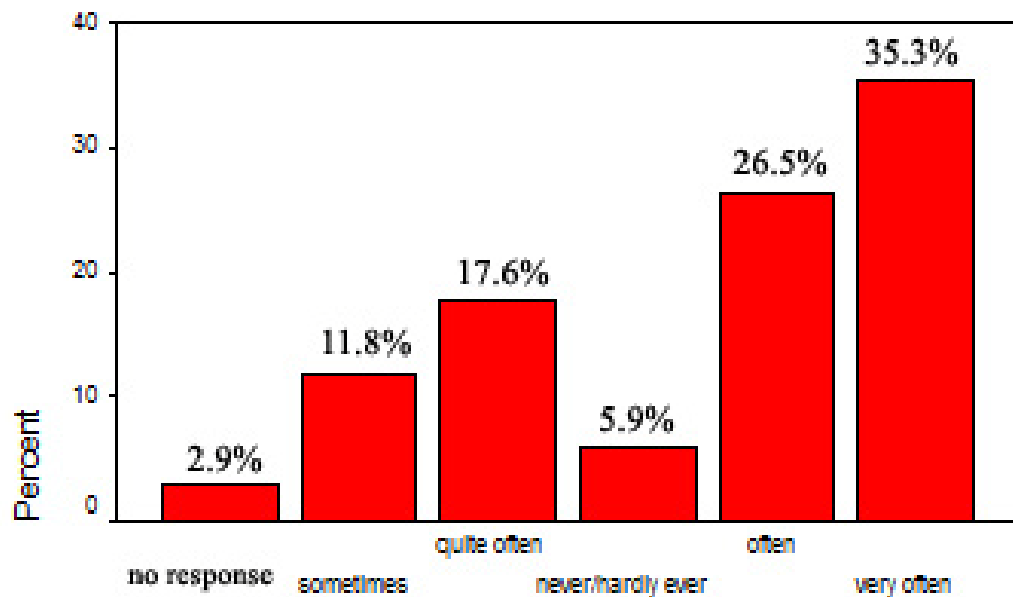


Figure 19 Responses to: “I encourage my students to look for current sources via the internet”

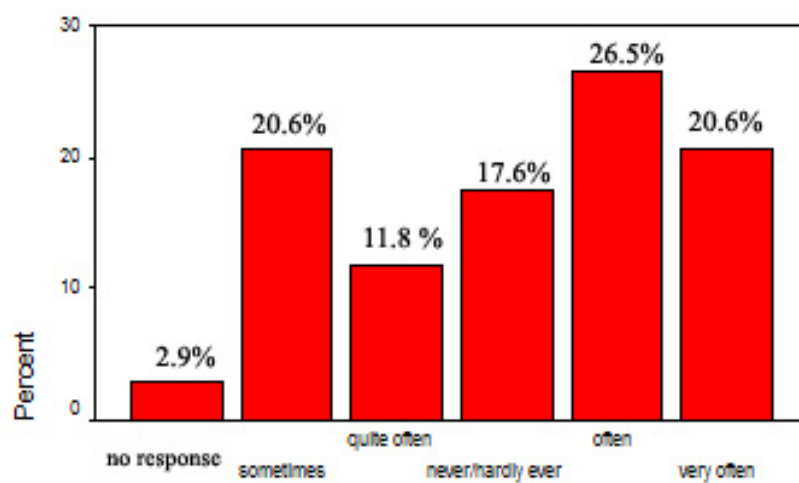


Figure 20 - Responses to: “My students carry out assignments co-operatively with the use of internet resources like e-mail, MSN, Skype or the electronic learning environment”

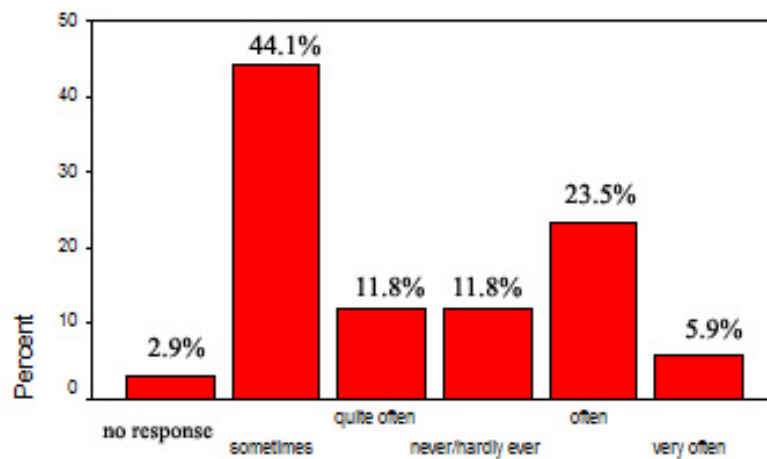


Figure21- Responses to: “I give assignments and then my students look for answers via the internet”

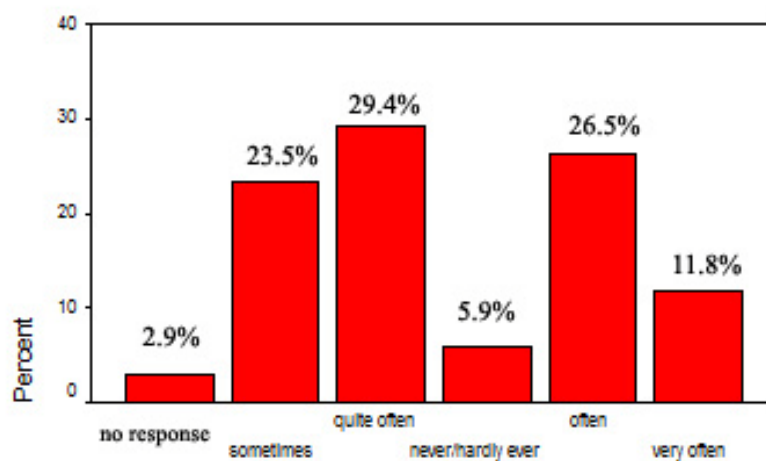


Figure 22- Responses to: “I encourage my students to use ICT for co-operative learning”

Obstacles Encountered “towards the use of ICT in teaching”

The following responses were gathered from faculties in terms of obstacles encountered in using ICT. It is observed that the fear of students graduating without foundational knowledge due to easy access to online facts and research is the major obstacle in not encouraging ICT in learning.

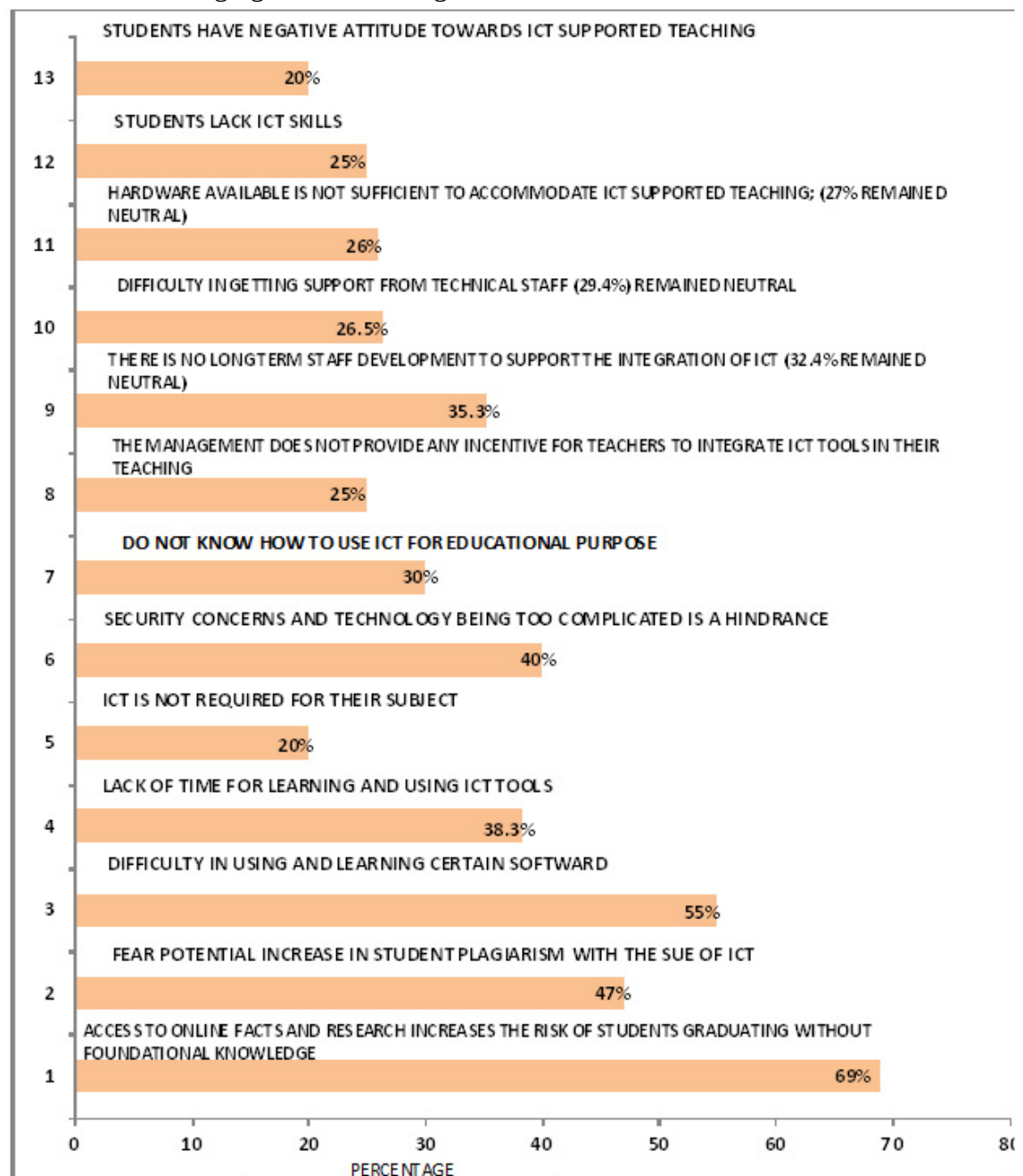


Figure 23- Obstacles in using ICT for teaching

“21st Century Skills (Partnership for 21st Century Skills, 2009)”

The faculties were asked to assess the level of preparedness of their students to compete in today’s global marketplace in relation to 21st Century skills. The responses show well preparedness in the areas of Expertise in field of study and Overall job readiness/Life and Career Skills.

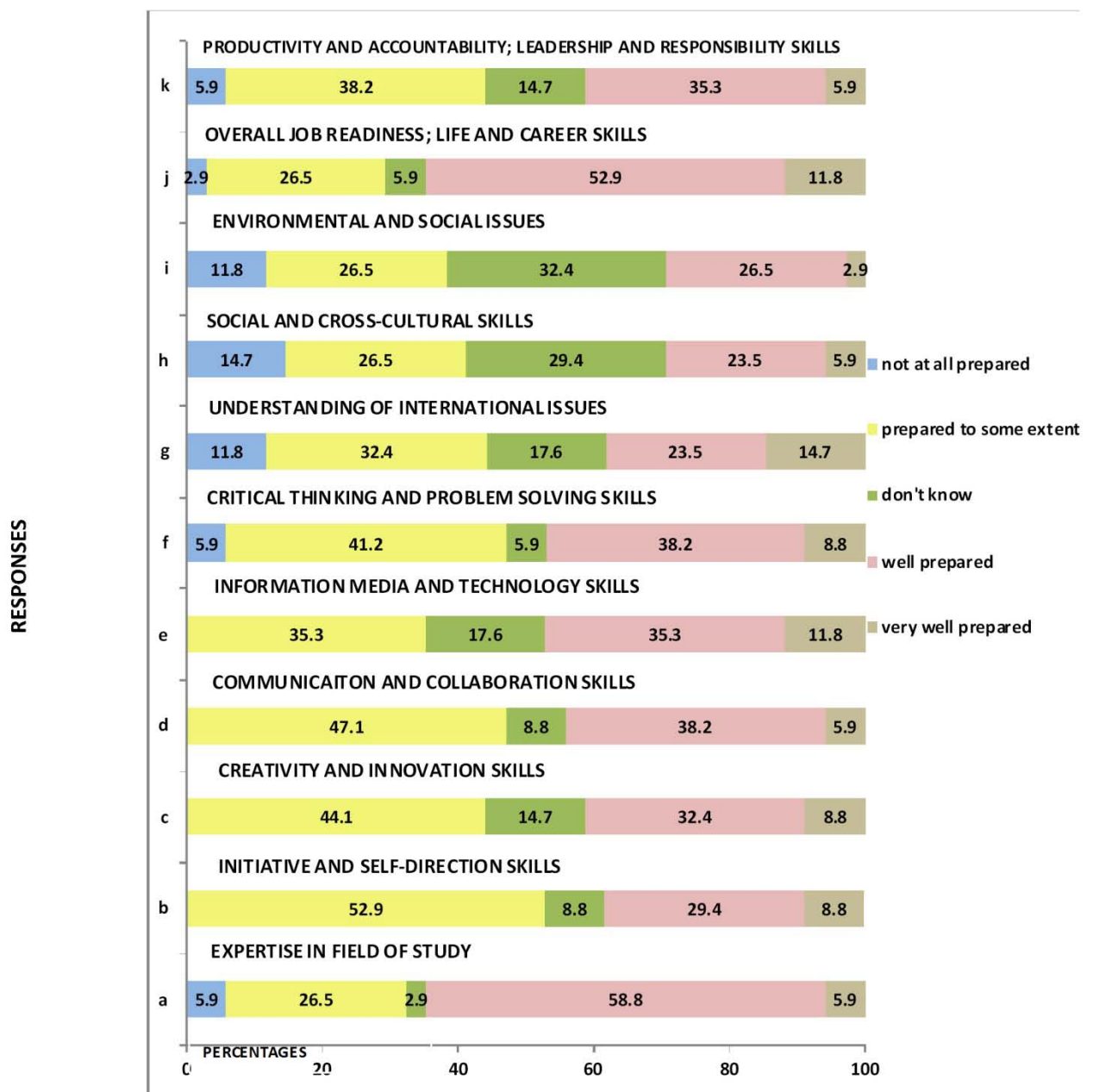


Figure 24- 21st Century Skills of Students (TZU faculties)

Case Study of Teachers

The following section covers case study of five faculties from different schools in TZU as mentioned in the Methodology chapter.

K. Chopra “Assistant Professor Mass Communication and Journalism”

Dr. K. Chopra is “Assistant Professor in Mass Communication and Journalism department”. She also creates PowerPoint presentation on the basis of various researches that she undertakes using the internet or books and then gives it to the students, which forms knowledge sharing using ICT. Knowledge resources include e-resources which TZU is subscribing through INFLIBNET or through department subscription. She noticed there is the issue of Information and Knowledge management. “One thing which I have felt personally while interacting with students is probably we have not been very successful in motivating them to look at those scholarly e- resources. Students are using Wiki, most of the time. Whenever we assign them to do some internet research, they reproduce the full thing in Wikipedia without doing any cross referencing. This is not the best usage of e Resources available to them. So if we can motivate them enough, in a structured mannered if in the pedagogy we can incorporate that sensitivity, openness and keenness towards e Resources, they will gain”. Dr. K. Chopra has been making efforts by giving assignments to make abstracts of research papers that they read to inculcate a culture of reading scholarly articles. Her students are using Web2.0; they are very enthusiastic about using social networking sites on their own, not initiated by the teachers e.g. creating publicity about events organized by the dept. events invitation sent in Face Book, posting ideas,

taking feedback from others. Photography students keep on uploading their photographs using picasa/ web albums. As part of the media course, they use video/ audio software; new media course, web designing, program writing, as per the requirement of the curriculum.

The department does not give ICT training for students because it is expected of them to have certain basic knowledge, or they pick up as they take up the course which has ICT component in its curriculum. “I believe the students of this age are more apt with ICT than the teachers, I would have learnt it and used ICT sparingly as and when I require, and they use it as a part of their life. Even as teachers, we are not making full use of the potential that ICT can offer”.

“Dr. K. Chopra had attempted to provide flexibility that ICT gives by creating a Blog to upload her lessons for students to refer and also to post their problems, so that they would be able to access it if they missed classes and also to upload other teaching material which she would have to distribute in class. Ultimately it did not materialize because of the network. There are certain restrictions in this regard Blogging etc. to a certain extent are restricted. So when she faced a little bit of trouble, she gave up that idea because it amounted to extra effort and extra time. She went for the other option which is easier i.e. creating a group mail id for all the students and circulate papers and other information. Group mail id is one thing I use but not those more interactive media like blog etc. Which I could have done, I have not taken that extra effort and time to keep on updating that on a regular basis. Moreover as an Immigrant (digital) I am not very comfortable to it so I have given up the idea”.

“TZU has put up certain restrictions to prevent misuse. Youtube and Orkut were blocked earlier. Orkut was allowed only on weekends earlier, and then later it was allowed after office hours. You tube is now partially open. The university does not want to restrict its limited bandwidth to students constantly downloading videos, audios and using it for non educational purposes. Certain restrictions are there which does not look into the extended social sciences frame work of looking into new media, of researching and working on new media. Reason being fear of new media or a very technical reason that the University has a limited band width and if these things are kept open students will be using more and more of it compromising on their class/study hours or taxing the entire band width by downloading other material and academic resources will become difficult to access. K. Chopra feels that financial constrains which limits the infrastructure (including the bandwidth) is a major challenge”.

Table 14- SWOT Analysis (K. Chopra)

SWOT Analysis (K. Chopra)
<i>Strengths-</i> Curriculum, which creates the opportunity for ICT incorporation; curriculum is flexible, is up to date regularly updated and upgraded. Infrastructure that the department has is one of the best; Faculty strength and variety of specialization.
<i>Weaknesses</i> –location disadvantage in terms of placement, industry-academia linkage, the biggest problem encountered is connectivity and location, which is a handicap. “If we have to invite someone, we do not have regular flights to Tezpur. Time is lost in travelling. Professionals have very little time in hand and it’s very expensive for us here. Going from university structure, we cannot spend so

lavishly on inviting people from the industry”.
<i>Opportunities</i> - already the best institution in terms of Media education in terms of Northeast; possibility to evolve as the best media institute in the whole country.
<i>Threat</i> - networking and coordinating only within Northeast, not evolving, not connecting, fear of being forgotten from the main stream; Loosing focus as a department and getting lost in trying to do too many things. Not having a USP on pedagogy, research and output/contribution the department gives to the society; ICT in Pedagogy not going hand in hand with ICT integration in Administration.

Dr. Madan M. Sarma, Professor English and Foreign Language Department

Dr. Madan M. Sarma is a senior Professor in English and Foreign Language Department. He mentions that from the time the university started, they had computers (only one type writer was available) and computer training was given to the faculties. According to him research scholars, faculties often access online journal, books and other internet resources for getting information, downloading useful materials. Dr. Madan feels that they do not use technology the way the Science departments use. Language Lab in the department is fully digitized where students learn English and other foreign languages, software is available and it is a self learning process using ICT. Faculties put digitized material in the server and it is used in the language lab class. ‘We can’t imagine teaching languages like French, Chinese without language lab/ICT’. ICT is further used for Presentation in seminars and classes. In terms of ICT usage in pedagogy, Dr. Madan M. Sarma feels ICT saves cost and time. He generally makes his students download or share a link, instead of making hard copies for distribution. For B.Tech English class he receives assignments

and responds through emails. While teaching language to B.Tech students, he makes lessons available on the internet to give them more flexibility. Communication between research scholars, and supervisors mainly takes place through emails, supervision takes place over email, chats. Usage of E-facilities instead of hard copies is increasing and he in his teaching methodology is shifting slowly from traditional method to new opportunities that ICT is providing. He feels that there is no problem even if there is no formal training because the computer center sends people whenever asked for and they give the necessary guidance. According to him, the senior Professors take the help of others in using ICT. They generally do not use ICT on their own but make use of ICT facilities through the help of younger colleagues. “The young faculties use ICT more. Teachers need to be innovative. We have not explored, made optimum use of whatever ICT facilities are already available e.g. in the language lab. Lack of Time is a major factor. Facilities are there, how much can we utilize”.

Dr. Madan M. Sarma mentions that the main challenge in using ICT is willingness on the part of the teachers to innovate. Teachers are comfortable with the traditional mode of pedagogy. He feels ICT in a department like English, can be used as an aid. Faculties who don't use ICT are not using it not because they are unwilling, but because they are uncomfortable. Students have access to EDUSAT; they have been interacting with experts from outside. According to him approximately 60% students are ICT pro, 40% are not that enthusiastic about ICT they need to be trained and encouraged. He feels it could be because of the kind of education they had, the kind of background they have. Within two years of their stay in University it's a challenge to develop the culture. ICT use is need based. Institutional policies are ICT

pro and Computer literacy course for students is introduced in the First semester of integrated course.

Dr. Madan expressed that ICT is extensively helping collaboration at an individual level. He mentioned that the department changes its curriculum every three years. Changes are based on feedback from the students; they also try to study where the students go for their job. Requirements based on job market, developments and changes happening in curriculum in the subject in different places are referred to with the help of ICT. ICT skills required are also considered, which may reflect in about 20% of the curriculum. According to Dr. Madan the types of Knowledge produced in his department are: Subject specific knowledge; Knowledge based on regional requirement, linking it with the outside world and Preservation of and contribution of indigenous knowledge. ICT according to him is very important for a university like TZU which is placed in a location like Tezpur. "ICT is helping us in staying connected. Otherwise we are placed somewhere else.. cut off from the rest of the world... we wouldn't be part of it". ICT is providing the access and is also helping in updating knowledge. Dr. Madan feels that ICT should be used in challenging and innovative ways. He is currently engaged in Centre for Assamese studies which is in process for making indigenous knowledge available on the web. They are archiving/documenting/ digitizing and uploading local knowledge using ICT. "ICT will preserve indigenous knowledge and will make it available to the people outside. I discovered a manuscript from 19th century (1826-1833). I am going to digitize that; in this way we are using ICT, not only in accessing knowledge but in producing knowledge and making it available worldwide. I am also archiving classical text on a website to make it available to Assamese settled anywhere in the world/ and to

everyone e.g. Kirtan by Shankar Deva 15th century scholar”. He believes this will be their contribution to the knowledge society.

Table 15- SWOT Analysis (Dr. Madan M. Sarma)

SWOT Analysis (Dr. Madan M. Sarma)
<i>Strengths-</i> ICT infrastructure
<i>Weaknesses-</i> lack of motivation/innovation, need for greater involvement of the students.
<i>Opportunities-</i> producing indigenous knowledge and making it available on ICT platform.
<i>Threat-</i> Excessive and over simplistic use of ICT, Plagiarism; students not going for more challenging work. Thinking, contemplation which is very important for creation of new knowledge will not happen. Importance of human endeavor and intellectual contribution being lost and becoming intellectually impoverished.

H Barpujary, “Assistant Professor Department of Business Administration”

H Barpujary is “Assistant Professor in Department of Business Administration”. According to her from the very initial phase when TZU started, the first VC had emphasized on ICT in education. The University being Pro- ICT has been a major push factor. “Our first VC mentioned that we may not have the infrastructure in terms of buildings but we should have Computer technology in our university. We had servers purchased from the US back in the 90’s. In 1998, internet and ernet was introduced. We also subscribed to BSNL dial up connection, so that the faculties could access internet. Each department had one PC with internet connection.

After that when the second VC came, he also added up to the importance of ICT by giving personal PC to every faculty with internet connection”. H Barpujary mentioned that initially they started with OHP for presentation in classes, but later on when LCD projector came the university was the first in Northeast to use in classes. That way, the University has been very pro active towards ICT in adoption of any new technology. “In our department all the classrooms are fitted with LCD projectors, teachers are accustomed to ICT; computers are available on the desk, so presentations are all computerized”. There is computer education for every branch of students. In all the branches there is audit course and in some branches, there is a credit course also.

H Barpujary takes information from the internet for preparing her courses; she refers to other universities through internet. “We compare our course content and structure through internet. So our course structure is also very flexible and up to date because we try to keep pace with the industry needs. Courses now require the latest technology, so our course keeps that in mind. We keep updating our syllabus and ICT is helping us this way”. According to her ICT is the main attraction for teachers to stay in the department. Because of ICT teachers are in the department from 9:30am to 5:30pm. She uses ICT not only for teaching purpose but also for research and projects. Many software have also been developed to help with office work and governance. Computer centre, System analysts are there, so they prepare the software on payroll, income tax etc. so employees can sit with the system and check and calculate for themselves. H Barpujary further mentioned that their MBA course has many IT related components. The curriculum tries to fit in the IT requirement. Integration of ICT in the course has helped the students in getting better jobs. The department will soon be running courses through distance mode of education which

will be through ICT. Through EDUSAT they are contacting professors in different institutes, who otherwise would not have been able to come to TZU because of its location. She expressed ICT has helped them in connecting with the rest of the world- i.e. not only different institutes of India but also abroad “e.g. we have had video conferencing with people from Australia for our students. We have been trying to take help from Professors in IIM through EDUSAT”.

According to H Barpujary, most of her students are using ICT. Assignments are sent via mail, she makes students browse information on the net and give report. However she feels there is one major disadvantage that student copy-paste material. But to check that some of the teachers ask for soft copy of the material to track it in the internet. She feels that advantages are also there because the presentations made by the students are better since they refer to more information using ICT. Going to the library is time-consuming, students may not find so many books and in some cases the information is also outdated. Now with E-books and E-journals the students get the latest version; she tries to inculcate a research attitude in them through the use of these mediums. Her students use ICT from the first semester itself. Initially they may make mistake but they learn and pick up gradually. They become experts with constant use. In terms of barriers, H Barpujary considers Connectivity the main challenge. “TZU falls in the periphery of ERNET connection, so network problem is there, but to support that we also have other connection e.g. BSNL, TATA (private subscription). If the network is not there we are disconnected, this is one major disadvantage. Since it’s a Central University, we cannot go for commercial/private services. For maintenance, some companies have kept their service person here. But

for some they have to come from Guwahati, so that takes time. Location is also a major disadvantage”.

Table 16 -SWOT Analysis (H Barpujary)

SWOT Analysis (H Barpujary)
<i>Strengths-</i> Access to information, work better organized /structured; better communication with the rest of the world; Networking for research and other projects.
<i>Weaknesses-</i> location of the University
<i>Opportunities-</i> building knowledge; upgrading skill and in the process making one more competent.
<i>Threat-</i> Plagiarism; loss of reading habit, compromise in quality of knowledge; use of computers in the class causing distraction.

E. Ishorari “Assistant Professor, Department of English and Foreign Languages”

E. Ishorari is “Assistant Professor in Department of English and Foreign Languages”. According to E. Ishorari, the department gives more emphasis on the use of internet to look for materials. She also uses mass media projection to show movies related to the course. Students use projectors, PowerPoint presentation, MS office etc. For B.Tech students which is a class of upto 170 students, she uses email for collecting assignments and sending feedback. She feels ICT helps as paper does not get wasted and there is prompt response increasing speed and delivery. Because the number is large she uses PowerPoint presentation to teach the class. This way the

back benchers can also see as it is there on their system in their hard drive and they get to take it as their notes later. E. Ishorari feels that students are more attentive in class with the usage of ICT because there is visual going on along with the teaching. “If you keep lecturing, they lose the attentiveness. Another thing is just two days back I got a mail from one of the students addressing all the students in the university regarding a social cause. Seeing him initiate it was good because he is not one of the better students, he had written the mail and his writing was ok... so what I have seen is that the use of computers may be makes them more confident”.

However she mentioned that there is a percentage (approximately 10-15%) of students who do not have any knowledge in using ICT before they come to TZU because some of them come from rural areas. Even students who come for B. Tech do not have any idea about computers. They also face language problem. According to E. Ishorari there is the question of equity amongst the student as far as technology integration is concerned. Courses such as basic skills program need better definition of course structure and need to have more measureable outputs. Most of the students are interested in just the degree, so anything extra becomes unwanted for them. Classes are from 9 am to 5pm so most of the students complain that they don't get time for themselves, they don't get time to read or do anything apart from what they learn in the course. She feels flexibility is lacking, certain websites have been restricted for regulation to avoid misuse. “In this age of photon those restrictions are meaningless. The younger crowds are so smart that they hack into your account and they use that. When they are caught, they say that is what they are learning in their B.Tech and comp. science courses. They excuse themselves saying they were checking if it's working or not. So after a point of time, I think these restrictions

become meaningless. We face lot of problem. Say if I type the word e.g. 'sex' in google search, it's blocked. In literature, we have to do a lot of research related to gender, for us for research purpose it becomes a huge block. When article 377 was revoked, we were having a discussion here in the department. One of the students raised a question that if it is not a crime, then why is the university not allowing pages with content of homosexuality?"

E. Ishorari also observed that there has been an increase in the number of students using laptops. TZU has Zero interest loan, laptop scheme. E. Ishorari feels that even if students are provided with computers, if they do not want to use it productively, one cannot force them. Usage wise, many people use it for networking, and other non educational purpose. "Only when you give them an assignment, they go and look up for materials". People now have their own photons, so the university network is used mainly for downloading things. "We have a lot of online journal-database is quite big. It's only the use- how to teach the students to use them. The usage differs individual to individual, there are people who are using ICT extensively and there are some who do not use it at all". The department had ICT orientation classes on how to log into the library using wi-fi, how to order books from your room, how to book texts from the room. "We had been doing that in the last two years teaching the first semester students. It was taught by one of the Computer Science department staffs. Somehow they found it not very useful and they took it away".

E. Ishorari observed that the interest level of the student did not match with what was being taught in the course. Basic skill courses would have been more successful if they were oriented more towards the specific need of the department rather than the Computer Science approach. There was communication gap between

the requirement and what was provided, contextualizing the course was required. Most of the students who come for Masters programme are familiar with basic computer operation. So they know and they did not find it interesting and sometimes computer programming languages were taught which are not relevant. Hence the course was removed. The course is out but now the department feels that it should have been there, because though the students have basic knowledge of PowerPoint, MS Word, they are still not well worse with formatting e.g. how to insert footnotes, endnotes etc. So, on a personal level in tutorial groups some of the faculties from the department teach them. There is an integrated MA/BA B. Ed course that will introduced soon, in that computer application is part of the syllabus. On MA level the course may not be reintroduced, but the department is planning to reintroduce the course at BA level. The content is yet to be decided.

E. Ishorari mentioned that fear of technology is always there among the humanities people both among the teachers and students. “And sometimes we teachers, I am speaking from experience, I am scared of making mistakes in the classroom while using ‘that’, and taking up a lot of time in trying to fix that and loose/waste time. I wouldn’t want to try out any programme that I am not sure of/comfortable with, whether it is software which is given for free. I would think twice... because if anything goes wrong e.g. (hardware), you don’t know how to fix it. What if you spoil it?”

She also mentions that there is a threat of plagiarism and that the students don’t make an effort to do their own work. “In a competition a student copy pasted the whole story of a French writer. He thought nobody would know. Except for the

change in the title and the characters' names everything was copied. Many of the students are not conscious about the gravity of plagiarism. Another instance is when I had to reject a whole lot of articles for a souvenir that we had to publish. Then I got a call from the higher up as to why am I rejecting the articles. So I had to explain that we can't have people copying from the internet and claiming it to be their work. That year the souvenir was around 40 pages only". ICT she feels is like a double edged sword, one side a group is copying using ICT and another group is tracking that group using ICT. One major challenge faced in using ICT according to E. Ishorari is that if something major goes wrong, it takes time because they have to get people from outside Tezpur. However, she feels that in spite of the physical limitations ICT is helping in increasing access. Most of the text taught is related to African literature or Caribbean literature, books are not available. E. Ishorari mentions that the internet helps in accessing the material. ICT has bridged the gap between availability of information/text.

Table 17 -SWOT Analysis (E. Ishorari)

SWOT Analysis E. Ishorari
<i>Strengths:</i> infrastructure; Support staff.
<i>Weaknesses:</i> fear of technology among the humanities people both among the teachers and students; Blocking/regulation system which is affecting the learning; Limited resources.
<i>Opportunities:</i> networking and placement; better communication with the students; ICT in curriculum also increases the job opportunities for students.
<i>Threats:</i> complete and free access to all kinds of resources might lead to misuse; plagiarism.

Dr. Bhabesh Nath, Assistant Professor Computer Science Department

Dr. Bhabesh Nath is Assistant Professor in Computer Science Department. He has built his web page where he puts up some of his course contents. In relation to ICT in teaching and learning Philosophy, Dr. Bhabesh Nath feels that ICT is required for higher education but it is not applicable for all. He feels ICT is required more for teachers and not the students. “In Higher education students have already learned how to formulate ideas on their own. In a classroom there are students with different capabilities/ intelligence level. Out of fifty students in a class, only five can manage on their own, whereas the majority will require more thorough guidance from the teachers”. In his classes, some students are more ICT pro and some lesser. Some have hesitations earlier in using ICT but eventually they pick up, but how many actually use ICT4E cannot be ensured. If they are already exposed to technology, it helps. “If we give them notes, they just memorize it. Similarly, they might just memorize the summaries in the slides. Their thinking in the subject area will not be developed”.

Dr. Bhabesh Nath feels that technology will act as a barrier, if ICT is used in the case of knowledge building. “However if it is blended /combined with traditional form it will be more effective. In some courses ICT should not be used at all, whereas in some ICT usage will help, depends on the type of students and the type of course”. According to him, as far as teachers are concerned, ICT materials on webpage are more helpful for teachers than for the students- to organize, update, add and share ideas with other faculties. ICT helps in knowledge building of teachers. He uses ICT for managing his courses.

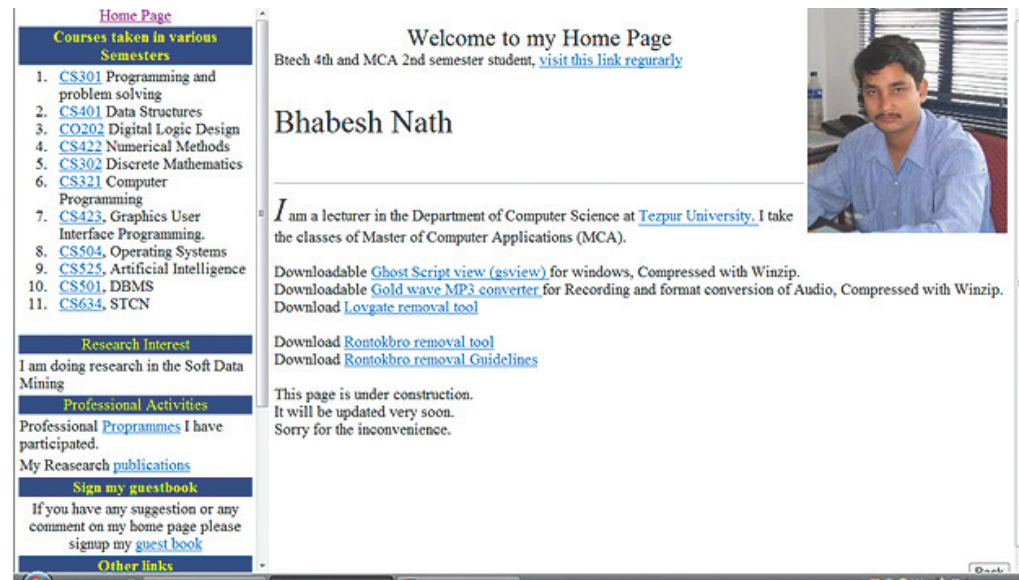


Figure 25– Homepage (Screen shot) of Dr. Bhabesh Nath

ICT has helped him in the preparation and presentation of the course. Once it's prepared, it saves time in the next course. In teaching practices the tools used are basically PowerPoint slides. In some courses he has developed some tools along with the students as projects to understand problems in data structure. Pictorial forms used as demonstration for students to see have helped in better understanding of concepts in his classes. He has however not used Open Educational Resources and is not using NPTEL videos. ICT4E translation is an individual enterprise; it depends on the faculty's level of understanding ICT. He finds implementing ICT4E time consuming. "Whatever experiments I have been doing till now, the results are satisfactory. It depends on the instructor's view point- how does he want to solve the problem, what direction he wants to give. Technology may not always support his mentality".

Dr. Bhabesh Nath mentioned that he has not been able to see if ICT4E has been beneficial or not as he has not been able to evaluate his students batch wise. However, it has increased the level of involvement/generated interest as it has helped in getting proper understanding and has increased motivation and participation since

some of the illustrations used in the classes have been developed by fellow students. Initially there were limited numbers of facilities which posed as a challenge but now he thinks the facility is sufficient. However he emphasizes, “Technology should be made for helping the instructors not the students. ICT should be there to help teachers to build knowledge and assist in developing courses but I think if we give it to the students, they will not be able to understand”.

Table 17 -SWOT Analysis (Dr. Bhabesh Nath)

SWOT Analysis (Dr. Bhabesh Nath)
<i>Strengths:</i> strengthening the teachers by sharing knowledge.
<i>Weaknesses:</i> students are not ready for ICT.
<i>Opportunities:</i> sharing information and improving skills by facilitating cross referring.
<i>Threat:</i> teachers replaced with ICT.

Students: ICT Usage, Attitude, Barriers and Challenges

“Students in TZU responded that ICT has enabled quick and increased information flow; helped in collaboration and networking. The study also showed that approximately 20% of students who come from rural areas do not have any prior knowledge in using ICT. They also face language problem. Basic skills programme in Computers was introduced for all the newly enrolled students. This has helped in bridging the gap. Challenges faced in the programme were that the interest level of the student did not match as some of the students in the class were already familiar with computer. In certain cases since the courses were conducted by staff from computer science background, the humanities and social science students had a problem in relating. The course has been revoked in some streams and in some it is

kept optional. Contextualizing the course as per the requirement of different departments would help. It has also been noticed that there is the need for skills on Information and Knowledge management. Students have mentioned the need of such courses as most of the time they are overwhelmed with Information overload in the internet. Students are receiving training from the library department to help them with Information search in locating E-Resources. INFLIBNET and E-Resources are heavily used by research students as each student is provided with an internet access point in the department”.

“Students enrolled for Integrated and Master’s programme, use ICT as per the need of curriculum or the initiatives taken by their teachers. Comparatively they rely more on text books and traditional method of knowledge acquisition. Lack of time and erratic internet connection, limited computers for individual use are other factors pointed out which restricts their usage of ICT4E. Usage of EDUSAT facility is also limited because in some disciplines, the required lectures are not available. However, the major hindrance is the problem in synchronizing the time with the experts who are to deliver their lectures using EDUSAT as the time schedule and time slot given do not go well with the class timing of the students. Depending on their individual level of interest and skills some students are also making use of Web2.0 and other ICT networks to enhance their knowledge gathering and creation. Some students are still juggling between traditional medium and the new medium of learning facilitated by ICT. Some of the students are not aware about Intellectual Property Right (IPR) issues and plagiarism. Motivation to use ICT4E, access to ICT, conflicting time/other priorities, learning style, technological confidence and curriculum are factors which effect ICT4E translation in the context of the students”.

Tezpur University has a Total student population of 2330 (approximately). A survey using Random sampling across different Domains of Study was conducted with a sample size of 250 students. The survey aimed to understand how students in Tezpur University use ICT in their studies, their attitude towards ICT and to collect their views about the enablers and obstacles in ICT for education. The following tables show their response.

Table 18- Main Domains of Study of Student Sample (TZU)

Main Domains of Study	n	%
Social Sciences (Masters)	30	12.0
Social Sciences (Research Students)	6	2.4
Science and Technology (Masters)	114	45.6
Science and Technology (Research Students)	40	16.0
Humanities (Masters)	50	20.0
Humanities (Research Students)	10	4.0
Total	250	100

The survey showed that most of the students access Computer/Internet from home/hostel. This is followed by access in the computer center and department.

Table 19 - Place of students' most frequent usage of Computer/ Internet

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Home/hostel	109	43.6	43.8	43.8
Library	3	1.2	1.2	45.0
Computer Center	70	28.0	28.1	73.1
Cyber Café	6	2.4	2.4	75.5
Department	61	24.4	24.5	100.0
Total	249	99.6	100.0	
Missing System	1	.4		
Total	250	100.0		

Table 21 - Hours per Week (On an average) of usage of Computer for academic purpose by students in TZU

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid <1 hr	10	4.0	4.0	4.0
2-5 hrs	75	30.0	30.0	34.0
6-15 hrs	86	34.4	34.4	68.4
15-25 hrs	37	14.8	14.8	83.2
>25 hrs	42	16.8	16.8	100.0
Total	250	100.0	100.0	

The survey also tested students' response to Teacher's ICT usage. Students felt 50.6% of Teachers used ICT effectively in their courses; 34.4% of teachers provided students with adequate training for the use of ICT in his or her course; and that 51.4% of teachers have adequate ICT skills for carrying out course instruction.

Purpose and degree of ICT usage by Students in TZU

The students' degree of ICT usage at different levels based on the survey is given below:

“Informative: 67.6 % of students use ICT to find, acquire and use information.

Functional use of ICT: 51.2 % of students ‘hardly’ use ICT for functional purpose

ICT for Creating Knowledge: 40.7% of students ‘hardly’ use ICT to compose, compile, produce new information (write papers, drawing, programming, make PowerPoint presentations, give oral presentations, prepare newsletter, create own website, etc.) 20.2% use sometimes and 32.3% use ICT very often.

ICT for Communication: 42.7% of students ‘hardly’ use ICT to exchange and to transmit information with other students, teachers and others using email and Internet; to join discussion forum and chats. 14.9% use ICT sometimes and 39% use ICT very often.

ICT usage for Collaboration: 37.3 % of students ‘hardly’ use Web design tools, multimedia, e-mail, discussion boards, E journals, use technology to simulate research and collaborate with other colleagues (even those situated in different geographical location). 34.1% use ICT sometimes”.

In terms of overall expertise in handling various types of ICT 58.5% of students felt confident in using ICT. The survey also indicated that 75.8% of students learned to use ICT from friends. Only 4% have formal training in ICT use.

Major Hindrances/Barriers in using ICT for Educational Purpose:

59.6% students consider lack of training as a barrier; 57.2% agree that lack of technical knowledge and support is a hindrance in using ICT. 45% agree, 18% remained neutral and 37 % disagree that limited number of computers is a barrier; 54% cited limited understanding of how to use ICT for Educational purpose as a barrier in itself. 54% disagree to the statement that lack of time is a barrier in using ICT4E.

The following section covers attitudes and beliefs of students towards ICT. It is noticed that the students in general have a positive response to the opportunities and advantages that ICT provides.

Opportunities that might be enhanced by ICT

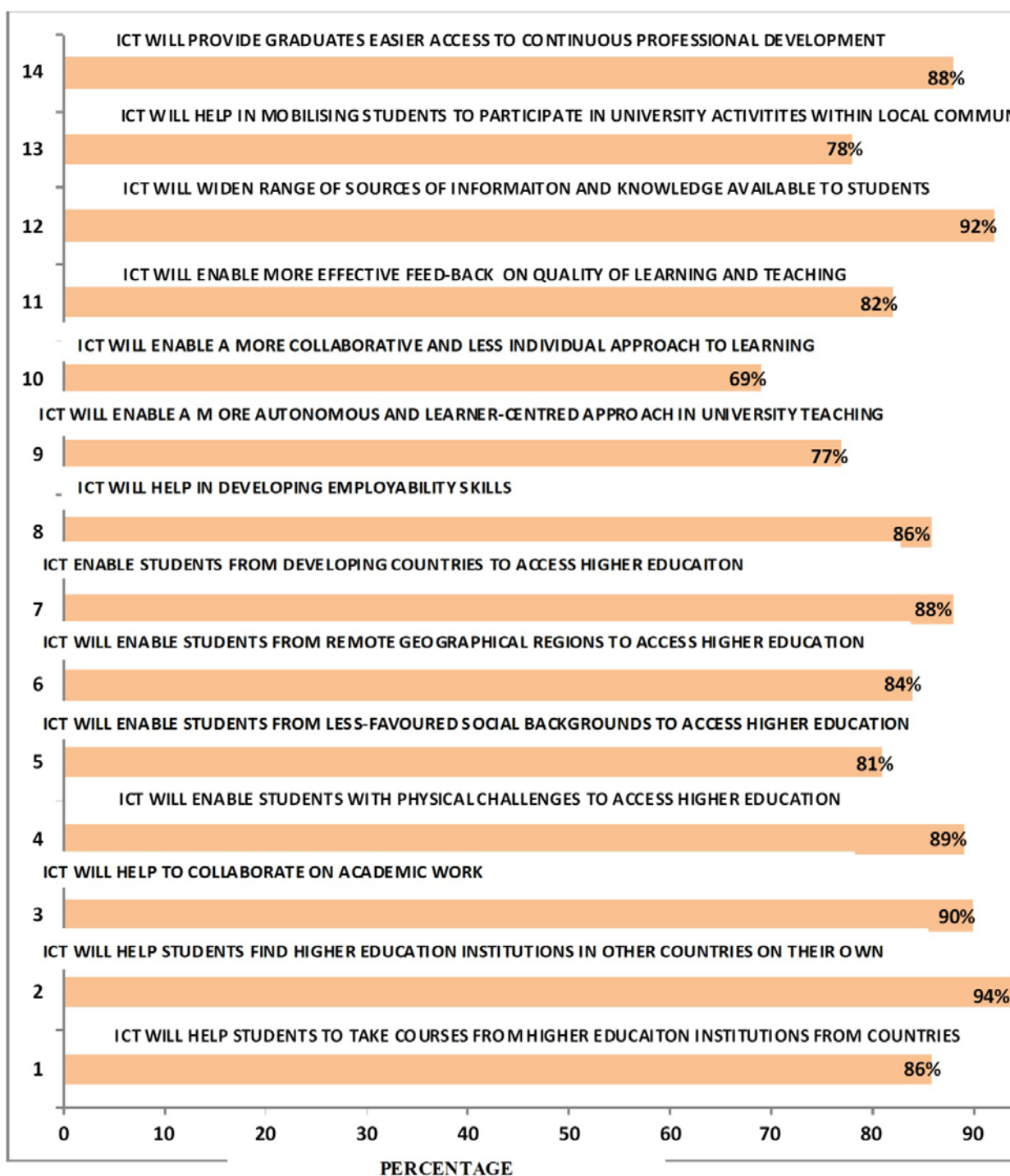


Figure 27 - Opportunities that might be enhanced by ICT

Advantages of ICT in transforming education systems' performance:

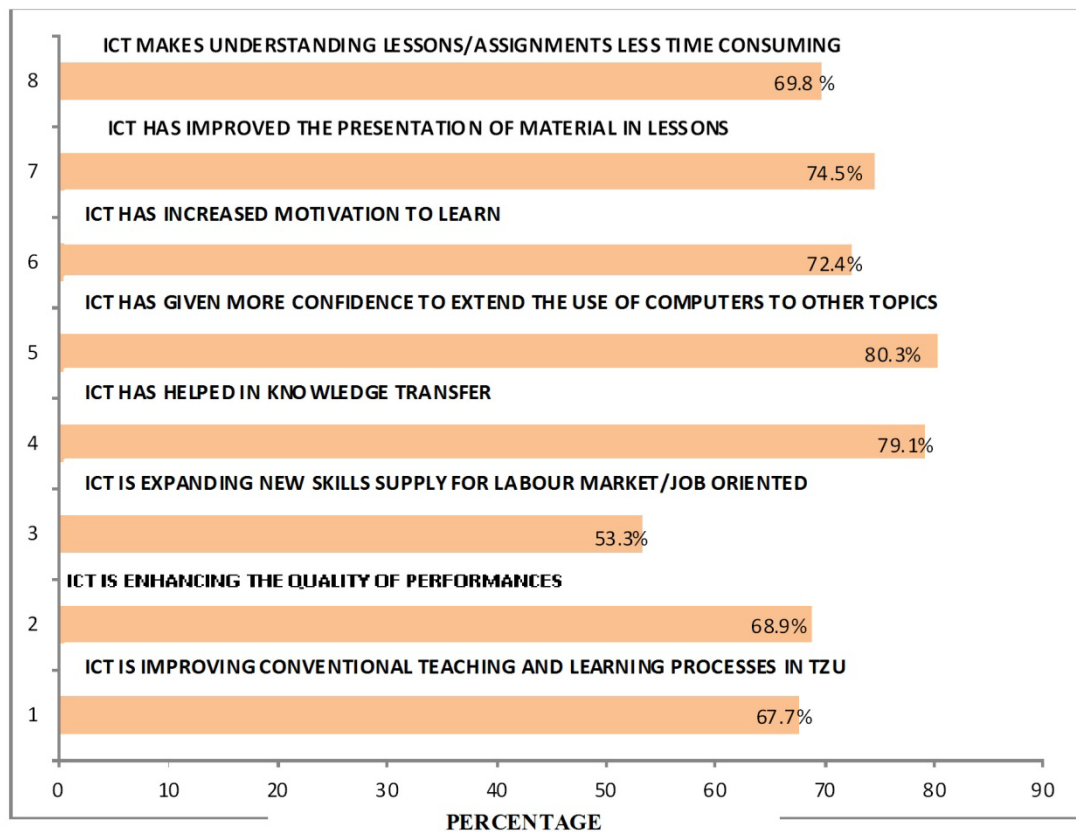


Figure 28 -Advantages of ICT in transforming education systems' performance

Disadvantages of ICT (TZU Students)

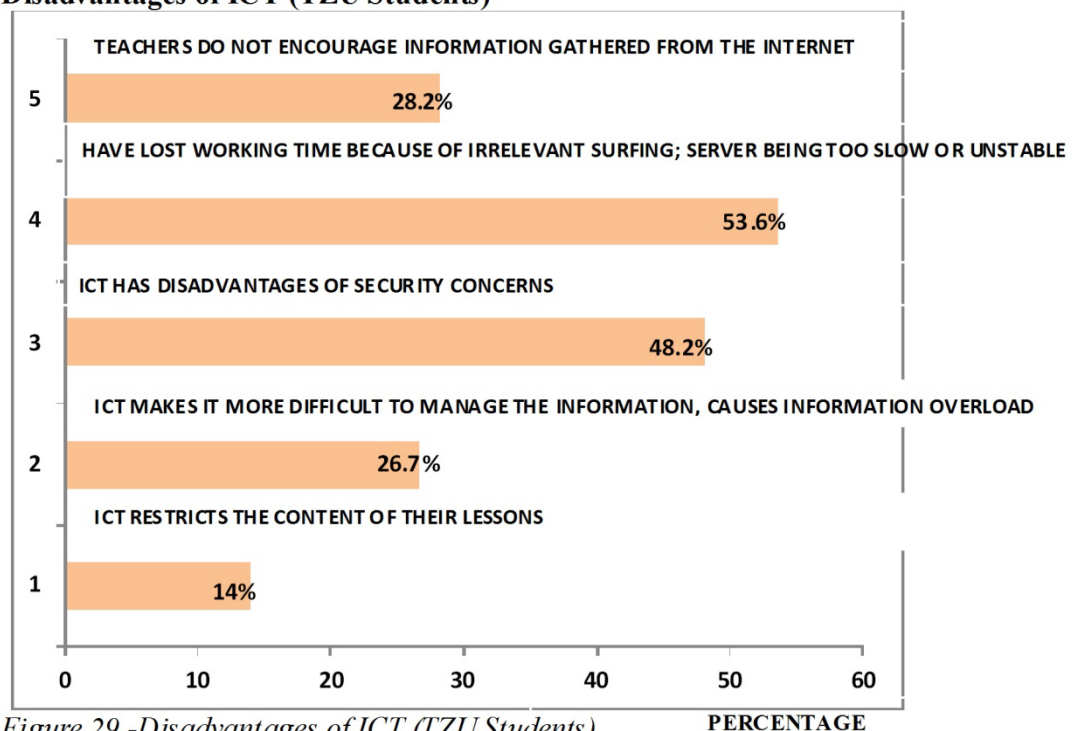


Figure 29 -Disadvantages of ICT (TZU Students)

“21st Century Skills (Partnership for 21st Century Skills, 2009)”

The following responses were received in terms of level of preparedness felt by the students of Tezpur University to compete in today’s global marketplace. The responses show that most of the students felt prepared to some extent in expertise in field of study. They also showed confidence in environmental and social issues; overall job readiness; life and career skills.

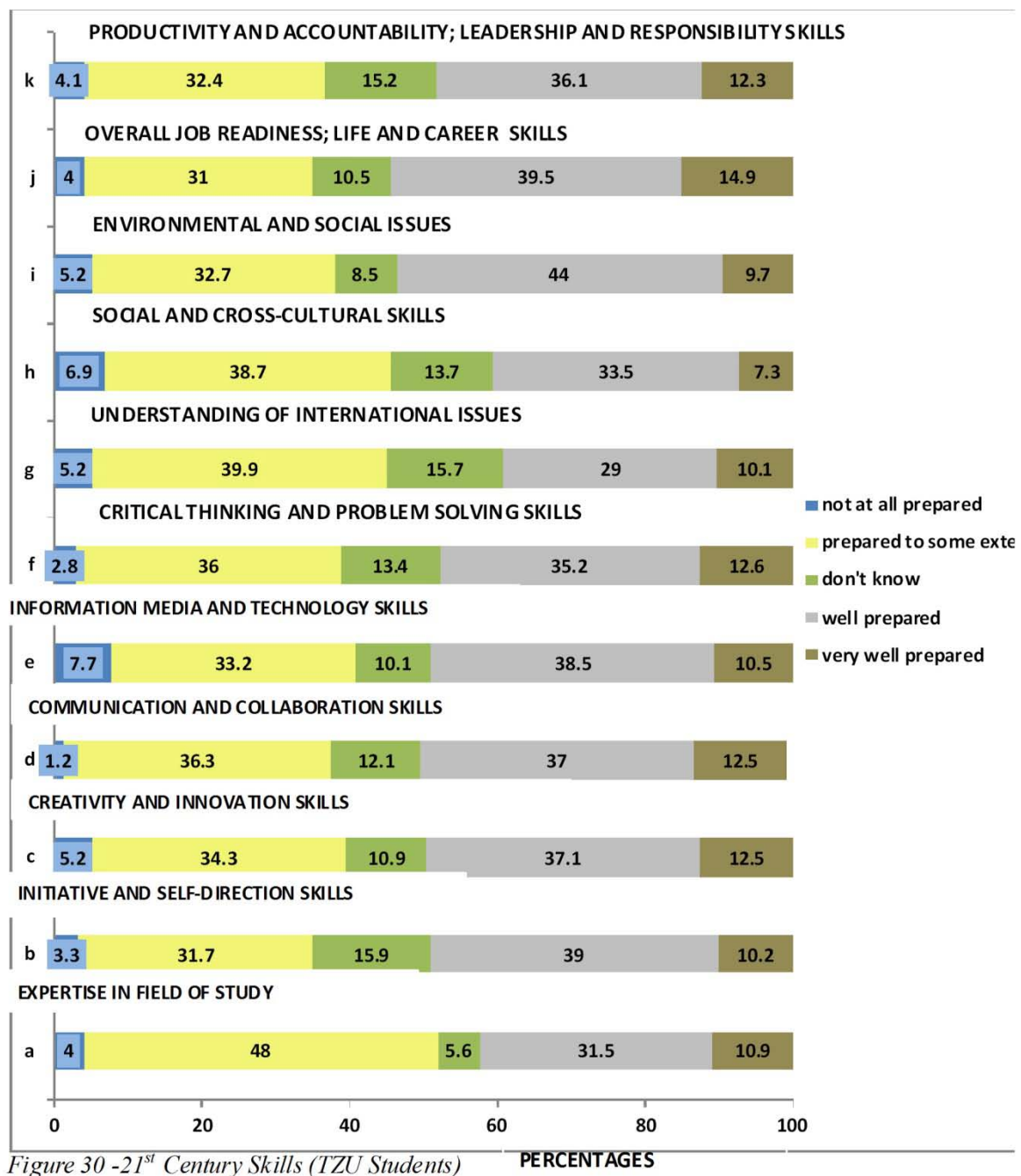


Figure 30 -21st Century Skills (TZU Students)

“Discussion and Key Insights”

“The students and faculties have benefited with the usage of services provided by services like INFLIBNET and ERNET. The actors are still at the initial stage of subscribing to NKN. A major effort has been made at the policy level and infrastructure level to provide access to ICT. To incorporate it at the user’s level more flexibility will be required in terms of making ICT4E learner oriented and not institution oriented. Contextualized capacity building is one of the key areas where there is a scope of development. There is a lack of trained pool of teachers, who can efficiently train the students and incorporate ICT in pedagogy”.

“We are not yet ready because somehow there is a problem of interpretation- the way we interpret knowledge, we interpret technology which would really bring a change in the way we understand knowledge... interpretation - there is a problem there”.

“Though most of the teachers acknowledge the importance of ICT4E, teachers are still comfortable with the Traditional form. ‘Still prefer chalk n board’ method of teaching. Hence, capacity building is required so that faculties can implement ICT in their teaching and learning practices. Gap is also seen in terms of lack of individual enterprise. Access to ICT does not ensure Equity; Digital Divide can be seen in the rate of diffusion of ICT among peers in institutions. Incentives to motivate teachers who are using ICT4E should help in creation of conducive learning environment to encourage Peer to Peer influence. Technophobia, issues related to plagiarism, fear of Dependency on Technology, reliability of information from the internet; concept of Knowledge, type/ kind of knowledge produced with the use of ICT are issues highlighted by the study of TZU. The need of awareness on Knowledge Management using ICT is also strongly felt. As far as University’s response to Knowledge Society

paradigm is concerned, TZU is gaining the idea, the statutes of the university are articulated and it is the policy of the university to encourage study and research which is more relevant to the Northeast. Most of the departments which are doing research do have a focus on the Northeast. Research grants expect researches being conducted to enrich the knowledge about and from the region. The university is adding up to contributing to the knowledge capital. Faculties are travelling abroad to share knowledge, quite a few international seminars have been organized by the university. Exchange of ideas is happening; there are collaborative papers of research work undertaken. ICT's role may not be actually at the level of knowledge generation here, but in providing information, sharing, networking and facilitating communication. As of now this level of collaboration is more for the faculties and researchers rather than the students at the Master's and Bachelor's level. But the University is planning for other ideas also. TZU recently put up a proposal to MHRD for a Center for studies in Northeast and Southeast Asia because of the proximity with culture and other things with Southeast Asia and also because of vis-à-vis India's Look east policy. If that happens, there will be sharing happening at the level of students as well".

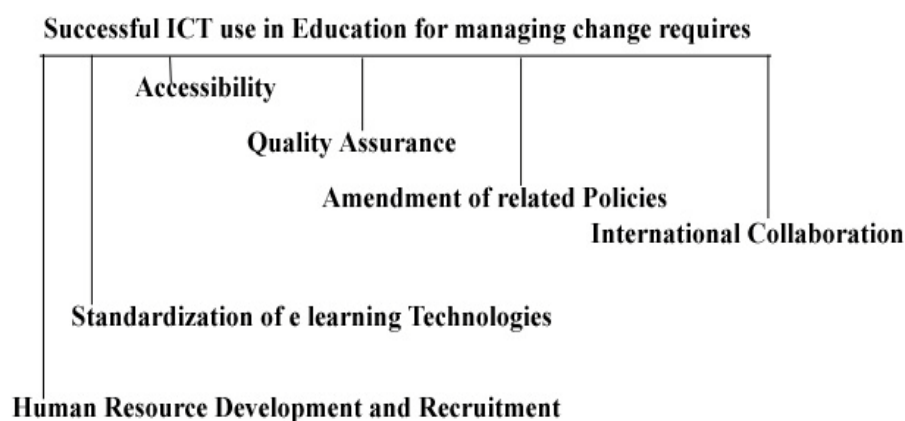


Figure 31 - Factors for successful ICT4E execution

Table 11- SWOT Analysis TZU

SWOT Analysis TZU Summary	
Strengths:	Pro-ICT Visions and Policies; adequate and continually upgraded ICT infrastructure; Self managed ICT services, skilled faculties in technology oriented departments; cost effective adoption methodology; Collaboration with external experts in place to strengthen ICT4E; human and infrastructural backup; good range of E-Resources subscription; Good LAN connection; good work culture; flexibility in adopting technological changes as far as the computer center is concerned.
Weaknesses:	Lack of ICT policy framework; inadequate support staff, end user technical support is poor, insufficient manpower for ICT support; inordinate delays in administrative procedures related to ICT infrastructure and maintenance; Non uniform ICT4E skills and awareness across departments; remoteness of location; lack of training; slow learning process of non IT staff in use of ICT; VSAT speed inadequate at present; technical infrastructure inadequate; erratic Wi-Fi connection; lack of proper focus in policies; impersonal approach; lack of publicity of materials available under national projects and funding opportunities available; insufficient budget for ICT; lack of coordination between the different government projects.
Opportunities:	Funding agencies ready to support ICT initiatives; Favorable ICT4E national policies; good amount of technical students available for support, they can be associated with ICT infrastructure (software and hardware) development; supportive staff and students; teaching and research targeting regional indigenous knowledge; cloud computing, grid computing etc. with high speed connectivity; collaborative and multi-institutional research and services; ultimate aim of paperless office.
Threats:	Data storage plan is insufficient; no disaster recovery plan; potential misuse of ICT- plagiarism; unrealistic expectation regarding ICT facilities; technology obsolesce; classroom face to face interaction may be disrupted; expert visit might be hampered by relying on virtual lectures; stereotype learning.

“The study shows that ICT4E change agents would involve the policies, process, ICT tools, Knowledge enablers and learners. Constant progress Monitoring and Evaluation of implementation of policies is required to increase accountability”.

Chapter 5

ICT for Education (ICT4E) Translation in University of Hyderabad

Abstract: This chapter begins with an Institutional overview of UOH. It discusses ICT integration in UOH covering ICT infrastructure Resources and Practices, ICT Governance, ICT Workforce leadership, Institutional Data Management, ICT Services Sourcing, Networking, Messaging and Communications, Wireless Data Communication, ICT Funding in Higher Education, ICT Engagement in Research and Status and Use of ICTs in Libraries. It analyzes the issues and responses of ICT4E from the view point of different users in UOH. “Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis” from different stakeholder’s perspective further highlights the advantages and the challenges faced.

“University of Hyderabad (UOH): Institutional overview”

“University of Hyderabad (UOH), one of the major institutions of higher education in India is largely devoted to postgraduate studies. With 46 different Departments and Centres organized in 10 Schools of study, the University has over 400 faculty and over 5000 students. The University offers close to 150 different programmes of study ranging from doctoral studies to Masters level degrees, as well as a range of post graduate diplomas and short term courses by Distance mode. It also has a Five year Integrated Masters Programme. The University hosts number of foreign scholars in the highly popular Study in India Programme. UOH has built up a reputation for providing high quality academic training, and has been recognized through a number of awards: PURSE, given by the Prime Minister of India, a grading of A, which is the highest, by the National Assessment and Accreditation Council

(NAAC). International measures of research excellence also show the preeminence of UOH - the University is counted among the top 100 in Asia in many of its academic areas of study. These include the Basic Sciences, Applied Sciences, Medical Science, Engineering Science, the Social Sciences, the Humanities, and the Arts, Fine Arts, Media Studies and Communication, in addition to more recent efforts in areas such as Folklore Studies, Health Psychology, Dalit Studies, Women's Studies, Neural and Cognitive Sciences. Several faculties belong to major national and international Academies - the Indian National Science Academy (INSA), the Indian Academy of Sciences (IASc), the National Academy of Sciences of India (NASI), the Indian National Academy of Engineering (INAE), the Sahitya Akademi, the Academy of Sciences for the Developing World (TWAS)".

Vision and Mission: "University of Hyderabad was established by an Act of Parliament (Act No. 39 of 1974) on 2nd October, 1974 as a Central University, wholly financed by the University Grants Commission. The objects of the University as envisaged in the Act are: to disseminate and advance knowledge by providing instructional and research facilities in such branches of learning as it may deem fit and by the example of its corporate life, and in particular to make special provisions for integrated courses in humanities and science in the educational programmes of the University and to take appropriate measures for promoting inter-disciplinary studies and research in the University".

“General Information Based On UGC Statistical Data Fact Sheet of Central Universities Input From the University”

1. Territorial Jurisdiction: Andhra Pradesh	
2. Number of Departments/Centres/Institutes: 10 Schools of Study, 21 Departments, and 21 Centres	
3. Number of Departments/Centres/Institutes getting support under UGC SAP/ASIST/DST/FIST/DBT/Innovative Programme: Almost all the Schools/Departments etc. receive some or other financial assistance from external funding agencies	
4. Number of Departments/Centres/Institutes having collaboration/exchange programmes with other national and international institutions	
5. Number of Books in the Library	3.82 lacs
6. Number of Journals subscribed	610 titles
7. Total Number of Students (as on 31.03.2011)	4746
Number of Students (Degree Class & above in University Departments)	4746
Number of Students (Diploma & Certificate Courses in University Departments)	- Not applicable -
Number of School Students (Upto 10+2)	1178
Number of Foreign Students (included in total number of students)	54
Number of Teaching Staff (as on 31-3-2011)	399
Number of Female Teachers	100
Number of Teachers having Ph.D. Degree	371
Number of Non-Teaching Staff (as on 31.3.2011)	1075
Teacher Student Ratio	1 : 12
Teaching to Non-Teaching Ratio	1 : 2.69

Actor-Network in UOH

“Mapping of relationships of actants and centrality of relationships, strong and weak ties, structural holes, and sources of resistance; Engagement of the key actants and translation of their interests into visions, objectives, plans and roles as seen in University of Hyderabad are discussed in the subsequent sections”.

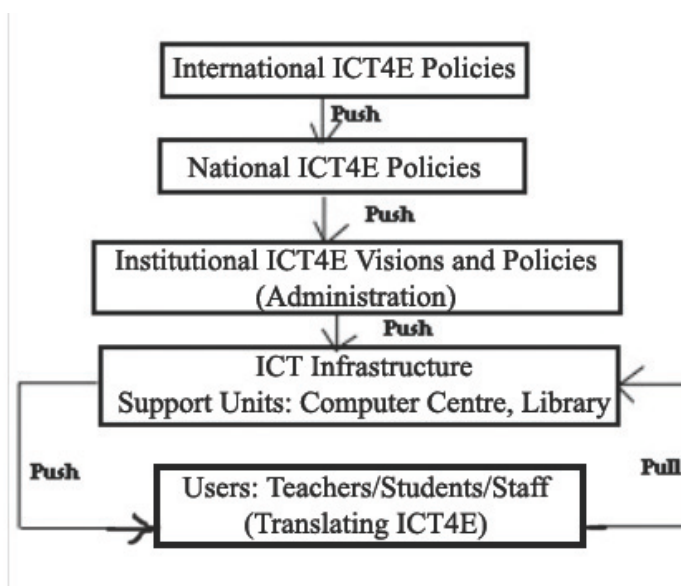


Figure 32 - ICT4E Actors and Translation in UOH and TZU

Administration

“In response to the national policy initiatives of ICT enabled knowledge access, the entire campus is connected on 1 Gbps NKN connectivity, Wi-fi enabled and this facilitates networking, vital for sustaining academic activity. The Indira Gandhi Memorial Library at the University has a collection of more than 3.56-lakh books and other reference material and subscribes to about 600 foreign journals and 18,000 online journals and 10 online databases. This fully computerized Library with special software for visually-challenged students operates through the week. UOH serves as an important node in the Knowledge network as large number of Institutions find their home on the campus, having close academic links with them. These include the C R Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS), the Association of Management Development Institutions of South Asia (AMDISA), the Tata Institute of Fundamental Research (TIFR), The Energy Resources Institute (TERI), the National Institute for Smart Government (NISG), the

National Institute of Animal Biotechnology (NIAB) and the Indian Institute of Public Health (IIPH) and the Institute of Life Sciences (ILS). The National Museum of Statistics, SANKHYA, is being set up on the campus, the first of its kind”.

The Vice Chancellor’s office is the office which gives approval for various functions. Teachers, Students, and Administrative Staff are the basic segments in the University and to support them the institution has the academic division in the University and also administrative division. The three critical areas are:

1. Academic division headed by Controller of Examination
2. Administrative division headed by Registrar
3. Finance Division headed by Finance Officer

The three sections are interlinked and technology is required to integrate the three. Based on responses from stakeholders in the administrative section it has been noted that integrating ICT here would mean thinking of automating certain procedure/processes. University performs various diverse functions and how ICT is integrated in this kind of a set-up, is a challenge which UOH also faces viz. to develop technology which takes into account the diversity of functions of a university. In automation, typically the software specialists develop ERPs for Enterprise resource planning. The problem identified is they have industrial enterprise in mind not academic enterprise. The administrative section feels that University is not industry; there is a requirement for different kind of software. It is required of the technology developer to come, understand the domain and it’s different parts, see what are their activities, how they are linked to each other and then develop a technology for the same. That doesn’t seem to be happening as of now. UOH hired software personnel

and the person spent nearly 6/7 months, he did some preliminary work and then went out, he did not come back. It is here that a major problem in translation took place. So an option suggested is of giving this as a project to the M tech students in the Computer Science department it may not work out, but the administration is willing to check out. Pay bills, students' fee collection are automated. Certain sections have been tried out but the institution has not been able to integrate technology in all the aspects. It is felt that all the software developed should be based on interaction with the people in the domain; ultimately it should serve the user's purpose not the software company's purpose.

Interview with the Pro Vice chancellor highlighted the concern that IT professionals who have to develop the ERPs do not have time to understand the institution's activities; “‘one size fits all’ won't work. They think that any typical standard solution will do”. He observed that in pedagogy it depends on the initiative of the teachers and that somehow has picked up better comparatively. “In research, access to sources is going on. In this area I am sure we are doing well – access to knowledge source. But e governance is a problem”. Another issue in e- governance is because of the involvement of several divisions, coordination and interactivity with different sections is a challenge. “The output of one division is the input of another division. E.g. all the fees collected by the academic section goes into finance section, this requires some coordination and the software developer must understand that”. UOH's policy is to automate, that is there on the agenda. UOH has large number of projects supported by lots of funding agencies to the extent of about Rs.200 crores. 30 – 40 % of that goes to the university. So this is used for infrastructure. HODs/Deans have lots of financial powers; Project managements are decentralized. Hence the

administration feels that the process needs to be automated. The study also showed that Network has been created but people should be actively participating in the network. Though all administrative staffs are capable of using computers, there is some resistance. A change in the mindset is required, that doesn't seem to be happening. They would rather operate manually; there is the challenge in shifting/transiting to ICT based operations.

UOH has strong departments in different Schools. The contribution of faculties from these departments has the potential to transform/contribute to the knowledge society by transforming the knowledge into some commodity. But in order to do that some other institutional mechanism is required which can play a role in converting this knowledge into commodity/some kind of useable and operational material. It is in this context universities must have offices like technology transfer offices/IPR offices. The context of knowledge production is changing today as researchers are trying to do research with the idea of whether or not that research can be converted into a patent. In that context, researchers/academicians are trying to enter the era of IPR. UOH administration expressed the importance of ICT in positioning the institution in this context. On the academic front, the administration feels that UOH is better than most of the Universities. "Look at our library; we have digitized most of our books. On academic front yes, we have been able to move forward, but in administration, we are trying to automate and it's going to take time. We are trying to put our course outline on the web that will happen very soon. A lot of work has to be done in this regard".

Table 22- SWOT Analysis (Administration)

SWOT Analysis (Administration)	
Strengths-	Funding; in-house expertise; attitude which is pro ICT; infrastructure; interactive website
Weaknesses	– mindset in some sections of the university to switch over
Opportunities	– information and knowledge gained through the various electronic data bases
Threats	–Cost (Ernet, which is going to increase the service charges); Maintenance because the grants are not enough; Power bills

Computer Centre

The Computer Centre along with Campus Network Facility (CNF) is the main hub of ICT translation in UOH. ICT governance decisions if it is related to University management system, is taken up by the Registrar, Finance Officer or Controller of Examination. The Vice Chancellor is also involved in certain cases. ICT requirements and goals are based on the regular day to day activity of the University and depending on the needs. Interview with Mr. C. Pradeep, Systems Analyst and Incharge Campus Network Facility (CNF) highlighted the Policy issue. Right now there no clear ICT policies to give directions but decisions are taken based on the requirements. Policies are there in bits and pieces (E.g. for email, for applying for an account, having general access, how guests are to be treated). As far as CNF is concerned, policies and governing rules for the users exist but as a whole ICT policy is not there. CNF is decentralized and works as an independent entity. There is not much hierarchy. The

committee meets once or twice a month. For driving the network need, there is a committee called empowered committee for campus network and computer center communication cell (ECCNF) The committee takes the decisions based on the in charge's recommendation. The ECCNF body takes decision whether certain thing related to ICT should be carried out, generally it will be need based.

In terms of external influence, NKN which is being used as of now is providing better deal for bandwidth. Ernet charges are too high. Since in-house staff cannot have all the expertise, certain services are outsourced. Outsourcing comes up for better services. However, very small amount of requirement is outsourced e.g. hostel Wi-Fi is outsourced and then CNF takes care of the maintenance. The administrators feel that there is a need to tighten the security; more discipline has to be brought into the network to avoid misuse. There is feedback mechanism through mail and blogs (including VC's blog) depending on that CNF is catering to the needs of its users CNF is also planning to set up a help desk. University management system has been automated partially and CNF is trying to look at cloud computing opportunities. There is data storage to store all the logs from Finance Office, Administration and Academic section based on the requirement placed. For administration it is for 10 years so data storage is scaled for ten years. For network one year storage is required but the space required is huge. Most of the time hunting for log is very time consuming as it is located manually. CNF is looking at Computer and Information Sciences department to provide data managing tool. ICT acquisition part is looked after by individual users. Domain knowledge experts acquire the required softwares, in respective departments. Only operating software are centrally acquired. Users buy hardware as per the need of the department. Since UOH already

had infrastructure, the university went for just connectivity 1 GB, under NKN and Centre for Development of Advanced Computing (CDAC) project. NKN will still take some more time to stabilize. CNF is looking at more inputs from the university. CNF expects that their users put in more inputs/feedback to enhance the connectivity.

“...and behave like sensible users, we can’t keep checking, so if the users can take care of more sensible usage then we can concentrate on providing better services”.

As far as funding is concerned, UOH does not have much problem. There are provisions where some projects can be taken up under UGC and PURSE grant. However, no specific ICT4E projects have been taken up from CNF side because of lack of staff. “It’s a challenge, we are providing services for quarters/ hostels departments and to take up all these we need good staff”. CNF is sending staff for regular training. There is collaboration internally with departments. In some departments the department labs are maintained by students. Users are more ICT literate to a certain extent, which makes it easier for CNF.

The following are the Top ten visited Sites in UOH (as on Jan 2012) according to CNF record:

1. <http://www.addshare.net/index>
With AddShare one can upload files, images, videos, audio and flash for free.
2. <http://www.dailymotion.com/in>
The website has the latest music videos, short movies, TV shows, funny and extreme videos. One can Upload, share, and embed videos. Dailymotion is a video sharing service website, headquartered in the 18th arrondissement, Paris, France. According to Comscore, Dailymotion is the second largest video site in the world after YouTube.
3. <http://www.nptel.iitm.ac.in/downloads/113104058/>
The website has Educational Videos Lectures, Courses, Classes from National Programme on Technology Enhanced Learning (NPTEL) and Indian Institute of technology (IITs) (Kharagpur, Bombay, Delhi, Chennai, Kanpur, Guwahati),
4. www.mail.google.com/
Gmail: Email from Google
5. www.microsoft.com/
Website provides product information, support, news from Microsoft.
6. <http://www.mxn.com/>
MXN Ltd., is a fully integrated multimedia and investment firm that acquires, develops and deploys innovative web properties.
7. www.youtube.com/
The Video-sharing website, created by three former PayPal employees in February 2005, on which users can upload, view and share videos
8. <http://www.dailymotion.com/in>
A video sharing website
9. <http://fileserv.com/>
It facilitates free Online Storage and file upload with 500GB File Storage.
10. <http://www.debridmax.com/>
DebridMax provides instant download of files, on hosts like Megaupload, Megavideo, Rapidshare, Fileserve and more. It offers a multi-platform hosting completely free.

Number of students visiting Computer Center in a day as on Jan 2012 is 220 (approximately); the number goes up to 400 in some cases.

Table 23- SWOT Analysis (Computer Centre)

SWOT Analysis (Computer Centre)
Strengths - Administrative support; Staff and users ICT literate; Cooperation and coordination from other departments.
Weaknesses - Shortage of ICT staff
Opportunities - Catching up with new technologies; attempt to provide as much technology comfort as possible.
Threats - catching up with technology (in some cases, it takes six to seven years to switch).

The following sections covers engagement of the key actants (non-human) and translation of “their interests into visions, objectives, plans and roles (interestment)”.

ICT infrastructure Resources and Practices

In University of Hyderabad, “research and teaching are both primary missions, and they are considered equally important for faculty and institutional success”. University of Hyderabad has an officially designated Centre for Knowledge Innovation and Culture Studies. The institution has an advisory body that deals primarily with ICT issues related to research, teaching and learning. The central ICT organization has “a distinct unit with the explicit mission of supporting faculty, students, or other researchers with their research needs”. Based on responses gathered from stakeholders it is seen that level of importance of high-performance computing at the institution can be seen maximum in “Teaching and learning in the case of research in Science and Engineering and to a moderate extent in other academic areas”. The respondents felt that following would most help the central ICT organization support more effective research use of cyber infrastructure applications and tools computing resources:

“Increased funding for central ICT infrastructure

Increased funding for central ICT services

Increased communication/outreach between researchers and central IT”

A comprehensive plan with proper funding in this regard is required.

Knowledge and Information sharing appear to be the first steps to harnessing ICT’s full potential across the institution. “The research suggests that effectiveness of integration of ICT resources is strongly positively associated with level of knowledge of campus administrators about certain ICT technologies. Collaboration with Virtual

Communities deals with facilities and support for teleconferencing, for hosting collaborations with off-campus researchers, and for the operation of remotely located research instrumentation and related devices; and with support for identity management and associated middleware in collaborative research activities”. It was noticed that research use of collaboration within virtual communities at the institution is used often by a few personnel only. Collaboration within virtual communities used by researchers at the institution are funded to a large extent by Research funds awarded to the researcher or lab and to a moderate extent by funds awarded to the institution and Campus central ICT organization funds. Small extent of funding comes from funds made available through collaboration/s with other higher-education institution/s and other campus funds. The institution has documented inventory of the collaboration within virtual communities resources used for research for all collaboration within virtual communities.

Information Communication Technology Governance

Accountability and Integration: At University of Hyderabad (UOH), the Campus Network Facility In-charge and the Head of Computer Centre is accountable for and has the authority needed to meet his responsibilities for providing sufficient storage “for research data, providing security for research systems, providing space and environmental support for research, ICT resources owned by campus entities other than central ICT, providing support services for research ICT systems, such as system administration, identity management, and help desk; enforcing the research community’s compliance with national regulations regarding privacy of data, providing sufficient network bandwidth for research, providing sufficient network

bandwidth for teaching and learning, providing ongoing maintenance and support for ICT resources obtained with one-time research funds. Facilities exist to encourage researchers to partner with the central ICT organization to achieve economies of scale in the use of cyber infrastructure resources and share cyber infrastructure resources with other researchers on campus. The staff of the central ICT Unit feel that they have been very effective at integrating - bringing together into a seamless whole a wide variety of human, software, and hardware systems to form a platform for enabling activities in research and in teaching and learning”.

Status and Alignment: Systems Analyst and Campus Network Facility In-charge mentioned that a documented institutional plan and ICT strategic plan is under development that outlines strategic priorities for the institution as a whole. The ICT strategic plan primarily addresses central ICT issues and initiatives. In UOH, Academic goals and ICT are aligned; the ICT unit is “able to develop important IT policies that apply throughout the institution (e.g. security, privacy, business continuity) and to coordinate the activities of ICT personnel effectively throughout the institution”. Primary drivers for pursuing formal ICT governance at UOH involve:

1. aligning ICT goals with institutional goals
2. applying performance metrics/accountability frameworks to ICT
3. cost reduction/increased efficiencies and Regulatory/audit compliance

The stakeholders felt that the primary barriers to pursuing formal ICT governance are:

1. Lack of institutional leadership support
2. Governance structures/processes insufficiently coordinated
3. Difficulty in developing campus policies and procedures.

Performance: At UOH, the Computer Center and Campus Networking Facility agree on measurable goals for ICT; organize regular measurement and reporting of ICT performance; incorporates measurement and reporting in ICT governance process and see to the satisfaction of the important stakeholders in relation to ICT services and operations. However the study revealed that regular review of the effectiveness of ICT governance processes is missing. UOH makes use of service level agreements, external review of the ICT function and Institution-designed performance measures as part of its ICT governance processes.

Assessing ICT governance performance respondents from CNF feel that ICT governance at the institution is influential in producing “cost-effective use of ICT; effective use of ICT to enhance teaching and learning; effective use of ICT to enhance research and effective use of ICT to enhance administrative processes”. Formal ICT governance structures (e.g., committees) and processes; Guidance from institutional strategic objectives; Communication of ICT governance processes and decisions are typically considered most responsible for successful ICT governance outcomes at the institution. Informal relationships among concerned parties, Non-inclusion/non-participation of stakeholders, Lack of support of executive leadership are listed as typically most responsible for unsuccessful ICT governance outcomes at the institution. The study showed the need to fortify ICT governance by pursuing higher maturity and better performance by adopting inclusion and shared decision making.

ICT Management and implementation: The senior ICT leader of the institution is a member of the Chancellor’s committee. The Vice- chancellor plays the role of cheerleader/champion in institutional ICT planning efforts. The senior ICT leader

participates in institutional planning, including non-ICT planning. The Vice - chancellor is characterized as a strong supporter of ICT implementation in the institute. The institution's ICT infrastructure is recognized as an important institutional asset and the leadership at the institution understands the value of ICT. Planning and reporting performance are important activities that are closely linked to the budget allocation process. The organizational climate of the institution can be best characterized as dynamic. Significant achievements have been documented based on the implementation of ICT strategic plan. ICT strategic plan influences decisions of academic and administrative units.

Institutional ICT priorities are tied to institutional budgetary procedures. The top three triggers for changes to ICT priorities are:

1. changes in the external environment (economy, marketplace)
2. new institutional leadership
3. new demands for ICT services

ICT Workforce Leadership

This section seeks understanding of the issues and concerns of current ICT leader and the broader ICT workforce. The responses are from the Head and staff of the Computer Centre and Campus Networking Facility. At University of Hyderabad, ICT is decentralized. The current overall organizational climate as per the ICT leader is considered Dynamic where change is continuous, orderly, planned, and navigable. In the past two years, the ICT leader has attended an academic disciplinary organization's meetings. The ICT leader feels that attending general ICT conferences

and independent reading of current ICT news/developments contribute most significantly to professional growth and development.

The ICT leader uses formal professional development plan to help select development activities sometimes. The Head of Computer Centre does not have a mentor to advise him on his professional growth and feels that having a mentor is not critical to career development. The Head of Computer Centre feels that ability to meet “future institutional technology objectives would be significantly threatened by a shortage of skilled workers. Job sharing and more varied job assignments will be most important to the ICT organization’s ability to maintain an ICT workforce adequate to meet institutional needs in the next five years”.

Institutional Data Management

In the past 12 months institutional data which includes Administrative systems data, Video/audio content available online, “Institutional web (domain.edu) content, E-mail, Research data, Library digital content available online have increased. UOH currently has the infrastructure it needs to effectively manage institutional data viz. Administrative systems data, Video/audio content available online, Institutional web (domain.edu) content, E-mail, Research data, Library digital content available online. Research storage managed by Computer Center on behalf of institutional researchers is about 60%. Total Computer Center disk storage needs will increase in the next 12 months by 50%.” UOH is considering implementing an enterprise directory within the next 12 months. The institution has fully operational “automated role- and privilege-based authorization (i.e., giving access to electronic resources using privileges or

permissions derived automatically from affiliations and groups) and a federated identity solution. The institution's identity management capabilities provide sufficiently granular user data access authorization”.

At UOH, the “Leadership and Users are demanding improved institutional data management capabilities; and improved institutional data management is a strategic priority”. The primary drivers for investing in data management are:

1. improving academic unit operational efficiency
2. supporting new applications/systems
3. improving user access to data.

“None of the data has been classified at this time. UOH has a governance structure for setting data access policy. The institution has a documented policy for defining individual employee responsibilities for data security practices, acceptable use of institutional data, encryption of institutional data on user devices, notification of affected parties following data breach, sharing, storing, and transmitting of institutional data (e.g., with or to ISPs, external networks, contractors' systems). In the past 24 months, zero to 30 % breach incidents have occurred at the institution that required notification of affected parties”.

Data Analytics: The most active users of Data Analytics tools are “Central admissions/enrollment management staff, Central administrative staff and Central academic/student services staff (e.g., registrar, financial section). The institution uses its reporting, modeling, analysis, and decision support capability to usually monitor operational performance such as budget to actual data. The institution plans to

significantly upgrade its reporting, modeling, analysis, and decision support capability in the next two years”.

Content and Records Management: “An integrated enterprise content management solution that manages the widest possible range of content would best describe the institution's environment for enterprise management of digital content. Web content management; Document management (i.e., imaging, search, and other document management focused on operational needs; Records management (i.e., managing/archiving official records for regulatory, financial, or historical needs) implementation is in progress. Three years from now, an integrated enterprise content management solution that manages the widest possible range of content is anticipated in the institution’s environment for enterprise management of digital content. A web policy/planning committee have primary responsibility for determining the look and feel of the institution's primary website (domain.edu homepage and subordinate pages). Computer Center, Public relations, Registrar, Faculty representative(s) are currently represented on this web policy/planning committee. In the next three years, video streaming/download, audio streaming/download and videoconferencing will be the most important to add or enhance within the institutional web environment in order to meet constituent expectations. UOH has an enterprise portal which has a dedicated portal content management system. Faculty, staff and students use extra-institutional web-delivered (cloud) services in preference to institutionally delivered equivalents sometimes. UOH has a group responsible for overseeing electronic records management but does not have a designated archivist or records officer. Documented electronic records retention schedules are available for student records,

human resource records, financial records, research grants records, staff e-mail and faculty e-mail”.

Research Data Management: In the past three years “use of high-performance networking, use of high-performance computing and amount of research data storage has increased and is expected to continue increasing in the next three years. The School, center and individual researchers, labs, or teams research data storage are responsible for placing the requirements for research data backup and recovery; assisting researchers with creating or fulfilling research data management plans; support metadata creation for research data and support investigators in the selection and use of research tools (e.g., visualization, data mining, statistical analysis, etc)”. The technical aspect of which is supported by the CNF and information content is supported by the Library. “UOH has a documented policy defining ownership of research data and this policy asserts that the institution owns research data. This policy also permits a third party to own research data that results from contract research. The institution has documented policies regarding investigator responsibility for compliance with privacy/confidentiality regulations relating to research data; investigator responsibility for sharing research data with other researchers; research data security and retention of research data. The institution assumes responsibility for archiving research data after investigator projects are concluded in most cases. UOH in terms of adopting new technologies can be considered early adopter. The current overall organizational climate at the institution is Dynamic (change is continuous, orderly, planned, and navigable). Managerial control can best be described as highly decentralized. Institution’s leadership is committed to evidence-based decision-making and to making management information widely available”.

ICT Services Sourcing

UOH's goal for ICT is to provide "IT infrastructure and services that further the institution's strategic goals". The institution's leaders' general view of outsourcing any function or service is Strategic i.e. it is the institution's preferred option where possible. The pressure to contain ICT costs is strong and to reduce energy consumption at the institution is moderate. In general, executive leaders at the institution believe that alternative ICT sourcing strategies reduce ICT costs and improve service. It is expected that in the next three years, alternative ICT sourcing strategies will help the institution meet users' expectations for technology capabilities. Adoption of open standards to support the expanded use of alternative ICT sourcing strategies is rated high. The executive leaders' general view of alternative ICT sourcing strategies is Exceptional i.e. it is an option in limited circumstances.

Institution's Use of Alternative ICT Sourcing: At UOH basic ICT services and functions are self-operated (no external providers). The most significant factors that have led UOH to elect to self-operate ICT functions and services are Cost-effectiveness of self operation, Technological limitations of outsourcing and Resistance to change within IT organizations. Institution's adoption of alternative ICT sourcing strategies is likely to greatly increase in the next three years for Enterprise applications, Learning technologies, Infrastructure and User services and support. UOH generally outsources its ICT functions and services to a consortium of institutions. The institution's decision to outsource all of its ICT functions and services will be to improve ICT services, make technology more reliable, bring technology up-to-date and to enable ICT staff to focus on higher priorities.

The institution uses alternative ICT sourcing strategies for specialized research applications, Data center management, Applications development technologies or services. UOH currently employs alternative ICT sourcing for Primary data center provided by a third party, “Contract with a third party to provide ERP project management and Contract with a third party to provide network design. Institution’s adoption of the alternative ICT sourcing strategies are likely to increase in the next three years for Application software via the Internet (Software as a Service) , Internet or “cloud”-based storage, Internet or “cloud”-based software development environments ,Contract with a third party to provide desktop computing support, Contract with a third party to provide ERP project management, Contract with a third party to provide network design and Contract with a third party to manage network operations”.

The best provider of this alternative ICT sourcing is government source. Stakeholders mentioned that if this service or technology were to fail, it would have a moderate impact on the Institution. The most significant barriers UOH had to overcome in order to implement an alternative ICT sourcing strategy for this technology function or service are:

1. data security risks
2. institutional leaders’ reluctance to outsource jobs
3. lack of trusted alternative IT sourcing providers.

High importance is given in the institution’s decision to improve IT services and enable ICT staff to focus on higher priorities; while moderate importance is given to make technology more reliable, bring technology up-to-date, gain access to greater

technical expertise, gain access to greater management expertise; and minor importance is given to reduce risk and to reduce energy consumption.

E-Mail: The primary factors that led the institution to decide to have its primary student e-mail hosted by a third party are to Enhance functionality, Enhance reliability, Enhance security and to Enable ICT staff to focus on higher priorities. Data privacy risks, Data security risks, Technological limitations of third-party hosting and Insufficient benefits of third-party hosting are the most significant barriers that had to be overcome prior to having its student e-mail hosted by a third party. Performance of the hosted e-mail in Reducing ICT costs, Enhancing user satisfaction, Bringing technology up-to-date, Making technology reliable, Enabling ICT staff to focus on higher priorities, Improving access to technical or managerial expertise, Securing data, Maintaining data privacy and Reducing risk is considered very satisfactory.

Networking in Higher Education

Approximately networking capabilities are provided for about 5,000 users - faculty, students, staff, etc. Five UOH staff and five from Outsourcing agencies are employed in the Campus networking facility. The CNF provides local area network support to all departments and schools. Wired and wireless network accesses are available to Administrative offices, Faculty offices, hostels and some classrooms.

External and Remote Connectivity: UOH physically connects to providers of Internet (commodity and advanced) services through “Leased circuits directly to ISP location and Co-location of network facilities of ISP. The institution connects to University system wide network, Regional research and education network and National research network – NKN. The institution rations its Internet bandwidth to different areas (e.g. dorms, classrooms, administrative offices, labs). UOH provides Virtual Private Network (VPN) capabilities for network access for the Staff. The institution has implemented and is considering further implementation of converged services [data, voice, and/or video using the same network infrastructure] to combine infrastructure and support staff and to provide enhanced services (e.g. VoIP, video streaming)”.

“UOH operates an advanced high speed network (>100 Mbps). Applications that are in wide use in the institution are enhanced educational applications, enhanced collaboration tools among institutions, Research applications (e.g. use of remote instruments), sharing of high bandwidth content across institutions, Medical applications, Grid computing, Legitimate peer to peer applications. UOH has implemented Quality of Service (QoS) to provide enough bandwidth for important applications, to prevent non-critical applications from consuming excessive bandwidth, to lay the foundation for VoIP and to lay the foundation for IP video”.

Network Access, Support and Management: Login to an authentication server is “required for access to network resources and services via Wired and Wireless network. All jacks are active by default. Central networking group cannot deactivate a port. UOH utilizes network monitoring (real-time or other) tools for Monitoring utilization of network, Monitoring network traffic levels and patterns, Monitoring the

availability and performance of key servers, Monitoring the availability of services or applications, Identification of devices connected to the network and Intrusion detection. The institution's network management tools are Standalone products supplied by a variety of vendors, Part of a commercial suite of network management products, Open source tools". Network support is centrally available to users during working hours.

Networking Practices: Access to selected "TCP/IP ports is blocked, Access to certain Web sites is blocked due to their content being objectionable or due to their content being dangerous (virus, spam, etc.). The actions taken to minimize the impact of P2P file sharing tools or other bandwidth consuming applications on network performance" are blocking the use of P2P applications on the network, monitoring the amount of bandwidth consumed by each user and creating policies about consuming excessive bandwidth.

Planning and Current Issues: Institution's goals for its network can be best described as to "provide high-speed networking to the entire institution. The top drivers of the institution's continued investment in networking technologies" are:

- “adherence to a strategic ICT plan/strategic networking plan
- availability of new technology
- need for additional bandwidth
- needs identified by academic community”

The “top three consumers of network bandwidth at the institution today are Research computing, Web traffic, Non-academic student usage (P2P file sharing, online

gaming, etc.) The top three barriers identified in the delivery of networking services are:

Non-academic student usage (e.g. File sharing, online gaming, etc.)”

Enforcement of policies

Security issues

“Network-related metrics are used for reporting to management, identifying and correcting network problems, identifying capacity constraints, improving service to users, planning for future upgrades and justifying the need for investment in the network. The primary sources of funding for central data networking operations are Annual ICT budget allocation and Grants. The institution will make its largest investments during the next three years on Network components and software, Wireless networking, Cable plant expansion or upgrade, Network management tools, Additional bandwidth and Additional network staff to expand its Networking practices”.

Messaging and Communications

Enterprise Communications: CNF has estimated that for meeting faculty/staff members’ and students’ messaging and communication needs, the importance of the following technologies at the institution in the next three years will increase: institutionally provided e-mail services, VoIP-based landline telephony, Mobile telephones with Internet capability, RSS feeds, Blogs, Wikis, Campus portal,

Learning management system, Conference/classroom videoconferencing, Social networking websites such as Facebook, MySpace, etc.

Outsourced e-mail services will decrease whereas; there will be no change in (private branch exchange) PBX-based landline telephony. The respondents feel that the institution's current messaging and communication infrastructure meets the institution's current needs and will meet the institution's needs over the next three years. As per the senior ICT leader, the messaging and communication infrastructure is accurate, timely, reaches its intended recipients and accomplishes its communication goals. UOH has a central directory service (e.g., Active Directory, LDAP) that stores information about users of the data network and offers broadband Internet access to residential students. In general, the individuals who determine which official information from the institution is disseminated to various constituents (faculty, staff, students, others) understand the communication preferences of those constituents. The central ICT organization understands the communication preferences of its constituents.

E-Mail and Calendaring: Faculty, staff, students have an institutional e-mail account. In the next three years, the number of e-mail systems hosted at the institution will not change. The Campus Networking Facility hosts the institution's primary faculty/staff/student e-mail system. The primary faculty/staff e-mail system was developed by an open source software provider. The institution's electronic records management policy has been enforced consistently for faculty/staff e-mail. 10% of e-mail arriving at the institution is spam. An effort at reducing the volume of spam carried by the institution's e-mail system(s) has been very effective. In the next three years, the

overall volume of e-mail transiting the system will increase. Only certain individuals (roles) are allowed to send official e-mail messages over the Internet to large groups of recipients. Institution's policy at limiting who sends official e-mail messages over the Internet to large groups of constituents has been very effective.

Mobile Communications: The institution does not use SMS text messaging as a medium for official, non-emergency communications. Mobile communication at institutional level does not exist. However, central ICT organization provides technical support to any faculty, staff, or students for web-enabled, handheld mobile communication devices such as BlackBerry and iPhone.

Crisis Communications: The institution's crisis communication plan is being developed. The e-mail channel and institutional website of the institution system will perform effectively under peak demand if emergency notification is required.

Wireless Data Communication: UOH has already implemented limited wireless data communication. The institution implemented wireless capability in 2007. The wireless implementation is part of institution- wide initiative. The primary barriers to adopting wireless data communication are unproven/technology not developed enough, have other ICT priorities and security concerns. The scope of the institution's current wireless data communication implementation is Campus wide and this implementation includes outdoor use. 50 % of the campus geographic wise is covered by wireless networking (geographic area defined as the area encompassing all academic, administrative, residential buildings). In 24 months from now, 50 % of the campus geographic wise would be covered by wireless networking. There are no

particular standard for wireless cards. Students in the institution are not required to have notebooks /laptops though 50% (approximately) of students use notebooks /laptops. Wireless access is provided to all the students. Campus Network facility helpdesk maintains the wireless ICT infrastructure in the institution and provides support to end users. 5 - 10% of institution's overall ICT budget sources funding for wireless implementations. Institution's overall ICT budget, Specific Department's budget, ICT supplier donations source the funding for wireless implementations. Approximately the wireless network serves 4000 students and 400 faculty/staff. Easier mobility compared to wired networks, ability of wireless networks to meet growth in institution's computing needs, improved student access to network anytime, improved faculty access to network anytime, improved access to commuter students, competitive pressures (other institutes have implemented wireless networks), for institution to be perceived as leading edge are some important reasons of the institution's decision to implement a wireless network. Some of the key challenges faced in implementing wireless data network are Security issues and End- user support issue. Overall respondents feel that the wireless data network so far has met expectation.

Information Communication Technology Funding

The senior ICT leader reports to the Vice- chancellor. The administrative computing, academic/research computing and data communications funding requirements are reported to the Finance Officer at the institution. All revenues are collected centrally and expenses are allocated to each department. The senior ICT leader must seek approval from more senior officers for moderate central ICT

expenditures. The Finance Officer greatly influences all expenditure decisions for administrative systems, desktop computing, and networks within campus buildings, instructional / academic/research technologies, web support services. A complete vendor-supported “Enterprise Resource Planning (ERP) system” has been implemented. In the last FY, the institution’s approximate central ICT budget amounted to 5 to 10% of the total budget allocation. The approximate percent change in the size of the institution’s central ICT operating budget in the past 3 years is 10 to 15%

Direct government allocation for specific technology expenditure is the major source of ICT funding. There has been no significant decline in central ICT budget since FY01 nor is any decline in the institution’s level of one-time investment in technology foreseen in the next three years. Largest one-time investments during the period of last three years have been made in academic/research computing, instructional technologies, ICT security, network services and web development/hosting. The most important investments have been for academic/research computing, administrative systems and data center/computer operations, desktop/user support services, ICT security. According to the Finance Section, the central ICT budget contains adequate funds to maintain critical ICT operations reliably, to keep current with vendor mandated upgrades, to research and experiment with emerging technologies, to respond to new user needs and interests, to implement the institution’s stated strategy for technology.

The base ICT operating budget always increases sufficiently to maintain new technology. According to the Finance Officer the institution currently provides

sufficient funding to meet its strategic objectives for administrative computing, academic/research computing, data communications, instructional technology, administrative computing. The fastest growing components of the ICT budget in the last three years have been hardware purchases, network equipment, software purchases, hardware and software maintenance contracts. The budget allocated to technology once it has been implemented, is maintained through separate annual budget request and included in the project budget. The cost of major upgrades to vended software is funded from existing ICT operating budget. The institution is pursuing an explicit strategy to increase the flexibility of the ICT budget by moving more costs from fixed to variable. There is value in increasing the variable portion of the budget, but the institution has been unable to do so. Remaining budget balances are partially carried over into the next fiscal year.

Consultants from consulting firms and contractors are sometimes used to provide expertise, not present in the ICT organization. External software development firms are sometimes used only to absorb spikes in ICT workload. Presently ICT-related functions within the institution viz. desktop/user support services, ICT security and network services are outsourced for maintenance. The primary drivers to outsource are improved service quality, annual cost savings, lack of in-house expertise and reduced risk. In the next three years, use of outsourcing will stay the same. The senior ICT leader, with the guidance of the Finance Officer “has the responsibility to manage and monitor the ICT budget on a day to day basis”. The background of the individual who manages the ICT budget (Finance Officer) is marked as someone who has prior position in financial management at this institution,

prior position at the institution, prior position in higher education and prior position in a budget office.

Emerging Financial Strategies: There is no pressure to reduce the costs of ICT services; UOH is focusing on ICT to improve the budget. The need to reduce central ICT costs is driven by general institutional budget climate calls for cutbacks in all expenses and need to create financial flexibility to invest in new ICT priorities. ICT cost containment strategies currently pursued are outsourcing, eliminating duplicate ICT organizations on campus, minimizing the number of technologies supported on campus, use of open source technologies, shared implementations of technology with other institutions through INFLIBNET. The use of external software development firms is critical to containing costs in the future. The institution will become more likely to pursue shared ICT services (with other institutions) as a way to reduce ICT costs. Centralized management of technology is more cost effective than decentralization. The respondents mentioned that UOH is receiving substantial value for its investments in ICT. The institution is working to increase the resources available to fund technology by expanding the use of charge-backs, pursuing technology transfer, pursuing corporate partnerships, pursuing grant funding.

Table 24- SWOT Analysis (Finance Section)

SWOT Analysis (Finance Section)
Strengths: Exclusive networking and qualified system managers
Weaknesses: changeover, resistance to change; lack of committed approach to knit together diversified setup; gaps in coordination
Opportunities: Global support and offers e.g. Microsoft; the Finance section feels that UOH as an educational institute should explore to attract many schemes; NKC,

INFLIBNET further offer more opportunities through networking

Threats: question of continued funding and Capacity building.

ICT in Research

“Research and teaching are the primary missions, but research is what really drives faculty and institutional success. UOH leadership has identified key areas for research excellence and is focusing attention and resources in these areas. Institution’s reputation for academic research is rated as excellent. Current overall organizational climate at the institution is Dynamic (change is continuous, orderly, planned, and navigable). The University has several specialized centres for specific research in different areas. The institution also has a medical school/health sciences center. In the past three years, computation-intensive research at this institution has increased. UOH places high priority on research, use of information technology for research, recruiting faculty who will do research, on inter-disciplinary research, on multi-institutional research”.

Institutional Perspectives on ICT Support for Research: “In the past three years, the number of ICT staff in the schools, centers, and departments who support research has stayed the same. The stakeholders feel that improved collaboration, governance, and decision-making over total (central and departmental) ICT spending for research would lead to significantly higher quality research. Ad hoc consultations on an as-needed basis arrangement are made by central ICT organization in its engagement with researchers around the ICT aspects of their work. Central ICT resources are allocated for research support. The institution engages in long-term planning exercises

to determine researchers' needs for ICT infrastructure and support services. The strongest drivers identified for the institution's overall investment in ICT related to research are Current demand for research support from the faculty and Institutional goals, priorities and strategic directions. In the past three years, activities at the institution have increased in the area of interdisciplinary research, multi-institutional research, number of faculty engaged in research, use of remote instrumentation, use of high-performance networking, use of online library resources and amount of data storage. Computer sciences department provides the central ICT organization with input and guidance on their research-related ICT needs for infrastructure and support services”.

ICT Infrastructure and Support for Research: Central ICT provides research-related ICT support services such as “selection and use of standard research applications (e.g., SPSS, research databases, etc.), software application programming and development, selection and use of research tools (e.g., visualization, data mining, statistical analysis, etc.) providing collaboration tools (e.g., videoconferencing), Software lifecycle management (e.g., upgrades, version control), Training classes, ICT consulting services (e.g., issue-specific problem-solving) and maintaining vendor contracts for hardware and software purchases. The central ICT actively coordinates with schools, centers, or departments for research-related ICT services. Central ICT organization is experiencing the fastest growth in demand from researchers for ICT support services in Software lifecycle management (e.g., upgrades, version control), ICT consulting services (e.g., issue-specific problem-solving), Planning for ICT infrastructure for research in new facilities”.

External Relationships and Consortia: UOH directly connects to University system wide network and INFLIBNET. “The greatest benefits from participating in a consortium, partnership, or shared services arrangement for ICT research infrastructure and services as stated, are Cost savings, Lowered barrier to entry for researchers, Opportunity for research in a wider range of disciplines, Opportunity for inter-disciplinary research and Opportunity for inter-institutional research”.

Central Library

“The Library supports study, teaching and research activities of the university by acquiring the learning resources and providing information services that enhance their usefulness, accessibility, and availability. The library also provides special workstations and software for visually-challenged students. University of Hyderabad is one of the few universities in the country which provides books in Braille (418) and other facilities and services to differently abled students as per the UGC guidelines. At present there are around 115 physically-challenged students and 12 visually-challenged students pursuing various courses in different schools and departments. The IGM Library provides barrier-free access to the book stacks and reading halls. There are separate computer workstations with special software for Visually-challenged students. The library has 5 computer workstations with JAWS and Kruzwel speech synthesizer software installed. In addition, there are two systems with 'Zoomex' readers to scan and convert image into text on the screen to enable the students to hear and also save the text. The library also provides free cassette tape recorders and audio tapes to visually-challenged students on their ID cards”.

ICT Facilities

“Workstations used by library staff: 35

Workstations used by library users: 42”

Total library staff strength: 77

Approximate number of users that the library serves: 6000

Approximate number of visitors (if known) to the library per week: 400x7

The library has its own Web site which is maintained directly by library staff:

<http://igmlnet.uohyd.ernet.in:8000/>

“The Computer Section in IGML is the hub of computerized activity of the library i.e., the back-end of automation activities in the library. Library Server is connected on the Campus-wide Local Area Network apart from connecting all the sections of the library with structured cabling using Switches and Hubs located in different levels. In all over 70 computers in the library are connected. The section is vested with responsibility of maintenance of all the systems, network, Internet and e-mail facilities, training the users, data validation, merging etc. All the staff members are trained to handle the Library software, Operating System, Proxy server, Scanner operations, Networking, Internet and CD based resources etc., apart from rectifying minor trouble shooting in the Hardware, Software, UPS connectivity, Database maintenance. This Section is also involved in practical demonstration of computerized activities to the visitors to the library apart from training the PGDLAN Students. This section handles various activities like Bibliographic Search Services from Library holdings, Union catalogue of 30 major city libraries, Union catalogue (Books, Serials, Thesis/Dissertations) of Indian university libraries from INFLIBNET

(Information Library Network) and also receives references from major databases whenever request received from Faculty/Scholar”.

“IGML has the distinction of being the first University Library in India to have fully automated its entire house keeping operations. The Library started its automation activity in the year 1989, by procuring a PC-AT Intel 80286 with 4mb RAM, 80mb Hard disk, MS-DOS operating system. Initially some programs were developed in dbase III+. During the year 1990, integrated library application software (LIBSYS) was procured using XENIX as operating system; an integrated library application software provided facilities for acquisition, cataloguing, circulation and serial control and OPAC (online public access catalogue) to provide quick search of books to the users. During the year 1991, the hard-disk was upgraded from 80MB to 200MB and again upgraded in 1993 its systems by acquiring a new PC 80486 system with 3 VT-220 terminals and UNIX operating system. During the year 1994, with the special grant from the UGC under modernization of library facilities, the library acquired a mini computer system DEC Alpha 2000 model with 6 GB hard disk, 16 numbers of 80386 PCs, 4 multimedia printers, 7 drive CD-ROM network servers. Library has started using Bar-code technology at the circulation desk for issue and return transactions. By February 1995, the library could convert all the book records i.e. 2, 35,000 volumes of data base by entering the data from the shelf list catalogue cards and was made available for campus wide access across the Local Area Network (LAN) for the benefit of users in various Schools/Departments”.

“During 2001, the Library switched over to VTLS software package for Library Automation and Digital Library. Users can search the database by author,

title, classification number, subject, Journal title, Accession Number to know whether a book/document is there in the Library or not, its status with reservation facility if the book is issued out. Users can also access the new books list from OPAC. Multimedia links are provided to enable users access digitized text of Thesis and few books and web pages of Journals to access Table of Contents, Abstracts and also the Full text. Library initiated linking the scanned pages of Table of Contents to Language Journals and few Indian Journals, where publishers are not providing such links. Library has in-house ICT support staff and receives ICT support from parent organization's ICT staff. A little amount of support and technical trouble shooting is available from non-ICT specialized library staff. Non-ICT specialized library staff and their ability to deal with minor and day-to-day ICT related problems is rated as reasonable. Non-ICT specialized library staff have to deal with Network access problems, Hardware problems, Software problems, printing problems, support of other staff".

ICT Expenditure

“Hardware: Expenditure on computers and equipment, network components and telephone systems; Purchase, hire or lease; - Installation and maintenance is Rs.33 lakhs

Software: Purchase/hire/licence fees for usage or development of software is Rs. 12 lakhs

ICT services: Service and consulting services, incl. purchasing and funding of staff training is Rs. 1 lakh (average)

Communications: Usage and other charges for network and Internet access/bandwidth at its central facility, charges are not applicable in this section.

Total Annual Expense amounts to Rs. 7 lakhs”

“ICT Strategy and Policy: The library has an ICT strategy. (ICT strategy means an official, written plan containing objectives and guidelines for acquisition or usage of ICT by the library). ICT strategy includes ICT infrastructure, ICT security policy, Library user services via the Internet, Electronic purchasing, Library user ICT facilities acceptable use policy and Library Web publishing policy”. UGC’s ICT for Education policies have an effect on the ICT strategy of the institution’s library. The library ICT strategy makes reference to the same, it is receiving support in terms of internet connection and on-line databases through UGC-INFONET and INFLIBNET. New library building with modern ICT facility, Radio Frequency Identification (RFID) system are planned in the library strategy in the next 12 months.

“The IGM Library has undertaken the following Turnkey Projects in facilitating knowledge network”:

“University has signed a Memorandum of Understanding (MOU) with Dr. B.R. Ambedkar Open University to computerize the Open university Library and provide network facilities in their academic departments.

University has signed another MOU with Hyderabad City Grandhalaya Samstha to computerize City Central Library, Ashok Nagar. All the library Housekeeping activities will be automated and the 89 branch libraries will be connected. When the project gets completed, this library will become the first public library in the

country to have computerized activities with e-mail and Internet access apart from providing the CD-ROM databases and on line search facilities to its users.

Social Sciences Union Catalogue of Periodicals in major libraries in Hyderabad and Secunderabad - This is a Major Project done under IDPAD (ICSSR) by Dr. E. Rama Reddy, University Librarian (retd.), covering 4455 unique titles in Social Sciences in the 25 major libraries twin cities of Hyderabad and Secunderabad. This will help for sharing the resources, eliminating duplicate journals and essential tool to locate the retrospective information from the major libraries”.

“Union Catalogue of Periodicals in the twin cities libraries- The library has compiled a 3 volume Union Catalogue of Periodicals and Serials subscribed by 25 major libraries in the twin cities of Hyderabad and Secunderabad. This Union catalogue is expected to help resource sharing and as an essential tool in locating the retrospective information from the major libraries”.

In an interview Dr. M. Koteswara Rao, University Librarian IGML mentioned that adoption of ICT in library has been a very gradual process. In 2008, six lakhs book were scanned. The major challenge has been shifting from lower end to higher end, migrating/adopting/conversion. In some cases data was lost. At every stage library staffs have been trained. In some cases vendors were hired; staffs have been trained nationally/internationally. Being an academic residential institute, the library support is considered very important. Library forms the first academic support. IGML is given priority and importance in the university teaching and research. Since the students are mostly PG students, the library does not have problems with the students not being able to use the library resources. However, the Integrated students simply

have no idea how a library works since they are right out of school. IGML gives flyers to guide them and also provides some orientation courses. Some don't even know how to use computers. Hence a lot of importance is given to user orientation. Circulars are sent to all the HODs to send the freshers for orientation as part of their first semester learning. Unfortunately the departments are not being able to provide a slot and this has hindered the capacity building effort. Changes have been noticed in the library, because of the online journals/books, research scholars have literally stopped coming to the library. Researchers can access the required information from their rooms. The demand for online resources has increased. The budget for online resources is about four and a half crores. The budget is now 50-50 % for online resources and print copies.

“Once upon a time we had 1100 titles in print now it's 515 to 520. In five years time the demand for print has come down to half. If the access is down for 1 hour we get hundreds of calls. We are the highest users of Elsevier, Wiley data base in India”. IGML had corporate members of library online resources but for over a year, this has been stopped. IGML is not outsourcing of its resources anymore to prevent misuse. Dr. M. Koteswara Rao mentioned that as far as NKN is concerned, unfortunately the infrastructure has not been able to take the load and speed. There is compatibility problem since IGML has a lower end set up. There is a need to switch and transfer. IGML has benefited from NKN. The bottleneck is internal viz. infrastructure and management. Dr. M. Koteswara Rao further mentioned security issues though information should be freely available; to facilitate that a log in name and password for each user is provided. Restrictions are considered necessary for which there is Network policy, and Web Policy. There are plans to have Remote

access policy too so that faculties travelling outside can access the university website. However there are security concerns in extending this facility. IGML is also planning to have an open access repository of all thesis and researches funded by the government and papers written by UOH faculties. IPR and security concerns are seen as the main issues in this aspect too.

Table 25- SWOT Analysis (Library)

SWOT Analysis (Library)
<i>Strengths:</i> Infrastructure (ICT, e-resources, server, software), Support Services, Trained library staff (in both theory and practice about ICT in libraries), Management support; efficient feedback mechanism, flexibility. Capacity to meet user demand e.g. server is on 24 hours, laptop zone is there, request/ on demand journals and books. Return on Investment: usage statistic for every electronic journal subscribed. If the usage is very less, it is unsubscribed. Funding is another strong point as in UOH library has always been given top priority.
<i>Weaknesses:</i> Shortage of qualified library staff with ICT skill, difficulty to recruit or retain ICT qualified staff (lack of applicants/prohibitive salary demands); lack of coordination and integration among different departments so the same work is repeated by different departments. Computer center needs to be the hub of all activities which is not happening – “may be they lack the leadership”. “ICT is given fair priority in the University ... somehow we are lagging in integration”. SWOT analysis revealed that support services are weak, this is a bottle neck. External support is not continuously coming because of the internal system (tendering, delays) though they are not directly related; they still have effect on the services delivered.
<i>Opportunities:</i> ICT is helping in surveillance; earlier lots of books were lost. IGML can provide good services to users (ICT, e-databases); UOH’s reputation also serves as an opportunity in enhancing its network; easy implementation of ICT due to skilled staff is another plus point; IGML’s attempt to build a hybrid library where whatever the user wants, the library buys, otherwise it lies in the stacks will give more advantages. The need to expand networking, infrastructure, remote access, have anti-plagiarism software in order to be ready for tomorrow; laptop schemes for students to purchase laptops at subsidized rates. Correspondences are happening via email e.g. to return a book, the user receives an email. IGML plans to go a little further by using sms. <i>Threats:</i> security and monitoring is a major concern; too many users even from outside, problem in dealing with the number; Network security threat and proper utilization of library e- resources. There have been cases of e- resources being downloaded and sold to corporate by students.

Distance Education Programme

Enrollment for Higher education is very less in India. Only 12% go for higher education. According to UGC and MHRD reasons for fewer enrollments are because of lack of flexibility in learning; universities being located far away; people wanting guaranteed education which is job oriented. XI th plan kept the target to increase enrollment for Higher education by 15% XIIth plan target is kept to 20 % Government of India has given directions to IITs and Central Universities to go for ICT based learning; to bring education at doorstep. UOH started distance education in 1994. Prof. S. Jeelani, Director Centre for Distance Education strongly feels that ICT can change the dynamics of education. The overall response has been pro ICT. Recently UOH had a meeting with MHRD for a proposal of converting the courses to ICT based e-Learning. MHRD has come forward with documents in mission based ICT learning. The approach is Four Quadrant approach:

1. Textual – digitizing stage
2. Multimedia
3. Simulations
4. Wikipedia

Prof. S. Jeelani mentioned that if UOH is to receive funding for ICT based learning, they have to send proposal in this Four Quadrant format for converting existing course into e Learning. MHRD will be funding Rs. 70 lakhs per course. 5 hours of regular learning is equivalent to 30 minutes of eLearning. Distance Education Council has been encouraging UOH to go for ICT based learning; and the Centre is under the process of converting. The centre has already converted text books

into soft copies and is providing audio lessons. These contents can be loaded in mobile phones for mobile learning. The centre at present is in stage 1 of the quadrant (Textual – digitizing stage) and soon expects to move to stage 2, 3 and 4 as per MHRD standards. ICT based teaching is expected to give equal quality of teaching even in the study centers and this should help in bridging the knowledge gap. Prof. S. Jeelani feels that learning has to be flexible but at the same time quality of evaluation cannot be downgraded. In order not to compromise on the quality of evaluation, students will have to come to the campus to give exams so that standards are maintained. The Centre is trying to encourage ICT usage by reducing the fees structure by Rs. 2000/- for students who opt for soft copies of study material as printing cost is also saved. Students however prefer hard copies as most of the rural students are still not equipped with ICT system. The Centre expects that ICT will catch up. In Distance education, Mobile learning supplements has better chances of picking up as mobile phone is available everywhere. Mobile phones, TV/ DVD based learning are good options for now. UOH will provide both methods (hard and soft copies) for some time to help the students transit to ICT based learning as all are not prepared. Prof. S. Jeelani asserted that ICT is the future of learning.

Most of the students enrolling for the courses are already employed working at different levels who take up these courses to enhance their skill. Employed students would comprise 60% house wives 20% and fresh graduates another 20 % The Centre also has students from rural areas. UOH does not have study centers. Prof. S. Jeelani mentioned that if study centers where to be there, probably 70% would be from the rural background. For now only those who can afford to come to Hyderabad are joining courses offered by the Centre. The courses offered are PG Diploma courses

for skill enhancement/Add-on courses and less of regular degrees. Interdisciplinary component of courses offered in regular mode are being offered in distance education. For collaboration UOH is also tying up with institutes like National Institute of Rural Development to offer a PG Diploma in rural development; similarly with NARM for agricultural technology management course. The Centre is planning to go for eLearning with these two courses first as these courses have the necessary infrastructure. As per MHRD direction for PPP (Public-private Partnership) the Center is collaborating with National/State institutions. The center has recently signed MOU with GVK for offering a small certificate course in Bio-informatics, because they are the pioneer in Bioinformatics course with excellent lab facility.

Prof. S. Jeelani considers e-Learning method cost saving and going for eLearning, with subsidized fee structure will have more students coming forward. The Centre plans to help the students in ICT adoption by providing training facilities on how to use these technologies. Keeping these policies in mind, UOH named the centre as “Centre for Distance and Virtual Learning”. The Centre feels that student intake can be increased once ICT based learning is fully launched. The older method has been restrictive as it is difficult to accommodate all the students for contact classes. Funding, according to Prof. S. Jeelani is a major challenge. “Government of India should come up with more financial assistance for government institutes. As of now the government is having the policy, but they are mostly encouraging premier institutes like IIT. They have to liberally encourage central and state Universities, colleges with good package of financial assistance so that the infrastructure can be developed properly since ICT based learning initially requires lots of investment. We have end number of institutions in our country who are willing to provide the

eLearning solution, if we have the budget. There is no specific scheme for ICT based learning. We are just purchasing some computers, infrastructure etc. but GOI should come up with clear cut funding for eLearning, that too in a liberal way. Some incentives should be given both for students and for those implementing to promote eLearning”. The need for clear policies for eLearning is thus required. There is also a shortage of ICT trained staff and faculty. Another challenge seen is in the context of Students and ICT. Most of the students are not equipped with computer maybe only 30% according to Prof. S. Jeelani, have computers. Even if they are equipped, they are not comfortable with ICT as they are not used to it. Main hurdle is also the contact course which is compulsory for 10 days. Students from other parts of the country find it difficult to attend. ICT based learning should help in solving this where education can be delivered at their doorstep. But the question also remains as to how far students are equipped to receive ICT based learning and the facilities. “In a couple of years we should be able to go completely the eLearning way. But we would still like to maintain some of the conventional ways of delivery for the benefit of the rural students”.

Table 26 - SWOT Analysis (Distance Education Programme)

SWOT Analysis (Distance Education Programme)	
Strengths	–ICT has been initiated in the Center, nomenclature of the centre has been changed to Virtual learning centre.
Weaknesses	– Financial constrain the main constrain for now.
Opportunities	- increasing access
Threats	– Security and IPR of content.

“Deans and Head of Departments”

“Deans and HODs are responsible for looking into the overall functioning of their respective Schools and Departments. Permission for setting-up of computing laboratories facility is given by the Vice Chancellor on recommendation by the concerned School Board on receiving proper justification from a department. Such specialized Labs may be funded by other funding agencies through research projects, or through departmental plan grants”. Interviews with the Heads and Deans of several departments highlighted the following issues:

ICT Access is leading to usage for information search. ICT in classroom is used mainly as a communication and presentation tool (email and ppt) not at the level of knowledge building and sharing tool. The HODs feel there is a need for capacity building to know what to do with which ICT tools; and to be ‘ICT illiterate’; they also feel there is a lack of individual enterprise. There has been negative feedback from students towards using Learning Management System (LMS) used in certain cases; learning environment has not been conducive. Peer to peer influence does not exist. Some feel there is lack of incentives to motivate ICT4E. Teachers feel ICT4E “should be incorporated at Institutional level and not at individual level” for successful usage. Infrastructure support is ample but ICT funding at decentralized (department level) needs to be incorporated. Awareness of right software is required e.g. Free and Open Source Softwares and Open Education Resources (FOSS, OER). Though the importance of ICT4E is accepted, teachers are still comfortable with the traditional form. ‘Still prefer chalk n board’. There is the question of comfort level of Digital natives and Digital immigrants. Respondents estimated an approximate of 10 % of

students not having prior ICT exposure. Fear of technology, fear that ICT will lead to plagiarism, fear of dependency on Technology, reliability of information from the internet and security concerns are key concerns in relation to ICT adoption. Heads of some Departments mentioned that usage of ICT will increase accountability which some staffs would not prefer. Some faculties think that using ICT would be like putting their courses in the web - for absentee audience. Others feel that ICT usage in conventional universities is not like IIT (or other technical institutes) where organized policy implementation takes place.

Discussion with Heads and Deans also brought forth the issue that flexibility which ICT can bring still needs to be incorporated. It was felt that there is lack of flexibility. Education and ICT is not Learner centered, it is institution centered. Some expressed that ICT support system/services are not adequate. There has been negative feedback about institutional data management. Trained Staff (non Teaching) are not using ICT rigorously which is also effecting the academic functioning directly and indirectly. Specialized ICT4E cell is required to keep up to date. Attempts are being made in some departments for collaboration with the industry. There is still lack of awareness of ICT4E and national knowledge society policies. Hence the study highlights the need for contextualization of ICT and knowledge society policies required. Some expressed that ICT policy implementation lacks focus. Respondents in language departments think that use of ICT in regional language is less since the need is less. According to them traditional methods of pedagogy are more suitable. ICT in these departments are used for communication, not for instruction. Some voiced that 'policies are from grand higher level not from grass root level.' ICT is not there in curriculum, language subjects do not emphasize on technology. Major challenge is

also to make application of ICT a regular part of the education system within conventional systems, students coming from diverse background with different level of ICT skills being a factor.

“The government of India is making efforts to facilitate the integration of ICT. One of the issues is infrastructure... we have very good support at the national level; now a lot needs to be done at the institutional level. A lot of it is to do with mindset, the willingness; ICT is not being used/ applied to the extent, as it should be”.

“Bureaucratic hurdle which a lot of university including our university faces is a hindrance. You have to run your curriculum according to the set pattern. In the administrative set up itself, e governance is lagging. We don’t even know where the files are. There has been a lot of talk in the university about ICT... but there has been bureaucratic resistance”.

Respondents also mentioned that within the teaching community, people are glued to things as they are, and they do not find much of an incentive to adapt new technologies into what they have been doing. Some of the more progressive faculties have been working with this new mode of delivery. “The faculty community is quite complacent in thinking we are good teachers, without realizing that there is a huge potential that ICT can provide. All of us are quite slow in adapting this”.

UOH was thinking of starting eLearning using Brihaspati E-learning Platform. Prof. Vinod Pavarala, Dean S N School was asked to coordinate initially. “We tried to put up a Learning Managing System. But there wasn’t much of a community

enthusiasm for doing something like this. We need to revive that effort again. There is no e-Resource centre still. It is only on paper. It's high time we set up something like that and see how that centre can work with faculty members to incorporate eLearning to develop modules for them". A lot of people are under the impression that eLearning is nothing but a digitizing platform, they are not aware about its architecture. University needs to set up an e- Resource centre. It has been observed that even if faculties are interested, they may not have the resources, and they may not know how to do it technically; in-house an instructional designer is required. UOH has a huge knowledge base so the subject matter is not a problem; the requirement is of some technical support. "We have been talking about it for many years but nothing has come out of it. There is no budgetary headline for ICT, if any individual school would want to do something, and then they may allocate some funds. Everything to begin with, must come from a policy. The first thing is get a coherent policy in place".

CNF / computer center deals with the networking facility of the university. But the stakeholders feel that what is required is something beyond that, some kind of a group which is more actively involved in ICT for education. Communication because of the ICT infrastructure has improved a lot. Between students; students and teachers and within the university, the communication systems have been handy. Students/faculties are tapping a lot of the library resources. At the masters' level students are of very diverse backgrounds, some effort is required there to use ICT based resources. "We try to create awareness at the department level, but beyond that, the university needs to put in some effort. Practical knowledge in ICT is one thing; its actual application for education is another. The later requires a university wide effort. That across schools and departments, ICT orientation should be there and every

program needs to have some ICT skill based course. The university could introduce small credits that people could go and learn to take”.

Negative aspect of technology as highlighted by some respondents is dependence on technology when there is too much of it there. “One hindrance is also that extra effort is required to learn how to incorporate ICT. Lack of awareness, not knowing the full potentials of ICT4E, low aspirations; fear of technology” are factors influencing the adoption of ICT4E in UOH. Three major challenges faced by UOH are:

1. Appropriate introduction of ICT based on the requirements.
2. Teaching community to start rethinking pedagogical usage of ICT to make better use of ICT.
3. Create some systematic and planned ICT4E set-up which will be the body that faculties can turn to.

As mentioned in the methodology chapter, the STaR Chart (CEO Forum, 2000) was administered to UOH. Responses generated from the Deans and Heads of different schools and departments are shown in the following tables.

Table 27- Technology Readiness in UOH in terms of Policies and Infrastructure

Scale of 1 to 4 where 1 = Minimal; 2= some; 3= Mostly; 4 = Great extent

Item	Average score
Strategic planning incorporating technology	2.19
Funding for technology	2.11
Technology is appropriately integrated in courses in all departments	1.85
Campus wide faculty development and technical support	2.15
Strategic planning incorporating technology	2.04
Funding for technology internally and via fundraising	2.30
Hiring, tenure, and promotion of faculty with technology research and teaching expertise	1.48
Faculty development	1.44
Program guided by national policies on technology integration standards	1.96
Partnerships with peers around/using technology	1.78
Access to advanced technologies in campus wide facilities	2.15
Access to advanced technologies and facilities in the departments	2.07
Technical support	1.74
Coursework that integrates technology to enhance learning	1.85
Use of online resources to support learning opportunities	1.59
Technology in field experiences and student teaching	1.44
Understanding and use of technology to enhance teaching and research	2.20
Understanding and use of technology by students to maximize learning	1.30
Connect with the relevant industry/market for continuous growth	1.67
Technology for a academic communication with the department/school/institute	2.41

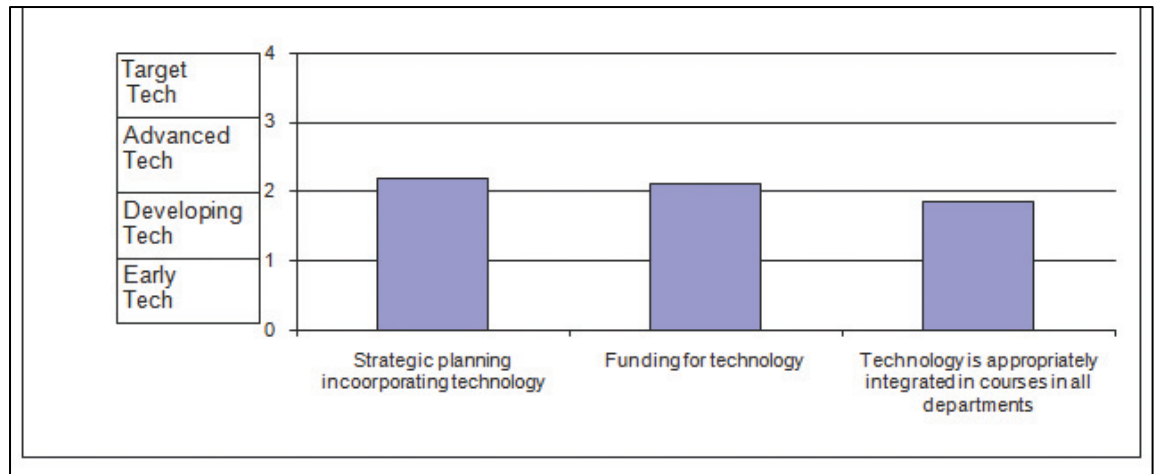


Figure 33 - Technology Readiness in UOH with respect to Campus Leadership

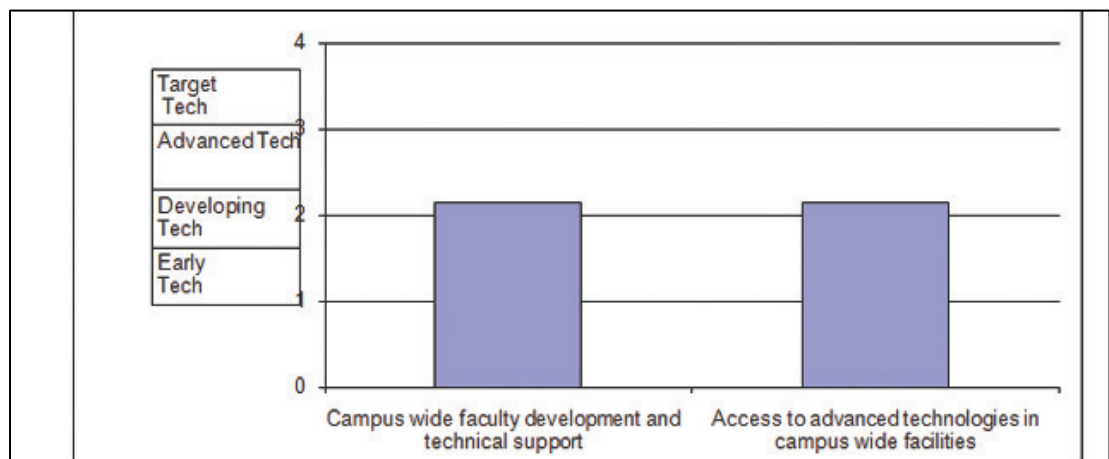


Figure 34- Technology Readiness in UOH with respect to Campus Infrastructure

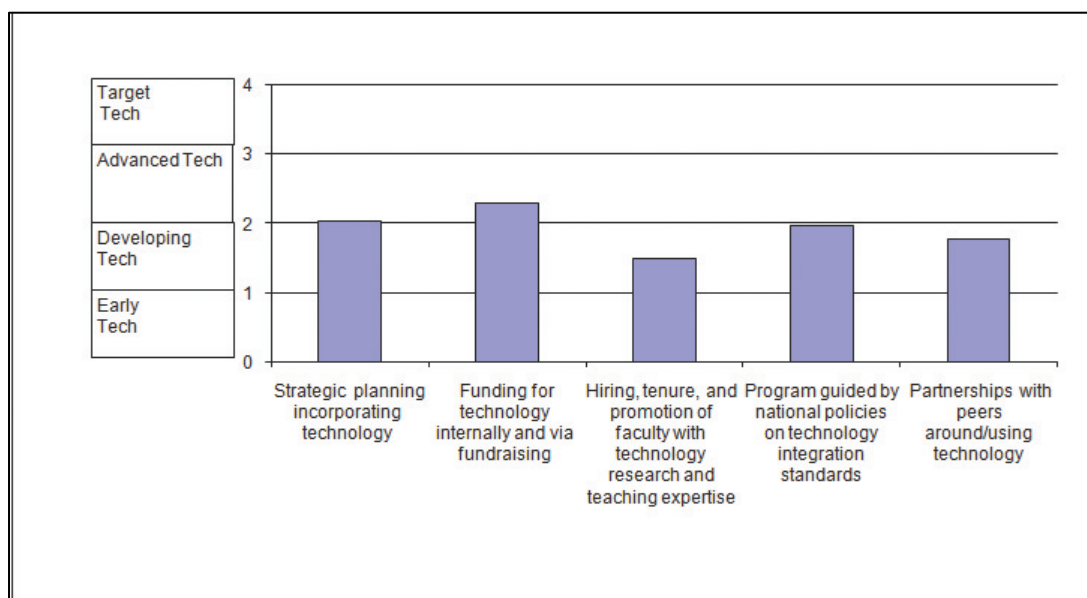


Figure 35 - Technology Readiness in UOH with respect to Schools/Departments

Leadership

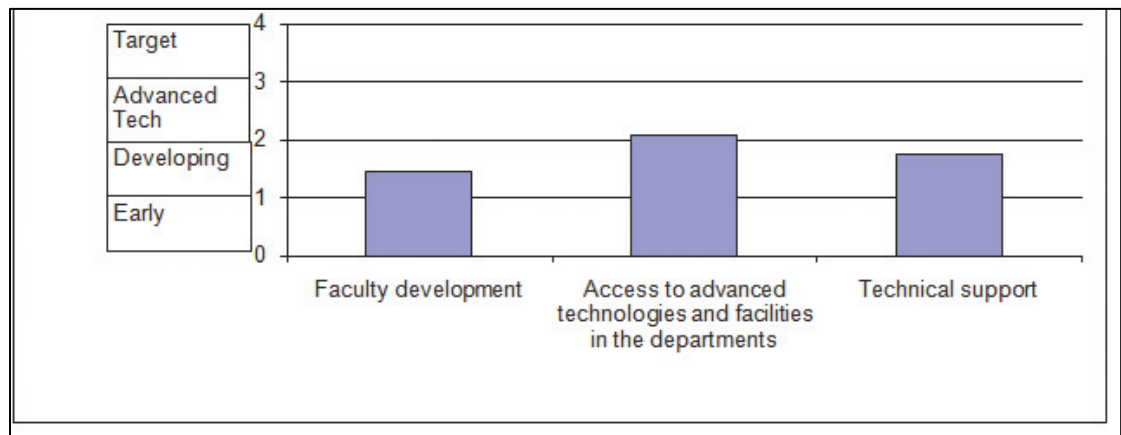


Figure 36- Technology Readiness in UOH with respect to Schools/Departments

Infrastructure

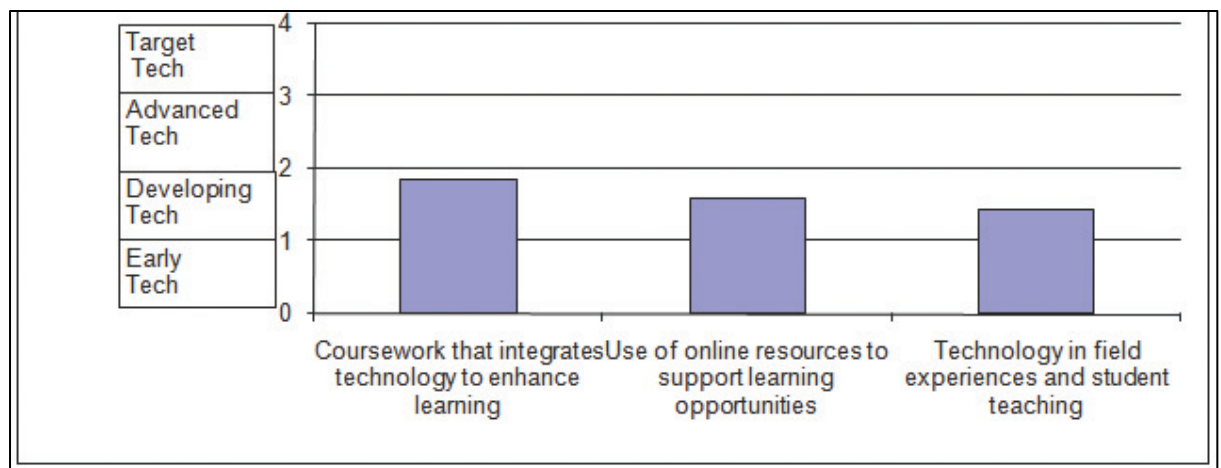


Figure 37- Technology Readiness in UOH with respect to Schools/Departments

curriculum

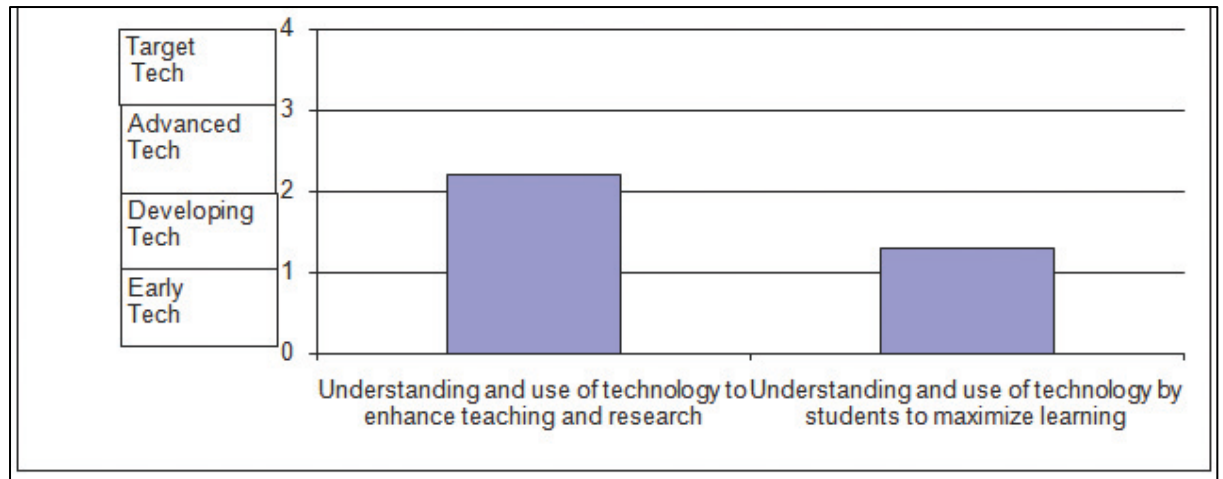


Figure 38- Technology Readiness in UOH with respect to Competence and Use

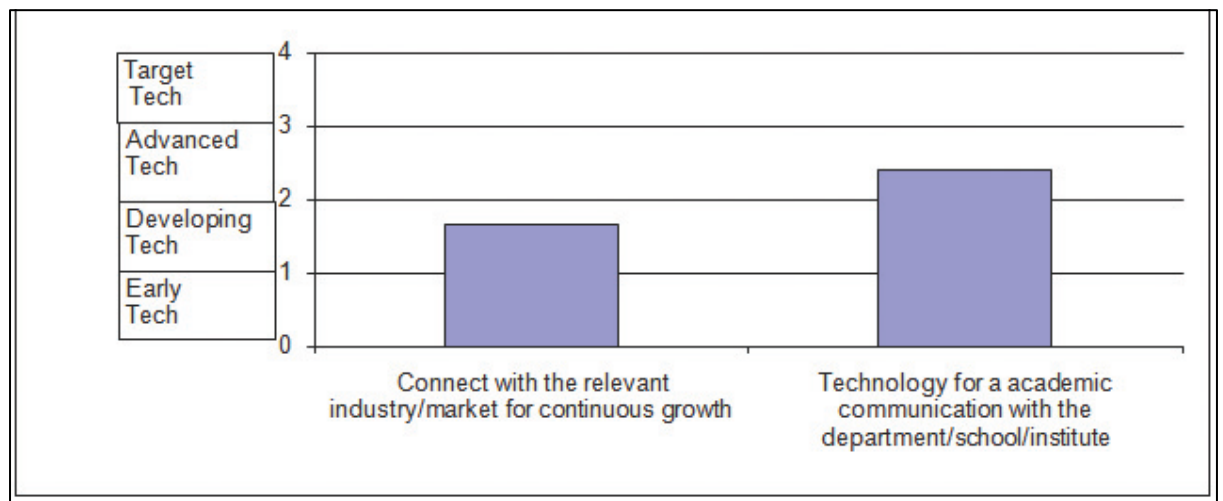


Figure 39 - Technology Readiness in UOH with respect to Connections

Table28 - SWOT Analysis Heads and Deans

SWOT Analysis Heads and Deans
Strengths- funding and infrastructure; Experience, resources, Global access; Accreditation, qualification, Reach, awareness, Location, Capability, Qualification, Availability and access, Knowledge, Data, Innovation aspects; Students being pro-ICT; Competent administrative personnel; students and teachers who have required

skills use ICT extensively for research and accessing information; ICT is frequently deployed for administrative communication in some departments.

Weaknesses –gaps in capabilities, lack of time, inefficient and lethargic support system, few programmes for up gradation, capacity building; funding; lack of interest/curiosity on the part of users; inadequate technical support, inability to provide 24x7 support to students, little use of ICT in teaching, ICT not used for feedback; negative attitude, lack of skills to integrate ICT, lack of knowledge management and support staff for educational resources.

Opportunities- plans to video and audio document all the lectures and make available through ICT; Global influences in information and research, knowledge from all leading journals/books etc technology, market development and partnerships, information, research, teaching, communication. Global opportunities- there is the global trend and environment, the enabling environment is there (though feedback is still slow), New markets, to reach out to the vulnerable population and develop a way to generate, disseminate knowledge through cooperation and insights.

Threats- hacking, misuse, loss of key staff, challenge in sustaining internal capabilities, infrastructure issues, plagiarism and outsourcing of academic work. ICT is a threat to those who fail to adapt.

Teachers: ICT Usage, Attitude, Barriers and Challenges

Depending on the understanding of ICT, teachers from different disciplines have administered the usage of ICT4E at different levels. Incorporating ICT4E is still an individual enterprise. Based on discussions and interviews with faculties across

different Schools and departments, the following paragraphs discuss the major trends observed.

Teachers mentioned that as there is no formal introduction to ICT in teaching, they generally learn from trial and error method. Some feel that administration should provide support and organize workshops for the faculty on ICT4E. Innovations in the usage of ICT resources and exposure are uneven among various schools and departments. Understanding of ICT in some cases is very limited. “ICT is good but it is increasing typist work; teacher has become computer assistant”. There is also the opinion that ICT has made educational method objective not narrative i.e. it is not helping in developing the mind. Far better need for potential use of ICT is not being perceived. The respondents also highlighted the need for encouragement to use ICT. They feel that just providing infrastructure is not enough. Training is lacking, enhancing skills is individual choice of the teachers. Faculties also expressed that Orientation and refreshers course coverage on ICT is not sufficient. “Use of ICT is dependent on individual interest/motivation and there is no overall strategy or support system that encourages faculty to explore, learn and integrate these tools into pedagogy”. Viewpoints of faculties differ as some feel that ICT needs to be integrated in every curriculum while some are of the opinion that ICT is very useful for research/personal acquisition of resources but not for teaching. Some feel ICT is more relevant in some subjects, not all. “I as a teacher would prefer to become the agent of knowledge transfer rather than ICT”. Hence there is the issue of whether a teacher becomes only a facilitator with the adoption of ICT. While this concept is accepted by some school of thoughts, it is being resisted by many conventional teachers. “Old is

gold. Up to Postgraduate level teaching and learning using ICT is not required. At a later stage computer programming and administrative skills using ICT is encouraged”.

Challenges also exist in terms of readiness of students coming from rural background and extra time required while teaching them using ICT. Pammi Pavan Kumar, Lecturer Department of Telugu mentioned that there is technophobia in social science and humanities. “Students face language barrier in using ICT in case of language students. Having said that, Gist machines developed by CDAC to work with 22 languages has helped in improving learning information, networking and increased job opportunities. Our students were looking at only teaching jobs until recently, but now they have joined Media, IT job. One of our students is now in Norway”. Usage of ICT is gradually improving among some faculties in the language department. In some cases ICT is being used to integrate Sanskrit and Science subjects to do quality research. Creating and maintaining online data base is the need of the hour in language domain. Sanskrit Department has started working in that domain. According to a faculty in Sanskrit, ICT is helping in overcoming language barriers. A faculty from Mathematics department mentioned that ICT is used to access journals, look at data. “I do ask students to refer to sites, but can manage without ICT. I started teaching in the eighties; we rely on traditional medium – chalk and board. It is a better medium of expression rather than simulations used and created sometimes. What about ICT accessibility? To an extent, not even LCD projectors are easily accessed”.

Many teachers feel that motivation is lacking in using ICT. While some feel that hedonistic culture, influence of American culture is encouraged with the usage of ICT. Students according to them are unaware of Indian system of learning. Between

indigenous culture and cosmopolitan culture, local seems to be completely ignored. “Education has to proceed near to far, today we are concentrating only on the far. This is reflected even in the education policies. Basic question is, ‘what is ICT for?’ Our policies are hijacking the system for our needs- approach of ICT is fraud, elitist and superfluous”. Some teachers further referred to lack of holistic approach i.e. ICT for larger goal, for empowerment in education. They observed that education policies are not addressing these questions. “ICT is a threat in a subtle way to Indian form of learning/ Indigenous knowledge. We talk about colonialism all the time. But we do not assess how much it is affecting us till now. Our scholarship/system of aping the west is reflected even in our ICT usage. Education (in the Vedas) should be; Shiksha (education) and Diksha (being cultured and civilized). Following the western model we are just giving shiksha. UOH motto in Sanskrit is “Sa Vidhya Ya Vimukthaye (Education results in liberation)”.

However, some sections of faculties consider that ICT has empowered them in bridging the knowledge gap with just a click.

Barriers and challenges

Barriers and challenges mentioned by several sections of teaching faculty include troubleshooting problem even though they want to use ICT; information overload, regular training and special efforts needed for updating in ICT field. Faculties also expressed that ICT facility needs to be upgraded. Some feel the method/policy followed reflects a clash between the goals and the system of education. “ICT is a distant dream when we don’t even have proper infrastructure in the classrooms.” Some of the social science and humanities faculties feel that they are

side lined. “There is a gap/differentiation between the emphasis/funding/infrastructure given to the Science vs. social science and humanities”. Another problem mentioned is that though ICT4E is being talked about, nobody is taking it up because maybe it requires coordination from different front. Faculties mentioned that ICT has to be there at a policy level otherwise it becomes excess baby, extra work. “If things are there (programmer, ICT infrastructure etc.) at the university level, we will be the first one to use, but to demand it at the school level, it is asking for too much”.

Lack of proper representation at national level is another barrier that some faculties mentioned. “As far as National projects are concerned, they pick up a faculty from IIT and ask them to work on a project of developing a course, it should not be done like that. There has to be a continuous effort in making improvements, to upgrade. Whereas now, you submit your project, your job is done. Method of implementation in project mode will not work. What should be done is: Pick a Course and give it to three top Universities and keep on adding, reuse and improve continuously, joint effort. But if you take everything and dump it one place and nobody looks at it afterwards, I don’t think that will work”. Lack of feedback and coordination from NKC is a setback. Faculties feel things should be open in National projects like NKC. “They had sent letters to everyone in the School, some of us did send some samples of courses but there was no response. Not even a feedback. I know a lot of people who are passionate about teaching and would gladly take up these work of contributing to the knowledge pool, they should be contacted. Communication flow should be there, a feedback loop”.

Teachers feel that ICT here is helping more of research rather than its direct application in classroom teaching. Exposure to knowledge pool through ICT makes a qualitative difference in the quality of teaching and learning. “However, just installing a set of computer is not sufficient. Provide facility, and then provide expertise, then the expertise has to grow, it cannot remain static”. Discussions also brought forth the reasons for ICT4E being less effective owing to value system – the culture, evaluation and grading system, where there are no incentives for efforts put in integrating ICT4E. Lack of exposure; Monitoring and evaluation system being weak; students coming from blackboard teaching method in school and colleges not being technology ready are other pointers mentioned.

A survey using stratified random sampling representing faculties across all the department in different schools in University of Hyderabad was conducted (10 Schools; 21 Departments and 21 Centres). UOH had a total of 399 faculties, at the time the survey was conducted (as on 2011).

Professors = 158

Associate Professors = 119

Assistant Professors = 122

Total = 399

This survey aimed to understand how teachers in University of Hyderabad use ICT in their teaching and to collect their views about the enablers and obstacles in ICT for education. The questionnaire had fourteen sections. Each is described in the following section. The “result of the data collected was analyzed using SPSS (Statistical package for social science) Version 10”. The following section show the result gathered:

Table 29- Respondents' main domain(s) of teaching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Science & Technology	29	35.4	35.4	35.4
	Humanities	26	31.7	31.7	67.1
	Social Sciences	26	31.7	31.7	98.8
	Business	1	1.2	1.2	100.0
	Total	82	100.0	100.0	

Figure 40- Years of teaching experience

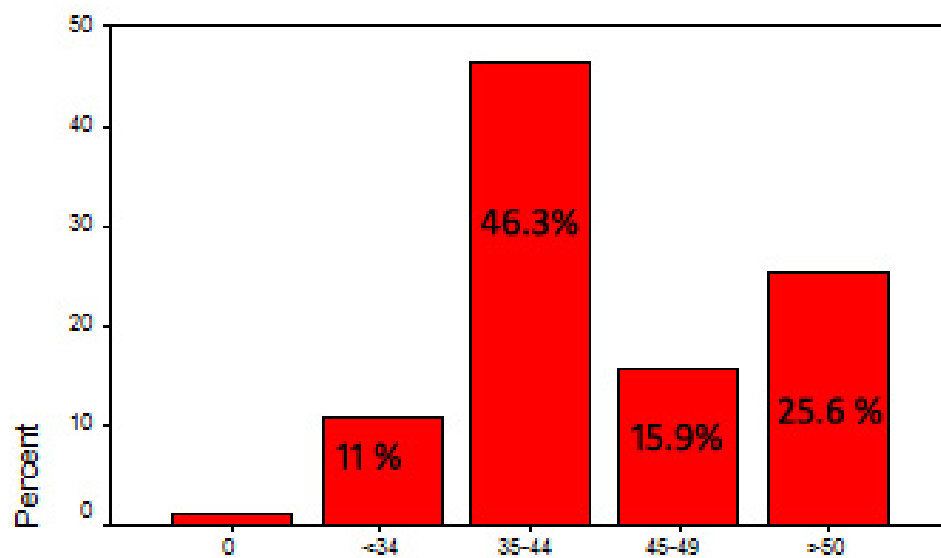
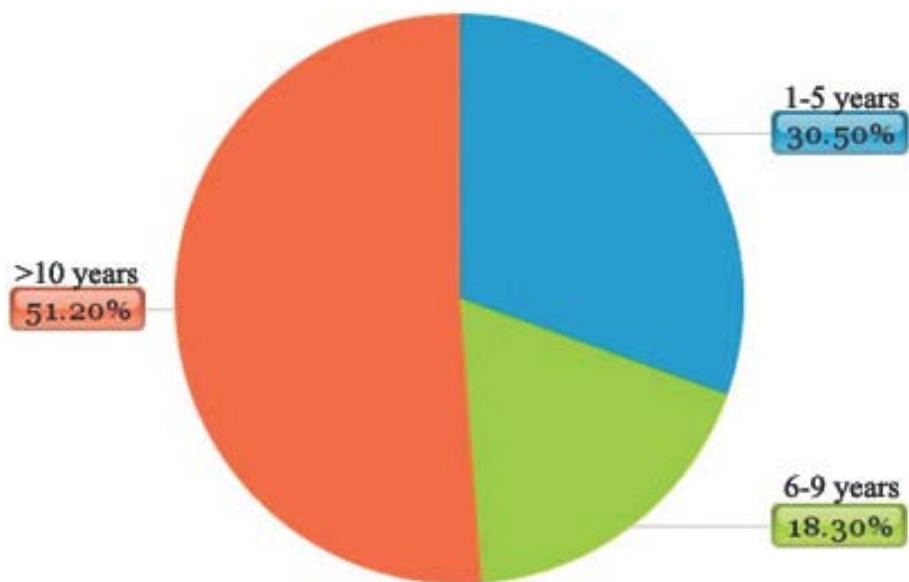


Figure41- Demographic profile: the category of current age of respondents

The survey of faculties in UOH shows that place of most frequent usage of computer/ Internet is in the department (72%). Most of the faculties' usage of computer for academic purpose is more than 6 hours per week (32.9% use 6-15hrs, 13.4% use 15-25hrs and 35.4% use more than 25hrs).

Purpose and degree of ICT usage by Faculties in UOH

The faculties' degree of ICT usage at different levels based on the survey is given below:

“Informative: 89 % faculties use ICT to find, acquire and use information

Functional use of ICT: 74.4 % faculties use ICT .

ICT for Creating Knowledge: 76.8% faculties use ICT to compose, compile, produce new information (write papers, drawing, programming, make PowerPoint presentations, give oral presentations, prepare newsletter, create own website, etc.)

ICT for Communication: 75.3% faculties use ICT to exchange and to transmit information with other students, teachers and others using email and Internet; to join discussion forum and chats.

ICT usage for Collaboration: 64.7 % faculties use Web design tools, multimedia, e-mail, discussion boards, E journals, use technology to simulate research and collaborate with other colleagues (even those situated in different geographical location) and also using Web resources and productivity tools to communicate, search for information, and create new products”.

“Most of the faculties (58.5%) learned to use ICT through Trial and error method. 95.1% have not received any training in information and communication technology (ICT) over the past 3 years while only 4.9% have received some training. For 75.6 % of faculties, ICT is not a part of curriculum in their domain of teaching”.

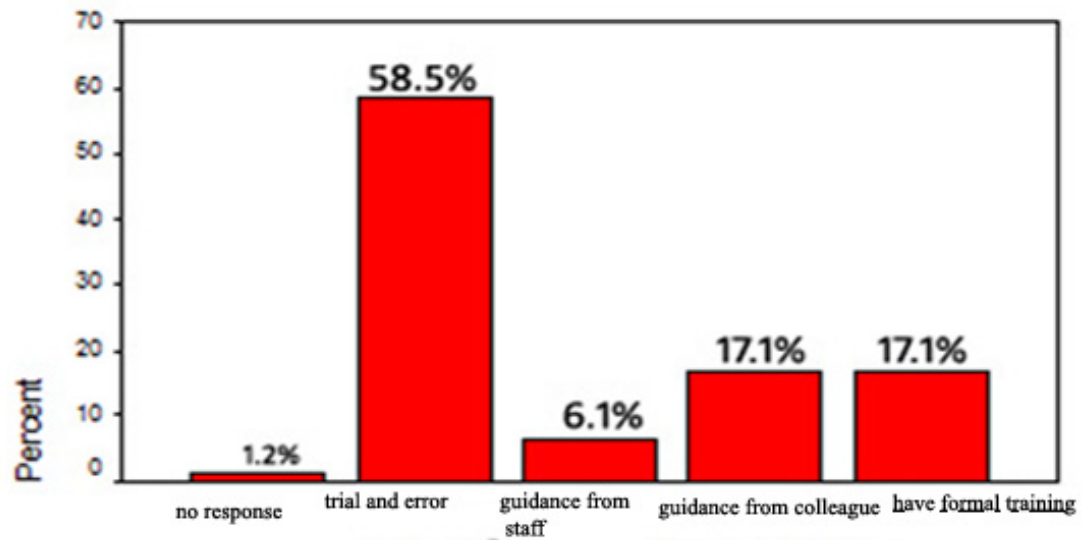


Figure 42- How faculties learned to use ICT:

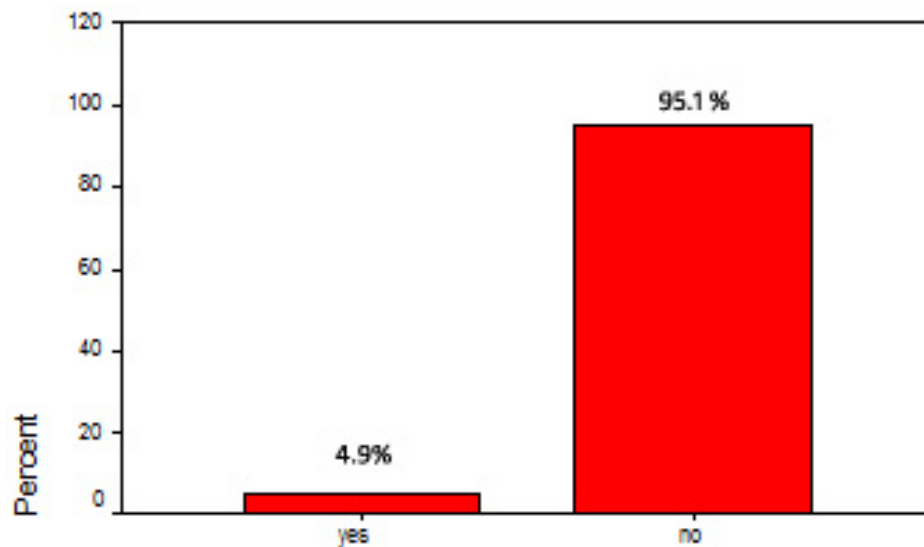


Figure 43- Faculties response on receiving any training in ICT over the past 3 years

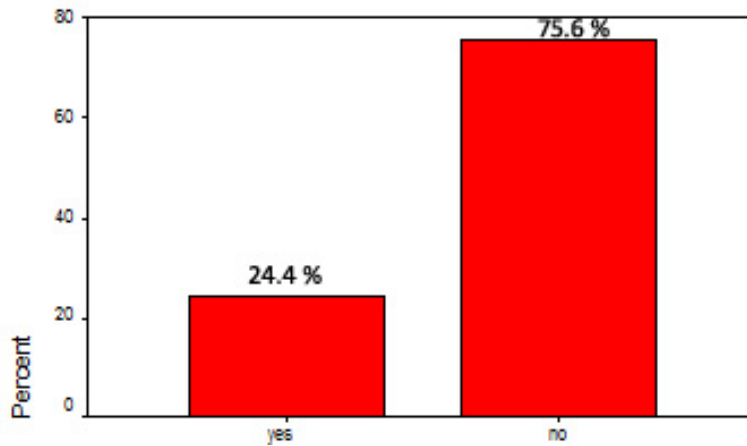


Figure 44- Faculties response on if ICT is part of curriculum in their domain of teaching

Skills and Output

The following responses were gathered from UOH faculties in relation to their ICT skills.

“Basic Skills – Simple use of ICT applications for Purposes both inside and outside the classroom”

- 84.1 % showed confidence in using Word processing software
- 51.2% of faculties are confident in using Spreadsheets
- 79.1% are confident in Presentation tools (PowerPoint) skills
- 93.9% are confident in Basic E-mailing skills
- 86.8% are confident with Internet browsing for information search skills
- 13.7% showed confidence in Web page designing skills
- 28.1% showed confidence in use of “chatting platform” skills

“Intermediate skills – faculties’ use of existing applications for learning both inside and outside the classroom- use of digital learning resources”

- “60.9% of faculties are confident in use of applications (word processing, spreadsheets, etc.) in classroom learning of specific subjects
- 59.7% of faculties are confident in use of various applications for doing assignments and lessons, managing administrative data about my students
- 59.7% of faculties are confident in E-mailing for telecollaboration/online collaborative projects, exchanging assignments and lessons, commenting on papers used in class
- 61% of faculties are confident in use of Internet resources to prepare research, lessons, or for collaborative class projects.
- 27.8% showed confidence in developing basic and static webpage for class”

“Advanced Skills – faculties’ use of ICT to create and develop new applications, Contents, learning materials, etc.”

- 61% of faculties have no capacity to “use statistical tools for developing formulations and Packages”
- 63.4% of faculties have no capacity in Programming, Database development and management
- 52.4% have no capacity to use various applications/Learning Management system e.g. Moodle for doing assignments and lessons

- 64.6% showed have no “capacity in Advanced website designing, maintenance and use for teaching/learning
- 14.7% showed confidence in Use of Free and Open Source Softwares (FOSS), Open Education Resources (OER) to support Class Room teaching
- 59.3% have no capacity in developing and operating e-learning or online learning platforms
- 67.1% have no capacity in setting up and moderating discussion groups and chats
- 19.5% showed confidence in use of Web 2.0 services (e.g. Flickr, You tube, Face Book, My Space) to take lessons beyond the traditional class room set up
- 19.5% showed confidence in use of ICT to collaborate projects with the industry in relation with my subject area”

Overall the faculties showed greater level of skills in Basic skills for simple “use of applications for purposes both inside and outside the classroom and the use of basic E-mailing and Internet browsing for information search. The faculties were also comfortable with Intermediate skills for use of existing applications for learning both inside and outside the classroom which includes use of digital learning resources. The survey also showed that faculties were confident in use of various applications for doing assignments/lessons, managing administrative data about their students and in E-mailing for telecollaboration/online collaborative projects, exchanging assignments and lessons, commenting on papers used in class”. However, they were not comfortable in Advanced skills.

“Perceived Usefulness and Perceived Ease of use toward ICT”

Over all the faculties in UOH “have a positive attitude towards perceived usefulness of ICT that it improves the quality of education” (72% agree). 90.2% of the faculties mentioned that using ICT improves their research and administrative tasks and 73.2% feel that using ICT facilitates new forms of learning in their courses. They also consider that using ICT increases students’ motivation and engagement (56.1% of the faculties) and that using ICT transforms the learning environment into one that is learner-centered (51.3%). The survey also showed that 60.5% of faculties think using ICT is expanding new skills supply for labour market.

Faculties gave a positive response to ease of learning to use ICT(64.7%); making choices with respect to when and how to use ICT in teaching-related work(81.7%); ICT use being less time consuming(67.3%) and use of ICT becoming a normal part of the way in doing teaching-related work (63.4%).

“Teaching styles of teacher educators: The following tables show responses of faculties regarding knowledge transfer and knowledge construction with ICT”.

Table 30- “Knowledge transfer with ICT: I have my students test their mastery of the learning contents by computer”

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	sometimes	33	40.2	40.2	40.2
	quite often	8	9.8	9.8	50.0
	never/hardly ever	26	31.7	31.7	81.7
	often	10	12.2	12.2	93.9
	very often	5	6.1	6.1	100.0
	Total	82	100.0	100.0	

Table 31 Responses to: “I have my students practice learning contents by using the computer”

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.2	1.2	1.2
	sometimes	25	30.5	30.5	31.7
	quite often	12	14.6	14.6	46.3
	never/hardly ever	24	29.3	29.3	75.6
	often	15	18.3	18.3	93.9
	very often	5	6.1	6.1	100.0
	Total	82	100.0	100.0	

Table 32 Responses to: “ I have my students use subject specific educational software”

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	3.7	3.7	3.7
	sometimes	24	29.3	29.3	32.9
	quite often	10	12.2	12.2	45.1
	never/hardly ever	26	31.7	31.7	76.8
	often	12	14.6	14.6	91.5
	very often	7	8.5	8.5	100.0
	Total	82	100.0	100.0	

Knowledge construction with ICT

Table 33 Responses to: “ I encourage my students to look for current sources via the internet”

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	sometimes	16	19.5	19.5	19.5
	quite often	23	28.0	28.0	47.6
	never/hardly ever	1	1.2	1.2	48.8
	often	23	28.0	28.0	76.8
	very often	19	23.2	23.2	100.0
	Total	82	100.0	100.0	

Table 34-Responses to: “My students carry out assignments co-operatively with the use of internet resources like e-mail, MSN, Skype or the electronic learning environment”

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	2.4	2.4	2.4
	sometimes	23	28.0	28.0	30.5
	quite often	16	19.5	19.5	50.0
	never/hardly ever	19	23.2	23.2	73.2
	often	15	18.3	18.3	91.5
	very often	7	8.5	8.5	100.0
	Total	82	100.0	100.0	

Table 35- Responses to: “I give assignments and then my students look for answers via the internet”

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	1.2	1.2	1.2
	sometimes	26	31.7	31.7	32.9
	quite often	14	17.1	17.1	50.0
	never/hardly ever	18	22.0	22.0	72.0
	often	16	19.5	19.5	91.5
	very often	7	8.5	8.5	100.0
	Total	82	100.0	100.0	

Table 36- Responses to: “I encourage my students to use ICT for co-operative learning”

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid sometimes	20	24.4	24.4	24.4
quite often	16	19.5	19.5	43.9
never/hardly ever	17	20.7	20.7	64.6
often	24	29.3	29.3	93.9
very often	5	6.1	6.1	100.0
Total	82	100.0	100.0	

The survey also showed that in terms of obstacles encountered in using ICT for teaching, the greatest obstacle seemed to be the fear of increase in plagiarism with the use of ICT.

Obstacles Encountered towards the use of ICT in teaching

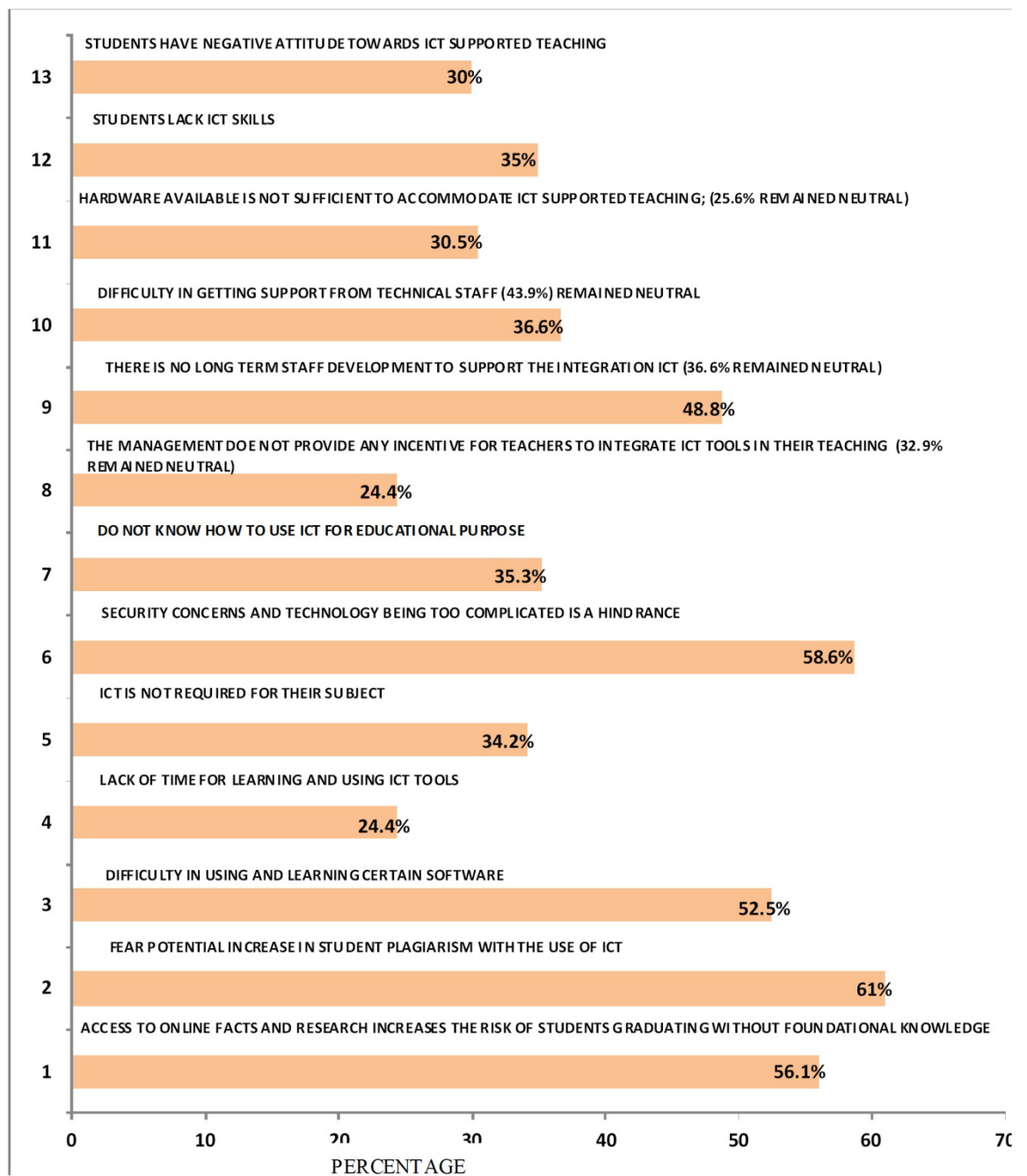


Figure 45--Obstacles Encountered towards the use of ICT in teaching (UOH)

“21st Century Skills”

The faculties were asked to assess the level of preparedness of their students to compete in today’s global marketplace in relation to “21st Century skills (Partnership for 21st Century Skills, 2009)”. The responses show highest level of confidence in their students in the areas of Expertise in field of study.

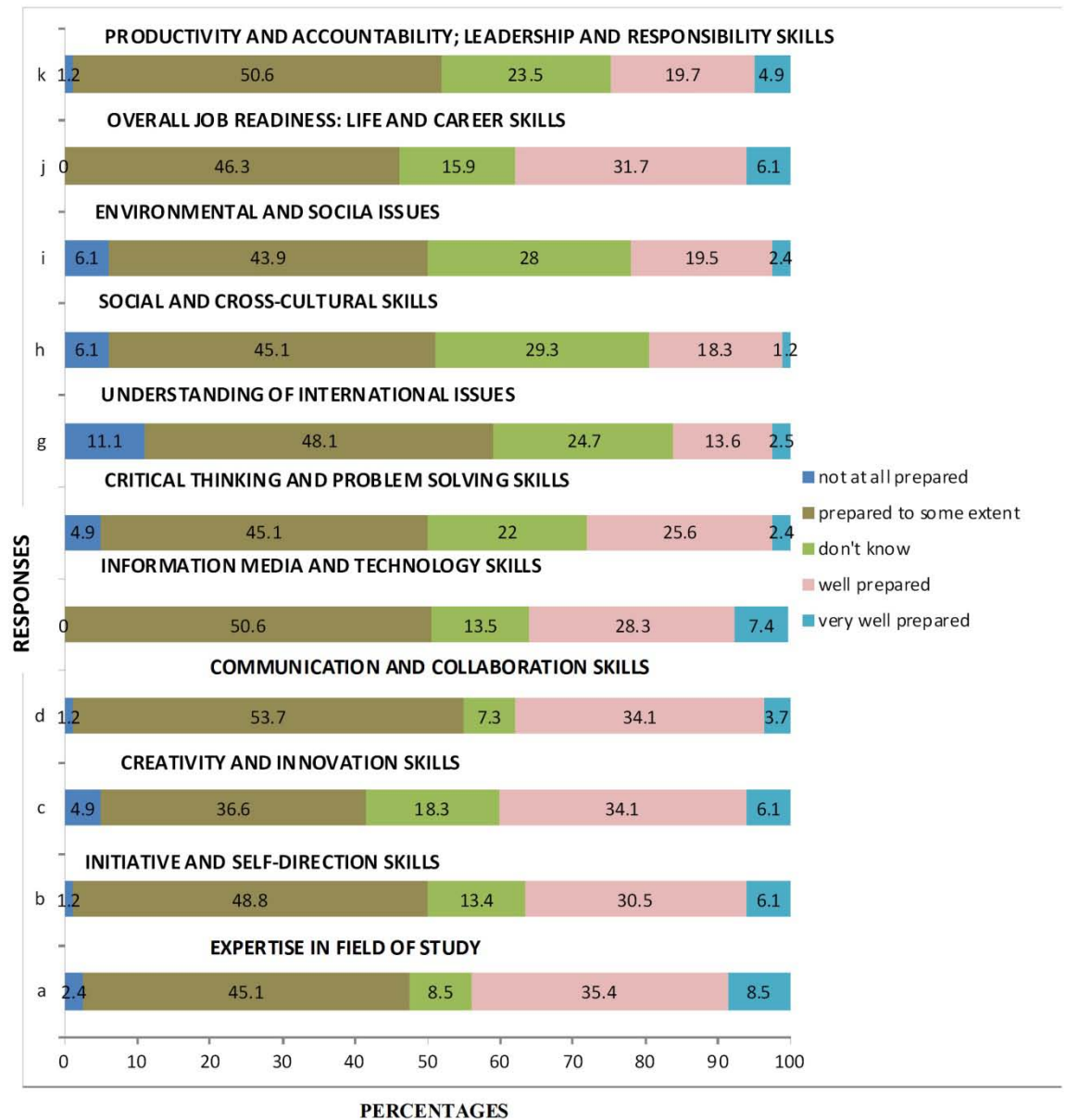


Figure 46 - 21st Century Skills of students (UOH faculties' response)

Case Study of Teachers

The following section covers case study of six faculties from different schools in UOH to get better understanding of how teachers interpreted and translated ICT in their pedagogy.

Professor A.K. Kapoor, School of Physics

Prof. A.K. Kapoor is a senior Professor in the School of Physics. He feels that coming of internet and ICT medium has made things easier and that there are many rewards of using ICT. “A combined class of IMSc students is very large. There ICT plays an important role. Initially some teachers would ask for 100s of photocopies for some lecture notes, we tried to save cost so we introduced something like moodle and uploaded the materials there. Students could access it there”. He has been experimenting with ICT4E using moodle (a learning management system) by uploading materials and link in the web, Lecture material, assignments. However there has been negative response from the students. “They don’t look at it they only look at things that will come in the exam, they just download lecture notes”.

ICT facility and experiences in using ICT4E: Prof. A.K. Kapoor cited that classrooms are not quite adapted to ICT usage. There are some halls with ICT facility but most of the classes do not have ICT facility. There he has to worry about connectivity, carry his own lap top. Some lecture rooms are more equipped. Whenever some detailed explanation is required he looks up for some internet clippings and it has helped. The department has Computer lab but the staffs have other duties and are not competent staff to integrate technology in education.

According to him there are two factors for ICT to pick up:

1. A teacher should be willing to make an effort.
2. Lecture rooms should be equipped.

Challenges: Maintenance problem according to Prof. A.K. Kapoor is a challenge. ‘If something doesn’t work, there is nobody whom you can call and get it rectified immediately’. ICT otherwise is mainly used for communication. According to him, students are overloaded and they don’t have time for ICT. He expressed that environmental condition also affects this. There are 15- 20% of students who do not have prior exposure to ICT. Prof. A.K. Kapoor has tried to integrate ICT in their assignments. Students’ response has been very poor unless somebody forces it. “I gave one assignment which was totally based on internet but they kept it till the end of the semester. We have lots of emphasis on problem solving in our subject. So I tried to provide variation in teaching and problem solving assignments using ICT. I thought they’ll enjoy working on these types of assignments but they don’t seem to”.



Figure 47 – Screen shot of Prof. A.K. Kapoor’s Lessons on Moodle

(<http://webphys.uohyd.ernet.in/~physics/moodle/>)

Some faculties who are using moodle as a Learning Management System are also putting up only lecture notes, assignments and are not making use of it fully as a Learning Management System. Courses have been created on moodle but no material has been put beyond pdf files. Most of the students download, print and read , that is a very limited usage. For Under Graduate students he has tried to incorporate more things and asked for feedbacks but there has been no feedback. He has also tried giving them orientation in Moodle so that they will be familiar with the platform, however it did not pick up. “In some sense one has to force them to use, that’s about all. Part of the reason could be, they are overloaded, and they don’t have time. It becomes an extra activity for them”. However, some of his students are very active in Junior Science Club, a group in Face Book where students share ideas and links.

As far as institutional approach is concerned, Prof. A.K. Kapoor feels that ICT incorporation in Teaching is not a priority, though infrastructure is. “One of my colleagues was taking part in creating courses using ICT initially but later he said what is the use? Innovation in using ICT4E will find no place in credits or the annual report of the University. Criteria/ parameters are for other things like publications, research, conferences etc. Although the Central Government has come up with many noble projects, they have remained as projects, it has not penetrated. Any inspection team which comes to Universities is not looking for this ICT4E, if they start looking for it, it will have a direct impact. Suppose somebody insists on the importance and implementation, the responsibility will go to that person. Who wants that extra load of developing a solution for the entire University? I would like to use these facilities but I do not want to manage these facilities. We have teaching and research to do. So far who would want to create something that people don’t use. Based on experience of

introducing moodle, out of 35 hardly 5 faculties are using this; that too not very aggressively”.

Prof. A.K. Kapoor is using ICT for collaborating. “If you can pick up that’s fine otherwise we’ll be left behind. If I know the possibilities and limitations, I can make maximum use of ICT”. He feels that efforts need to be collective not just an individual endeavor; Linux model should be taken up where there is one group which takes up the managing part and others are free to add to it to enhance the material.

Table 37- SWOT Analysis Prof. A.K. Kapoor

SWOT Analysis Prof. A.K. Kapoor
<i>Strengths</i> - People are very competent; they have the experience and knowledge; Basic infrastructure is there and that can be built up.
<i>Weaknesses</i> - Faculties do not have motivation, they don’t have time, and they lack the innovation in this direction, though in other direction they may be doing very well. There is lack of recognition for ICT4E effort, lack of expertise (technical knowledge) in implementing ICT4E.
<i>Opportunities</i> – Unlimited, enormous. e.g. simulations to enrich classes.
<i>Threats</i> – Intellectual Property Rights (IPR) issues.

Dr Kanchan K. Malik, Reader Department of Communication and Program Coordinator Study in India Program

Dr Kanchan K. Malik is Reader in Department of Communication and Program Coordinator for Study in India Program. According to her experiences, she feels that within the classrooms, the best of facilities are available; although things are slow, they are happening, which should help in improving effectiveness. Connectivity between departments and access to information between departments is not happening now because of lack of coordination.

Changes observed over the years – Every faculty has computer connected to the internet; accessibility has become very convenient, which was not so earlier. The library resources are advanced. Library facility has become more accessible, one does not need to personally visit the library, and subscription is easy. Accessibility has helped people to do better research. With Enet, connectivity among the faculty members is much better. Information flow has increased though sharing of academic resources amongst faculties is still limited. Dr Kanchan mentioned that owing to increased access through ICT she tends to read more than what she used to read earlier. “Earlier I used to limit myself to my text books or material which I have collected over 15 years of my teaching. Now every time I have a class I look for new material in the web making my class more interesting. Also I am able to recommend better readings to my students knowing they don’t have to go around purchasing books. It’s cost effective and facilitates easy access to information, saves time and increases the quality of information. If I have a doubt I can easily clarify, technology is out there to support you. It’s your guide, philosopher, professor; as long as you

know you are accessing it from an authentic source. There is a quality change in the way we deliver. There are more resources, more choice, more things we can offer to our students”. As a teacher, she feels she needs to tell her students the different opportunities available since they are doing a professional course. Being on different emailing list she can give them more information for workshops and internships. Involvement with the students is much more beyond the classroom hours because teachers are available through ICT outside class.

Dr Kanchan K. Malik states that her participation/ contact/ collaboration with peers in the industry, other universities have become so much easier. “If I am doing a gender and Media course, I can send my syllabus to professors in different countries and get their comments and feedback”. ICT has helped in networking and empowerment; ICT also provides accuracy of information. What empowers a teacher is that students are given information that that can be used, information which is accurate and are confident about. She thinks internet gives that confidence. “I saw so many interesting videos on you tube, it helped me how to make my approach more interesting in the class. Just to see another person talking about the same topic. It enhances the quality of information. A lot of things which you have to physically go and check, now is available on your computer (flexibility, mobility) e.g. for my salary, I no longer have to go and stand in the line; everything is available here through net banking. It saves time; I don’t have to depend on people, makes things easier”.

Training in ICT: Dr Kanchan mentioned that it’s all self learning so far except for orientation on the use of library. She feels there is so much more to learn and it’s

easier if tools are provided. But a lot has to do with attitude towards technology. “If I don’t know how to do it, I’ll always be scared of it and may not be able to put it to good use. If there is some good training towards how to use technology it will be very useful”. She feels that capacity building is required not just on how to use computers but to bring about a change in attitude.

She feels that it is a big advantage to be in the department of communication, where everyone constantly talks about ICT. There is pro-active leadership towards ICT to enable the environment.

Type of knowledge produced: Dr Kanchan is very much in favor of ICT based knowledge creation. A lot of knowledge which is created but never shared is being shared because of ICT. “With the resources available we also tend to participate more in this whole process of knowledge creation”. The people who are contributing to knowledge pool have become more diverse because of ICT. Knowledge is more collaborative and participatory. It’s not just the experts or the top down kind of knowledge flow. Knowledge creation is becoming more democratic. It’s not just the ICT infrastructure and funding being available, but even when that is available, the negative attitude and lack of capacity building can serve as a bottle neck. However, Dr Kanchan K. Malik also feels that ICT trying to replace something is not the solution. “Video conferencing can be helpful for some modules but you can’t have an entire course running on it. ELearning needs to have personal contact component. If things are all virtual, it would not work well. Virtual cannot take the place of personal contact”. A programme like Study in India Program (SIP) would not have been possible without ICT. Personal contact with students from different countries is

always there, but admitting them, coordinating is done with the help of ICT. ICT has thus helped in community building, sharing of knowledge.

ICT in curriculum and pedagogy: The department has new media as part of syllabus where training in ICT is being built in and subject specific software. “We don’t go by any syllabus, we always have the opportunity to update our syllabi, and we look up to at least ten to fifteen sources before we put together our syllabus – course outline. Check the reading list of similar courses being conducted. So curriculum building as well as what is promised in the curriculum is facilitated by ICT”. When preparing her lectures, a lot of preparation source comes from already existing material, text material and latest information on the internet or archives in the web. Google group is very common with her students. “We have groups for each class. Along with me one student is put as the manager to ensure that everybody is on board and all the documents are attached. We save a lot of paper, a lot of our assignments are now submitted online”. Dr. Kanchan feels that all students are not comfortable using the group forum. Some of them are always online where as some are not accessing. There are people who do not check emails. There have been students whose email accounts were created after joining the department. But by the time they reach the first semester most of them are online and are using email, they pick up the skills. If they are not familiar with technology, they learn as non of their assignments are hand written. As of now social network is not used so much to exchange information with students. As far as faculties are concerned, there are two groups on face book viz. Media educators group and (ACME) Association of Communication and Media educators to be in touch with faculties members across the country. She encourages her students to write for media related websites, lots of her students have blogs.

Access: A lot of students have laptop but all do not have laptop. They are dependent on the computer facility of the department which has specific timings (9:30am to 5 pm). They are limited that way. During exams they can take special permission and use the facility. 40% have laptops when they join the course as they continue by the end of the year, the number goes up to 60 - 70 % The need is there but depends more on affordability.

Teaching philosophy and Challenges: Dr. Kanchan uses a mix of lectures, class discussions and presentations by students in teaching a course. ICT makes the class more interesting. The students also have group work where they divide their work and put it together through ICT. “I remember three years back two or three students in my class who actually never picked up working on a computer. They would always make somebody else do their work. Whereas I also had students where one of them was visually challenged who was so good with computers. Even his presentations were as good as anybody else. The software which are available now for the visually challenged has helped a lot. There is difference in the approach of students but majority have taken it very well. Maybe only 10% face difficulty in adopting technology”. Dr. Kanchan K. Malik observed that there are lots of people who are afraid of technology; personal initiative, positive attitude towards technology is also required.

Table 38- SWOT Analysis Dr Kanchan K. Malik

SWOT Analysis Dr Kanchan K. Malik
<i>Strengths-</i> access to more information/knowledge base. ICT facilitates better delivery of lecture and more participation from the class.
<i>Weaknesses –</i> plagiarism; if there is no regulation, students might get misguided.

Opportunities- networking; education has become more sustainable because of the access that ICT provides. Information about the courses offered is more widespread.

Threat –Unreliable information being as freely available as authentic and reliable information and people not having ways to regulate that.

“K. A. Padmanabhan, University Chair Professor, School of Engineering Sciences and Technology”

“Prof. K. A. Padmanabhan is University Chair Professor from School of Engineering Sciences and Technology”. He feels that it is up to the Universities concerned to make use of ICT facilities available. The problem with most Universities is that the person whom they put in charge may not know about the potentiality of ICT. Wherever the leadership is aware of the potentialities, those institutions have moved forward. The IITs according to him are classic cases. Other institutions have some space to catch up.

ICT in Pedagogy: In teaching methodologies, there are concepts like Producer oriented teaching (PORT) and Teacher oriented teaching (TORT). In PORT, the teacher goes to a studio, gives lecture and then it gets broadcast. In India PORT has become more important because of shortages of teachers in several Universities. If AICTE norms are followed, more teachers with PhDs are required. Prof. K. A. Padmanabhan feels that lack of easy access to knowledge and good qualified teachers

makes ICT absolutely necessary so that web based education can be delivered to remote areas. In Engineering School every room is provided with automatic projection system. PORT method is more cumbersome. Instead the TORT method where classroom lectures can be recorded will be ideal in this case. He also expressed that one of the tragedies of Indian system is that, the system does not make any demand from a person. “You will have to create your own challenges/goals and hurdles to cross. This would mean person who are extremely motivated, they would be able to do very well. On the other hand, people who want to take it easy, they can also get away from it. Then our methods of evaluation, promotions are aimed at the average level and therefore we have no way of punishing the very weak or rewarding the very best. Like George Bernard Shaw mentioned Middle class morality, similarly, Middle Class Academic value system we have developed. We don’t emphasize on excellence for anything and those who emphasize, they will be left alone and those who are not able to enforce in spite of wanting it”. He thinks that our system is excellent in taking decisions but goes soft when it comes to implementation. This would imply that there has to be a national will and commitment. Universities cannot do it alone because if the whole country wants to do things in a separate way, one cannot go alone and the parent pool is instrumental. In UOH he considers Teacher oriented teaching TROT will be more successful because everyone takes a class and there are good computing facilities. Everyone in the School uses PowerPoint presentation. The slides are circulated to the students at the end of the lecture. It makes things simpler for students and teachers rather than drawing figures with free hand in class and in the process students might miss some features. In his classes he also encourages students to give seminars where they give presentations. Prof. K. A. Padmanabhan mentioned that not much of National Programme on Technology

Enhanced Learning (NPTEL) lectures are used, because in UOH there are good competent faculties. “This is meant for those institutes where shortage exists in some disciplines”.

Networking through ICT: ICT has helped Prof. Padmanabhan in Networking, he has students in Anna University, Chennai and IIT Madras; has collaborators in IIT Madras, collaborators in Germany. Without ICT it would have been impossible for him to collaborate with students outside UOH. “Here for example, if my student takes a picture with microscope, he comes to me with the results. Then a student there takes a picture and sends it to me by email because ICT makes it very easy. Only thing is I don’t physically see the equipment but everything else is available”. Similarly, he sends his study material and feedback to them using internet. He feels that in national and international cooperation physical location becomes practically irrelevant. Finalization of papers, discussions becomes very easy. “Massachusetts Institute of Technology (MIT) puts its entire course on the internet. That means it is not enough that you have good resources, you must have the right kind of atmosphere to work in and also the right kind of resource persons who will be able to communicate things to you well. So these two things are also important. Otherwise a University like MIT would not have taken this risk, after all their brand value is at stake. They say if you can go through these lectures and equip yourself and the students, there is no need for you to come here. It’s a challenge. We do refer to those courses to see how it is being taught. If we want to do things differently, we do refer to many other Universities that way”. Prof. Padmanabhan strongly believes that the overall environment has a great influence on overall Knowledge building. Cross fertilization of ideas not only helps but leads to the sprouting of new ideas because of the environment one is in and this

has become very easy with the arrival of ICT. “Otherwise I have never visited some of these Universities, but this is possible through ICT”.

Challenges: Faculties in the UOH according to Prof. Padmanabhan, are slowly trying to focus a little bit on ICT in pedagogy. He feels that one of the problems with Universities like UOH is that there is some kind of laid back attitude. “In my group (which includes the students) of research, I am the slowest. In fact students are much faster, they have grow up with ICT. We were introduced to ICT when we were in our 30’s and 40’s. When I get stuck up I ask one of my Ph D students who is really good”. The ICT background of incoming students is far better than before. But he feels they must be taught how to use ICT to leverage knowledge in their area of expertise. That is where the teachers are necessary to guide and in the process of guidance, the teachers themselves will improve. According to him instinct of curiosity is much more in the younger person. School of Engineering doesn’t have much problem in ICT as the students are computer literate; Hyderabad one of the metropolitan centre, the environment adds to it. However, retention in a language that one is not familiar with is always a problem, which is true with ICT also. Prof. K. A. Padmanabhan feels ICT has to be carefully studied, socially examined, then patenting will not come in and that is where the problem will come. Explosion and accessibility to knowledge; the goal to achieve universal education, is not possible without ICT. The “gaps between the haves and the have nots have to be bridged”. However, he feels that within the University, the have-nots are there because they want to be there. “If you don’t want to learn something, how can I force you. Otherwise accessibility is wonderful. This is the kind of atmosphere most of the good universities try to give”.

He further mentioned the need to balance between one's own domain knowledge and the advances in ICT.

Level of ICT usage: Prof. Padmanabhan is involved in consulting for some companies, there video conferencing using web cams is common. Within the university, with the students he uses email communication and cell phones. Web2.0 is used. "In Germany and America, I see if you have a problem to solve, they pop the question in their social network and ask for answers, unlike here where you search the internet or go to the library. So it is also one way of solving the problem. But at the end of it you may not know who solved it. When you google something and something emerges, probably it makes our lives more cohesive ... I don't know". He feels availability of so much information on the net has also led to so much plagiarism. That way ICT has become a real ruin. "But some are passionate about ICT therefore they are able to pick up. I don't think its essential to institutionalize it. In fact , there are articles which say why you should not put computer in school because you should not start building in vacuum. You have to think, but before you think you have to have some basic knowledge – these things have to go together. One school of thought which is probably in minority is that don't overfeed them with ICT techniques, make them aware of these things a little bit and then let them build their knowledge and then let them go into these things so that they are able to use them better".

In Engineering School, ICT is used as a tool. According to him, there are some students and colleagues who are really gifted, so they take it to a higher level. But most of the others use ICT as a vehicle in order to deliver certain quantum of

knowledge within a certain period. For him usage of ICT is need based. “Whenever I need I ask people who know about that colleagues or students. You have to change with the time, but the thing is how much you change is based on necessity, at least in my case. But some people feel they should be equipped with everything, they are different and they will be the leaders in the use of ICT in education. I have some of my friends in other countries who put everything they generate on the net. I feel that it will take enormous time. Of course if I do that it will take enormous time but they do it much faster. Therefore your skills also decide to what extent you use. These are the things which will limit the use within the University not the accessibility”.

Table 39- SWOT Analysis Prof. Padmanabhan

SWOT Analysis Prof. Padmanabhan
<i>Strengths-</i> Visualization is a very important component as far as Engineering is concerned. This was not easy in the past but now it has become easy because of ICT; Speed and precision are other advantages.
<i>Weaknesses-</i> addiction, other teaching/learning methods may be undermined.
<i>Opportunities</i> – Universal education, especially for a country like India to increase people going for higher education.
<i>Threat-</i> physical understanding of the real problem was much better when ICT was not there, now with the usage of software, some solutions are given. But often students don't what they are talking about. The touch with physical situation is gone with ICT. Accessibility is a question so long as laptop is expensive. Between Cost and Quality, the policy makers have to decide. This would require some sort of redistribution in terms of cost, and that is the main bottleneck on a general level.

P. Jyothi, Reader School of Management Studies

Dr. P. Jyothi is Reader in School of Management Studies. She cites that increased connectivity which is facilitated by ICT is the main benefit in the department.

ICT usage: Dr. P. Jyothi states that ICT access is good and Wi-Fi is being used extensively because most of her students have laptops. There is also the Computer room in the department. A lot of time the students stay back after class hours and use the facilities. The library IGML's digitization has again helped as students sit in the rooms or in the computer room and access the eJournals. CMSD facility that has been created has enabled most of the Research Scholars to take help for statistical analysis. In class room LCD projectors and screens are being used by faculties and students. Most of the lectures are presented through LCD, which is followed by discussions. Students use the same facility. ICT according to Dr. P. Jyothi has enabled students to grasp concepts easily and they make a point easily. "In our school everybody (students) out of necessity, are quite ICT savvy". There has been an increase in knowledge, the inflow is more, and accessibility is simpler and faster. However she feels students are not making full use of ICT. There is a lot of cut paste happening in assignments. To avoid plagiarism she insists on hand written assignments so that her students apply their thinking. The school has a group mail created, where the placement coordinator is constantly in touch with the students. She personally does not communicate much with students via emails. She uses Face Book, Orkut for information sharing sometimes, though the academic aspect is still very less.

Curriculum and Networking: In her Courses, first the concept of the course is presented and then the ICT component is included. Nature of the course is such that the students have two papers in computers. 95-98% of her students are Engineers so basically they are computer literate and after they join, they do a little more of application oriented courses using computers. “As far as networking is concerned, we are literally on our computers all the time we live with them. The entire placement, which is very important for a MBA course, happens because of ICT Networking. Very little paper work is generated. There have been instances where companies have conducted online test and they come here identify some 30 computers to create particular facility, and students take the test online”.

Challenges: Dr. P. Jyothi considers maintenance a major challenge. “Sometimes what happens is you have to call different people for the same problem that happens because ‘this is managed by different group, that is managed by different group’. The one which is managed by university, they say come through some procedure; all that is time consuming. We have ICT, we have invested in it, we have allocated a budget, the issue is maintenance; the process of maintenance has to be lessened. One Systems manager post has been created and that person is responsible for maintenance. In some cases we outsource our requirement”. She considers that a little more speed of response should be there when something goes wrong. Things are delayed because of the bureaucratic way in which the entire thing is handled. If the number of steps can be reduced, the work can be done faster. According to her security challenges, misuse of ICT are other major challenges .

Table 40 - SWOT Analysis(Dr. P. Jyothi)

SWOT Analysis(Dr. P. Jyothi)
<i>Strengths</i> - ICT facilitates, it is time saving
<i>Weaknesses</i> - redundancy, complacency could set in.
<i>Opportunities</i> -video conferencing; interviews, online tests for students.
<i>Threats</i> - vigilance, security, monitoring, evaluation, maintenance.

Professor G.Sudarshanam, Department of Political Science

Prof G.Sudarshanam is involved in the distance education course, apart from regular courses in the Political Science Department.

ICT usage: According to him, most of the faculties are not technically oriented. Facilities are sufficient according to him but some kind of orientation will be useful. “We are old timers but what I think is that ICT has a lot of Potential if one makes use of the technology”. Prof G.Sudarshanam feels that the students are not using ICT appropriately as they just copy paste material without gaining proper knowledge of the concepts involved. However, researchers are gaining a lot because of the access to knowledge. In his class, he doesn’t use much of ICT as he is not used to it. “I use only traditional method of teaching and make my own notes. But I encourage students to make use of ICT”.

His students are mixed in terms of their ICT knowledge, in the classroom students like to use PowerPoint when they have presentations, though he personally does not use it. As far as his regular students are concerned, research students are

more engaged with ICT whereas for integrated students, the opportunities are very less, but then for general understanding of issues, they are also using ICT. He wants his students to read more from text books and articles. “When I was doing my research (that must be some 30 years ago) we couldn’t even imagine that technology would develop in such a rapid way. We used type writers then. Editing, accuracy was difficult then. Present research scholars are not reading originals; they are not applying their thinking”. When using a medium like PowerPoint, students don’t concentrate on the teaching. They don’t gain in-depth understanding; rather they are busy catching up with the slides in case they miss the previous slide before going to the next slide. In the process they focus more on what is seen on the screen and not in the concept. “And the teacher too just goes point by point when explaining things ... there is no creativity in explanation, thought process is obstructed. You teach out of routine. So there are some advantages and disadvantages, it depends on how one uses ICT”.

Distance Education: In distance education there are contact classes for ten days. So if a faculty wants to show relevant films the facility is available. Apart from that PowerPoint presentations are regularly used. The center is also providing soft copies of the course materials. There are limitations in converting these materials into eLearning materials. Prof G.Sudarshanam mentioned that the courses were prepared some 10 years ago; most of the data is outdated. Everything needs to be updated and there is difficulty in finding experts who can give time. The coordinator of the course is responsible but most of the time the Centre does not have in-house experts. They have to depend on others by inviting experts and assigning courses to them. Those who are using the soft copies are happy with the changes, but UOH is not being able

to cope up with the new demands. It is taking time to transit. Shortage of technically qualified person for content preparation is a major problem. There is also digital gap between students enrolling for the distance education courses. Most of Prof G.Sudarshanam's students are from urban area. But some students are there who cannot afford to have personal computers. Accessibility is a problem in such cases. "We contact our students through cell phones and emails and they are responding. Everybody now has cell phones so most of them are responding, but emails it is reaching only 60-70% of people. So we are using postal mechanism also for contacting them". Access according to him is the main problem in using ICT in Distance Education.

In the regular mode most of the interaction with his students happens face to face and sometimes via emails. But in Distance mode emails are used frequently. He feels in regular mode students see them daily so there is no need of ICT mode of communication. "Some of the faculties do encourage using ICT, even assignments they ask them to submit in soft copies. But the problem with soft copy submission is that they are downloading and submitting. Even in the Distance mode assignments are there, so even there we insist that they submit hand written assignments. Because they are just copying and pasting, we are not able to judge if they have gone through the book or not. So we are insisting that to make sure that the student will read and write to that extent he will apply his mind. Otherwise we will be judging the original author not the student".

Curriculum: There are courses like E-governance, Office administration where ICT is integrated in the curriculum. Prof G.Sudarshanam mentions that subject like Political

Science are not Market oriented. “We have two groups here – some say we are not here to provide jobs, our job is to equip the students intellectually, how the student uses that knowledge is upto him. So you equip the student with knowledge. Let that student use it in whichever field he/she wants according to his abilities and requirements. But some people say we should also cater to the needs of students appearing for civil services and various competitive exams. Accordingly we look into those kinds of requirements – civil services, NGOs, Academics, Political journalism etc. accordingly we modify our contents and add these elements into our contents also”.

Training/ Orientation: Prof G.Sudarshanam emphasized the “need for proper training and orientation of faculties”. For their courses they are looking into the market requirement and intellectual training. There is emphasis on soft skills in the market. But when recruiting faculties the subject knowledge is tested and soft skills are not mandatory. Academic Staff College is also there but most of the faculties who are attending Academic staff classes are not satisfied. “What our requirement is, and what they give is completely different. Our requirement is basically updating our knowledge system, orienting in ICT that differs from subject to subject, person to person, but when you go to attend such courses, they have these set pattern of organizing things. Many faculties say that they just go there because they need a certificate. Hence, there is a need for Academic Staff College to reorient its courses”.

Table 41- SWOT Analysis Prof G.Sudarshanam

SWOT Analysis Prof G.Sudarshanam
<i>Strengths</i> - knowledge and information resources access
<i>Weaknesses</i> – quick solution, students not applying proper thinking; plagiarism.
<i>Opportunities</i> - many, user friendly technology has to be encouraged'
<i>Threat</i> –technology most of the time comes from the west with western values, clash of values in the Indian context; cultural problems; Education influenced by the West.

Dr. M.Anjaneyulu, Lecturer Department of Hindi

Dr. M.Anjaneyulu is Lecturer in Department of Hindi. He is visually challenged.

Experiences with technology: According to Dr. M.Anjaneyulu being visually challenged, he is completely dependent on ICT. He is guiding research students two of them are doing PhD. “We get very few books in Braille. Other educational resources, we get them audio recorded”. He listens to audio resources through iPad then makes notes in Braille for teaching in class room. “I cannot use black board but if I want I can use PowerPoint presentations, I am mostly dependent on audio recording. I record wav files in I pad then convert it to mp3 so that it can be used in dvds. Its been 3 years I have been using iPad. Then I also use Angel recorder, Daisy Books, Leka software in Hindi, iLeap the old software and Software Talks for mobile phones”.

Dr. M.Anjaneyulu is making use of the following ICT sources:

- Duxbury
- DAISY
- Media Lab Asia
- JAWS for Windows



Figure 48– Screen shot of Duxbury

“Dr. M.Anjaneyulu mentions that ICT in this manner has made life much easier for him”.

“*Number of years using ICT:* Dr. M.Anjaneyulu has been depending on ICT since 1989. Up to class X he had Braille books but after that they didn’t have books and were dependent on tape recorders. That time we didn’t have computers. We used to record and then listen. Upto 2004 he was dependent on tape recorders. Until the completion of PhD he was listening only to tape recorders. He accessed computer for the first time in 1993 but personally used computer only in 2001. The Vice Chancellor

then provided two computers for the department. About two years back they got Jaws software. The Hindi version is also available but it is not as good as the English version. There are limitations in the Hindi version e.g. pdf files do not read”.

He has been teaching for 10 years. “Four years ago, a student came to me for her MPhil guidance, so I told her if you want to do MPhil under my guidance, first you learn computer. Then she had to be computer literate”. He teaches two categories of students, visually challenged and some the usual. Some of his students are very keen on using ICT while some lack the skills. Approximately about 75% of his students are ready to use ICT whereas about 25% are reluctant. This has basically got to do with their attitude/interest. Some want to completely avoid technology. He collects student’s assignments and work through emails and DVDs. Even in last year’s batch six students learnt computer on his insistence. Some students feel that in a subject like Hindi, learning computer is not required. But now the same students after learning computers and are engaged in online translations. “Compared to other departments, our students and staff are not very keen on using ICT”. He feels that using computers has made the student’s work more efficient because of the software available, there are lesser mistakes. That way it’s easier to correct their work. “We are completely dependent on technology, we can’t do anything ourselves. For people like us anybody who does not know computers is as good as illiterate because at the higher education level, we can’t read/study without computers”.

Challenges: Dr. M.Anjaneyulu mentions that infrastructure is very poor in his department. Many faculties are using very old computers 260 RAM 40 GB space. Students don’t have computer lab (one lab near the classrooms is there where only

one computer is working) so they are facing a lot of problem. Even in the Computer Center, they don't have the Hindi software. Technology is not well developed in Indian language. Typing is very difficult in Hindi whereas in English it is not a problem. The technical support is not there. "ICT is helping me in information search and presentation. We can use blackboard but at the same time it is difficult, so demonstration using computers is much better". He mentions that support system is required to enhance the delivery mechanism. "American software companies are more sensitive to our needs; here in India we don't have people who will check into our requirements and develop softwares for us. Just two weeks back I did a course on eLearning and ESeva in the Staff college. In that we had a special course on Wikimedia. In English there are 2 lakhs people joining this course, in hindi there are just 25,000 enrolled. Even at the school level, if we go to English medium schools, they will have better computer facilities; whereas Hindi medium schools don't generally teach computers".

Table 42 - SWOT Analysis Dr. M.Anjaneyulu

SWOT Analysis Dr. M.Anjaneyulu
<i>Strengths</i> –95% dependent on technology, ICT empowers; it is cost saving; technology is unbiased, it is fair.
<i>Weaknesses</i> - language software are not well developed. Technology can sometimes take the place of people, lead to unemployment. The number of staff required can be downsized to enable/cost cutting e.g. E-tutoring.
<i>Opportunities</i> – video conferencing, video lectures, access to expert knowledge.
<i>Threats</i> - loss of data in case of system failure.

Students: ICT Usage, Attitude, Barriers and Challenges

In UOH learning space through ICT is expanding creating new geographies of learning. Students now feel that learning is not limited to classroom; their learning has gone beyond that through ICT. In student's translation of ICT in University of Hyderabad it has been observed that students who come from rural areas do not have any prior knowledge in using ICT. In some cases it is the access to technology (even prior) to joining which makes them uncomfortable with technology even if they have access now. It could also be lack of initiative (probably they could be called the laggards). But even among the people who are using technology, there are some who are very good whereas there are others who will not go beyond the needed features, people picking up in different ways. There are different categories of students. A lot of them pick up gradually. Necessity is the mother in most cases. In the past three years there have been more students enthusiastic about picking up ICT skills. Now they realize they cannot do without it. The study shows that INFLIBNET and E-Resources are heavily used by students as each student has access to IGML online library in the department and hostel rooms. Many feel that they don't have to physically visit the library anymore. Many students are members of online groups where they continually share resources and join discussions related to their area of subject interest. Research scholar's group is there. There is a community of researchers; Students are also sharing their research experiences in sites like ademia.edu which is a platform for academics to share research papers.

It is noticed that there is no gap in the way students use their mobile phones for communication. The culture of communication is changing. A lot of students from

abroad come to UOH, students in UOH are able to access their library through them, creating new geographies of learning. Some Research scholars from the university have been working on the Greater Hyderabad Academic Network (G-HAN). “Hyderabad is home to a very large number of academic institutions. Apart from Universities, both Central and State, there are laboratories that come under the CSIR, the DRDO, as well as numerous institutions of the Department of Atomic Energy, DAE. G-HAN is a virtual linkage of all these institutions. The impetus to form the GHAN came about at a meeting organized at the University of Hyderabad on 21 January 2012, chaired by the Minister of State for Human Resource Development, Dr D Purandeswari”. “At this meeting, a number of State and Central University Vice Chancellors and other officials decided to share infrastructure and to work out modalities for closer collaboration. UOH is in the process of trying to involve over 100 academic and research institutions in the city. These institutions would have their own web administrators responsible for posting details of activities and events being organized in the university. UOH with the help of Google, is also offering personalized mail id for the whole campus community. The move raised a few questions among students who suspected it to be a part of broader internet regulation on campus to track their activities, especially after the university blocked websites containing explicit content recently”. The recent attempt by the University of Hyderabad to police the internet use of its students has been opposed by some students. “Last night I wanted to read Foucault’s history of sexuality. Before plunging in to it headlong, I wanted to look up some short introduction to the book on the net. I could not even access the reviews available on JSTOR. The university had blocked anything that contains the word ‘sex’ in it. I reckon, this is gonna frustrate many researchers in the field of gender studies.” The disadvantage of ICT is also felt in

terms of having access to too much of material, filtering the material and also where to get the material becomes a challenge (reliability of material).

University of Hyderabad has a Total student population of 4746. A survey using Random sampling across different Domains of “Study was conducted with a sample size” of 495 students. The survey aimed to understand how students in University of Hyderabad use ICT in their studies, their attitude towards ICT and to collect their views about the enablers and obstacles in ICT for education. The following section shows their response.

Table 43- Main Domains of Study of UOH Student Sample

Main Domains of Study	n	%
Social Sciences (Masters)	80	16.2
Social Sciences (Research Students)	86	17.4
Science and Technology (Masters)	81	17.0
Science and Technology (Research Students)	84	16.4
Humanities (Masters)	80	16.2
Humanities (Research Students)	84	17.0
Total	495	100

Table 44 - Place of students' most frequent usage of Computer/ Internet

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Missing	3	.6	.6	.6
Home/hostel	330	66.7	66.7	67.3
Library	17	3.4	3.4	70.7
Computer Center	52	10.5	10.5	81.2
Cyber Café	9	1.8	1.8	83.0
Department	84	17.0	17.0	100.0
Total	495	100.0	100.0	

Table 45- Hours per Week (On an average) of usage of Computer for academic purpose by students in UOH

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Missing	4	.8	.8	.8
<1 hr	17	3.4	3.4	4.2
2-5 hrs	175	35.4	35.4	39.6
6-15 hrs	147	29.7	29.7	69.3
15-25 hrs	76	15.4	15.4	84.6
>25 hrs	76	15.4	15.4	100.0
Total	495	100.0	100.0	

The survey also tested students' response to Teacher's ICT usage. Students felt 44.6% of Teachers used ICT effectively in their courses; 27.4% of teachers provided students with adequate training for the use of ICT in his or her course; and that 42% of teachers have adequate ICT skills for carrying out course instruction.

Purpose and degree of ICT usage by students in UOH

The students' degree of ICT usage at different levels based on the survey is given below:

“Informative: 63.2 % of students use ICT to find, acquire and use information.

Functional use of ICT: 48.1 % of students 'hardly' use ICT to utilize and manipulate existing information for educational purposes using existing information (compile lists of books, abstract and summarize books and materials, use accessed information”

“to prepare homework, compare information). 15.4% use sometimes and 30.1% use ICT very often.

ICT for Creating Knowledge: 40.4% of students ‘hardly’ use ICT to compose, compile, produce new information (write papers, drawing, programming, make PowerPoint presentations, give oral presentations, prepare newsletter, create own website, etc.) 21% use sometimes and 32.3% use ICT very often.

ICT for Communication: 35.8% of students ‘hardly’ use ICT to exchange and to transmit information with other students, teachers and others using email and Internet; to join discussion forum and chats. 13.5% use ICT sometimes and 45.1% use ICT very often.

ICT usage for Collaboration: 41.4 % of students ‘hardly’ use Web design tools, multimedia, e-mail, discussion boards, E journals, use technology to simulate research and collaborate with other colleagues (even those situated in different geographical location). 31.5% use ICT sometimes”.

In terms of overall expertise in handling various types of ICT 72.8% of students felt they are average users in ICT. The survey also indicated that 46.5% of students learned to use ICT through trial and error. Only 16.6% have formal training in ICT use and 30.1% learned from friends.

Major Hindrances/Barriers in using ICT for Educational Purpose

58.5% students consider lack of training as a barrier; 61.5% agree that lack of technical knowledge and support is a hindrance in using ICT. 54.7% consider limited number of computers is a barrier; 52.3% cited limited understanding of how to use

ICT for Educational purpose as a barrier in itself. 56.9% disagree to the statement that lack of time is a barrier in using ICT4E.

The following section covers attitudes and beliefs of students towards ICT. It is noticed that the students in general have a positive response to the opportunities and advantages that ICT provides.

Attitude and Beliefs towards ICT

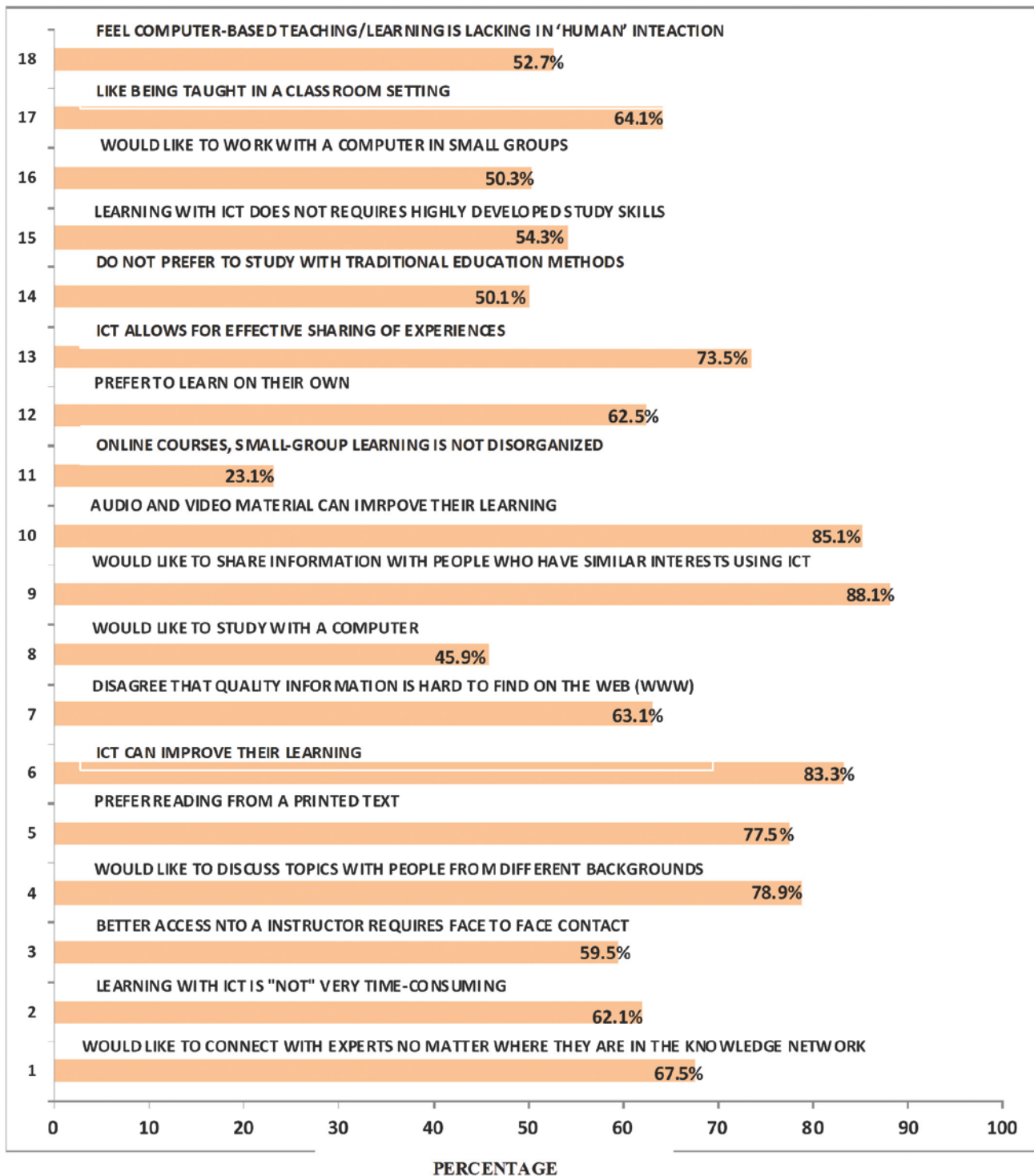


Figure 49 - Attitude and Beliefs towards ICT (UOH students)

Opportunities that might be enhanced by ICT

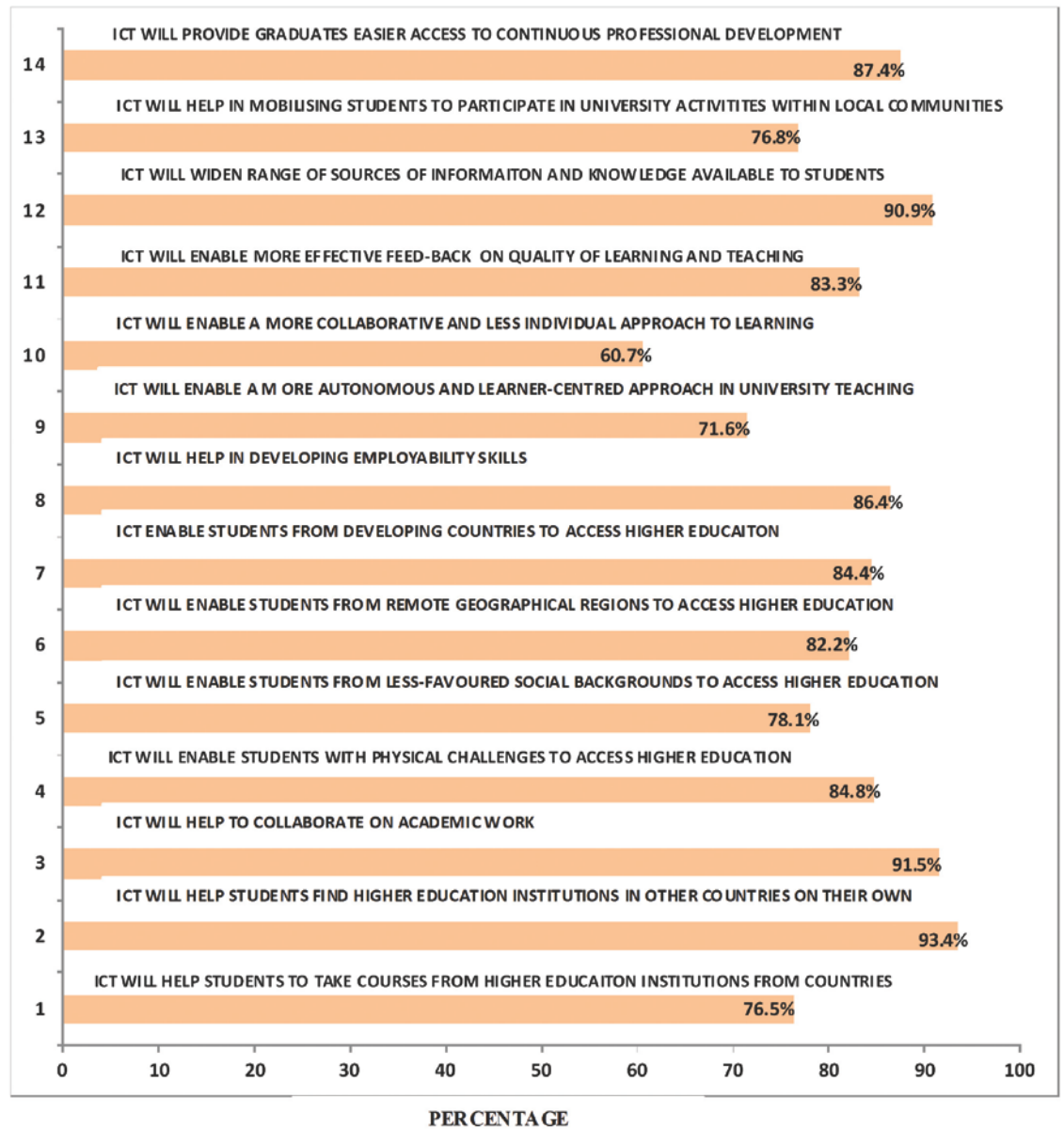


Figure 50 - Opportunities that might be enhanced by ICT (UOH students)

Advantages of ICT in transforming education systems' performance

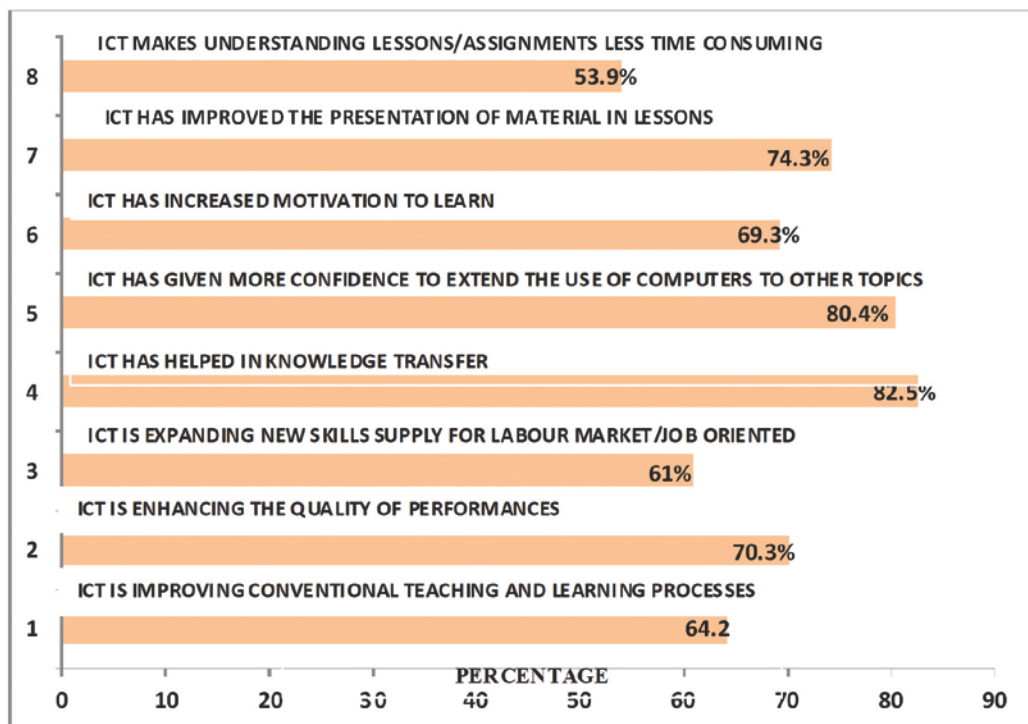


Figure 51 - Advantages of ICT in transforming education systems' performance

Disadvantages in using ICT

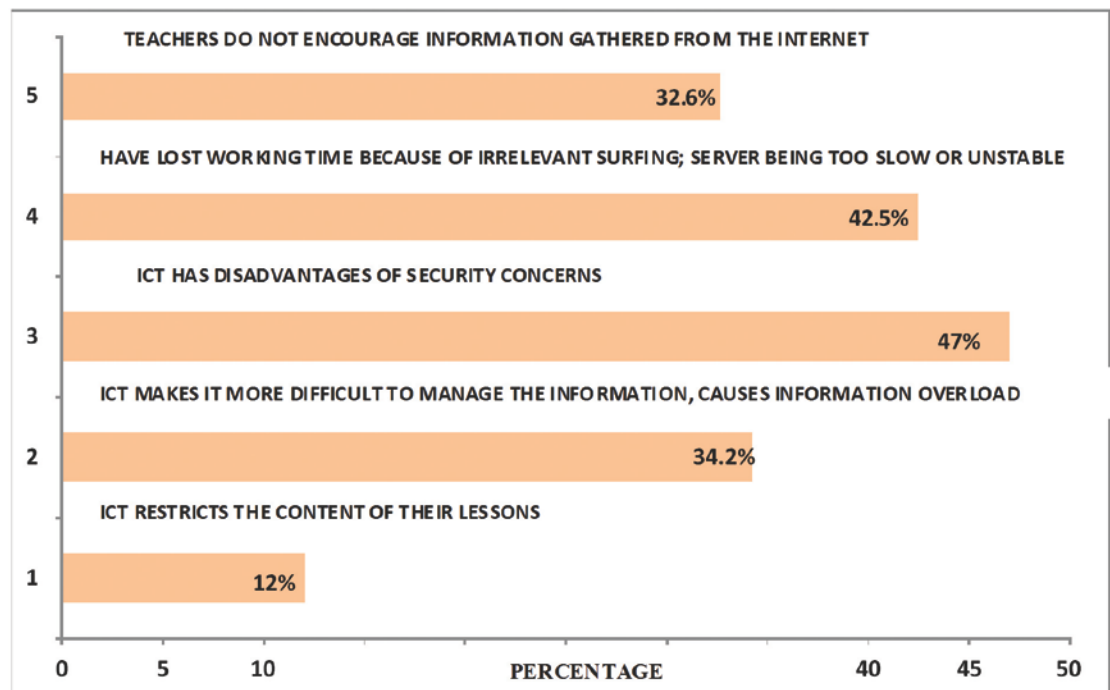


Figure 52 - Disadvantages in using ICT

“21st Century Skills (Partnership for 21st Century Skills, 2009)”

The following responses were received in terms of level of preparedness felt by the students to compete in today’s global marketplace. The students gave highest level of response to being prepared to some extent in Expertise in field of study. They also felt better prepared in Environmental and social issues; Social and cross-cultural skills.

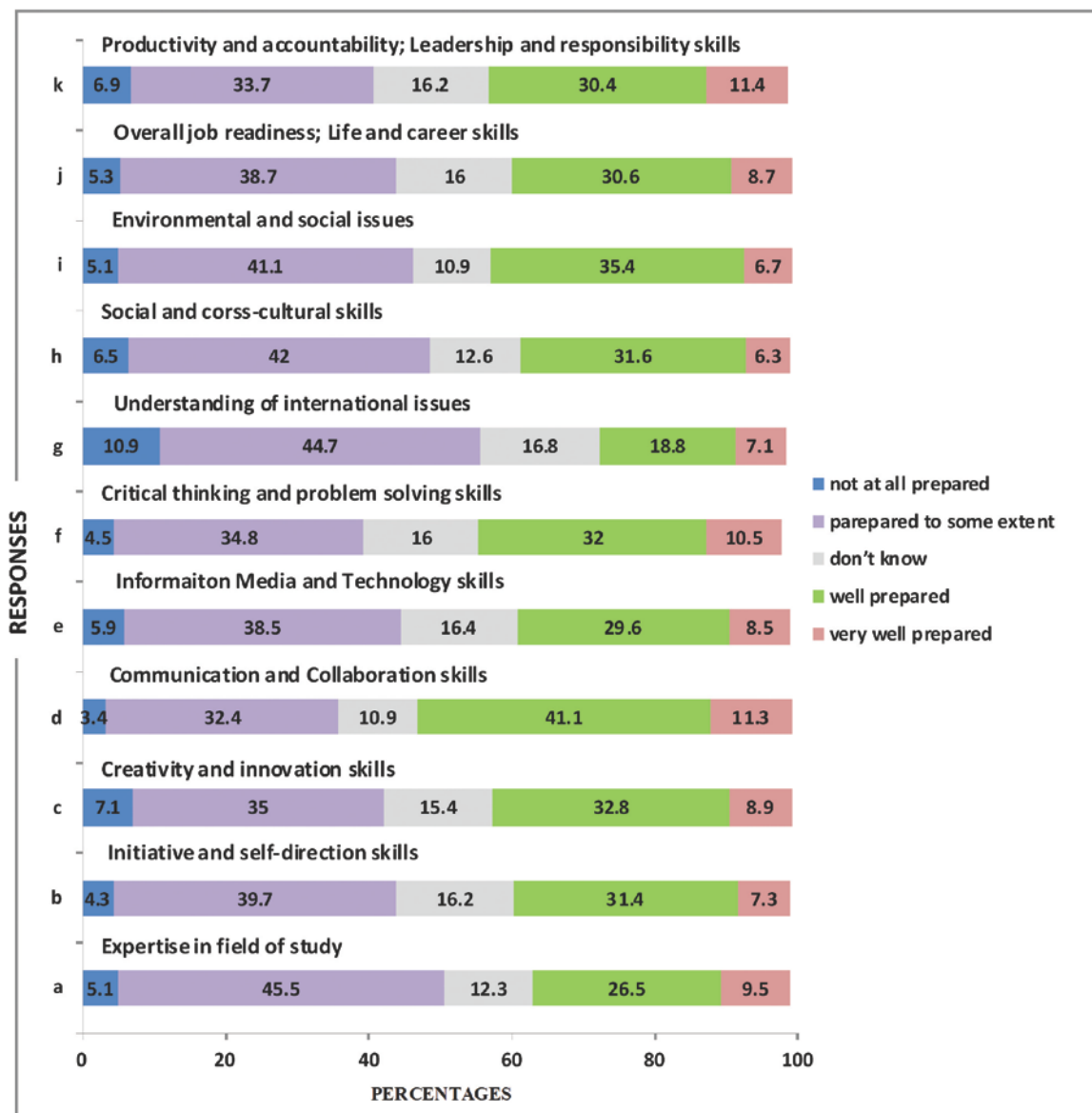


Figure 53- 21st century skills (UOH students' response)

Discussion and Key Insights

UoH HERALD blog and University of Hyderabad on Facebook is helping the UOH community in keeping updated with the latest happenings on the campus. UOH is also making use of other ICT mediums like the Campus radio, an initiative which is about building community - to talk about issues, for exchanging knowledge, information also cultural aspects. The University website, VC's blog, several groups in the social media and the University Newscope is used by different groups for communication and sharing of information. "connect.uohyd.ac.in" is a web portal that is exclusively for the members of the University. Its intent is to enable better community engagement and discussions. Similarly, a personalized email account with features and custom settings similar to Gmail is expected to enable better information exchange and greater participation in events and community engagement. ICT has enabled greater communication in UOH. INFLIBNET and IGML resources have facilitated access to wide range of knowledge and information.

To enable better reach of ICT4E amongst various actors in UOH the following factors can be addressed:

- Capacity building
- Attitude towards ICT
- Overall Learning environment
- Time spent on using ICT4E
- Clearer policies and specific funding
- appropriate response to security concerns
- Proper coordination among different ICT related departments

Many faculties feel that if ICT capacity is there then they can be at a level of communicating in the “triple helix dynamics of university-industry-government” relationships. ICT brings industry and academia closer; enhancing networking and collaboration in knowledge sharing. “A lot of industry would collaborate with you only if you have ICT competency”. Internal and external forces are at play in the knowledge society. Internal – everybody wants access to and through ICT. External – globalization phenomena. Extend of collaboration in UOH is more at research level. There has been “change in teaching and learning culture because of ICT”. In the ICT and knowledge society context, central universities like UOH can be a lot more cautious about what kind of access to give and what kind of ICT political commitment to use. UOH is also transiting, from the old stage to new stage. Policies need to percolate down to classroom level. “Somehow policies are worked out very well. There is everything right about policies. But the implementation is where the issue lies”. There are disparities in the way ICT is used and adapted. Policies towards knowledge management, kind of knowledge, policies towards controlling plagiarism need to be formulated. Considering the fact that UOH is located in a place like Hyderabad with good ICT facility, the University environment is comparatively enabling.

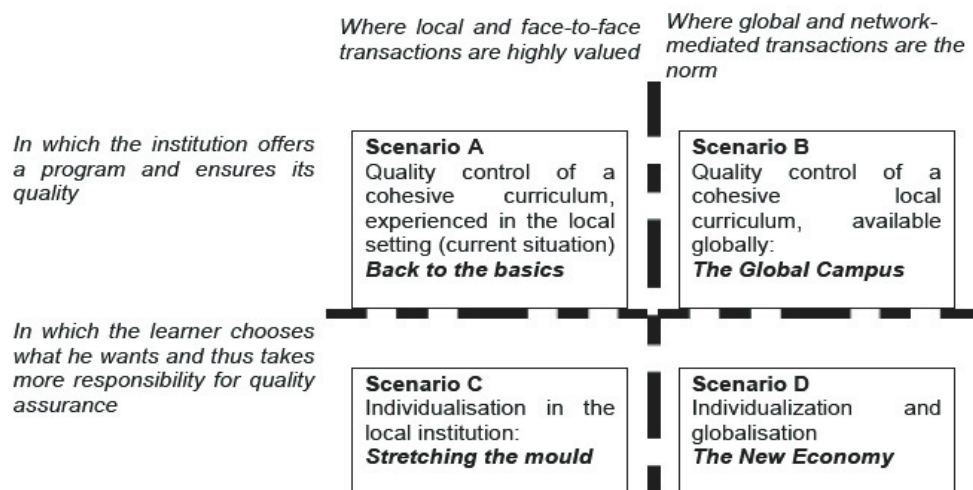
Chapter 6

“Scenarios of learning with ICT in UOH and TZU”

Abstract: “This chapter investigates which scenarios are emerging with respect to the use of ICT in higher education and how future developments can be predicted and strategic choices can be based on that. It seeks to answer issues on: strategic responses made by the institutions UOH and TZU with respect to the use of ICT; external conditions and developments influencing these choices; external and internal conditions and measures are taken in order to achieve strategic targets; the implications for technology use, teaching and learning processes and staff”.

“ICT and educational delivery scenarios”

Scenarios of the future in which flexible learning will be part of a setting ...



“Scenario A Back to Basics is the current dominant situation for many traditional postsecondary institutions. It is also the case that many universities are starting to experiment with distance participation in their established programs”. This can lead to

“Scenario B The Global Campus. Scenario C Stretching the Mould relates to increased flexibility with or without changing the underlying pedagogical model within the institution. Many traditional universities are now moving toward some forms of Stretching the Mould, by offering more flexibility for participation within their pre-set programs”.

“Scenario D The New Economy is the most radical; a systematic example of it does not yet seem to be available in most traditional universities and yet it is increasingly being seen as the way of the future” (Collis & Moonen, 2001, p. 199)

Based on this, questionnaires were administered to the Heads and Deans of all the Schools in University of Hyderabad and Tezpur University.

Number of respondents from Hyderabad University = 27

Number of respondents from Tezpur University = 18

The following responses were gathered.

Table 46- “Extent to which typical learning settings occur in TZU and UOH”

	TZU		UOH		Table Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Back to basics: On-campus settings for course activities”	4.33	1.19	4.74	.76	4.58	.97
“Stretching the mold: Many variations in where and how students participate in courses, but campus-based settings remain the basis”	3.33	1.03	3.15	1.35	3.22	1.22
“Global campus: Many students are attending at a distance”	1.11	.47	1.44	.85	1.31	.73
“New economy: Students use the home institution as a base but pick and choose their courses from many locations”	1.11	.47	1.07	.38	1.09	.42

1=little or none, 3=some, 5=very much the case

“On-campus settings for course activities are the main learning setting in both the Universities, though they are looking at variations in learning of where and how students participate in courses. This is influenced by the actors’ view of what

contributes to good education. Face to face contacts, Contact with the instructor when needed by the students and Communication among students are highly valued”.

Table 47 “Aspects contributing to good education”

	TZU		UOH		Table Total	
	Mean	Std Deviation	Mean	Std Deviation		
					Mean	Std Deviation
“Face to face contact”	4.56	.86	4.85	.53	4.73	.69
“Contact with instructor when needed by the students”	4.33	1.37	4.04	1.13	4.16	1.22
“Communication among students”	3.89	1.23	4.33	1.24	4.16	1.24
“Pedagogy related to group work”	3.78	1.22	4.07	1.07	3.96	1.13
“Appropriate use of ICT for teaching and learning support”	3.89	1.23	3.89	1.15	3.89	1.17
“Time and place independent learning”	2.78	1.35	2.56	1.40	2.64	1.37
“Individualization for different student characteristics”	2.89	1.75	2.63	1.47	2.73	1.57

1=little or none, 3=some, 5=very much the case

“This is also influenced by institutions’ mission where innovation in teaching and learning along with emphasis on externally funded is seen to have greater priorities in both TZU and UOH”.

Table 48 “Importance of various aspects in the mission of an institution”

	TZU		UOH		Table Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“innovation in teaching and learning	4.78	.65	4.48	.89	4.60	.81
externally funded research	3.17	1.20	3.07	1.30	3.11	1.25
teaching international students	1.11	.47	2.93	1.41	2.20	1.44
interaction with business and industry	2.89	1.28	2.63	1.47	2.73	1.39
internally funded”	2.56	1.10	2.48	1.19	2.51	1.14
“research providing lifelong learning”	2.11	1.23	2.41	1.34	2.29	1.29

where 1=Low, 3=Moderate, 5=High

“The following table shows that change in demands on current and future ICT related policy has not been much effected by flexibility of learning, delivery of education, pace of learning; lifelong learning, international students. But in both the cases, providing increases access to traditional students has had some impact”.

Table 49 “Effect of changes in demands on current and future ICT related policy”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Flexibility in locations of learning”	2.78	1.52	2.63	1.47	2.69	1.47
“Flexibility in delivery of education”	2.67	1.41	2.78	1.40	2.73	1.39
“Flexibility in pace of learning”	2.44	1.65	2.41	1.45	2.42	1.51
“Lifelong learning”	2.11	1.41	2.33	1.47	2.24	1.43
“International students”	1.56	1.15	2.52	1.01	2.13	1.16
“Increased access for traditional students”	3.22	1.17	3.81	1.00	3.58	1.10

1 = very little, 3 = some, 5 = very much

“Extent of flexibility (choice) offered now and in the future offer on average only moderate choice: programs are in principle fully planned and only once students have entered the program may they have some level of choice (a type of flexibility from within). In most areas increase is expected in the future”.

Table 50 “Extent of flexibility offered now and the future”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“fully planned programs, but within many choices: now	3.44	1.29	3.07	1.62	3.22	1.49
fully planned programs, but within many choices: future ”	3.89	1.41	3.52	1.05	3.67	1.21
“fully planned programs, some individual choices for students: now	3.22	1.17	3.07	1.30	3.13	1.24
fully planned programs, some individual choices for students: future ”	3.44	1.46	3.48	1.22	3.47	1.31
“flexible programs, students can choose from a range of combinations: now	2.33	1.37	2.26	1.38	2.29	1.36
flexible programs, students can choose from a range of combinations: future ”	3.33	1.57	3.15	1.23	3.22	1.36
“fully planned programs, little or no individual choices for students: now	2.89	1.45	2.56	1.40	2.69	1.41
fully planned programs, little or no individual choices for students: future ”	2.56	1.46	2.33	1.24	2.42	1.32
“programs are highly flexible, students can choose more or less own combinations: now	2.67	1.41	2.04	1.29	2.29	1.36
programs are highly flexible, students can choose more or less own combinations: future ”	3.11	1.45	3.00	1.24	3.04	1.31

1 = very little, 3 = some, 5 = very much

“The following table further shows that at present there is little substantial flexibility in the overall picture for course-related aspects offered to students”.

Table 51 “Flexibility options offered to students in course related aspects”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Learning resources	3.00	1.19	3.37	1.11	3.22	1.15
Time for submitting assignments and interacting within the course	3.00	1.19	3.04	.90	3.02	1.01
Topics of the course	3.00	1.37	3.00	1.07	3.00	1.19
Ways in which the course is experienced	3.44	1.46	3.15	.95	3.27	1.18
Assignments required for the course	3.33	1.03	3.00	.96	3.13	.99
Orientation of the course	3.00	1.19	2.93	1.04	2.96	1.09
Assessment standards and completion requirements	2.56	1.29	2.22	1.25	2.36	1.26
Times for starting and finishing a course	2.11	1.57	1.74	1.48	1.89	1.51
Language to be used during the course”	2.22	1.40	1.07	.38	1.53	1.08

1= no flexibility, 3= some flexibility, 5 = extensive flexibility

“The various forms of flexibility are currently supported in the institutions; it seems again that no radical changes have been made as yet”.

Table 52 “Extent to which various types of support for flexible learning are currently available to students”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Information about variation”	2.78	1.66	2.11	1.40	2.38	1.53
“Technology support outside the institution”	1.89	1.41	1.59	.93	1.71	1.14
“Support for participating in courses with persons from other cultures”	2.11	1.02	2.41	1.22	2.29	1.14
“Support for choosing a personalized program of study	2.33	1.19	1.67	.96	1.93	1.10
Variation in time and location of courses”	1.33	.77	1.44	1.01	1.40	.91
“Support for participation in other courses at other universities via the internet”	1.56	1.15	1.44	1.01	1.49	1.06

“Financial aid for flexible learning	1.33	.77	1.44	1.01	1.40	.91
Support for taking examinations outside the institution”	1.44	.86	1.07	.38	1.22	.64

1=not at all, 3=some, 5=major feature

“Respondents were asked various questions about their competitors as well as about their partnerships for cooperation in the area of ICT. They were also asked to indicate to what extent external actors (National higher education institutes, Foreign higher education institutions, National business and industry, Foreign business and industry) influence the institutional policy for ICT. Their answers indicate that only National higher education institutes have some influence; other actors had very less influence”.

Table 53 “Influence and role of competition and cooperation in ICT policies”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Competition change perceived by National higher education institutes”	3.89	1.23	3.07	1.30	3.40	1.32
“Influence of competition on current ICT policy perceived by National higher education institutes”	3.33	1.03	2.78	1.15	3.00	1.13
“Influence of competition on future ICT policy perceived by National higher education institutes”	3.78	1.40	3.22	1.40	3.44	1.41
“Role of cooperation in current ICT policy perceived by National higher education institutes”	3.00	1.53	2.78	1.28	2.87	1.38
“Role of cooperation in future ICT policy perceived by National higher education institutes”	3.56	1.65	3.00	1.36	3.22	1.49
“Competition change perceived by Foreign higher Education institutions”	2.56	1.62	2.67	1.44	2.62	1.50
“Influence of competition on current ICT policy perceived by Foreign higher Education institutions”	2.33	1.68	2.56	1.40	2.47	1.50

“Influence of competition on future ICT policy perceived by Foreign higher”	2.33	1.37	2.56	1.40	2.47	1.38
“Education institutions Role of cooperation in current ICT policy perceived by Foreign higher”	2.11	1.41	2.48	1.31	2.33	1.35
“Education institutions Role of cooperation in future ICT policy perceived by Foreign higher”	2.56	1.62	2.56	1.40	2.56	1.47
“Education institutions Competition change perceived by National business And industry”	2.56	1.46	2.41	1.34	2.47	1.38
“Influence of competition on current ICT policy perceived by National business And industry”	2.00	1.41	2.26	1.38	2.16	1.38
“Influence of competition on future ICT policy perceived by National business And industry”	2.44	1.34	2.33	1.47	2.38	1.40
“Role of cooperation in current ICT policy perceived by National business And industry”	1.89	1.23	1.96	1.29	1.93	1.25
“Role of cooperation in future ICT policy perceived by National business And industry”	2.67	1.57	2.04	1.29	2.29	1.42
“Competition change perceived by Foreign business and Industry”	1.56	1.15	1.89	1.50	1.76	1.37
“Influence of competition on current ICT policy perceived by Foreign business and Industry”	1.56	1.15	1.74	1.38	1.67	1.28
“Influence of competition on future ICT policy perceived by Foreign business and Industry”	1.78	1.00	1.81	1.39	1.80	1.24
“Role of cooperation in current ICT policy perceived by Foreign business and Industry”	1.67	.97	1.59	1.34	1.62	1.19

“Role of cooperation in future ICT policy perceived by Foreign business and Industry”	2.00	1.03	1.74	1.38	1.84	1.24

1= Not at all, 3=some, 5=Very much/intensively

The following two tables show the level of importance placed in various aspects relating to ICT policy in the two Universities

Table 54 “Main objectives of the ICT policies”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Enhancing quality	4.44	.92	4.04	1.29	4.20	1.16
Enhancing status and reputation of the institution”	4.11	1.02	3.85	1.32	3.96	1.21
“Enhancing flexibility	4.22	1.40	4.04	1.02	4.11	1.17
Enhancing competitiveness”	4.44	.92	3.67	1.47	3.98	1.32
“Increasing efficiency	4.44	.92	4.30	1.03	4.36	.98
Widening access to traditional students	4.11	1.23	3.67	1.24	3.84	1.24
Enhancing cost-effectiveness”	3.56	1.34	3.67	1.36	3.62	1.34
“Creating opportunities for lifelong learning	3.44	1.62	3.22	1.60	3.31	1.59
Creating opportunities for international students	2.67	1.71	3.00	1.36	2.87	1.50
Generating institutional income”	2.11	1.41	1.96	1.29	2.02	1.32

1=none or low, 3=some, 5=High

Table 55 “Extent to which current and future activities involve in the use of ICT”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Innovation in teaching and learning”	4.11	1.02	3.59	1.22	3.80	1.16
“Externally funded research”	3.56	.92	2.52	1.50	2.93	1.39
“Internally funded research”	3.11	1.08	2.26	1.26	2.60	1.25
“Interaction with business and industry”	2.89	1.45	2.33	1.57	2.56	1.53

“Teaching international students	2.11	1.57	2.85	1.35	2.56	1.47
Providing lifelong learning”	2.89	1.75	2.19	1.24	2.47	1.49

1=Low, 3=Moderate, 5=High

“The respondents were asked to indicate in percentage the role of different actors in terms of formal responsibility and importance in implementation of ICT policy”.

Table 55.1- “Formal responsibility and importance in implementation of ICT policy (TZU)”:

Roles of actors in TZU	Formal responsibility Average %	Importance in implementation Average %
Vice Chancellor	37%	30%
Heads of departments	18%	18%
Deans	15%	16%
Support centre	13%	15%
Individual prof/instructor	16%	17%
Other	1%	4%
Total	100 %	100 %

“Tezpur University respondents felt that the Vice Chancellor and Heads of Department had a greater role to play in both the formal responsibility and implementation stage; followed by Individual instruct”.

“University of Hyderabad respondents however felt that the Vice Chancellor and Heads of Department had a major role to play at the formal responsibility stage. At the implementation stage, the individual instructor would have to give the maximum input”.

Table 55.2 “Formal responsibility and importance in implementation of ICT policy (UOH)”

Roles of actors in UOH	Formal responsibility Average %	Importance in implementation Average %
Vice Chancellor	43 %	20%
Heads of departments	20%	19%
Deans	12%	15%
Support centre	11%	18%
Individual prof/instructor	13%	27%
Other	1%	1%
Total	100 %	100 %

“In both the cases of TZU and UOH Vice Chancellor, Heads of Department and Individual instructor are the most important actors in this respect”.

Table 56 “Leadership of actors in the development and implementation of ICT policy”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Professors or instructors	4.00	1.24	3.89	1.28	3.93	1.25
Support centre	2.78	1.35	2.93	1.41	2.87	1.38
Heads of departments	3.56	.92	4.70	5.57	4.24	4.36
Deans	3.44	1.29	3.44	1.28	3.44	1.27
Vice chancellor”	4.44	1.15	3.81	1.14	4.07	1.18

1=weak, 3=moderate, 5=strong

“The following table indicates that the use of ICT within the institutions is still very less. ICT usage is somewhat limited to course preparation or organizational purposes and for communication with and among students and instructors”.

Table 57 “The extent to which ICT is used within the institution”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Course preparation or organizational purposes	3.44	1.10	3.15	1.46	3.27	1.32
Via a web environment used outside of classroom activities”	2.78	1.17	2.59	1.58	2.67	1.41
“ For communication with and among students and instructors	3.00	1.53	3.11	1.58	3.07	1.54
In classroom activities	2.89	1.08	2.85	1.23	2.87	1.16
For a combination of classroom activities and web activities outside classroom”	2.44	1.34	2.85	1.10	2.69	1.20

1=rarely, 3=some, 5=extensively

“Web resources have the greatest influence on actual teaching practices followed by e-mail systems which are used basically for communication and sharing of resources”.

Table 58 “The extent to which technologies influence actual teaching practice”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“e-mail systems	3.67	1.53	2.89	1.53	3.20	1.56
Web resources	4.22	1.00	3.78	1.42	3.96	1.28
Web based course management systems	2.56	1.62	1.93	1.21	2.18	1.40
Planning tools, such as network-accessible agendas”	1.89	1.02	1.89	1.28	1.89	1.17
“Externally available courses or modules, accessible via the web	2.44	1.50	2.56	1.40	2.51	1.42
Conferencing tools	2.22	1.40	1.81	1.27	1.98	1.32
Wireless solutions”	3.22	1.35	2.41	1.55	2.73	1.51

1=very little, 3=some, 5=very much

Table 59 “The extent to which the following technologies are being used within the institution”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Information presentation tools”	3.78	1.56	3.33	1.78	3.51	1.69
“Personal bookmark collections”	2.56	1.29	1.89	1.15	2.16	1.24
“Database tools”	2.56	1.62	1.81	1.27	2.11	1.45
“Authoring tools”	2.22	1.22	1.74	1.13	1.93	1.18
“Course planning tools	2.33	1.19	1.52	.89	1.84	1.09
Newsgroups”	1.78	1.00	1.30	.72	1.49	.87
“Course management systems”	1.56	.92	1.52	1.05	1.53	.99
“Instructional design tools”	1.67	.97	1.52	1.05	1.58	1.01
“Testing tools	1.56	.92	1.52	.89	1.53	.89

Tools for analysis and tracking student performance”	2.67	1.71	1.44	1.01	1.93	1.45
“Chat”	1.89	1.23	1.44	.85	1.62	1.03
“Groupware”	1.67	1.19	1.30	.72	1.44	.94
“Whiteboards”	1.67	1.37	1.96	1.40	1.84	1.38
“Tools for on-line marketing”	1.33	.77	1.30	.72	1.31	.73
“Desktop video conferencing”	1.56	1.15	1.41	.97	1.47	1.04

1=very uncommon, 3=somewhat, 5=very common

“ICT is used to support certain orientations in a typical course mostly in the case of students producing or creating reports and products using ICT tools, knowledge transfer, connecting to prerequisite knowledge and re-using materials made by someone else or found elsewhere (appropriate re-use, not plagiarism)”.

Table 60 “The extent to which ICT is used to support certain orientations in a typical course”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“Students producing or creating reports and products using ICT tools	3.56	1.15	3.37	1.57	3.44	1.41
Knowledge transfer”	3.56	1.15	3.44	1.40	3.49	1.29
“Providing feedback on assignments	2.78	1.52	2.56	1.15	2.64	1.30
Skill development”	3.22	1.35	2.85	.95	3.00	1.13
“Re-using materials made by someone else or found elsewhere”	3.56	1.50	3.22	1.40	3.36	1.43
“Connecting to prerequisite knowledge”	3.44	1.46	3.37	1.36	3.40	1.39
“Developing positive attitudes towards the discipline”	3.00	1.37	2.85	1.35	2.91	1.35
“Students planning their own learning processes”	2.67	1.24	2.11	1.28	2.33	1.28
“Giving guidance / informally monitoring progress and effort”	3.00	1.68	2.33	1.24	2.60	1.45
“Motivating on-going participation”	2.56	1.46	2.59	1.37	2.58	1.39
“Offering access to course activities via the web”	1.67	1.19	1.67	.96	1.67	1.04

“Giving feedback after formal assessments”	2.89	1.45	2.30	1.35	2.53	1.41
“Testing and other formal assessments”	2.89	1.60	2.19	1.27	2.47	1.44

1=rarely, 3=some, 5=extensively

“The following table confirms that face-to-face interaction and direct communication between instructors and students and among students is still very important in the way in which instructors teach. ICT is used in a way that is complementary to this, but does not replace what traditionally has occurred in the teaching and learning process”.

Table 61 “Overview of how instructors teach their courses”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“how much interaction with the instructor occurs in the course (Very low amount = 1, Very high amount = 5)”	4.78	.65	4.63	.79	4.69	.73
“how much interaction among the students occurs in the course (Very low amount = 1, Very high amount = 5)”	4.33	.97	3.89	1.28	4.07	1.18
“with what type of knowledge does the course deal” “(Stable knowledge = 1, Newly emerging knowledge = 5)”	3.44	1.10	3.74	1.26	3.62	1.19
“how are the learning materials used in the course acquired (All predefined/ acquired by the instructor= 1, All found or created by the students= 5)”	2.89	1.08	2.85	1.10	2.87	1.08

“does the course involve the appropriate re-use of materials made by someone else or found elsewhere (Not at all = 1, Very much = 5)”	2.78	1.52	2.93	1.41	2.87	1.44
“how does the student participate in the course how much of the course is web-based (Individually = 1, As part of a group = 5)”	2.67	1.24	3.07	1.30	2.91	1.28
“how does the student communicate within the course (Face to face = 1, Only via the computer = 5)”	1.56	.92	1.22	.64	1.36	.77
	1.67	1.19	1.56	.89	1.60	1.01

“Instructors are generally quite positive about the freedom they have to make choices in the way they use ICT”.

Table 62- “Perceived impact of ICT on learning effectiveness according to instructors”

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
“I feel i can make my own choices with respect to when and how i use ICT in my teaching -related work”	4.11	1.02	4.33	1.11	4.24	1.07
“I feel comfortable and confident about my use of ICT for teaching-related work”	4.00	1.03	4.19	1.14	4.11	1.09
“The use of ICT is becoming a normal part of the way i do my teaching-related work”	3.56	1.15	3.67	1.36	3.62	1.27
“Using ICT is facilitating new forms of learning in my courses”	3.56	1.15	3.74	1.38	3.67	1.28
“My students are satisfied with the learning value of the use of ICT in my courses”	3.33	.77	3.67	1.11	3.53	.99
“I am satisfied with the results of using ICT in my courses”	3.78	1.00	3.89	1.15	3.84	1.09

"My students are satisfied with the ease of ICT in my courses"	3.44	.86	3.67	1.11	3.58	1.01
"I am satisfied with the way i use ICT in my teaching"	4.22	1.00	4.04	1.16	4.11	1.09

1=very negative, 3=neutral, 5=very positive

"ICT use, in terms of email, PowerPoint, word processing and Web resources, has become commonplace. The lecture remains the "core medium", the instructional form that is most highly valued. However, ICT has clearly become part of the blend, serving as a complement to already existing instructional tools".

"The respondents feel that very little support is available to instructors as far as incorporation of ICT is concerned".

Table 63 "Extent to which various types of support are available for instructors"

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
"An ICT technical unit or help desk	2.78	1.17	2.22	1.58	2.44	1.44
Materials made available via the web	2.78	1.17	2.85	1.46	2.82	1.34
Short courses or workshops"	2.22	1.22	1.85	1.13	2.00	1.17
"Handbooks for self-study or other printed reference material supplied by the institution"	2.56	1.29	1.96	1.16	2.20	1.24
"A pedagogical-support unit"	1.56	1.15	1.44	.85	1.49	.97
"Special projects to stimulate ICT use"	1.44	.86	1.52	.89	1.49	.87

1=not at all, 3=some, 5=major feature

"The overall impression of the respondents about the impact of ICT on the efficiency of teaching activities is somewhat positive with the greatest level of confidence shown in finding resources to use in Courses".

Table 64 "Extent to which instructors have become more efficient by using ICT"

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
"Finding resources to use in my courses"	4.44	1.34	3.96	1.29	4.16	1.31

"Managing administrative data about my students"	4.00	1.24	3.22	1.40	3.53	1.38
"Doing routine tasks relating to my teaching"	4.22	1.22	3.44	1.28	3.76	1.30
"Doing tasks relating to planning and managing my agenda in general"	3.67	1.19	3.37	1.24	3.49	1.22
"Giving feedback"	3.22	1.35	3.37	1.76	3.31	1.59

1= much less efficient, 3=neutral, 5=much more efficient

"Instructors were asked to indicate how they feel about the amount of time they need to perform specific (ICT-related) duties. The following table shows their responses. It seems that instructors are more or less neutral about most issues. Feelings of annoyance are observed in terms of being bothered by technical problems".

Table 65 "Feelings about the amount of time to perform typical instructor's duties"

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation
"Dealing with e-mail Learning to use new technology"	4.22	1.40	3.81	1.04	3.98	1.20
"Using a course management system"	3.56	1.34	3.89	1.15	3.76	1.23
"Responding to unexpected interruptions Solving technical problems"	3.00	.97	3.00	.96	3.00	.95
	2.22	1.00	2.70	1.07	2.51	1.06
	2.67	1.41	2.26	1.38	2.42	1.39

"1=I am very annoyed by the time needed, 3= Neutral (or not applicable), 5=I am very satisfied about the time needed"

"In general it is observed that ICT use plays only a modest role in institutions' staffing policy and is often only valued as having a little to some role. This result shows that using ICT in education is not a major issue in staffing policy and consequently that the necessary incentives and reward for staff are lacking".

Table 66 "The role of ICT in staffing policy, compared by actors' views"

	TZU		UOH		Group Total	
	Mean	Std Deviation	Mean	Std Deviation	Mean	Std Deviation

“ICT competencies are systematic criteria for selection and recruitment of new staff”	2.56	1.04	2.93	1.27	2.78	1.18
“ICT use in education is part of regular external quality assurance”	2.72	.83	2.81	1.27	2.78	1.11
“ICT use in education is an integral part of regular staff assessments”	2.33	.97	2.81	1.27	2.62	1.17
“professionalization of staff in ICT competencies is mandatory”	2.39	.98	2.93	1.38	2.71	1.25
“ICT use in education counts towards promotion and tenure”	2.06	1.00	2.67	1.30	2.42	1.22
“financial incentives to individual staff are provided for development of ICT use in education”	2.06	.94	2.19	1.21	2.13	1.10
“ICT use in education is mandatory”	2.89	1.23	3.11	1.42	3.02	1.34

1 = Not at all, 2 = a little, 3 = some, 4 = much, 5 = very much

“Predicting future educational delivery scenarios”

“This section aims at predicting the future scenarios of educational delivery using CHEPS model. The dependent variables in the model were four scenarios Back to Basics, Stretching the Mould, the Global Campus, and the New Economy. Independent variables were derived using factor analysis. How well the model was supported by the questionnaire data? To answer this question, a series of statistical analyses took place. First, factor analysis was used to reduce the number of variables in the model and replace them with new variables based on factors, or patterns” of relationships within the data. “After this, a number of regression analyses took place in order to see which combinations of the factors were the strongest predictors of the dependent variables. The analyses showed that the scenarios are an appropriate way to consider models of change. The analysis has been carried out for University of Hyderabad (UOH) and Tezpur University (TZU) separately and pooled analysis as well”.

“Factor analysis is a technique used to identify a small number of factors that explain

the variance observed in a larger set of variables. These factors not only present a more concise way to represent a set of variables but also can identify new combinations of the original variables that relate closely to each other even if the researchers originally thought they should be in different groupings. In the original model, there were five categories of predictor variables--Environmental conditions and settings, Policy/response, Implementation, Practice, and Experience and effects. Together these were expressed by 21 clusters of variables and a total of 178 individual variables. In addition, the dependent variables were represented by one cluster (future scenarios) with a total of four variables. Each of these six categories (five of predictors and one of dependent variables) underwent a factor analysis for simplification of its component clusters and associated variables”.

“Component A: Environmental conditions and settings”

“In the original model, nine clusters of variables were predicted for environmental conditions and settings. Ten were obtained from the factor analysis, representing similar sets of clusters but with some recombination of variables. Table 67.1 shows the original and new clusters for Component A, gives the number of variables involved with each cluster, and indicates the variable loading most highly on each new cluster in order to give an indication of the types of variables in the new cluster. The new and old variables are not presented in a matching order in the figure. For the old variables, the order is used that was given in questionnaire. For the new factors, the order relates to the importance of the variables in the factor analysis, with Factor A1 listed first (accounting for the largest amount of the variance in the overall set of variables, eigenvalue = 13.57, 16.5% of the overall variance), ranging down to Factor A10 (eigenvalue = 2.68, 3.26% of the overall variance)”. The outcome of factor analysis was given as table 67.1.

Table 67.1: “original clusters and obtained factors for component A of the model for pooled data (UOH + TZU): Environmental conditions and settings”.

A. “Environmental conditions and settings(original clusters)”	“Factor- A. Environmental conditions and settings”	“Variable loading most heavily on new factors”
“A1. Aspects contributing to good education as item 2 (7 variables)”	“F-A1:Influence of competition and cooperation (16.5 % of variation)”	“Influence of competition from national business and industry on future ICT Policy (item 8nbi3)”

“A2. Mission of the institution as item 3 (6 variables)”	“F-A2: Flexibility and support offered to students (8.8% of variation)”	“Times for starting and finishing a course (item 6c)”
“A3. Choice offered as item 5 (10 variables)”	“F-A3: Inability to use ICT methods (7.4% of variation)”	“Knowledge transfer (item 16 b)”
“A4. Flexibility offered in course related aspects as item 6 (9 variables)”	“F-A4: Teaching and learning not being innovative in mission (5.8% of variation)”	“Giving feedbacks after formal assessments (item 16l)”
“A5. Support to students as item 7 (8 variables)”	“F-A5: Choice offered to students (4.6% of variation)”	“Extent of flexibility (choice) offered through fully planned programs but within many choices for students in future (item 5af)”
“A6. Competition and cooperation as item 8 (20 variables)”	“F-A6: Good education practices (4.4% of variation)”	“Individualization for different characteristics (item 2g)”
“A7. Extent to which ICT is used as item 13 (5 variables)”	“F-A7: Mission of the institution (4.4% of variation)”	“Providing lifelong learning in the mission of the institution (item 3f)”
“A8. Use of ICT to support in course as item 16 (13 variables)”	“F-A8: Cooperation between national higher education institutes in a negative manner (4.0% of variation)”	“Role of cooperation in future ICT policy - national higher education institutions (item 8nhe5)”
“A9: How instructors teach their courses as item 17 (8 variables)”	“F-A9: Pedagogy (3.9% of variation)”	“Pedagogy related to group work (item 2d)”
	“F-A10: Little or no choice in programs offered (3.3% of variation)”	“Extent of flexibility offered: fully planned programs, little or no individual choices for students in future (item 5df)”

“A total of 88 variables across 9 clusters were subjected to factor analysis. The results of the factor analysis as shown above indicated that first 10 factors together captured 63% of the variation existed in the original data set; which means that the original 88 variables might be replaced with the new 10 uncorrelated variables (hidden factors). The technique resulted into reduction in number of variables that can be handled quite easily in further analysis. At the same time the compromise made while doing so is not at a great deal. The main clusters of variables that were reflected” in the “factors had been influence of competition and cooperation, flexibility offered to students, etc. as given in the table”.

Table 67.2: “original clusters and obtained factors for component A of the model for UOH: Environmental conditions and settings”.

A. “Environmental conditions and settings(original clusters)”	“Factor- A. Environmental conditions and settings”	“Variable loading most heavily on new factors”
“A1. Aspects contributing to good education as item 2 (7 variables)”	“F-A1:Influence of competition and cooperation”	“Role of cooperation in current ICT policy perceived by Foreign higher education institutions (item 8fhe4)”

“A2. Mission of the institution as item 3 (6 variables)”	“F-A2: Flexibility and support offered to students”	“Times for starting and finishing a course (item 6h)”
“A3. Choice offered as item 5 (10 variables)”	“F-A3: Inability to use ICT methods”	“Knowledge transfer (item 16b)”
“A4. Flexibility offered in course related aspects as item 6 (9 variables)”	“F-A4: Flexibility in Assessment and course completion requirements”	“Assessment standards and completion requirements (item 6g)”
“A5. Support to students as item 7 (8 variables)”	“F-A5: Face to face contact”	“Face to face contact (item 2a)”
“A6. Competition and cooperation as item 8 (20 variables)”	“F-A6: Flexibility in learning resources”	“Learning resources (item 6a)”
“A7. Extent to which ICT is used as item 13 (5 variables)”	“F-A7: Support offered while examinations”	“Support for taking examinations outside the institution (item 7h)”
“A8. Use of ICT to support in course as item 16 (13 variables)”	“F-A8: How instructor teach course”	“How are the learning materials used in the course acquired (item 17d)”
“A9: How instructors teach their courses as item 17 (8 variables)”	“F-A9: Support offered while choosing courses”	“Support for participating in courses with persons from other cultures (item 7c)”
	“F-A10: Flexibility in programs offered”	“Flexible programs, students can choose from a range of combinations: future (item 5cf)”

“In case of UOH the 88 variables across 9 clusters yielded 10 factors together capturing 73% of variation. The crucial factors were found to be same to that of the pooled data. One can guess this kind of results as the UOH had a major share in the pooled data (27 out of 45 respondents). The factors identified and the variables loaded heavily on each factor are given in table 67.2”.

Table 67.3: “original clusters and obtained factors for component A of the model for TZU: Environmental conditions and settings”

“A. Environmental conditions and settings(original clusters)”	“Factor- A. Environmental conditions and settings”	“Variable loading most heavily on new factors”
“A1. Aspects contributing to good education as item 2 (7 variables)”	“Use of ICT”	“Skill development (item 16d)”
“A2. Mission of the institution as item 3 (6 variables)”	“Flexibility and support offered to students”	“Times for starting and finishing a course (item 6h)”
“A3. Choice offered as item 5 (10 variables)”	“Influence of competition and cooperation”	“Role of cooperation among foreign business and industry on current ICT policy (item 8fb4)”
“A4. Flexibility offered in course related aspects as item 6 (9 variables)”	“Mission of the institution”	“Providing lifelong learning in mission of the institution (item 3f)”
“A5. Support to students as	“Innovative Teaching and	“Giving feedback after formal

item 7 (8 variables)”	learning not being in mission”	assessments (item 16l)”
“A6. Competition and cooperation as item 8 (20 variables)”	“Communication among students”	“Communication among students (item 2c)”
“A7. Extent to which ICT is used as item 13 (5 variables)”		
“A8. Use of ICT to support in course as item 16 (13 variables)”		
“A9: How instructors teach their courses as item 17 (8 variables)”		

“From the data of TZU a total of 6 factors were derived that together captured 65% of variation of the data. The variables that were loaded heavily on different factors were coming from the clusters, use of ICT to support in course, flexibility and support offered in course related aspects, influence of competition and cooperation etc. The results of the analysis are set out as table 67.3”.

“Component B: Policy/Response”

Table 68.1: “original clusters and obtained factors for component B of the model for pooled data (UOH + TZU): Policy/Response”

“B. Policy/Response”	“Factor- Policy/Response” B	“Variable loading most heavily on new factors”
“B1. Effect of changes in student demands on current and future ICT- related policy (item 4)”	“Main objective ICT policy”	“Enhancing competitiveness (item 9d)”
“B2. Extent of flexibility (choice) offered now and in the future (item 5)”	“Little or no choice in programs offered”	“Fully planned programs, little or no individual choices for students: now (item 5dn)”
“B3. Main objectives of the ICT policies (item 9)”	“Some individual choice to students in programs”	“Fully planned programs, some individual choices for students: now (item 5bn)”
“B4. Extent to which current and future activities involve in the use of ICT (item 10)”		

“A total of 32 variables across 4 clusters were used to derive hidden factors related to policy. These clusters include effect of changes in student demands on current and future ICT related policy, extent of flexibility offered, main objectives of ICT policy and extent to which current and future activities involved the use of ICT. First three factors covering 43% variation of the data were considered for further analysis. These

three factors are largely drawn from the aforesaid second and third clusters of variables used as input to factor analysis". The results of the analysis are furnished in table 68.1.

Table 68.2: "Predicting policy (UOH+TZU)"

Outcome factors	"Predictors: Environment factors"									
	"F-A1"	"F-A2"	"F-A3"	"F-A4"	"F-A5"	"F-A6"	"F-A7"	"F-A8"	"F-A9"	"F-A10"
"PR1 $R^2 = 0.692$ "	X				X				X	
"PR2 $R^2 = 0.530$ "					-X	-X				-X
"PR3 $R^2 = 0.624$ "		X			X		-X			-X

"The ten factors derived using the 88 variables of environmental conditions and settings were used to predict the three policy related factors obtained. The first regression was carried out considering the first factor of policy as dependent variable and the ten factors of environmental conditions and settings as predictors. The results of regression can be seen as table 68.2. The first factor of policy that is main objective of ICT policy was predicted with an R^2 value of 0.692. It means that the ten factors of environment together explained 69% variation in the dependent variable. The coefficients corresponding to F-A1, F-A5 and F-A9 were found significant at 5% level of significance. It implies that the three aforesaid significant factors of environment "play important role in predicting the first factor of policy. The second factor of policy was predicted with an R^2 value of 0.53. The factors of environment that were found significant in this case were F-A5, F-A6 and F-A10. The third factor of policy was predicted with an R^2 value of 0.624 with significant predictors as F-A2, F-A5, F-A7 and F-A10".

Table 68.3: "original clusters and obtained factors for component B of the model for UOH: Policy/Response"

"B. Policy/Response"	"Factor- B Policy/Response"	"Variable loading most heavily on new factors"
"B1. Effect of changes in student demands on current and future ICT-related policy (item 4)"	"Use of ICT in internally funded research"	"Internally funded research (item 10c)"
"B2. Extent of flexibility (choice) offered now and in the future (item 5)"	"Little or no choice in programs offered in a negative manner"	"Fully planned programs, little or no individual choices for students: now (item 5dn)"
"B3. Main objectives of	"Some individual choice	"5bn Fully planned programs, some

the ICT policies (item 9)”	to students in programs”	individual choices for students: now (item 5bn)”
“B4. Extent to which current and future activities involve in the use of ICT (item 10)”		

“The results of factor analysis of policy related variables with UOH were given as table 68.3. Two of the three factors derived were found to be similar to that of UOH + TZU. The factor found to be specific and crucial to the UOH was use of ICT in internally funded research. This factor was not appearing in the first three factors of policy with pooled data. The three factors of policy with UOH together explained 47% of variation in the data”.

Table 68.4: “Predicting policy (UOH)”

“Outcome factors”	“Predictors: Environment factors”									
	“F-A1”	“F-A2”	“F-A3”	“F-A4”	“F-A5”	“F-A6”	“F-A7”	“F-A8”	“F-A9”	“F-A10”
“PR1 R^2 = 0.757	X									
“PR2 R^2 = 0.784			X	X			X		-X	
“PR3 R^2 = 0.602		X				-X				

“Regression analyses were carried out using the three factors of policy derived from the data of UOH as dependent variables and 10 environmental factors shown in table 67.2 as independent variables. The factors of policy were found to be more predictive with coefficient of determination value as more than 0.6 in all the three regressions. One can see from table 68.4 that the set of predictors found significant” (at 5% level of significance) “were different for the three regressions. Only factor F-A1 was found significant while predicting first factor of policy. But the % of variation explained by the regression was more than 75%. Second factor of policy got highest predictive power (78.4%) with significant predictors as F-A3, F-A4, F-A7 and F-A9. the factors significant in case of third policy factor were F-A2 and F-A6”.

Table 68.5: “original clusters and obtained factors for component B of the model for TZU: Policy/Response”

“B. Policy/Response”	“Factor- B Policy/Response”	“Variable loading most heavily on new factors”
“B1. Effect of changes in student demands on current and future ICT- related policy (item 4)”	“Main objective of ICT policy being enhancing quality”	“Enhancing quality (item 9a)”

“B2. Extent of flexibility (choice) offered now and in the future (item 5)”	“Flexibility in programs offered”	“Programs are highly flexible, students can choose more or less own combinations: now (item 5en)”
“B3. Main objectives of the ICT policies (item 9)”		
“B4. Extent to which current and future activities involve in the use of ICT (item 10)”		

“The results of factor analysis for policy variables with TZU are given as table 68.5 Only two factors were derived from the policy variables data of TZU as the number of respondents in case of TZU were less (18). These two factors together captured 42% of variation in the data”.

Table 68.6 “Predicting policy (TZU)”

“Outcome factors”	“Predictors: Environment factors”					
	“F-A1”	“F-A2”	“F-A3”	“F-A4”	“F-A5”	“F-A6”
“PR1 R ² =0.779	X				-X	
“PR2 R ² =0.644						-X

“The two factors of policy with TZU were regressed on to the six environment factors provided in table 67.3. The results of these two regressions were set out as table 68.6. With the data of TZU also the policy factors were found reasonably predictive. The first factor of enhancing quality through ICT was predicted with an R² value of 0.78 with F-A1 and F-A5 as significant predictors. The second factor of policy i.e. flexibility in programs offered was majorly predicted by environment factor F-A6”.

“Component C: Implementation”

Table 69: “original clusters and obtained factors for component C of the model for pooled data (UOH + TZU): Implementation”

“C. Implementation”	“Factor- C Implementation”	“Variable loading most heavily on new factors”
“C1 Flexibility options offered to students in terms of course-related aspects (item 6)”	“Use of technology”	“Use of Course management systems (item 15g)”
“C2 Extent to which various types of support for flexible learning are currently available to students (item 7)”	“Use of ICT for support”	“Developing positive attitudes towards the discipline (item 16g)”
“C3. Formal responsibility	“Less importance of	“Head of departments importance

and importance in implementation of ICT policy (as reported by decision makers) (item 11)”	Head of departments in implementation of ICT policy”	in implementation of ICT policy (item 11hodi)”
“C4 Leadership of actors in the development and implementation of ICT policy (as perceived by all respondents) (item12)”		
“C5. The extent to which support staff estimate that the following technologies are being used within the institution (item 15)”		
“C6 The extent to which ICT is used to support certain orientations in a typical course (item 16)”		
“C7 Extent to which various types of support “are available for instructors (item 19)”		

“The responses (UOH+TZU) to 68 variables related to implementation of ICT across seven clusters were subjected to factor analysis. The results were presented as table 69. First three factors together capturing 37% variation of data were considered for further analysis”.

Table 69.1: “Predicting Implementation (UOH+TZU)”

“Outcome factors”	“Predictors: Environment and policy factors”												
	“F-A1”	“F-A2”	“F-A3”	“F-A4”	“F-A5”	“F-A6”	“F-A7”	“F-A8”	“F-A9”	“F-A10”	“F-B1”	“F-B2”	“F-B3”
“I1 R ² = 0.866	X	X	-X										
“I2 R ² = 0.879	X	-X	-X										
“I3 R ² = 0.401				X									

“Regression analysis of three factors of implementation was carried out using the factors of environment and policy as explanatory variables. The results were set out as table 69.1. First two factors were well predicted with R² value more than 0.85. It means that the first three factors of environment have better explained the variation in the criteria. The fourth factor of environment alone was found significant while predicting the third factor of implementation. It is to be noted that no factor of policy was able to predict the factors of implementation”.

Table 69.2: “original clusters and obtained factors for component C of the model for UOH: Implementation”

“C. Implementation”	“Factor- C Implementation”	“Variable loading most heavily on new factors”

“Results of regression of Implementation factors with environment and policy factors as independent variables for UOH data are provided in table 69.3. The factor of use of technology was very well predicted with an R^2 value of 0.916. With the data of UOH also first three factors of environment were found significant. While predicting the second factor of implementation only the environment factor F-A2 (flexibility and support offered to students) was found significant. No predictor was found significant in the regression of third factor of implementation. However the intercept explained about 50% of variation”.

Table 69.4: “original clusters and obtained factors for component C of the model for TZU: Implementation”

“C. Implementation”	“Factor-Implementation” C	“Variable loading most heavily on new factors”
“C1 Flexibility options offered to students in terms of course-related aspects (item 6)”	“Flexibility and support offered to students”	“Assignments required for the course (item 6e)”
“C2 Extent to which various types of support for flexible learning are currently available to students (item 7)”	“Least formal responsibility of support staff in ICT policy”	“Supporting staff formal responsibility (item 11 supf)”
“C3. Formal responsibility and importance in implementation of ICT policy (as reported by decision makers) (item 11)”		
“C4 Leadership of actors in the development and implementation of ICT policy (as perceived by all respondents) (item12)”		
“C5. The extent to which support staff estimate that the following technologies are being used within the institution (item 15)”		
“C6 The extent to which ICT is used to support certain” “orientations in a typical course (item 16)”		
“C7 Extent to which various types of support are available for instructors (item 19)”		

[illegible]

	1"	2"	3"	4"	5"	6"	7"	8"	9"		1"	2"	3"	1"	2"	3"
"P1 R ² " =0.980	-X		-X					X	-X					X		
"P2 R ² " =0.945	X		X							-X				-X		

"Regression analysis was carried out with the two factors of implementation derived above (UOH) as dependent variables and environment (10), policy (3), implementation (3) factors as independent variables. The results were given in table 70.3. The predictors, viz., F-A1, F-A3, F-A8, F-A9 and F-C1 together explained about 98% variation in the first factor 'use of technology'. The second factor of implementation was predicted by F-A1, F-A3, F-A10 and F-C1 with an R² value of 0.945".

Table 70.4: "Original clusters and obtained factors for component D of the model for TZU: Practice"

"D. Practice"	"Factor- D Practice"	"Variable loading most heavily on new factors"
"D1 The extent to which ICT is used within the institution (item 13)"	"Use of technology in Newsgroups"	"Newsgroups (item 15f)"
"D2 The extent to which technologies influence actual teaching practice (item 14)"	"Use of technology in chat"	"Chat (item 15k)"
"D3 The extent to which support staff estimate that the following technologies are being used within the institution (item 15)"		
"D4 Overview of how instructors teach their courses (item 17)"		

"The TZU data on the practice variables were subjected to factor analysis. The results of the same are given as table 70.4. The new factors identified were use of technology in news groups and chat. These two factors together captured 41% of variation in the data".

Table 70.5: "Predicting Implementation (TZU)"

"Outcome factors"	"Predictors: Environment, policy and implementation factors"									
	"F-A1"	"F-A2"	"F-A3"	"F-A4"	"F-A5"	"F-A6"	"F-B1"	"F-B2"	"F-C1"	"F-C2"
"P1 R ² " =0.974					-X			X		X

"P2 R ² " =0.942	X								-X	

"The two factors identified above with TZU data were subjected to regression analysis with 6 factors of environment, 2 factors of policy and 2 factors of implementation as explanatory variables. The results can be same in table 70.5. The two factors of implementation were highly predictive. The predictors found significant in case of first regression were F-A5, F-B2 and F-C2 while the second factor of implementation was predicted with F-A1 and F-C1 as significant predictors".

"Component E: Experiences and Effects"

Table 71: "Original clusters and obtained factors for component E of the model for pooled data (UOH + TZU): Experiences and Effects"

"E. Experiences and Effects"	"Factor- E Experiences and Effects"	"Variable loading most heavily on new factors"
"E1 Perceived impact of ICT on learning effectiveness according to instructors (item 18)"	"Perception of instructors on impact of ICT on learning effectiveness"	"The use of ICT is becoming a normal part of the way i do my teaching-related work (item 18c)"
"E2 Extent to which instructors have become more efficient by using ICT (instructors perceptions) (item 20)"	"ICT education not to be linked to promotions to staff"	"Professionalization of staff in ICT competencies is mandatory (item 22e)"
"E3 Feelings about the amount of time to perform typical instructors duties (item 21)"		
"E4 The role of ICT in staffing policy compared by actors views (item 22)"		

"The responses from UOH and TZU together pertaining to 25 variables across four clusters measuring the component experiences and effects were subjected to factor analysis. The results were as given in table 71. The first two factors that together captured 43% of variation in the data were considered for the model. It can be seen in the table that the new factors were coming from cluster E1 and cluster E2".

"The two factors derived above (table 71) were subjected to multiple linear regression analysis including the environment, policy, implementation and practice factors as

regressors in the model. The predictive power of these two criteria was found low and no predictor was found significant in the model. Hence presentation of the results was skipped”.

Table 71.1: “Original clusters and obtained factors for component E of the model for UOH: Experiences and Effects”

“E. Experiences and Effects”	“Factor- E Experiences and Effects”	“Variable loading most heavily on new factors”
“E1 Perceived impact of ICT on learning effectiveness according to instructors (item 18)”	“Perception of instructors on impact of ICT on learning effectiveness”	“I am satisfied with the results of using ICT in my courses (item 18f)”
“E2 Extent to which instructors have become more efficient by using ICT (instructors perceptions) (item 20)”	“professionalization of staff in ICT competencies made mandatory”	“professionalization of staff in ICT competencies is mandatory (item 22d)”
“E3 Feelings about the amount of time to perform typical instructors duties (item 21)”		
“E4 The role of ICT in staffing policy compared by actors views (item 22)”		

“Two factors of experience and effects were derived from UOH data (table 71.1). These two factors together captured 47% of variation in the data. When these two factors were regressed on the environment, policy, implementation and practice factors no predictor was found significant in either of the regressions. Hence the results were skipped from the presentation”.

Table 71.2: “Original clusters and obtained factors for component E of the model for TZU: Experiences and Effects”

“E. Experiences and Effects”	“Factor- E Experiences and Effects”	“Variable loading most heavily on new factors”
“E1 Perceived impact of ICT on learning effectiveness according to instructors (item 18)”	“ICT improving instructors efficiency”	“managing administrative data available via web (item 20b)”
“E2 Extent to which instructors have become more efficient by using ICT (instructors perceptions) (item 20)”	“Instructors’ feeling about their duty”	“solving technical problems (item 21e)”
“E3 Feelings about the amount of time to perform typical instructors duties (item 21)”		
“E4 The role of ICT in staffing policy compared by actors views (item 22)”		

“The data of TZU pertaining to the variables of experience and effects were subjected to factor analysis the results of which were presented in table 71.2. The first two factors together capturing 47% of variation in the data were considered for the model”.

Table 71.3: “Predicting Experience and effects (TZU)”

“Outcome factors”	“Predictors: Environment, policy, implementation and practice factors”									
	“F-A1”	“F-A2”	“F-A3”	“F-A4”	“F-A5”	“F-A6”	“F-B1”	“F-B2”	“F-C1”	“F-C2”
“EE1 R ² ” =0.902			-X				-X			
“EE2 R ² ” =0.777									X	

“The two factors of experience and effects with TZU were subjected to regression analysis using the predictors derived so far from the previous components. The results were furnished as table 71.3. The predictive power of these two factors was reasonably good with R² values as 0.902 and 0.777 for the first and second factors respectively. The predictors F-A3, F-B1 were found significant while predicting the first factor. The predictor F-C1 alone was found significant in the second regression”.

“Dependent variables: Education Scenarios”

“Responses pertaining UOH +TZU four variables of scenarios were subjected to factor analysis. The results were as presented in table 72. After looking at the eigen values of each factor one can understand that each of the four factors was capturing 25% variation in the data. On the other hand each factor was loaded heavily by one variable only. Loadings of other variables were minimal. It may be due to low correlation among these 4 variables. The low correlations also can be justified. Given the scenarios, respondent does not give high scores to more than one scenario. In such cases factor analysis cannot reduce number of variables. The users will be forced to retain all the factors (equal to number of variables). In such situation it does not matter whether we consider new factors or original variables. As it becomes easy to interpret original variables, the original variables were considered in the model rather than the four factors derived”.

Table 72: “Loadings of four scenario variables on the factors with pooled data (UOH + TZU)”:

	Factors			
	1	2	3	4
“Back to basics”	.019	.996	.051	-.067
“Stretching the mold”	.996	.019	-.016	-.088
“Global campus”	-.090	-.069	.105	.988
“New economy”	-.016	.052	.993	.104
“Eigen value”	1	1	1	0.999

Table 72.1: “Predicting scenarios (UOH+TZU)”

“Outcome factors”	“Predictors: Environment, policy, implementation, practice and experiences and effects factors”																			
	“FA1”	“FA2”	“FA3”	“FA4”	“FA5”	“FA6”	“FA7”	“FA8”	“FA9”	“FA10”	“FB1”	“FB2”	“FB3”	“FC1”	“FC2”	“FC3”	“FD1”	“FD2”	“FE1”	“FE2”
“SC1 (back to basics) R ² = 0.639																X				
“SC2 (Stretching the mold) R ² = 0.415																				
“SC3 (Global campus) R ² = 0.448										X									X	
“SC4 (New Economy) R ²		X													X					

=																			
0.5																			
72																			

“All the twenty factors derived from the five components were used as predictors to explain the variation in each of the four scenarios. The results of the regression were as provided in table 72.1. The predictors used in the model explained about 64% variation in the data pertaining to back to basics scenario. However factor F-C3 alone was found significant at 5% level of significance. This implies that the responsibility assigned to HODs and individual professors in implementation of ICT policy could predict this scenario. As the regression coefficient corresponding to this factor was negative, lesser the factor score, chance of preferring back to basics will be more. Stretching the mold scenario was less predictive (with R^2 value as 0.415) and no predictor was found statistically significant at 5% level of significance. It means that this scenario cannot be predicted with any of the factors derived above. Global campus scenario was predictable with the factors F-A10 and F-E1 as significant. Global campus becomes the most preferred scenario when respondents feel that extent of flexibility offered in the programs in future will be less and instructors’ perception on impact of ICT on learning effectiveness is positive. When the responses pertaining to the scenario new economy were regressed on the twenty predictors used above, the factors F-A2 (flexibility and support offered to students) and F-C2 (use of ICT for support) were found significant. One may obviously expect ‘new economy’ scenario when such factors predict the mode of delivery. All the factors together explained 57% of variation in the dependent variable.”

Conclusion:

“On-campus settings for course activities are the main learning setting in both the Universities, though they are looking at variations in learning of where and how students participate in courses. This is influenced by the actors’ view of what contributes to good education. Face to face contacts, Contact with the instructor when needed by the students and Communication among students are highly valued. Institutions’ mission on innovation in teaching and learning along with emphasis on externally funded is seen to have greater priorities in both TZU and UOH. Change in demands on current and future ICT related policy has not been much effected by

flexibility of learning, delivery of education, pace of learning; lifelong learning, international students. But in both the cases, providing increased access to traditional students through ICT has had some impact. Extent of flexibility (choice) offered now and in the future offer on average only moderate choice: programs are in principle fully planned and only once students have entered the program may they have some level of choice (a type of flexibility from within). In most areas increase is expected in the future”.

“At present there is little substantial flexibility in the overall picture for course-related aspects offered to students. Respondents were asked various questions about their competitors as well as about their partnerships for cooperation in the area of ICT. They were also asked to indicate to what extent external actors (National higher education institutes, Foreign higher education institutions, National business and industry, Foreign business and industry) influence the institutional policy for ICT. Their answers indicate that only National higher education institutes have some influence; other actors had very less influence. Tezpur University respondents felt that the Vice Chancellor and Heads of Department had a greater role to play in both the formal responsibility and implementation stage; followed by Individual instructor. University of Hyderabad respondents however felt that the Vice Chancellor and Heads of Department had a major role to play at the formal responsibility stage”.

“At the implementation stage, the individual instructor would have to give the maximum input. ICT usage within the institutions is still very less. It is somewhat limited to course preparation or organizational purposes and for communication with and among students and instructors. Web resources have the greatest influence on actual teaching practices followed by e-mail systems which are used basically for communication and sharing of resources”.

“Looking at the actual use of the various available tools and applications other than email and Web resources it is observed that most options are used only to a very limited extent (between "uncommon" and "somewhat"). Most popular (but only scoring just above "somewhat") are presentation tools (PowerPoint etc.) ICT is used to support certain orientations in a typical course mostly in the case of students producing or creating reports and products using ICT tools, knowledge transfer, connecting to prerequisite knowledge and re-using materials made by someone else or

found elsewhere (appropriate re-use, not plagiarism). Face-to-face interaction and direct communication between instructors and students and among students is still very important in the way in which instructors teach. ICT is used in a way that is complementary to this, but does not replace what traditionally has occurred in the teaching and learning process. Instructors are generally quite positive about the freedom they have to make choices in the way they use ICT. The respondents feel that very little support is available to instructors as far as incorporation of ICT is concerned. The overall impression of the respondents about the impact of ICT on the efficiency of teaching activities is somewhat positive with the greatest level of confidence shown in finding resources to use in Courses”.

“In general it is observed that ICT use plays only a modest role in institutions' staffing policy and is often only valued as having a little to some role. Using ICT in education is not a major issue in staffing policy and consequently that the necessary incentives and reward for staff are lacking. It can be summarized that ICT usage and learning scenario in both the cases of UOH and TZU is on the line of traditional Back to Basics scenario where local and face-to-face transactions are highly valued and the institution offers a program and ensures its quality. Actors feel the importance of global and network mediated transactions through ICT even though in actual practice ICT is at an entry stage”.

Conclusion

Abstract: The chapter summarizes the research findings that relate directly to the questions posed by the research; the issues, challenges and responses. It also mentions limitations of the research and recommendations for management, human resources, processes and institutional culture in ICT4E implementation based on the study conducted.

Towards Knowledge Societies

The “introduction of ICT innovations have opened up opportunities for accelerating the flow of knowledge”. TZU and UOH are in the process and need to further exploit traditional knowledge, taking full advantage of new developments in ICT. UOH has taken several initiatives (e.g. G-HAN, connect.uohyd.ac.in) to facilitate community engagement and also to take the network beyond the institution. Linkages using ICT is helping in networking with groups, organizations, support communities in cyberspace forming international and regional links which should build towards the larger picture of Knowledge Society as highlighted in National Knowledge Commission (NKC) and other education policy documents. MOU signed by the Universities should further add up to the collaborative knowledge building in these networks. The benefits of these endeavors by the Universities will be limited to few early adopters if general mobilization of all the actors in the network does not take place. Access to knowledge has become “a critical factor for individual development, careers and success”. This research further proves that “capacity-building at various levels is a unique means to enable individuals and institutions to access, utilize and sustain knowledge and skills”. The study also shows that the nature

of knowledge production thus facilitated is having an impact on change in societies, cultures and economics. Exposure to profusion of information using ICT is changing the way knowledge is being created. This change is welcomed by some and being resisted by some actors in the academic network. It is also observed that the Knowledge Society confirms the “existence of a knowledge community whose members share a common stock of knowledge and more or less similar experiences” facilitated by ICT.

The knowledge mission of TZU has been to harness indigenous knowledge of the Northeast and thus contribute in building the knowledge capital. The knowledge activities of UOH have also been focused on several areas of research in humanities and science. “The modern university is the ideal environment for the creation and transfer of knowledge that drives national competitiveness in an increasingly global era. Institutions of higher education are destined to play a fundamental role in knowledge societies, based on radical changes in the traditional patterns of knowledge production, diffusion and application. An innovative knowledge society prepares its people to not only embrace and adapt to change but to also manage and influence it. There is a need to respond to a changing and challenging world which demand different skills and knowledge; critical thinking and innovativeness; as well as the ability to absorb and analyze information. Knowledge is expanding rapidly and diversifying through the establishment of new crosscutting disciplinary communities organized in the form of networks around international symposia and specialized research journals” (UNESCO, 2007). International networks for knowledge sharing are spreading within institutions of higher education. The knowledge economy is demanding for “changes in the organization of higher education and the way

knowledge is managed within the education system” and this can be seen in the way several Schools of study are making changes in their curriculum. The National Knowledge Network should enable “higher education institutions become a more prominent and interspersed part of the knowledge society”. Efforts are being made in both TZU and UOH for research and other knowledge to be harnessed more efficiently in the education and learning sectors and to establish a systematic or scientific knowledge base in these activities.

“In knowledge societies it is essential to reduce the digital and knowledge divide. Training in the new information and communication techniques requires the art of navigating to avoid information overload. It is not just juxtaposing information but it involves using information for building and structuring knowledge. ICT-based innovation can and does occur in classrooms without there being a close linkage to national policy. Without a strategic basis to guide policies of technology integration in education, it becomes only functional. There is a tendency to become techno-centric where emphasis is laid only on the infrastructure and technical training; the underlying essence of using ICT for knowledge building is lost”. The four main “rationales for introducing ICT in education” can be summed as (Cross and Adam, 2007).

“Social: Perceived role that technology now plays in society and the need for familiarizing students with technology.

Vocational: Preparing students for jobs that require skills in technology.

Catalytic: Utility of technology to improve performance and effectiveness in teaching, management and many other social activities.

Pedagogical: To utilize technology in enhancing learning, flexibility and efficiency in curriculum delivery”

“With education being passed as the constitutional right of every individual in India, ICT with all its advantages needs to be incorporated ‘at all levels of education system, addressing the challenges’ discussed. ICT4E change agents would involve the policies, process, ICT tools, Knowledge enablers and learners”. Hence, successful ICT4E for managing change requires accessibility, quality assurance, amendment of related policies, international collaboration, standardization of learning technologies, human resource development and recruitment.

Research limitations, findings and contributions

In UOH, since the researcher is an insider, the respondents were more open. In TZU, some of the respondents were more cautious about the projection of the institution. Moreover due to large number of sample (Head/ Deans/ Faculties/ Administrative staffs/ Students) involved in the study, it took a considerable amount of time to collect data. In certain cases some of the respondents “were not willing to participate in the study”. Hence a respondent at an equivalent level had to be arranged which caused further delay in completion of data collection. This study is essentially based on ICT4E translation in the two universities. Hence, another limitation is that all the findings may not be relevant for generalization. However, an attempt is made to throw light on the factors that affect ICT implementation and the directions that ICT4E policies can take on a general level. These “findings in terms of research contributions are further discussed in the following paragraphs”.

The “study shows that both the universities have a strong commitment towards ICT for education. Extent of integration of ICT into the curriculum”, changes in curriculum delivery using ICT, and ICT taught as a subject is department and school specific. TZU owing to its location faces greater challenges in terms of connectivity. On-campus settings for course activities are the main learning setting in both the Universities, though TZU and UOH are looking at variations in learning of where and how students participate in courses. This is influenced by the actors’ view of what contributes to good education. The study also shows that change in demands on current and future ICT related policy has not been much effected by flexibility of learning, delivery of education, pace of learning; lifelong learning, international students. But in both the cases, providing increased access through ICT has had impact on the way students and teachers construct knowledge. Stakeholders in UOH and TZU have asserted the benefits of INFLIBNET and are waiting for National Knowledge Network to be fully operational. Both UOH and TZU are strong Knowledge bases, UOH with its resourceful faculties and innovative Centres and Schools; and TZU with its special North East India focus for conservation and promotion of indigenous knowledge. The common challenges faced based on the study of the two universities can be listed in the subsequent paragraphs.

ICT Access is not necessarily leading to ICT usage. Nature and intensity of ICT use depends on individuals. General understanding of ICT usage is still limited to communication and presentation tool, not at the level of Knowledge Building and Sharing Tool. The research highlights the fact that there is a section of students from rural background who still need to be ICT literate. “Digital Divide can also be seen in

the rate of diffusion of ICT among faculties/peers in the institutions. Need is felt for creation of conducive learning environment to encourage Peer to Peer influence. Flexibility of institutional policies is required for integration of ICT use in curriculum and in teaching/learning. Teachers feel that ICT4E should be incorporated at Institutional level and not at individual level for successful usage of ICT". Faculties consider that Knowledge society in today's context is all the knowledge base that is available at the click of a button. Some feel that the more knowledge one has the more the need of ICTs to bring it in Public sphere; whereas some teachers would like to 'preserve the sanctity of knowledge' by not using ICT. Teacher's fear of plagiarism, fear of dependency on technology, reliability of information from the internet can be seen as barrier to incorporation of ICT in pedagogy. There are issues "related to the concept of knowledge produced with the use of ICT. Tacit knowledge vs. explicit knowledge; the issue of knowledge management and quality of knowledge are some of the concerns voiced by faculties in both the universities".

Though most of the teachers acknowledge the importance of ICT4E, teachers are still comfortable with the conventional form. 'Still prefer chalk n board', capacity building is required so that teachers know 'what to do with which ICT tools'. There is a need for early adopters acting as catalyst in mobilizing ICT adoption at all levels. Following the ANT theory, these successful adopters will "act as role models for trialability of technology in teaching and learning amongst their peers" which should lead to further assimilation. Though most of the faculties agree on the benefits and opportunities that ICT can bring in education; most of them do not have the required training and knowledge. Using ICT becomes time consuming for them.

The study also showed that “most innovative teachers who prepare their lesson plans and activities need time and ongoing support. Teachers are further motivated in technology innovation and integration when they see progress in their students’ learning pattern. Faculties who are not ICT pro need further motivation and training in using ICT in pedagogy beyond the normal ICT competence. They have to be trained to select appropriate methods for the designed learning activities in accordance with curriculum development. The integration of ICT into other subject areas depends on teachers’ ICT and pedagogy skills and extra sets of computer and peripherals available. The training courses should incorporate pedagogical skills to ensure that teachers know how to apply or integrate ICT into the curriculum”. The research shows that evaluation of implementation of policies is required to increase accountability.

“Monitoring and Evaluation can include documentation of benefits of using ICT in education; assessing learning impact”. In certain cases Infrastructure support is ample but there is the need to develop relevant and adequate content which would include development of local software. There is a need for holistic approach to infrastructure creation. Flexibility which ICT can bring still needs to be incorporated. There is lack of flexibility, in most of the cases. Education and ICT is not learner centered, it is institution centered.

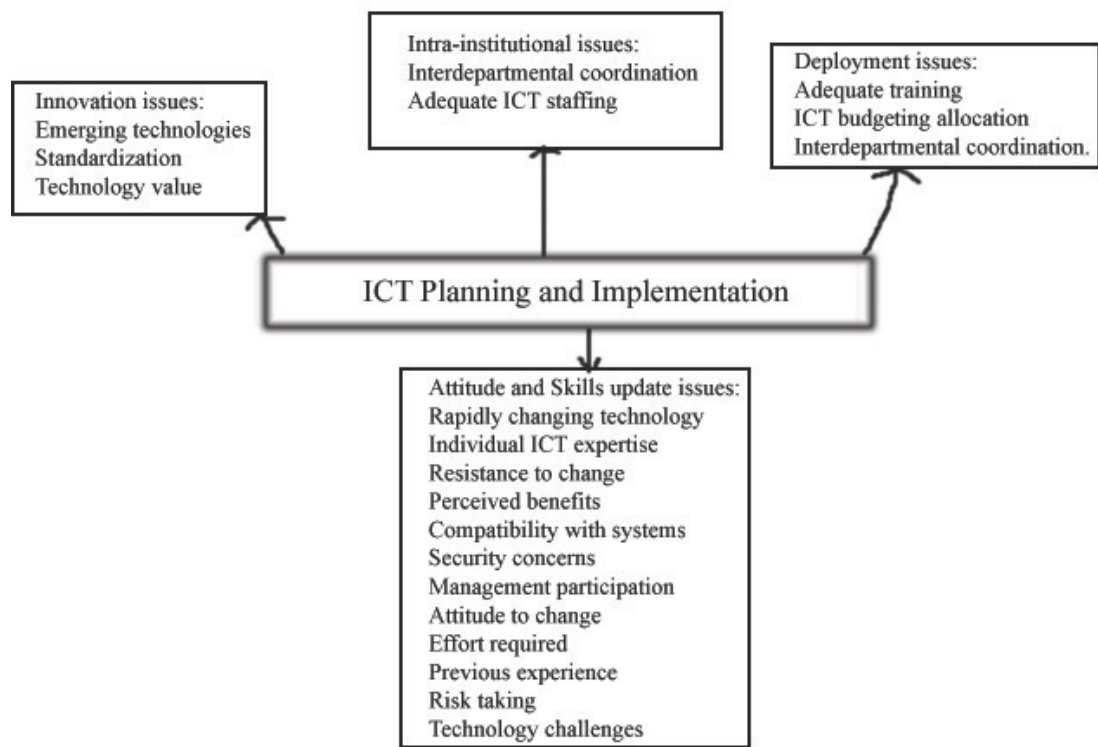


Figure 55- ICT planning and implementation issues

The study also shows that there is certain amount of harmonization and coordination necessary among policy makers in the areas of curriculum decisions, infrastructure decisions, content decisions, policy making, and policy implementation. As of now they operate in a fragmented manner. ICT support system and service needs to be enhanced, there is requirement of trained support staff to assist teaching/learning process. The Computer Centers in both the Universities are doing their best in keeping up to date with the fast changes in technology.

Some actors during the implementation displace their position in the network far or close away from the original plan portrayed by the primary actor. ANT gives an approach to understand how actors displace themselves in the network through the “process of Interesement. Engagement of the key actants and translation of their interests into visions, objectives, plans and roles” has highlighted following uses of

ICT which need to be addressed in further development of ICT policy in the two Universities:

- i. ICT in teaching and learning: provide a platform for content; improve “teaching methodology; develop management and monitoring of the teaching and learning process”.
- ii. ICT in research: to gather, exchange, and construct academic information; support management of research projects.
- iii. ICT in academic information services: IGML in University of Hyderabad is already facilitating this; the library in Tezpur University still has to transit from the traditional form completely.
- iv. A more focused policy is required for administration support and ICT institutional facilities.
- v. Review of participation, skills and output: learners with only computer literacy are produced in cases where ICT is taught as a subject; on a more general level students graduate with better information searching skills using ICT and better prepared for the knowledge economy.
- vi. Review of outcomes and impact: Wherever the initiatives have been taken by teachers in incorporating ICT in pedagogy, evaluation of ICT in enhancing education systems’ output and facilitating better teaching and learning; improving student innovative thinking and knowledge building skills and making them ready for the job market and vocational absorption.

“In actor network theory, the network of social, technical and physical actors involves a series of transformations, transductions and translations”. Networks are looked at without distinguishing between human actors and non-human actors, trying to find any disconnection in the network and measure the power of the signal at each

node. “Mapping the Enrolment, mobilization, empowerment, and coordination of actants as translators (i.e., creating chains of translators, and dealing with resistance) it has been noticed that ICT has brought about changes in the existing networking patterns which have extended beyond the traditional form, creating new geographies in knowledge sharing and gathering. Increased presence of computers in educational administrations and increased use of computers for management can also be noticed over the years. Both UOH and TZU are responding to the social roles of higher education in their regions. These changes are connected to changes in knowledge production in universities”; while some courses are in response to new global economy paradigm, some courses and researches conducted are focusing on preserving and documenting the regional knowledge.

Good leadership, support, and a proactive style of management that encourages innovation and integration, that supports and responds to human resources and ICT integration will assist in successful adoption of ICT. The need to improve information structuring and integration is becoming critical as institutional ICT boundaries are being dissolved in favour of inter-departmental information exchange. For an effective and efficient ICT4E system to operate co-maturation is required. This research has shown that the structure and culture of an institution and its associated human element require substantial attention when considering ICT adoption. Processes, management, human resources, and the institutional culture all require concurrent attention as they all can deeply influence successful ICT4E adoption. For effective ICT4E towards Knowledge Society there is a requirement of integration of process system and the social structure policy among its drivers. Teachers- make students use ICT for specific purposes informative/collaborative. Depending on that

students follow the teachers' adaption of technology pattern. But outside the classroom students are the lead actors. In some cases it is the technology itself that acts as the lead actor.

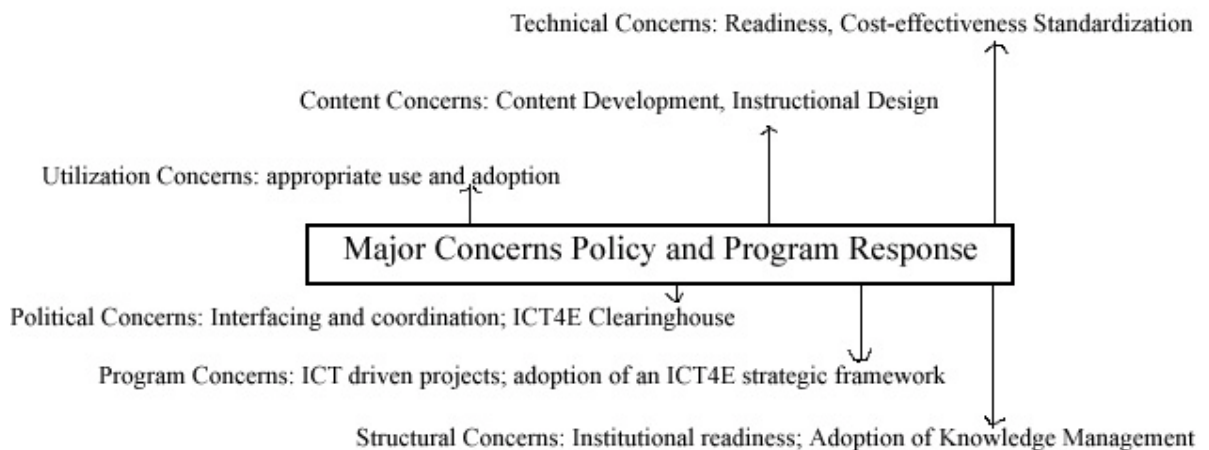


Figure 56- Major Concerns Policy and Program Response

As indicated by several studies, simply putting ICT in the classroom is not enough for ICT4E. It has been found that even the best policies and technologies will fail to reach their full potential if the users “don’t know how to get the best out of them. The need has been felt to match infrastructure needs with investment in collaborative learning networks, content support and ICT4E development initiatives. The focus in education needs to shift from the teacher to the learner. Increase in the use of ICT in education has not occurred at the same pace as the increase in overall ICT infrastructure. Translation of ICT as an Obligatory passage point (OPP) where the actors have to transit through the OPP” to achieve their objectives in the case of the two Universities are given in the following tables.

Table 73- ICT4E in UOH

Main Actors	Proposition as an OPP	Agents Proposing it as an OPP	Agents that had to be enrolled	Outcomes/Translations
Administration	ICT for e-governance and automation	National and Institutional policies, Vice Chancellor's office, Administrative section	Administrative staff, Schools, Departments, ERP (Enterprise resource planning) developer, Computer Center	Enterprise resource planning had limitations as the outsourced technology developer did not understand the institutional domain and its different parts, how they are linked to each other. The software developer had a corporate approach which could not be applied to an educational institute.
Schools/Departments	ICT for information access, communication and knowledge building.	Institutional policies, Administration, some Deans, Heads, Faculties	Administration, Deans, Heads, Faculties, Students, Staff	Depending on the understanding of ICT, stakeholders from different disciplines have administered the usage of ICT4E at different levels. Incorporating ICT4E is still an individual enterprise. ICT usage is seen to have greater impact on aiding communication and information search.
Library (IGML)	ICT to contribute in the role of library as a knowledge hub	National and Institutional policies, Administration, Library Staff, Academic staff	Administration, Library Staff, Schools, Departments, Faculties, Students, Staff	IGML is supporting study, teaching and research activities of the university by acquiring the learning resources and providing information services that enhance their usefulness, accessibility, and availability using ICT. IGML is also serving as an important networking node in the context of knowledge society.
Computer Center	To provide networking facility and ICT support services	National and Institutional policies, Administration, Computer Center, Academic staff	Administration, Computer Center Staff, Schools, Departments, Faculties, Students, Staff	The Computer Centre along with Campus Network Facility (CNF) is the main hub of ICT translation in UOH but the stakeholders feel that what is required is something beyond that, some kind of a group which is more actively involved in ICT for education.

Table 74 - ICT4E in TZU

Main Actors	Proposition as an OPP	Agents Proposing it as an OPP	Agents that had to be enrolled	Outcomes/Translations
Administration	ICT infrastructure to support academic activities as well as administration	National and Institutional policies, Vice Chancellor's office, Administrative section	Administrative staff, Schools, Departments and Computer Centre	TZU has a pro ICT approach which has resulted in the administration emphasizing on ICT infrastructural support. The study shows the need to shift from techno-centric stance of ICT to a more socio-technical approach. TZU is in an early adopter stage of technology.
Schools/Departments	ICT for information access, communication and knowledge building.	National and Institutional policies, Administration, some Deans, Heads, Faculties	Administration, Deans, Heads, Faculties, Students, Staff, Computer Center	Stakeholders feel that ICT has helped in bridging the location disadvantage by providing access. Understanding and definition of ICT is at different levels, there is technophobia amongst some users.
Library	ICT to aid in Library Information System	National and Institutional policies, Administration, Library Staff, Academic staff	Administration, Library Staff, Schools, Departments, Faculties, Students, Staff	INFLIBNET has been very helpful for the users. The number of qualified staff in Library Information System using ICT is very less. The challenge is to maintain a logical and reasonable balance between electronic and traditional resources in the library and its services. Knowledge resource management is at the initial stage.
Computer Center	To provide networking facility and ICT support services	National and Institutional policies, Administration, Computer Center, Academic staff	Administration, Computer Center Staff, Schools, Departments, Faculties, Students, Staff	Accommodating the requirements of different departments in the time slots of central computer centre is becoming difficult with time. Centralization of the computing facilities is viewed as a major drawback by a section of the user community. Maintenance of these computing resources, limited staff, delayed decision making and lack of ICT policy framework are the major challenges faced.

Institutional recommendations

Using “ANT for devising strategies for expansion and continuance of the network (e.g., for creating centers of translation for expanding and perpetuating the network and effecting the desired change)”, the following suggestions can be made for the various Actors and the networks formed by them (Mobilization).

a) Administration: the institutions through the administration require a clear understanding of how ICT4E is to create the right impact taking into consideration, administration, people as change agents, processes, and institutional culture. There is a need to manage the impact of change through effective positive communication and planning. This would require proper Monitoring and Evaluation strategy throughout the implementation, ICT adaption operations across all departments.

b)People as change agents: people, the main actors and actant require being receptive to change and be flexible in its approach to change. Ownership should be established quickly and a proactive approach. “Cross-department-training and general capacity building needs to be effectively addressed and ongoing. There should be better communication between the ICT related units”.

c) Process: the ICT4E process to be adopted needs to ‘fit’ the existing system.

d) Institutional culture: The overall institutional culture “can have a positive or negative impact” on new adoptions. Encouraging initiative from all actors will discourage resistance to change and encourage a successful outcome. ICT enabling infrastructure and pro-ICT policies in both the Universities have helped to a great extent. Thinking about people first, not technology first should strike a balance between supporting innovators while at the same time strengthening process.

This study also confirms that ICT needs to be ‘demystified’ as it is clear that not everyone can just jump in and go. Some people want additional support to get going with ICT4E. ICT usage for managerial/ instructional and knowledge management tool is dependent on available ICT facilities and Perceived attributes of ICT as an enabler.. A committed approach on the part of National Policies supporting the transformation is critical to ICT4E success. Continuous development and support should be key for any constructive change. ICT policies which aim to develop all educational personnel should also look into the following areas:

- i. Awareness and understanding of ICT system for administration and management.
- ii. Know-how of computers and network system
- iii. Usage of ICT tools for creating instructional materials.
- iv. ICT4E vision development and implementation in pedagogy.
- v. Capacity building under collaborations with national and international ICT4E projects and exchange programmes.

Conclusion

As observed “from the Case study of the two Universities Diffusion of Innovation helps in underlining the problematic issues in ICT planning as: Capacity Building, resistance to change from certain actors, changing technology, standardization, interdepartmental coordination, individual ICT expertise, lack of clear policies and ICT funding. Issues in ICT implementation can be seen again in the areas of changing technology, standardization, interdepartmental coordination” and overall culture of the institutions. ICT Diffusion concerns are seen in areas of attitude towards ICT4E, security issues, time required, information management, ICT skills,

effort required, perceived benefits and level of involvement of the administration. It has been observed from this study that there is a difference in the level of understanding of ICT policies at work in the National level and the ICT perception for diffusion at work at the users (teachers/students) level. Hence, Institutional ICT4E development should follow a structured approach which involves “adopting specific policies and plans leading to specific goals”. Strategies can be adopted in the following areas:

Widen access

- install appropriate ICT equipment, hardware, peripherals and connectivity
- reinforce the use of ICTs to enhance and increase access to information
- Carry out research on ICT4E.

Enhance the quality of learning

- Encourage good practice in ICT-supported learning.
- Incorporate ICTs into basic educational projects, as appropriate.
- Facilitate ICT-enhanced learning resources, when appropriate.
- Provide relevant ICT infrastructure and connectivity for ICT integration.
- Have standard policies for ICT-supported learning.
- Assess the quality of ICT-supported learning.

Advance the quality of teaching

- Provide support for ICT in teaching.
- Training in ICT integration in curriculum.
- Create ICT related resources
- Embrace ICT competencies

Develop educational planning and management

- Plan and implement ICT design
- Develop software applications for educational management.
- Use ICTs to enhance communication with stakeholders.
- Expand ICT services for educational planning and organization.
- Capacity building programs on the appropriate use of ICTs for educational administrators, non-teaching and support staff.

“Information literacy is a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. Information literacy competency focuses on five broad abilities: to recognize the need for information; to know how to access information; to understand how to evaluate information; to know how to synthesize information; and to be able to communicate information” (Isbell and Hammond, 1993).

Policies are required to look into areas engaging the stakeholders in higher education leading to system-wide reform. Thus a system-wide approach to ICT4E is more tactical. ICT by providing the communication infrastructure within the institution should further encourage decentralized decision-making process. On a functional standpoint, the Universities can further add/enhance capacities in the area of capability to manage and coordinate ICT4E.

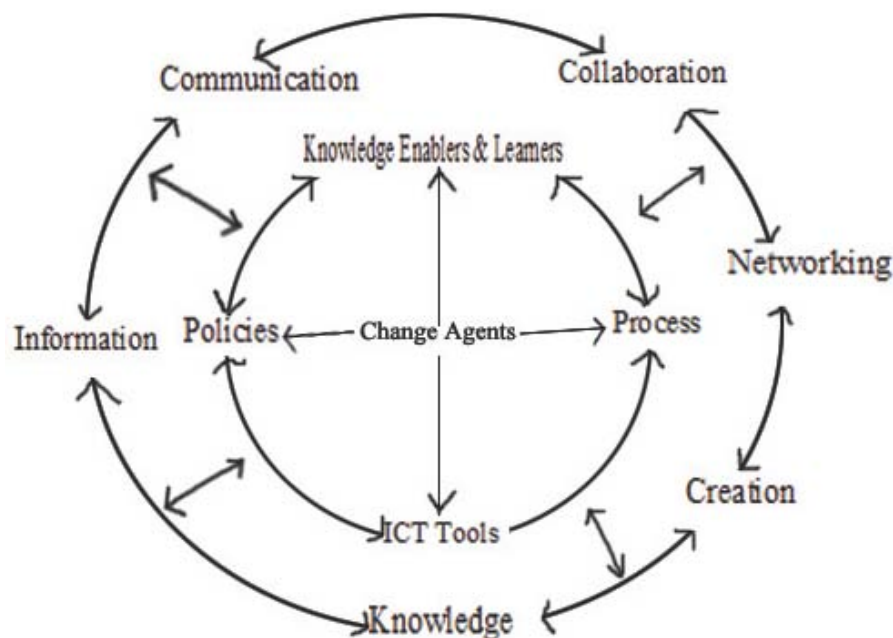


Figure 57- Communication loop for ICT4E towards Knowledge building

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Appendix (A) Respondents List

UOH Respondents

1. Prof. E. Haribabu, Pro Vice Chancellor UOH
2. Dr. M. Koteswara Rao, University Librarian Indira Gandhi Memorial Library
3. Dr. N. Varatha Rajan, Deputy Librarian IGML
4. Office of the Registrar
5. B Pandu Reddy Finance Officer, UOH
6. Mr. C. Pradeep, Systems Analyst & Incharge Campus Network Facility
7. Dr. C. Ravindra Kumar, Director I/c Computer Centre
8. Prof. S. Jeelani, Director Centre for Distance Education
9. Dr. V Neelima, guest faculty Criminal justice Centre for Distance Education
10. Prof. S Kumaresan, Head of the Department, Mathematics and Statistics
Department
11. Prof. R.Tandon, Mathematics and Statistics Department
12. B.Shobha, Reader Mathematics and Statistics Department
13. T. Suman Kumar, Lecturer Mathematics and Statistics Department
14. Prof. P.N. Girija, Head of the Department,
15. P. Anupama, Lecturer Department of Computer and Information Sciences
16. Alok Singh, Reader Department of Computer and Information Sciences
17. S. Durga Bhavani, Reader Department of Computer and Information Sciences
18. Rajendra Prasad Lal, Lecturer Department of Computer and Information
Sciences
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