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Criticality of Deploying Digital Intervention in Higher Education: a Case Study of Uttarakhand

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ABSTRACT

The Indian educational system is widely considered a major keystone for ensuring the much-desired socio-economic development of a substantial part of the world's humanity. India's considerable economic growth during the last couple of decades has been universally credited with having led to improvement in the quality of life for many of its citizens. However, lack of breadth and inclusion has kept the benefits of this economic growth from reaching a majority of Indians in full measure. Despite recent improvements in some education related indicators such as enrolment, compelling challenges face the nation in the realm of education. Among the most pressing issues pertains to broad-based and widespread delivery of quality education, particularly in the rural and remote regions of the country such as the state of Uttarakhand. Being located in the mighty Himalayas, large parts of Uttarakhand comprise of difficult to very difficult terrain and fragile ecosystems that cannot be disturbed due to ecological constraints. The resultant difficulty of reach has led to the lack of widespread inclusion and given rise to various concerns of a socio-economic nature. Among the primary issues, constraining the state's service delivery mechanism is the insufficient provision of educational facilities, since using conventional modes to deliver higher education is a daunting task in the prevailing circumstances. This study is aimed at exploring the use of suitable digital technology for enhancing the ease-of-access, quality, cost and equity of relevant higher education in the Indian context, in general, and Uttarakhand, in particular. Further, an attempt has been made to explore the various ways in which digitization of higher education could lead to desirable transitions in the higher education system.

Keywords: *Cognitive Load Theory, ICT), e-Learning, Digitization, Uttarakhand.*

1. INTRODUCTION

The invention of a Graphic user interface (GUI) dramatically influenced the computer industry. "I have seen the future ", said Steve Jobs when he visited Xerox in 1979 and saw a demonstration of mouse-based GUI running on the Alto. Towards the end of the previous century, the advent of WWW brought about a huge transformation, which is direct result of Human-computer interaction research: applying hypertext technology to browsers allows one to traverse a link across the world with a click of the mouse (Brand A. Mayer, 1998). Human-Computer Interaction includes considerations of the social, political, ethical and societal implications of computer systems. Human–computer interaction in the personal computing era has been marked by the spread of Internet and intranet use, graphical user interfaces, and the World Wide Web (Jonathan Grudin, 2012).With the wings of Internet, the world started changing tremendously. It highlighted the fact that computer is not only a data-crunching machine; rather it provides an immensely powerful and potent tool as information.

Information & communication technology (ICT) includes a diverse set of technological tools and resources used to communicate, create, store, manage and disseminate information (Zuppo et al,2012). The most crucial asset in the digital era is information, a commonly accepted definition of which is that "Information is the organized, specific and accurate Data which is relevant and meaningful in some context and affects the outcome of some process." The word Information pertains to be involved in growth of everything under the sun, including areas as diverse as healthcare, economy, social, cultural, ecology etc. Amongst these, Education is one of the more important areas. Information and education has deictic in the information age or post-information age (Negroponte, 1995) in which we live, education is essential to enable individuals, groups and societies to access the best information in the shortest time to identify and solve the most important problems and then communicate this information to others. Accessing information, evaluating information, solving problems and communicating solutions are essential to success in this new era (Bruce, 1997a; Mikulecky & Kirkley, 1998). In previous studies, pant et al. identified 'IT Awareness', 'Connectivity',

'IT Execution', 'IT Communication', 'Government's Role', 'IT Inertia', 'IT Cost', 'IT Capacity Building', 'IT Usability' and 'Geographical Location' as the prime factors for planning usage of ICT(pant et al,2012)(Ghanshala and pant, 2013). Difficult geographies, characterized with unequal contours, tough elevations, steep and uneven landscape and settlement of humans, which has less access to modern-day resources due to its critical location (Ghanshala pant & pandey, 2012). More so in the case of Uttarakhand that, being located in the trans-Himalayan range in Indian Himalayas, is prone to face the deleterious effects of fragility of Himalayas. Access to quality education, universally for everyone at last mile in difficult geography, can be crucial milestone for educationalists. Additionally, Uttarakhand is a relatively newly created state with limited resources that challenge the state with considerable financial limitations. Under these circumstances, the digital medium, with its cost-effectiveness and ease of deployment, is the apt tool for giving the much-needed boost to higher education in Uttarakhand. An effective Information & Communication Technology (ICT) enabled education system has the capability to withstand the challenges faced by the higher education sector. It can provide access to higher education at the last mile and enhance employment opportunities by creating skilled workforce even in remote places.

This study is a qualitative research to scrutinize various parameters as persuasive access, quality, cost-effectiveness, relevancy to difficult geography, for augmenting education by technology in Uttarakhand. In next section, the research attempted to provide an interpretative analysis for various transitions that, technology intervention can offer for education systems. Thus, it is logically argued to evaluate, impact of technological diffusion in higher education for last mile learner. This work attempted to scrutinize the impact of technological accessibility on development of education system and cognitive load of individual learner. Finally, researchers attempted to delineate a framework to augment higher education in state, through technology.

2. RESEARCH QUESTION

This work aims to conduct a comprehensive study on current situation of digital intervention education sector in Uttarakhand. The direct objectives of study are as follow:

1. To explore the use of suitable digital technology for enhancing the ease-of-access, quality, cost-quality tradeoffs and equity in higher education system in difficult geographies in India.
2. To identify the needs of last mile learners in difficult geographies in Uttarakhand
3. To explore the various ways in which digitization of higher education could lead to desirable transitions in the higher education system
4. To scrutinize the probable impact of digital education to minimize the cognitive load of learners.
5. The study strives to discuss the needs and challenges facing higher education in the Uttarakhand state.

In essence, the study strives to analyze the needs and challenges facing higher education in the state and to define a framework for minimizing the gap between actual and desired level of digitization in higher education, from the stakeholders' perspectives.

3. ICT AND EDUCATION SYSTEM

There is no denial that, the future education paradigm hinges on technical intervention. There are two distinct prospective of using technology for quality education. One is designing quality content using technological aids including MOOCS, online courses, learning management systems, presentation, audio/video educational clippings that, impacts quality content; hence, overall quality of education and another prospective is using technology to deliver the quality education which impacts quality process matrix. For delivering quality education, we argue to utilize satellite as well as cost effective internet based connectivity for universalization of education facility in rural milieu.

ICT use to enhance delivery mechanism in education: Access and delivery

The integration of ICT in education has multifaceted effects on education system. A pervasive access to quality education, for each one in the society, is the most vital objective of an education system. Accessible ICTs have the potential to provide the extensive access to education, skills training and employment for everyone as well as the opportunity to participate in the economic, cultural and social life of their community[Phipps, Linda,200]. There exist infrastructure, socio- economic, linguistic and physical barriers in India for people who wish to access education (Bhattacharya and Sharma, 2007).

Uttarakhand, being a hilly state in Indian Himalayas envelops intrinsic issues of accessibility and connectivity, for almost all tangible and intangible resources. In Indian context, access to education is prime pre-requisite for attending goals of "right to education". Since past few decades basic child literacy rates have steadily risen and now more than nine out of

ten adolescents are deemed literate according to NSS data. However, despite all efforts by government, difficult geography is a daunting challenge that deters access to educational resources. Ghanshala, Pandey and Pant, 2012 explained difficult geography as an impacting factor for usability of ICT and application in Himalayan region. In previous studies, Ghanshala & pant identified the geographical conditions as an obstacle in the way to the development of education and other services in rural Uttarakhand (Ghanshala & pant,2013). A regression model given by Pant et al. defined difficult geography as an important factor that impact usability of services in rural milieu of state (Ghanshala & pant,2013).Thus, virtual education resources facilitated through ICT services can boost up education milieu in ICT. Anywhere and anytime, approach of information & communication technology, provides the solution for issues of inaccessibility. However, connectivity is one of parameter need to be researched in order to implement ICT solution for essential services like health and education at any place.

3.1 Cost and Quality: a trade-off

Cost, timely accessibility and quality constraints are fostering educational world to retrace the way that content material is delivered. To match up this requirement, e- learning has emerged as a solution with anytime –anywhere delivery mechanism. The fast expansion of the Internet and related technological advancements, in conjunction with limited budgets and social demands for improved access to higher education, has produced a substantial incentive for universities to introduce eLearning courses (Volery, 2000). E-learning is an umbrella term; various people defined it in distinct ways. Ong, Lai and Wang 2004, defined e-learning as learning experience enabled by electronic technologies (Shyong, Jung-Yu Lai, and Yi-Shun Wang, 2004)". In this study we are considering the wider spectrum of e-learning used by Canada industry report 2001, which defines e-learning as learning experience that can include the use of the Internet, intranets/extranets, audio- and videotape, satellite broadcast, interactive TV, and CD-ROM, not only for content delivery, but also for interaction among participants (Canada industry ,2001). Technological advancements are offering many promising approaches that might give access to high-quality educational systems while keeping cost under reasonable control. Open source solutions are one of them. The average learners probably believe that technological innovation should reduce educational costs. But, the acceptance and readiness of a naïve user for technology may alter because of the notion that the introducing new technology in education may increase rather than reduces cost. Effective utilization of resources has always been an important factor for IT-Interventions. There are several points where technology-resource can be shared (Ghanshala and pant , 2013). Associative informatics is the key to the resource allocation problem in cost –effective manner, faced by developing economies in general and countries like India with huge population in particular. Using AVIEW through Edusat in Uttarkhand, is an excellent example of associative informatics.

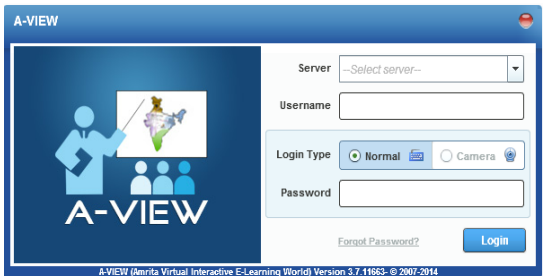

Fig. 1. A-View interface for e learning

4. IMPACTS ON COGNITIVE LOAD OF LEARNERS

It is important to effectively plan the implementation of technology-centric teaching-learning processes. With technological advents, scenario of higher education is constantly changing in both ways; strategically and tacitly. Once the quality education is accessible to every individual in society, next the most fundamental objective is to improve efficiency of learners. The use of technology as a learning tool can make a measurable difference in student achievement, attitudes and interaction with outer world. A learner learns by building models based on one's current understanding. The information received through the teaching goes to replenish the model or question the same. Thus, accumulation or accommodation takes place in the models. These models of reality are the ones that inform the learner's actions. Anything that does not fit the existing belief may raise curiosity or disbelief, depending on whether curiosity is encouraged. More complex a reality, the more support is needed to keep the model in tune with observations. If the model is only verbal like in a language or mathematics, learner tends to create one's own visual images and other physical associations to support the model. That explains the cognitive difficulty in understanding the environmental issues. Technology provides the visualization tools for all this to be understandable. Technological intervention can help to construct Cognitive bases i.e. Processes of model building which, when supported by data and visual representation can aid the deeper insightful learning. Cognitive load is refereed as "total amount of

mental effort being used in the working memory" (Sweller, John,1994). Cognitive load theory is an instructional theory based on our knowledge of human cognition (Sweller, Ayres & Kalyuga, 2011). Since its inception in the 1980 s (e.g., Sweller, 1988), the theory has used aspects of human cognitive architecture to generate experimental, instructional effects. A well-designed content, augmented with graphics and visuals can help to a learner in building constructs. Thus, usage of ICT in education can reduce cognitive load of learners; hence, increase the efficiency of learning.

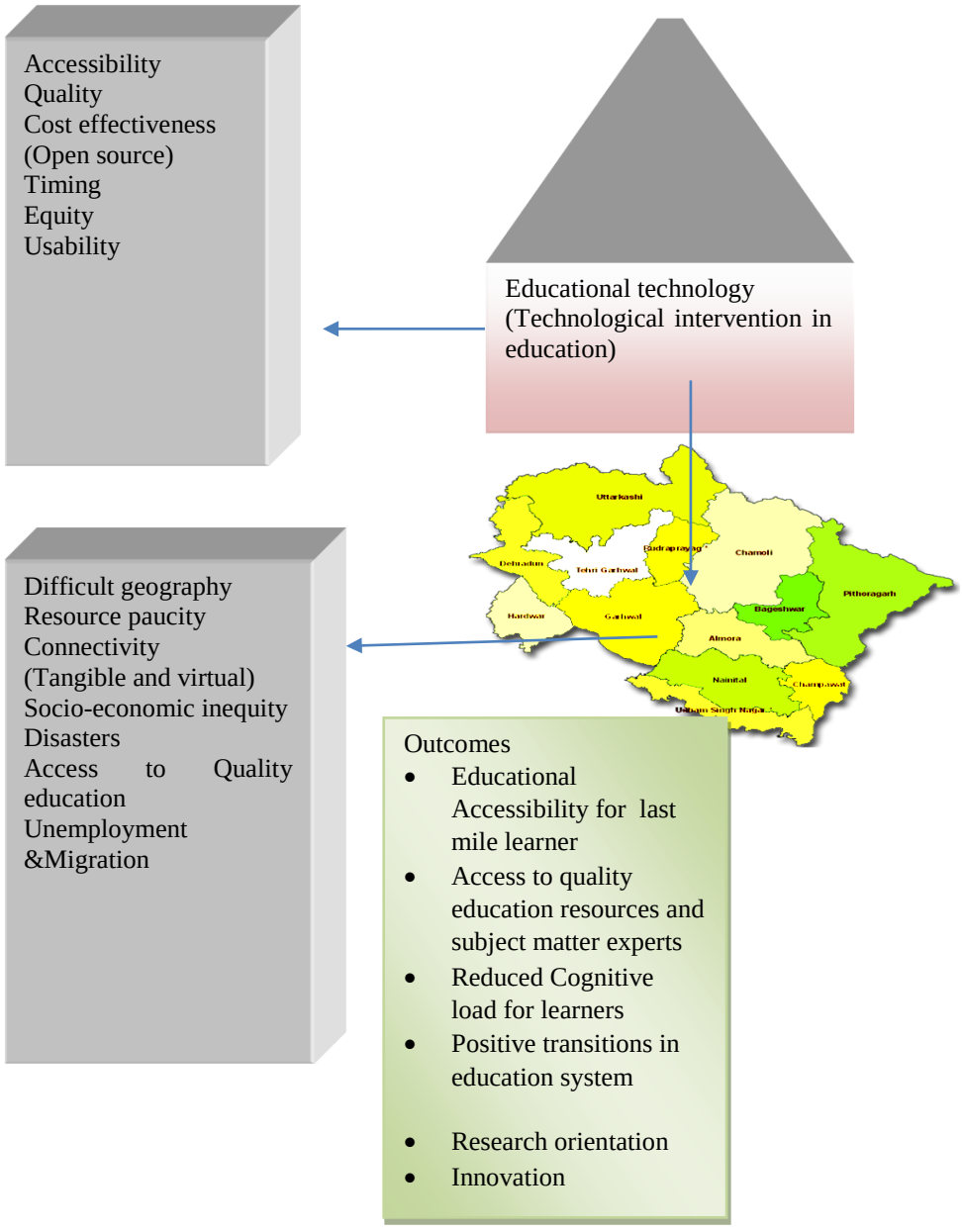

Fig. 2. Considering geography as a constraint for ICT usage in Education (Case:Uttarakhand)

5. CONCLUSION

Despite technology being a powerful and efficient tool for dissemination of information, it has been an underutilized asset in the field of education, especially the rural and remote areas of the state. Well-planned deployment of educational programmes, assisted with suitable digital interventions, can give manifold returns by bare minimum investment and rewrite the educational script of Uttarakhand. It would act as a catalyst in enhancing educational interventions of the state and provide en extra edge over other states. Moreover, digital classes can be deployed for purposes other than education, e.g. disaster management, skill enhancement, capacity building etc.

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