

The Development of ICT for Envisioning Cloud Computing and Innovation in South Asia

Sheikh Taher Abu, University of Hyogo, Japan

Masatsugu Tsuji, University of Hyogo, Japan and National Cheng Kung University, Taiwan

ABSTRACT

This paper examines the implications of cloud computing in South Asia in relation to ICT deployment. The authors employ empirical analysis based on related literatures and an ICT panel dataset from 1999-2007, to discover significant factors in this field. Evidence from several studies has shown that the deployment of ICT is greatly related to improvements in a country's economic performance. The study thus focuses on how ICT deployment helps South Asian countries to adopt cloud computing concepts and innovations, such as Web 2.0, Health 2.0 or Education 2.0. ICT penetration differs from country to country in several respects, except with regard to mobile phones. The study therefore generates new ideas, first, to increase capacity and add capabilities based on mobile technology to adopt the concepts of Web 2.0, Health 2.0 or Education 2.0 throughout South Asia, and, second, to re-think ICT deployment and encourage the diffusion of cloud computing and technological innovation. The paper concludes its analysis with suggestions for policy in developing countries.

Keywords: *Cloud Computing, Fixed Phone, ICT Deployment, ICT Diffusion, Mobile Phone, South Asia, Technological Innovation*

INTRODUCTION

Currently, the new challenge for reducing the digital divide in developing countries is to improve access to Information and Communication Technology (ICT), especially through mobile phones. Developed countries have already reached proper ICT deployment at a national level, with the highest penetration rates in PCs (51%), fixed-phones (44%), the Internet (53%) and mobile phones (110%). The Asia-Pacific region has also experienced enormous growth in

the last decade and has become a world leader in ICT. As of 2007, the region accounted for 42% of the world's mobile subscribers, 47% of the world's fixed phones, 39% of the world's Internet subscribers, 36% of the world's fixed broadband subscribers, and 42% of the world's mobile broadband subscribers (ITU, 2008). In Asia, Japan, South Korea, Taiwan, Singapore and Hong Kong lead in every area of the ICT sector, while South Asian countries are very under-represented. With more than 24% of the world's population, South Asia, as of 2007, accounted for only 4.83% of fixed phones, 38.51%

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of mobile phones, 5.13% of Internet users, and 2.1% of personal computers.

Despite its high potential, South Asia has long faced serious obstacles to the adoption of ICT. There are enormous potential benefits, and the degree to which these are realized depends mostly on the commitment, knowledge, innovation and dynamism of each country. In addition, the depth and pace of ICT development depend on and are compatible with the proper deployment of innovations like Web 2.0, Health 2.0 or Education 2.0. Also, these innovations require Internet access that will allow for the deployment of cloud computing applications. Considering the potential market of 24% of the world's population, cloud computing players should assess the area's potential and establish data centers in this region. Of the eight countries, India is already using cloud services in e-education and e-banking. To date, cloud computing players such as Microsoft, VMware, Salesforce.com and Parallels are active in developing countries and provide cloud services (Kshetri, 2010). According to the definition of cloud computing, clients must access the Internet to use cloud services like Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) in order to reduce costs. Hamm (2009) reported that cloud computing applications have been changing ideas about business, while major players, such as Nokia, IBM and Microsoft, are now focusing on investment in start-ups. For the \$3.4 trillion global tech industry, this shift offers a path out of economic inactivity. In fact, it may be the largest growth opportunity since the Internet boom. While Gartner reported the global technology market as shrinking by 3.8% in 2009, forecasters have high hopes for portables, wireless networks, and cloud computing over the next few years. Gartner predicts the market for cloud products and services will increase from \$46.4 billion last year to \$150.1 billion in 2013.

The basic question raised in this paper is the extent to which cloud computing, a general purpose technology, can fundamentally contribute to improving efficiency in the private and

public sectors and promote growth, competition, and business creation, especially for developing countries. Since cloud computing is a metaphor for the Internet and focuses on the provision of infrastructure (renting virtual machines), platforms (on which software applications can run) or software (renting a full service), the question is whether or not ICT deployment, through the Internet, fixed phones, mobile phones and personal computers, can promote cloud computing applications in South Asia.

The paper is organized as follows. The next section investigates the dynamics of ICT penetration in South Asia from a global perspective. Next, the factors that promote ICT at a national level are measured, followed by the presentation of empirical results on the demand for ICT and a discussion. Then the implications of ICT on cloud computing and innovation are examined, followed by a discussion on visions for cloud computing in South Asia. The next section provides a brief discussion of a mobile cloud and then finally the implications for policy and a conclusion is presented.

ICT DIFFUSION IN SOUTH ASIA

This section examines the pattern of ICT diffusion by comparing PCs, fixed phones, mobile phones and the Internet (ISDN, DSL, and Cable). We investigate this pattern from an international perspective and look at the dynamics of ICT penetration across the world over the period 1999-2007. According to the World Bank (2009), South Asia is classified as a low ICT penetration group. The following discussion will provide brief insights on ICT in South Asia from a global perspective.

Personal Computers

The ICT revolution is basically characterized by a rapid diffusion of PCs, which are a pre-requisite for access to a fixed and mobile broadband Internet. Developed countries are advanced in their use of an ICT infrastructure to adopt new communication technology. The divide between developed and developing

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