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## **SOCIAL CAPITAL AND THE NETWORK EFFECT: IMPLICATIONS OF CHINA'S eLEARNING AND RURAL ICT INITIATIVES<sup>1</sup>**

**Alexander G. Flor, Ph.D.<sup>2</sup>**

### **ABSTRACT**

In spite of the vaunted social promise of ICT, many are still unconvinced that it can bring on large-scale societal impact on poverty and the development process. This presentation relates social capital formation, the network effect and critical mass theory to eLearning and rural ICT initiatives in China. It submits that large scale social impact brought about by ICT can potentially be achieved and, more importantly, observed as in the case of the Central Agricultural Broadcasting and Television School.

CABTS, unknown to many, is the largest distance learning institution catering to rural folk in the entire world. It has 38 Provincial Schools, 330 Prefecture Schools, 2,408 County Schools, 23,000 township teaching stations, 45,107 staff, and an estimated yearly average enrollment of 900,000 farmers, rural youth and housewives. CABTS is now in the process of migrating from traditional educational broadcasting to eLearning. It is now in a position to tap the social potential of electronic and social networking and perhaps serve as a model for social capital formation.

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<sup>2</sup> Formerly, Vice Chancellor of the University of the Philippines Open Campus (UPOU) from 2002 to 2003 and currently, Dean and Professor of the UPOU Faculty of Information and Communication Studies, Dr. Flor has served as Regional Consultant for FAO ICT4D projects in China, Indonesia, Thailand, Sri Lanka, Bangladesh and Lao PDR.

## I. INTRODUCTION

It has been often said that ICT4D<sup>3</sup> often neglects the *C* in its acronym, that it is generally focused on information technology: hardware, software, networks or infrastructure. The *C*, *communication*, along with other *Cs* such as *content* and *capacity building*, often takes on a secondary role.

Perhaps the difficulty lies in the fact that the phrase ICT4D has lumped together two concepts that belong to different levels of complexity. Information being a *product* falls under a level different to that of communication being a *process*. Hence, the problems in putting an operational handle to the phrase. This is probably one reason why in spite of its vaunted social promise, many are still unconvinced that ICT can bring on large-scale societal impact on poverty and the development process. People fail to appreciate the process dimension inherent within the term.

However, although information and communication belong to different conceptual levels, we should recognize the historical, theoretical and operational affinities between information technology/science and communication science. During the early years of information technology and communication science, one was indistinguishable from the other. The two were considered as one discipline exploring how mind and signals work, with the same scientists – Claude Shannon, Warren Weaver, Paul Ashby, Norbert Weiner and Allan Turing to name a few - doing the groundwork. In the course of time, however, the mathematical-engineering dimension of this grand inquiry eventually split from the socio-communicational both branches developing on their own. The former became known as information technology while the latter was called communication science. Yet, the information and communication sciences share the same roots and may well again merge into one inclusive discipline.

It was along this line that the University of the Philippines established a Faculty of Information and Communication Studies in its Open University. This College puts equal emphasis on the *I* and the *C* in ICT, offering graduate programs on computer science and information systems alongside development communication programs. It specializes on ICT4D with a research focus on social capital formation, critical mass theory, networking and knowledge management.

How the aforementioned concepts are related to ICT4D, particularly the first three – social capital formation, critical mass theory, and networking – is the subject of this paper. It makes use of the China example, a centralized programmatic ICT4D model as operationalized in the Central Agricultural Broadcasting and Television School, as its empirical referent.

Let us first discuss these concepts briefly.

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<sup>3</sup> information and communication technology for development

## **II. THE CONCEPTUAL LEVEL**

### **Social Capital**

In recent years, economists and sociologists alike have been closely studying a factor which has been deemed as a necessary element in the development equation. This factor is called social capital as distinguished from financial capital, resource capital and intellectual capital.

Social capital has been defined as the capacity of groups to work together for the common good (Montgomery, 1998) or as the ability to draw on relationships with others especially on the basis of trust and reciprocity (HDR, 1998). The sociological definition of social capital is trust, reciprocity and mutuality that are inherent in social relationships (Cox, 1996). Robinson & Hanson (1995) forwarded an economic definition that describes social capital as the institutional dimension of transactions, markets and contracts.

To the above definitions, we would venture to add another, which may be considered as communicational in nature. Simply put, social capital is the economic value obtained in institutional or individual networking. Note that reciprocity and mutuality, two concepts contained in the sociological definition, are variables central to networks and network analysis. However, social capital must be measured in economic terms.

### **The Network Effect**

Perhaps the most popular IT adage is found in Moore's Law, which states that, technology-wise, computing power doubles every eighteen months. A lesser known IT principle is the Network Effect. Otherwise known as Metcalf's Law, after the head of the Ethernet development team, the Network Effect states that the total value of a network where each node can reach every other node grows with the square of the number of nodes.

This may be illustrated in the following hypothetical scenario.

Consider that an NGO has five stand-alone Pentium IV PCs worth US\$ 1000 each. The total hardware resources would amount to US\$ 5000. The MIS administrator then installs a local area network. Once the LAN is installed, the potential value of the system increases exponentially.

**Let:**  $NV$  = ***potential network value of the system***  
 $V$  = ***unit value of hardware resources***  
 $n$  = ***number of nodes***

$$\begin{aligned}
 NV &= nV^2 \\
 &= 5 (US\$1,000)^2 \\
 &= US\$ 5,000^2 \\
 NV &= US\$ 25 M
 \end{aligned}$$

For a system whose hardware resources total US\$ 5,000, the potential value reaches up to US\$25 million when it is networked and connected to the Internet.

Presumably, this exponential increase in value is due to the synergy produced by the interconnectivity of the nodes. More so, the potential value reflects the access to computing resources in the Internet.

### **Reed's Law**

David Reed, a sociologist and community development expert, applied Metcalf's Law to social networks and arrived at a similar conclusion. Social capital may increase exponentially through Intra and Internet connectivity. How may social capital increase in a networked environment? The following reasons are given:

1. Superimposing electronic networks on social networks allow individuals to cross easily between these networks
2. Electronic networks provides "doors" between online community infrastructures
3. Access to the World Wide Web increases the potential social capital of a community through the augmentation of its knowledge capital.

Let us make use of the earlier example.

Supposing the subject NGO has a team of five project officers individually generating community development assistance projects worth \$10,000 each: Their total project portfolio would amount to \$50,000. When linked as a workgroup via LAN, their *potential* social capital may increase exponentially, given Reed's Law.

**Let:**  $NV$  = ***potential network value or social capital***  
 $V$  = ***average unit contribution to social capital***  
 $n$  = ***number of nodes in a social network***

$$\begin{aligned}
 NV &= nV^2 \\
 &= 5 (US\$10,000)^2 \\
 &= US\$ 50,000^2 \\
 NV &= US\$ 2.5 B
 \end{aligned}$$

In this particular example, the basis for computing the average unit contribution to social capital by each node was based on the average unit project portfolio. Due to: (a) the synergy produced in working together as a group; (b) the use of a common platform; and (c) the knowledge resources in the World Wide Web available to them individually and as a group, the *potential* social capital of the non government organization may reach as much as US\$ 2.5 billion.

### Critical Mass Theory

In physics, critical mass is that amount of radioactive material necessary to produce nuclear fission. Since the eighties, social scientists have been applying this term to refer to the number of early adopters necessary to steer the rest of the population into collective action.

The Critical Mass Theory developed by Oliver, Marwell & Teixeira (1985) attempts to answer: the following questions:

1. What are the conditions for sustained collective action?
2. When does a development intervention assume a life of its own?

The theory was tested through empirical research on, among others, early adopters of rice production technology. In 1987 Markus applied the Critical Mass Theory to interactive media. In general, these research found that sustained collective action is achieved when a core of members (10 -15 %) within a group or community engages in mutually reinforcing reciprocal behavior. When such conditions within a critical mass are achieved, then one is assured of a practice spreading throughout the population.

A very clear example of this phenomenon is the spread of *texting* or the use of the SMS functionality in cellular phones in the Philippines. When a core of 10 to 15 percent of cellular phone users began reinforcing one another's utilization through the exchange of SMS messages, the rest of the population migrated to GSM and followed suit making it more popular than telephone calls or voice mail.

Can we apply the Critical Mass Theory on ICT4D, in general, not merely focusing on cellular telephony? Can a critical mass of rural development users eventually trigger large scale utilization of ICT in the countryside? Will such large-scale utilization bring about dramatic increases in social capital among rural development user-communities as predicted by Reed's Law? What would be the implications of this to

traditional development sectors such as agriculture, natural resources management, and others?

Answers to these questions may be found in China's eLearning and rural ICT initiatives.

### **III. THE EMPIRICAL LEVEL**

#### **China**

China is the world's biggest nation and fastest growing economy. It is Asia's most powerful country with a population of 1.25 billion. However, rural dwellers account for 78 percent of its population.

Agriculture is the main source of livelihood in the rural areas. In fact, this sector accounts for a substantive portion of China's GNP. Chinese agriculture is diverse and technology driven. Yet, it has reached less than half of its potential because of poor education (FAO, 2001).

#### **Rural ICT Initiatives**

Because of centralized planning, China has adopted a radial approach in developing its rural ICT infrastructure. In collaboration with the telecommunications and education ministries, the Ministry of Agriculture has taken the lead in establishing eCommunity centers all over China, albeit employing an approach that differs from that of other countries in four respects.

Firstly, China is simultaneously developing both satellite and fiber optics technology for its rural ICT infrastructure. It currently operates a robust satellite service actively participated in by commercial service providers. Recently, however, it has entered into an agreement with the Government of Israel for the provision of 500 very small aperture terminals (VSAT) for its rural satellite broadcasts and internet access. Hand-in-hand, the development of the fiber-optics backbone is well on its completion. The last mile links, however, are concurrently being addressed primarily through eCommunity centers.

Secondly, the eCommunity centers belong to a centralized multi-tiered network at the national, provincial, prefecture, township and village levels. In other countries eCommunity centers usually start as independent community initiatives and are thus not networked institutionally.

Thirdly, the Ministry of Agriculture is building upon existing networks of agricultural service providers such as agricultural bureaus, agricultural information centers, local governments and other distance education institutions. For the past three decades, the Ministry has been establishing an expanded network of farmers' libraries. These libraries are gradually being retrooled and transformed into eCommunity centers thus ensuring density and penetration.

Fourthly, the eCommunity centers particularly those under the Ministry of Agriculture form part and parcel of a distance learning network called the Central Agricultural Broadcasting and Television School (CABTS).

## **CABTS**

The Central Agricultural Broadcasting and Television School was established in 1980 with a mandate for providing education and training to enhance agricultural production. Its target audiences are farmers, rural youth, rural women, leaders of rural communities and agricultural extension workers. CABTS, which has been called the "cradle of competent farmers," is now the world's largest educational establishment for agriculture and rural development catering to an average of 900,000 enrollees per year.

To say the least, the CABTS Network is huge. It has: one central school in Beijing administering the network; thirty eight (38) provincial schools; three-hundred and thirty (330) prefecture schools; two-thousand four hundred and eight (2405) county schools; twenty-three thousand (23,000) township training centers; sixty (60) virtual classrooms, which will soon increase to 560 with Israel's donation of VSAT units; two-thousand seven hundred and fifty (2,750) administrators; and forty-five thousand one hundred and seven (45, 107) staff.

## **Developments**

Since it was established in 1980, CABTS has been employing traditional print, radio and TV-based distance learning delivery. In 2001, however, it began migrating to online teaching and digital learning environments employing broadband and wireless technologies. It will make full use of the noncommercial Internet backbone and will eventually establish two-thousand (2,000) virtual classrooms all over China.

In other words, most of the CABTS network is now linked.

## IV. IMPLICATIONS

With the size of its network and its thousands of nodes, not to mention its centrality or network integrity, CABTS has assumed a very formidable position to tap the social and economic potentials of interconnectivity as described in Metcalf's Law, Reed's Law and the Critical Mass Theory. It can very well serve as a model for social capital formation and learner mobilization through distance instruction. In fact, it may be said that the ideal conditions exist for social capital and critical mass formation.

To begin with, China has had a long history of collective action. Furthermore, it has strong centralized social structures. More importantly, the norms supporting these structures are imbedded in society such as respect to authority and adherence to the common good.

Furthermore, CABTS has been a thriving institutional network long before it has decided to implement its online learning network. Reeds Law illustrates that social networks need to be in place before electronic networks can generate the required synergies for social capital. Hence, the migration to online learning was initiated with the proper sequence.

Additionally, CABTS deals with the appropriate subject matter or content. Agriculture and rural development is still a major agenda in China considering the FAO observation that only half of the country's agricultural potential is being tapped due to the lack of education

Lastly, China has the numbers or the critical mass. CABTS's 900,000 students per year will expand with the availability of digital online learning technologies. When the number reaches the critical ten to fifteen percent threshold, then agricultural productivity may double. Also once this critical mass is reached, then the impact will be felt not only in China but the rest of Asia as well.

If Reed is right, then:

- Social capital among farmers' groups in China would increase exponentially
- A critical mass of farmer-learners will be formed to spearhead productivity not only in China but for the rest of Asia
- China's agricultural productivity would increase dramatically
- Social capital formation becomes a legitimate preoccupation for nonformal eLearning programs