

Community Informatics: Challenges in Bridging the Digital Divide

Peter Songan ^a, Khairuddin Ab Hamid ^b, Alvin Yeo ^c, Jayapragas Gnaniah ^d, and Hushairi Zen ^b

^a Centre for Applied Learning and Multimedia, Universiti Malaysia Sarawak, Malaysia.

^b Faculty of Engineering, Universiti Malaysia Sarawak, Malaysia.

^c Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak, Malaysia.

^d Faculty of Cognitive Science and Human Development, Universiti Malaysia Sarawak, Malaysia.

Abstract. This paper describes how community informatics can help to overcome the digital divide between rural and urban communities in developing countries of Asia. The e-Bario project, a research initiative undertaken by a group of researchers from Universiti Malaysia Sarawak (UNIMAS) provides a context to demonstrate how information and communication technologies (ICTs) can provide opportunities for remote and rural communities to develop socially, culturally, and economically. The results of the initiative show the many ways in which ICTs can be used to improve the lives of the marginalized groups. However, other than the opportunities that the initiative provides, there are also many challenges that are encountered along the way. These challenges, based on the e-Bario experience are the major focus of this paper.

Keywords. Community informatics, Challenges, Digital divide, e-Bario.

1. Introduction

Community informatics is an emerging field that involves the process of using ICTs for community practice in order to improve the socioeconomic well-being of the community. According to Gurstien (2000), community informatics is the application of ICTs to enable community processes and the achievement of community objectives including overcoming “digital divides” both within and among communities. The pervasiveness of the Internet has brought ICTs to large numbers of people who have never used them before, particularly where community-based telecentres have provided access to ICTs in developing countries where there is very little likelihood of individuals owning their own computers. Community informatics, which is described in this paper as the use of ICTs for community practice, particularly in developing countries of Asia present many challenges. This paper highlights those challenges to community informatics as a practice for the identification of information needs in communities and for the development of information systems that can deliver those needs.

It is estimated that nearly 75.0 percent of the population of Asia is reckoned to be living in rural districts. Dysfunctional patterns of technology diffusion serve to prevent the poor, mostly rural, majority populations of developing countries from benefiting from ICTs to the same extent as their educated urbanised compatriots. Although the information revolution threatens to increase income inequity, nationally and internationally, it can provide tools, which can dramatically reduce isolation and poverty and alleviate its worst effects. A pro-poor agenda of technology-improved access to education, health care and information is increasingly possible for developing countries. Contemporary ICTs can now be used to integrate rural and poor urban

communities into economic life, thereby raising income, and improving their quality of life. Appropriate regulatory services can be designed to encourage the provision of rural telecommunications on a commercial basis. Satellite network, wireless communications, public telephones and community information centres, cyber kiosks, or telecentres are effective arrangements for reducing information inequality (Harris, Bala, Songan, Khoo and Trang, 2001).

The World Bank recommends a systematic approach to the application of ICTs to the needs of rural communities (World Bank, 1998). In order to support ICTs adoption that will contribute to rural development, it is essential to begin with the needs of the rural community. As a first step, a feasibility study is required in order to:

1. Identify the needs and priorities of rural communities for such areas as agriculture, education, commerce, natural resource management, health and the like.
2. Determine the types of information needed to help meet those needs, including information gathered from the rural population and transmitted to policy-makers and project designers, and information shared among rural communities.
3. Determine the gaps between the information currently available and what is needed.
4. Determine how ICTs can close those gaps and build valuable synergies by mobilising information across sectors.

Evidence suggests that rural dwellers have more to gain than do urban dwellers from any increase in the density of communications capability (International Telecommunications Union, 1998). For example, the economics of telecommunications are related to distance. The greater the distance from communities of interest, the greater the savings

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 00 JUN 2004		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Community Informatics: Challenges in Bridging the Digital Divide				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Centre for Applied Learning and Multimedia, Universiti Malaysia Sarawak, Malaysia				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM001766, Work with Computing Systems 2004 (Proceedings of the 7th International Conference).					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 4	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

in travel costs and time which individuals enjoy with improved communications. Unit gains from additional telephones are greatest where density is at its lowest. The greatest social payoff from telecommunications improvements, therefore, is found in rural and isolated areas. Unfortunately, these areas do not generate as much total revenue for private telecommunications providers as do high density urban areas, even with higher revenue per individual subscriber. Consequently, special arrangements and incentives are needed to upgrade telecommunications networks in rural and remote areas, and such facilities have to be designed to keep capital, operating and maintenance costs as low as possible. In gaining access to information, geography alone places rural people at a disadvantage compared to urbanites before communications are taken into account.

Accepting that information poverty is as debilitating as any other form of poverty, the means of overcoming it is more readily available in urban settings compared to rural settings. However, when telecommunications are considered, the advantages that they bring are almost exclusively delivered to urban centres, not to rural populations. In many cases, this is the by-product of processes of deregulation, which amplifies the focus on telecommunications as a source of profit, at the expense of telecommunications as a social service. In some cases, near-saturation in urban areas has resulted, with households in metropolitan areas enjoying multiple telephone connections while the entire rural communities go without. The technology itself does not prescribe such a disparity. Contemporary technology enables implementations of telecommunications where previous generations were nowhere near economic or practical feasibility.

2. The e-Bario Project

The e-Bario project provides the context for analysis of the challenges of ICTs used in bridging the digital divide. The project is being coordinated by the Universiti Malaysia Sarawak (UNIMAS), and financially supported by Canada's International Development Research Centre (IDRC) and the Malaysian Institute of Microelectronic Systems (MIMOS). Conceptualized and inspired by a group of researchers from the Universiti Malaysia Sarawak (UNIMAS), e-Bario seeks to demonstrate the many ways in which ICTs can be used to help marginalized communities in Malaysia develop socially, culturally and economically. It is a development project that utilizes computers, telephones, and VSATs to connect villagers in the remote village of Bario to the Internet. The e-Bario project is one of the most notable of Malaysia's Internet development initiatives.

Located in a remote area in Sarawak, Bario exemplifies the disconnected portion of the digital divide. For instance, while most of the district's 1,200 inhabitants have heard of a computer, more than 90.0 per cent have never used one, let alone logged onto the Internet (Songan, Harris, Bala and Khoo, 2000). Thus, Bario met all of the experiment's qualifications for the pilot project, and presented a challenging environment in which to test the idea of rural Internet connectivity in Malaysia. Initially, the researchers conducted a baseline study to help them gain an understanding of the cultural, social, information and economic dynamics of Bario.

Not only did the initial research demonstrate that the residents were hungry for new information resources, it suggested that the majority of teachers and students were well prepared for ICT adoption. For instance, it was found that each of the 13 secondary school teachers who have been polled had an intermediate to advanced level of IT understanding (Khoo, Tingang Trang, Sia, Songan, Harris, and Bala, 2000). An IT literacy program was established to help them expand their knowledge of how to use computers and the Internet.

Realizing the importance of community engagement and empowerment, the researchers designed the e-Bario project around a participatory development model from the beginning (Bala, Harris and Songan, 2003). While the project was inspired by the researchers from outside of Bario, they made sure that throughout the implementation process community leaders would consistently provide input to its evolution. Given their understanding of social and cultural dynamics, the community leaders have also been actively involved in identifying ways to sustain the project once the researchers withdraw. The e-Bario project also clearly demonstrates the effectiveness of how the public and private sectors can work together to sensitize rural communities to the capabilities and uses of new technologies, and the many ways in which ICTs can improve the lives of marginalized groups.

Initially, two computer labs in local schools, consisting of 10 PCs at a primary school and 12 PCs at a secondary school, and a publicly accessible telecentre with four computers, a printer and a fax machine were created to connect the small village to the global information network. By systematically introducing these computers into this society, the researchers hope to improve information flows to and from Bario, thus helping to better the living conditions of the entire community. Connected via two Very Small Aperture Satellites (VSATs) provided by Telekom Malaysia, and powered by diesel fuel and solar power, e-Bario has allowed the community to learn how to use ICTs to better their socio-economic position. Additionally, to help the villagers communicate and share information with family and friends outside of Bario, Telekom Malaysia has also installed six public payphones throughout the district.

The e-Bario project highlights the various components of creating a sustainable ICT-focused development program. For instance, the project demonstrates that ICTs cannot just be "dropped" in a rural village, but needs to be accompanied by training and education to be successful and sustainable. Despite the imminent success of e-Bario, such grassroots ICT development initiatives remain largely experimental, as the long-term effects on a given society are not readily apparent. However, it is obvious from the first three years of the project that a participatory approach is a prerequisite for sustainability.

While the Government played an indirect role in conceptualizing e-Bario, it was instrumental in creating the necessary enabling environment for the project's implementation. By helping the researchers fully understand its national modernization vision, the Government has played an important role in helping the community of Bario realize its potential to reshape its environment and become a knowledge-based society. Given that rural Internet connectivity is a central component to the government's

overall Internet development objectives, e-Bario will probably become a benchmark for how ICTs can improve the lives of rural Malaysians.

3. Challenges of ICTs in Bridging the Digital Divide

Based on the experience of the e-Bario project, the challenges that are faced in using ICTs for bridging the digital divide are largely related to the following aspects (Bala, Songan, Khairuddin, Harris, and Khoo, 2002):

1. Costly infrastructure, connectivity and use
2. Language of resources
3. Coordinated approaches and skilled human resources
4. Awareness of development in ICTs among rural communities

3.1. *Costly infrastructure, connectivity and use*

Non-existence and under-developed telecommunications infrastructure remains an important impediment to the expansion and use of ICTs in the rural areas. It restricts access and keeps it expensive. While computer prices have declined, telecommunications continue to be costly and of limited availability. The financial cost of introducing ICTs in rural areas, which have access to meagre or non-existent telecommunications service is costly. In Bario, for instance, there was no basic infrastructure for ICTs implementation. A few VSAT ground stations have to be set up to enable Internet connectivity. The research team had to work from scratch to explore ways and means to ensure 24 hours uninterrupted power supply. The team resorted to solar panels and diesel generator to ensure stable power supply at the telecentre. The installation of technologies and especially equipment to secure access to the Internet is usually beyond the community's financial means.

3.2. *Language of resources*

The contents of training manual and the materials that are available on the Internet are primarily in English, which are not understood by many people in the rural areas. In the e-Bario project, an IT Literacy Training Programme in conjunction with a local company was introduced at the schools for teachers, students, and other members of the community. The project's trainer had already conducted one month intensive training programme in Bario. Although the members of the community had tremendous eagerness to learn, their little command of the English language, which undeniably is the IT language, presented a huge challenge to many of them. As such, the trainer had to redesign the present manual into a simplified manual and in Bahasa Malaysia. Additionally, the resources that are found on the Internet are mostly written in English, which pose a challenge for the rural people to comprehend due to their poor command of the English language.

3.3. *Coordinated approaches and skilled human resources*

The application of ICTs-based development efforts at community levels implies new skills and approaches from a variety of professions, some of which challenge traditional practices in several disciplines. The e-Bario project is experimental in many ways. Nothing like it had been known

to exist in Malaysia. The close working organisation of the multi-discipline research team and the harmonious relationships it has with the Bario community facilitated the progress of the project's goals. However, as a result of an analysis of the project's boundary partners, it was recognised that there was a wide range of institutions and individuals who were all potential stakeholders in the project and in what it potentially represented if it were to be replicated on a wider scale.

As project implementers and promoters, the research team encountered a huge range of skills, disciplines and professions as part of its regular deliberations. Members had to be capable of associating and dealing with illiterate farmers, local administrators, technicians, small businessmen, officials, local and national community representatives, senior government officers and government ministers. Community benefits were identified that implied a range of agencies that needed to be mobilised and co-ordinated for such benefits to emerge. Thus, no single agency should carry responsibility or authority for community development with ICTs.

Information solutions span education, health, commerce, agriculture, tourism and culture as well as telecommunications. In small concentrated projects with closely-knit teams, co-ordination of various skills of people from different backgrounds need not be difficult. But wider implementations with multi-institutional involvement are likely to be a challenge. Given the low level of awareness of ICTs experienced by the project at multiple levels, there is still uncertainty of the value and sustainability of rural ICTs and the consequent need for constant advocacy on behalf of the promoters. It is evident that new approaches to ICTs implementation will be necessary if rural communities are to be given the opportunity to benefit from connectivity. Such new approaches are likely to be required in the following areas of work:

- Anthropological and ethnographical contributions to Informatics.
- Information systems designed in community-bounded, as opposed to business-bounded, contexts.
- Social analysis of loosely organised communities as opposed to tightly organised hierarchical organisations.
- Sensitivity to the cultural contexts and variations of technology deployments.
- Social impacts of technology generated community empowerment.

3.4. *Awareness in development of ICTs among rural communities*

Although the Government of Malaysia has been aggressively promoting ICTs as one of the major components of its drive to fully developed nation status by the year 2020, the base-line survey indicated that 99.0 percent of the people in the Bario community had no knowledge of the Internet (Songan, Harris, Bala and Khoo, 2000). The significance of this emerged in the context that the Government has been promoting the advantages of the "k-economy" in which dependence on physical resources will give way to the exploitation of knowledge resources in the future development of the economy. Even though ICTs is the subject of a popular song frequently heard on the radio, which indicates a wholesale

national commitment to ICTs, it was surprising, and a little alarming, to discover an entire community have heard little of such developments. Despite its remoteness and isolation, it seemed reasonable to suppose that Bario was not alone in this finding. A further research opportunity is provided by the need to discover how widespread this condition might be among Asian rural communities. Moreover, at the project's outset, there was no evidence to indicate the existence of specific programmes for rural ICTs. Alongside the absence of awareness of ICTs at community level, it also appeared that there was little understanding of the potential for ICTs-induced rural development among community representatives. While such understanding is only recently emerging worldwide, and many questions remain to be answered regarding the value and sustainability of ICTs-related benefits for the rural poor, it might be expected that Malaysia's positioning in the forefront of ICTs for national development could have ensured that community representatives are better informed about ICTs and their applicability within communal rural settings.

4. Conclusion

With the advancement in community informatics, the use of ICTs as an instrument for dissemination of information for socioeconomic development is getting more popular nowadays. ICTs enable information to be disseminated synchronously or asynchronously, and provide the opportunity for the people to acquire information anytime, anywhere and on anything, which they can use to develop themselves socially, culturally and economically.

However, the use of ICTs in socioeconomic development brings about many challenges, especially in developing countries in Asia. Access to and use of ICTs remain extremely uneven between the rural and the urban areas. This disparity—the so-called “digital divide” is the greatest challenge for ICTs in the process of socioeconomic development. The challenge of the digital divide brings about other challenges, such as those revealed by the e-Bario project. In closing, the means and ways of how to tackle these challenges to allow for more opportunities and the efficient use of ICTs in the process of national development need

further investigation.

5. References

- Bala, P., Harris, R.W., & Songan, P. (2003). E Bario project: In search of a methodology to provide access to information communication technologies for rural communities in Malaysia. In S. Marshall, W. Taylor, & X. Yu (eds.), *Using community informatics to transform regions* (pp. 115-131). Hershey, PA: Idea Group Publishing.
- Bala, P., Songan, P., Hamid, K., Harris, R., & Khoo, G. L. (2002). Bridging the digital divide: the e-Bario experience. *Sarawak Development Journal*, 5(1), 63-78.
- Gurstein, M. (2000). *Community informatics: enabling communities with communication technologies*. Hershey, PA: Idea Group Publishing.
- Harris, R., Bala, P., Songan, P., Khoo, G.L., & Trang, T. (2001). Challenges and opportunities in introducing information and communication technologies to the Kelabit community of North Central Borneo. *New Media and Society*, 3(3), 271-296.
- International Telecommunication Union. (1998). *World telecommunications development report: universal access*. Retrieved March 22, 2004, from http://www.itu.int/ti/publications/WTDR_98/index.htm
- Khoo, E.G.L., Trang, T., Sia, P. W., Songan, P., Harris, R., & Bala, P. (2000). Rural secondary school teachers' attitudes towards information technology: A case study in the Kelabit Highlands of Bario, Borneo. In F. Sudweeks, & C. Ess (eds.), *Cultural attitudes towards technology and communication* (pp. 57-73). Murdoch, Australia: Murdoch University.
- Songan, P, Harris, R., Bala, P., & Khoo, G.L. (2000). Awareness and usage of information technology in a rural community of Bario, Sarawak. In M. Leigh (ed.), *Borneo 2000: politics, history & development* (pp. 560-575). Kota Samarahan, Sarawak, Malaysia: Universiti Malaysia Sarawak.
- World Bank. (1998). Knowledge for development. *World bank development report*. Washington, DC.