

## Guest Editorial – Low Cost Distance Education Strategies: The use of appropriate information and communication technologies

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## **Guest Editorial – Low Cost Distance Education Strategies: The use of appropriate information and communication technologies**

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### **Introduction**

The argument for distance education (including e-learning) in developing countries could be imagined as a “triple jump.” Each leap of the triple jump consists of a theorem and a corollary applying it to developing countries.

**Theorem 1:** *Education is good for development.*

Corollary: The demand for education is especially high in the developing world. Traditional education cannot cope with its size and is, in many cases, not the most cost-effective allocation of resources.

**Theorem 2:** *Distance education can help.*

Corollary: Distance education is able to deal with large numbers more cost-effectively than traditional education, and has proved to do so also in developing countries.

**Theorem 3:** *E-learning is extending the capabilities of traditional distance education.*

Corollary: Given the emerging global information infrastructure, there are a number of cases where e-learning can enhance the capabilities of distance education in the developing world.

Many distance educators would readily subscribe to theorems of leaps 1 and 2 of the triple jump, but argue that the argument collapses at leap 3, especially when it comes to the corollary suggesting that ICT-based distance education could be relevant in the developing world. This paper takes the role of the “devil’s advocate”<sup>1</sup>, and will try to cast some doubt on the first two theorems, while intending to strengthen the third leap theorem, the least established argument of the three.

## Education and Development

General laws in social sciences are rare and tend to be trivial. The law that “on the average the educated earn more than the less educated” is less trivial, and has served as the cornerstone of the “human capital research program” (Blaug, 1992). One line of this research uses the hypothesis that “people invest in themselves” to throw light on decision patterns made in such diverse fields of activities as health, migration, and education (Blaug as cited in Woodhall, 1995).<sup>2</sup> This line of research led to the micro-economic approach of calculating “rates of return to education” (Psacharopoulos and Woodhall, 1985). The underlying idea is to offset the costs of an additional year of education against the benefits in terms of increased earnings. The finding of this line of research insists that both “private rates of return” as well as “social rates of return” are substantial and especially high in low-income countries (Psacharopoulos and Patrinos, 2002).

Unfortunately, macro-economic evidence paints a less rosy picture of the relation between investment in education and economic growth. While Post-World War II statistics confirm that the experiment of such a massive investment has been conducted in almost all countries, the reported findings of correlating growth in educational investment and economic growth are sobering.

*“[T]he association of growth of educational capital and conventional measures of TFP [= Total Factor Productivity; TH] is large, strongly statistically significant, and negative” (Prichett, 1999).*

The reason for this may be sought in the low quality of educational investment in some countries – too low for affecting productivity – but may also result from the fact that the demand for educated labour rose slower than the supply, turning educational investment into a costly “screening exercise.” Most disturbing is, however, the *piracy* metaphor suggests that substantial amounts of education may not have been successfully channelled to productive tasks, but to rent seeking forms of employment. Prichett (1990) illustrates his piracy metaphor by reporting the case of a country that offered degree holders a place in a civil service department of their choice, and most students opted to work in customs. Education may have shown them the privately most rewarding avenue of activities, albeit adding little to “total factor productivity.”<sup>3</sup>

Investment in education, however, can be justified not only for “efficiency reasons,” but also for “evaluative reasons” (for the distinction between “evaluative and effectiveness reasons” (Sen, 1999, p. 4). At least basic education is viewed as a “human right” (or as economists may wish to call it “a merit good”). In a society so deeply shaped by the “typographic system of communication” (Giesecke, 2002),<sup>4</sup> literacy has become a necessary prerequisite for “appearing in public without shame” (Sen, 1999, p. 71) and fully “functioning” in society.<sup>5</sup>

To sum up: An *advocatus diaboli* may be able to successfully challenge the claim that education would lead to economic growth. As a consequence, any hopes that educational investment would be self-paying out of added productivity (which would eventually trickle down into the coffers of the ministry of education) seem unfounded. However, education (at least basic education) is increasingly regarded as a “merit good” and should be provided. This means that the conflict between sustained demand for education and restrained budgets to fund it remains and calls for cost-effective resource allocation. Could distance education help to resolve this conflict?

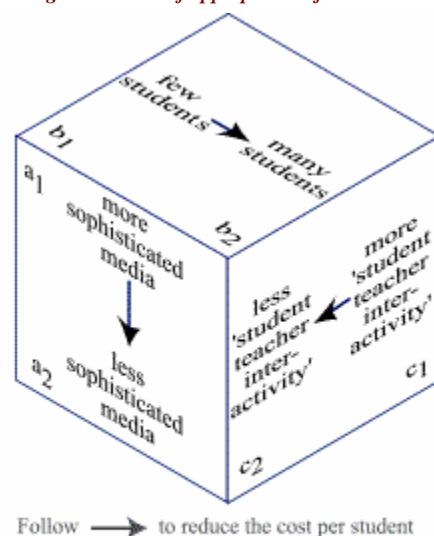
## Distance Education

The second leap of the triple jump is the theorem, generally upheld by distance educators (Daniel, 2001), that distance education is able to deal with large numbers of learners in a cost-effective manner. The argument here is different from the traditional rationale for distance education in terms of increased flexibility. Learners who cannot be reached by traditional delivery methods remain a captive market for distance education. However, it has also been claimed that distance education is the more cost-effective means for allocating educational resources, and that it is especially capable of reaching large numbers. The heart of the argument lies in distance education's susceptibility for *scale economies*.

Theorem 2 is meant to imply that distance education is attractive in developing countries, because it is said to increase access and, at the same time, to be more cost-efficient – i.e. lowers average costs per student. The point is that the “very good thing” of increasing access leads to the “very good thing” of driving down average costs per student. The mechanism behind this is the attractive AC formula ( $AC = F/N + V$ ), where AC = average cost, F = fixed costs, N = numbers of students, and V = variable cost per student. The large fixed costs of course development (embodiment of the academic dignity in traditional distance education<sup>6</sup>) produce the quality material, which will be available at a *prix démocratique* because the arrangement welcomes so many people (N) – “the more, the merrier.”

The success of this type of distance education cannot be denied. A number of quite successful organizational models have been developed, both supporting formal and informal education at various levels. An international overview of trends and policies is given in UNESCO (2002), Perraton (2000), and Perraton and Creed (2000). However, there are weak points.

Traditional pedagogues lament that distance education does not allow for interactivity between teacher and student, which good quality education would require. In fact, even Rumble, an intimate adept of the world of high quality distance teaching, gives short thrift to claims that, for instance, Holmberg's “guided didactic conversation” could qualify as substitute for an academic discussion (Rumble, 2001).<sup>7</sup> As a result, quality distance education is often measured by its investment in student support (mostly contributing to V, the “variable costs per student,” parameter, which sets the lower limit, below which average costs per student could not possibly fall).<sup>8</sup>



**Figure 1.** Costing Cube

Before deriving practical policy consequences from the average cost formula, it should be noted that the variables  $F$ ,  $V$ , and  $N$  are not independent. You cannot reduce  $V$  and increase  $N$  at will. Enrolment level is mediated by market decisions of the clients – i.e., in our case, the students. And given the proliferation of flexible learning options, distance education students are not anymore a captive market. They will opt with their feet. If  $V$  is brought down as part of “walking the efficiency path,” (i.e., the path to reduce “cost per student” identified in Perraton’s Costing Cube<sup>9</sup>) then many may opt out. Luckily, this means conversely that investment in student support can increase cost-effectiveness by lowering the “costs per graduate” to the extent student support impacts on retention and throughput. (Traditional distance education has been accused of operating with drop-out money (Noble, 1997), which could be seen as an act of piracy, in the sense of Pritchett (1999): the education, which the correspondence school offers, does little in terms of adding value and only “redistributes” students’ money into the coffers of the institution.) The AC equation is only half of the story. Enthusiasts of scale economics, who aim at bringing down average costs per student, may lose sight of the fact that total costs ( $TC = F + V \times N$ ) nonetheless rise. In many developing countries this means, as Butcher and Roberts (2004) convincingly demonstrate, that the funding stream may be interrupted before the rollout of a project has led to the low average costs per student, the program may have had aimed for. Arguably, the biggest disadvantage of this model is that it needs to restrict the scope of course offerings of an institution. The more courses an institution offers (without being able to proportionally expand its learner base), the more the effect of scale economies is lost. This is one reason why it is difficult to teach specialized courses by distance education.

To sum up: The *advocatus diaboli*, while not being able to completely damage the case that distance education is able to contribute to coping with large numbers and provide education more cost-effectively, would be able to identify the limitations of the model. Lack of interactivity may be such a weak point, as well as the limited scope of course offerings. In fact that the very advantage of the model, that it is compatible with broad access, may – in a number of contexts – turn out to be a weakness since markets, in particular for specialized courses, are likely to be limited. Nonetheless, there are stories of success. Open universities, or in-service teacher training for example, have been found to be potentially successful organizational models.<sup>10</sup>

## e-Learning

Full exploitation of the potential of digital learning environments would certainly drive-up both fixed and variable costs. Fixed costs may rise if the multimedia capabilities of the digital learning environment are exploited or when programmes are designed to increase, what Hülsmann (2000) calls “internal interactivity” (ranging from multiple choice questions to computer marked assignments or simulated dialogue in the ELIZA tradition (Weizenbaum, 1976). Media and IT experts are necessary alongside instructional designers to realize such projects in the form of Computer Based Training (CBTs) or Web-Based Training (WBTs). Their development is costly, despite the fact that the cost-structure<sup>11</sup> may be compatible with Fordist distance education and, in principle, is susceptible to scale economies.

Variable costs per students are likely to increase where enhanced demand for teacher student communication drives up teaching costs. This remains true whatever medium may sustain the line of communication. Increased costs of “external interactivity” (Hülsmann, 2000) re-establish the link between costs and volume, and thus erodes scale economies.

Fortunately, there are choices. They may be seen as ranging between two poles: (1) the *type-i* option which emphasizes the *information* aspect of ICT-based distance education (e-learning), and which puts a premium on the use of multimedia and programmed “internal interactivity;” and (2) the *type-c* option, which emphasizes the *communication* aspect of ICT and puts a premium on communication (both between teacher and students, and among peers).<sup>12</sup> On an adequately equipped computer, both types of e-learning can be realized. This is why the problem of media selection in e-learning differs from the problem of media selection in traditional distance education (for the latter see Bates, 1995, in his chapter “Selecting [educational] technologies” where he develops the ACTIONS model of media selection). While in traditional distance education selection of technologies has implications for costs and pedagogy, standard e-learning environments – such as learning management systems (LMS) – enable realization of *educational scenarios* of a highly different nature, both with respect to cost-structure and with regard to teaching and learning, on the same platform. So CBTs (WBTs), which epitomize the *type-i* variant of e-learning, may just be sent to students (or access via the Internet) without further tutorial support being given. In some contexts such an option may look cost-efficient, for instance if it is possible to reach large cohorts of learners. In corporate training environments, this is often seen as an attractive option (see Whalen and Wright, 1999).

On the other pole, there is the “virtual seminar,” which illustrates the *type-c* variant. This variant can be seen as driving horses through the classical layout of a distance education institution. Its extensive use of teacher-student communication, e.g., in the form of asynchronous communication, re-establishes the link between costs and volume of activities (number of students to be taught) and is little susceptible for scale economies. It also calls into question the need for specialized course development altogether. Why write new courses when one can cherry-pick from an increasingly large repository of knowledge, which is already there? Why re-inventing the wheel? Once the infrastructure is in place, such a virtual seminar option can be rather “low cost.” To some extent, this option can be seen as enabling a response to the problem of scope (the demand for a more diversified set of specialized course offerings).

It is important to realize that in this *type-c* variant of e-learning, personnel costs are the decisive cost drivers (Rumble, 2001). Once the infrastructure is in place, not the technology costs but instead the personnel costs (e.g., teachers/ tutors) are the main cost drivers.

We can relate this observation to Orivel's argument against the computers in schools in developing countries (Orivel, 2000). Orivel distinguishes between (1) costs that depend on a global world market, and (2) locally driven costs. Costs for computer equipment fall in the former, costs for tutors and teachers fall in the latter category. This leads Orivel to conclude that even if computers were introduced with the aim of substituting teachers,<sup>13</sup> they are unlikely to lead to lower costs since world market gadgets (such as computers) are generally more expensive than services, such as those provided by teachers, bought on local markets. While this does not mean that tutorial support in the developing world will be inexpensive, it may help to put things into perspective. Given the infrastructure in place, linking wireless local loop (WLL) to vocational training centres in Ethiopia may lead to much lower costs than would be incurred in an industrialized country.<sup>14</sup>

There are ways to recover efficiencies lost in e-learning (lost due to its possibly higher fixed costs together with its possibly less scale economies in e-learning). Hülsmann (2004) points out that e-learning allows, in principle, better re-use of developed material (keywords: "re-purposing, learning objects") which allows to depreciate "nuggets" (i.e., learning objects which had been costly to develop such as climate simulations) not only horizontally along the shelf life of a course, but also vertically – i.e. across various courses where such nuggets could be re-used.

A second way to recover lost efficiencies is cooperation. Hülsmann (2004) quotes Rumble and Latchem, (2004) pointing out:

*Technology and e-business approaches make it possible for integrated processes of open and distance education to be disintegrated into their constituent parts: curriculum development; content development; learner acquisition and support; learning delivery; assessment and advising; articulation; and credentialing. These processes can then be managed by different organizations (p. 134).*

The fact that distance teaching is a complex system, requiring a number of components being in place in order to function properly, does not imply that all components have to be housed at the same institution. E-learning, in principle, not only allows easier sharing of resources, it also facilitates the process of co-operation at a distance.

To sum up: The *advocatus diaboli* may point out that: 1) cost-effectiveness arguments against e-learning in developing countries are often biased when high infrastructure costs are charged to e-learning projects; fair comparison is only possible on the basis of operating costs. If infrastructure is not in place, the question is: Will governments opt for rolling out the required ICT infrastructure or not? This is a different debate, which would need to include the "opportunity costs" for not doing so (Mansell and Wehn, 1998, p.7). 2) Infrastructure will, albeit unevenly, percolate in remote areas of developing countries, especially by means of wireless technology – i.e., either using satellite transmissions, or hooking up WLL to Mbones (multicast backbone) linking major centres. 3) When infrastructure is in place, personnel costs are the main cost drivers in a number of e-learning options. Personnel costs are dependent on local markets and therefore comparatively lower than in the industrialized world. 4) E-learning facilitates sharing of resources

and cooperation. Hence, there are a number of avenues to recover lost efficiencies, which are in line with cultural traditions in developing countries.

## **The Contributions**

In this issue, Rashid Aderinoye's and Kester Ojokheta's contribution unequivocally supports the above theorems 1 and 2. They say that: "Clearly, education is the key to human development and progress" and they cite both "effectiveness and evaluative reasons" (Sen, 1999, p.4) for this. They ground their contribution on a line of reasoning about education ranging from human capital theory (citing Schultz, 1977), to the more recent approach by Sen (1999) who sees education as capability, "expanding the real freedom that people enjoy."

Traditional distance education works for and contributes to development. Among the numerous examples is the *National Teachers' Institute* (NTI), a dedicated distance teaching institution, which has contributed to upgrade and train more than 300,000 teachers since it was officially established in 1978. The authors point out the "ripple effect" this contribution had for the development of the country. Distance education may serve outreach programmes of the university including the *University Village Association Rural Literacy Programme*, which has been also supported by the *British Council*. Moreover, NTI has established a *Preventive Education Unit* addressing, as the first academic institution in West Africa, the issue of HIV/ AIDS using open and distance learning methods.

That international cooperation can create synergies is demonstrated by cooperation between Nigerian distance teaching institutions and international agencies such as the Commonwealth of Learning (COL), UNESCO and, more regionally, the Sudan Open Learning Organization (SOLO).

But there are also moves towards including e-learning, interestingly mentioned in two different, but both important contexts. First, tele-centres have been established within less privileged communities are reported. Second, ICT is used to recruit back the African intellectuals lost due to brain drain (e-Africa). Optimistically the authors see a change away from the former "brain drain" situation, to one where African professionals having gained experience abroad, return home to become a veritable "brain trust" for Africa to draw from.

Lentell and O'Rourke address a key issue of open and distance learning: the scalability of student support. This is an issue for traditional distance education where quality has often been measured by close tutorial support ('of Oxbridge type') is provided. To the extent the rationale for distance education to be expected as cost-effective as being based on scale economies, the scalability of quality tutorial support is, indeed, a key issue. Moreover, the emergence of e-learning does not make the issue go away, but puts it more firmly on the agenda since e-learning facilitates communication with the teacher, and therefore tends to drive variable costs per student up.

The authors put forward a number of propositions, which go beyond the traditional suggestion of labour-for-labour substitution. These propositions include better targeting of support, unbundling issues of academic support, and more generalized need for counselling, making use of local mentors, and more effectively organizing peer support. All these propositions are of great relevance for e-learning contexts.



Alvana Maria Bof reports on a large-scale project that, at the same time, is innovative in terms of its organizational approach. Proformação is a programme aimed at qualifying 27,000 uncertified teachers in different Brazilian States. The programme is innovative in terms of organization since it operates not from a big institutional base, but by leveraging support from several institutions which are close to the learners where necessary. The approach recalls what Moore calls “vertical disaggregation.”<sup>15</sup>

*However, in the distance education field, it is not only the strategic alliance, but also the vertical disaggregation form of network that is likely to be of greater interest in the future. Vertical disaggregation is the process developed in the manufacturing industry to deal with shortening product life cycles, by which large firms outsource the production of various components of the product to smaller suppliers. As in manufacturing, in the knowledge industries too it looks as if vertical disaggregation will become the means of reducing product life cycles and improving efficiency and quality. What that means in distance education is outsourcing some of design and a lot of the product development of course materials. It means devolving learner support services to local points of contact and specialized services. It means drawing in instructor resources from wherever they may be located, rather than solely on the faculty on campus (Moore, 2003, p. 4).*

Proformação operates on three different levels: 1) the federal level; 2) the state level; and the 3) municipal level. While the design of the curriculum was planned on the federal level, where also the small management unit of the project is located, there is state level coordination of the training agencies (TAs) that conduct the training at the municipal level. The upper two layers make extensive use of telecommunication technologies, while tutoring is done on the local municipal level close to learners.

The last contribution by Mason and Rennie is about development, although not about a developing country. We may recall here that the partition of the world into countries, which could be classified as “industrialized” or “underdeveloped,” is increasingly becoming obsolete. There are pockets of underdevelopment in the US for example, whereas China has pockets of leading edge industrial development. The impact of the emerging global information and communication infrastructure may restructure the geography of development further.

It is not the first time that ideas tried in the remote areas of the developed world have been used as an organizational template for developing countries. The Canadian Farm Radio Forum “that ran in the 1940s with the motto “Read, listen, discuss, act”” (Perraton, 2000, p. 17) has served as a model for a number of programmes in developing countries, such as the radiophonic programmes including Acción Comunal Popular (ACPO) in Columbia, the African Medical and Research Foundation (AMREF), and the Institut Africain pour le Developpement Economique et Social (INADES) in Africa. The idea of tele-centres had its origins in the mid-1980s in Scandinavia. It then spread to Western Europe, Australia, and North America, and is now taking root in the former Eastern Bloc countries as well as in Africa, Asia, and Latin America” (Oestman and Dymond, 2001, p. viii).

The Western Isles of Scotland are truly remote areas in an industrialized country. The installation of broadband services<sup>16</sup> in a remote and rather isolated part of the country may lead to some

interesting lessons. One principal lesson underlines the dilemma, which is due to the complementarities between technology and social context<sup>17</sup>. If there is not infrastructure in place, neither appreciation nor demand for a new technology is likely to develop. Without expressed demand and awareness from the local communities on the other hand, the interest to rollout the necessary infrastructure will be limited. Mason and Rennie decide that, in the final analysis, introducing broadband is “inevitably a technology-led operation.”

The identified demand relates to job opportunities, community services, and access to e-learning. E-learning applications are not the primary reasons for introducing broadband at home, but “will piggyback on a range of applications.” The authors suggest that there is a “convergence between working and learning,” and that e-learning providers “need to lead the way in working through the implications of these changes.”

There is a section applying the lessons learned to rural e-learning in developing countries. According to Mason and Rennie, it is essential to take into consideration both aspects: technological infrastructure as well as pedagogical readiness. They warn against over-optimism about wireless technology, allowing developing nations to leapfrog ahead of developed nations. They believe that the use of tele-centres could play an important role.<sup>18</sup>

## **Changing Contexts**

In the final analysis, much of what influences one’s stance towards e-learning in the developing world depends on how one gauges the profoundness of the changes of the last twenty years. Are we undergoing “revolutionary changes” comparable to those triggered by the invention of the printing press or the introduction of writing? Or do these comparisons completely overrate the impact of the emerging Global Information Infrastructure (GII)? Those who believe the latter, point out that the introduction of writing had undoubtedly a profound cognitive effect (Goody, 1977; Ong, 1982) while using computers, the new “intellectual tool,” shows no comparable features. Similarly, the introduction of the printing press not only contributed in generalizing the cognitive effects on the individual, but also established a completely “new system of communication,” which Gisecke (1991, 2002) refers to as “typographeum.” Some, on the other hand, are convinced that the typographic age is rapidly crumbling and soon to be substituted by what some call “informationalism” (Castells, 2000) and others, more euphorically, refer to as a “knowledge society” (Mansell and Wehn, 1998), then it would not be possible to dismiss the use of ICT for development (including e-learning) as a mere fad. When today it is hardly possible to “appear in the public without shame” as Sen puts it, as an illiterate tomorrow, one might not be able to function fully in society without a solid grounding as an e-literate.

Are we moving away from the typographeum towards informationalism is a question difficult to answer, being in the thick of the process. The difficulty is apparent once we reflect on the all pervasive influence of writing on individual cognition, and the printing press as a system of communication. The typographic age has generated its proper epistemology, impinging strongly also on our understanding of knowledge (e.g., it being largely of propositional form and ideally organized as a theory). This may make us run into the difficulty exposed in Menon, where Socrates suggests that it is not possible to search for things that are new, since either they are profoundly new, then we do not know what we are looking for, or, if we know what to look for, the things are not really new<sup>19</sup>. Either we tend not to see the changes at all, or we fail to see what is new, since it hides behind our old categories.

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## Endnotes

1. Cf. Robert Wade: “The Catholic Church has the practice of appointing a “devil”’s advocate” (Advocatus Diaboli) when considering a person for sainthood. The role of the devil’s advocate is to ferret out all the reasons why that person should NOT be made a saint, and to present them forcefully in the discussion among the group of cardinals who make the decision.” (Wade, 2001)
2. “The concept of human capital, or “hard core” of the human-capital research programme is the idea that people spend on themselves in diverse ways, not for the sake of present enjoyments, but for the sake of future pecuniary or non-pecuniary returns (Blaug 1976 pp. 829, 850)” (Woodhall, 1995, p. 27)
3. Cf. also Mace (1984) and Wolf (2002)

4. Giesecke insists that the invention of the printing press has shaped society profoundly. Far from seeing the printing press as a mere technology which does more or less what has been done by hand earlier on, he insists that the invention of the printing press changed the whole “system of communication,” which he gives the name “typographeum.”

5. For the concepts of “functionings and capabilities” cf. Sen 1998, p. 75.

6. Mills (2003, p.104)

7. “The argument that it (traditional distance education, T.H.) provides opportunities for “guided didactic conversation” is clearly unconvincing.” (Rumble, 2001, p.3)

8. To reconcile student support with scale is one of the themes discussed in this special edition by Lentell and O’Rourke.

9. The cube is based on Perraton (2000, p. 137). For a discussion of the relation between the AC formula and the cube cf. Hülsmann, 2003, p.304.

10. cf. Aderinoye’s and Ojokheta’s contribution in this edition.

11. Cost-structure means the composition of total costs in fixed costs and variable costs per student.

12. The distinction is due to Rumble’s classification of e-education in Type A and Type B (Rumble, 2001, p.75). It is renamed to make the names more “telling” by relating them to the different aspects of ICT.

13. In general this is not the case since computers are meant for rising quality, which in terms of costing, makes them to add-on costs bound to increase overall expenses.

14. A similar argument can be developed for the type-i variant for some contexts. It has been observed that programming services in India are available at substantially lower costs in India than in the US or Europe (Heeks, 1999).

15. Vertical disaggregation is one of two features (the other being “strategic alliances”) of what Michael Moore calls “network systems” and which he sees as the “emerging organizational paradigm” (Moore, 2003).

16. No exact definition of “broadband” is given. It is, however, pointed out that other parameters than communication capacity (speed) such as “always-on connectivity,” bandwidth symmetry, and addressability need to be taken into consideration.

17. Steven Jones illustrates this point using the metaphor of an electromagnetic field induced by a current. Like the flow of electricity, which generates an electromagnetic field, the introduction of a new technology induces changes in the social context. This applies also reversibly: social

changes may invoke technological changes, like a built up of an electromagnetic current induces electricity flow. (Jones, 1997, p. 131-146)

18. Perraton and Creed (2000) point out that professional extension services in health education and agriculture face similar problems. Establishing multipurpose community tele-centres would create synergies in addressing these problems.

19. “Do you realize what a quarrelsome proposition you are putting forward? That it is impossible to search for something, neither for what one knows not for what one does not know. Since you cannot search for what you know because you know it already, neither you can search for what you don’t know, because you do not know for what to search.” (my translation; Platon, 1962, p.21)

