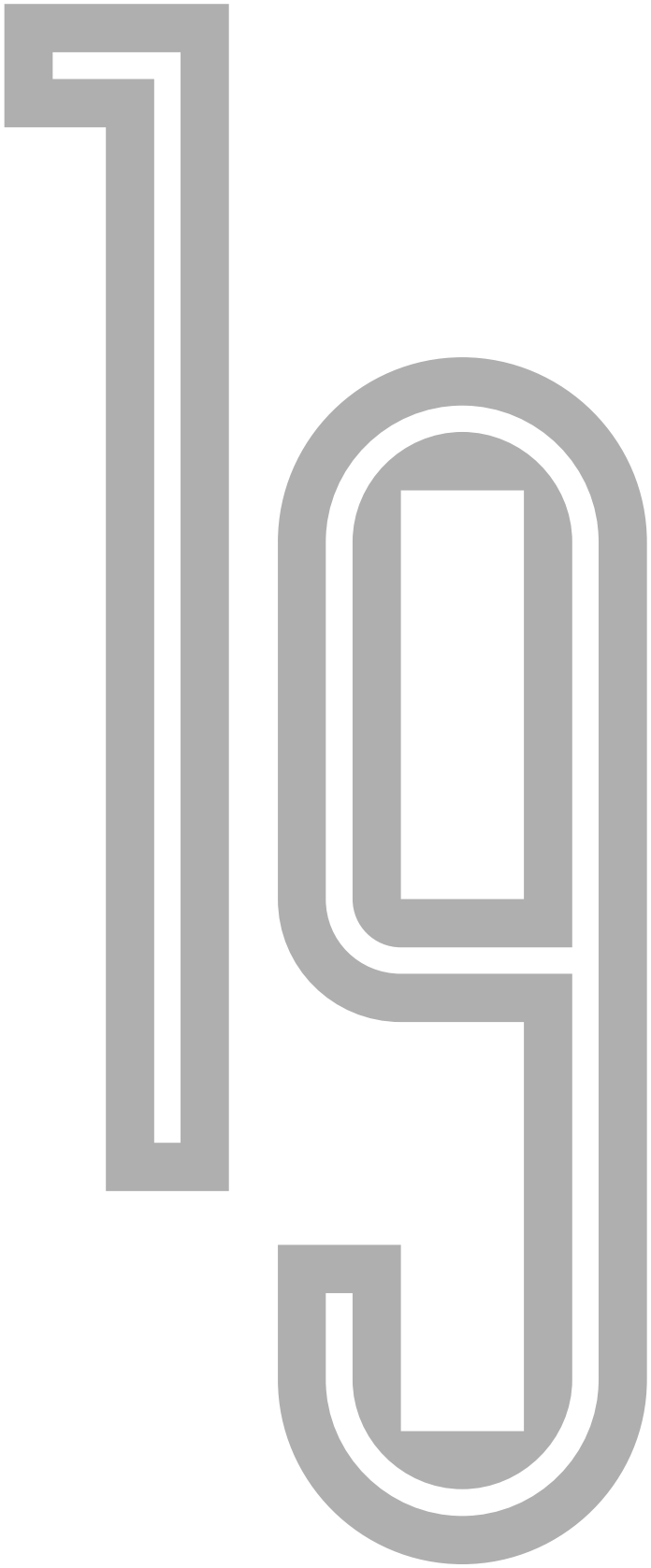

ARE WE THERE YET?

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> **The Destination**
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> **A Final Thought**

The preceding chapters discussed ICTs for education in the context of the educational enterprise's struggle to be relevant, responsive, and effective in meeting the challenges of the 21st century, by providing the whole spectrum of education services to everyone, anywhere, anytime with a focus on learning acquisition and teacher empowerment—all under conditions of an ever-expanding base of education clientele and limited physical and human resources. Drawing on the wealth of worldwide knowledge and experience, the authors of the preceding chapters outlined the rationales and realities of ICTs for education, examined the options and choices for applying them, and summarized a series of case studies that illustrated modalities of integrating ICTs into learning systems in different settings.

The message is clear: Technologies are only tools—but powerful ones. They have the *potential* to contribute to different facets of educational development and effective learning: expanding access, promoting efficiency, improving the quality of learning, enhancing the quality of teaching, vitalizing management systems, boosting the possibilities for lifelong learning, and offering e-training for the workplace. But there is a distinction between potential and effectiveness. For the potential of ICTs to be realized, constraints have to be alleviated, and a set of co- and prerequisites must be met. The *parameters* for success cover a wide spectrum, including education policies and strategies; physical, hardware, and software infrastructures; human and financial resources; and implementation modalities.

What are the prospects of the process of effectively integrating technology into learning systems, considering global and country realities? Are we there yet? The answer depends on the destination of the future, the coordinates of the present, and the journey from here to there.

THE DESTINATION

If you don't know where you are going, then it doesn't matter which road you take, does it?
—*Cheshire Cat in* Alice in Wonderland[1]

The process of effectively integrating technology into learning is not a simple one-step activity. It involves a series of deliberate decisions and actions:

- *Rigorously analyzing educational objectives and changes.* This step may involve rethinking educational policies and strategies to accommodate the new challenges and to exploit the potential of ICTs.
- *Determining which educational objectives will be pursued for ICT application.* This decision affects the choice of technologies and modalities of use.
- *Understanding the potential of different ICTs for different applications.*
- *Examining the appropriateness of specific technologies in light of educational objectives, desired roles of teachers and learners, and country realities and prospects.*
- *Sustaining a program of investment in the necessary human, physical, and instructional infrastructures.*
- *Implementing the pre- and co-requisites of effectiveness of ICTs for education within the dynamics of educational change and reform.*
- *Continuous evaluation and adjustment.* Despite their potential, ICTs and their use for education and learning continue to be high-risk operations. But because they are so fashionable, highly visible, and often overwhelming, it is difficult to maintain a rational and critical posture regarding their role. However, for the same reasons, it is crucial to incorporate into any ICT program rigorous evaluation, feedback, and subsequent adjustment in both approach and implementation.

THE COORDINATES

Where are we in this endeavor, and how far have we progressed? We are at the beginning of the road. Some of us are dazzled: the familiar technologies are evolving into more sophisticated ones, and many of the new technologies are astonishing. Some of us are hesitant: our empirical knowledge of the effectiveness of different ICTs is spotty, and our experience with what works and when is still sketchy. Some of us are confused: many of our education policies and practices are not compatible with the nature and potential of ICTs, which leaves us unsure of where to start. Some of us are doubtful: we see problems with convincing people, with finding resources, and with ensuring sustainability. Some of us are holding on: the technologies are changing so fast, and costs are dropping so rapidly, and we are waiting for the technologies to stabilize and prices to hit bottom.

Different countries and institutions are at different places. The digital divide, the gap between the ICT "haves" and "have-nots," is there and widening. Many countries struggling with providing minimal levels of educational services to their populations are questioning the suitability of ICTs for them. Unfortunately, no country or institution has the luxury to think in an orderly and sequential fashion about providing educational opportunities in terms of levels of

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education, domains of access, degrees of quality, or ICT modalities. It is always a question of striking a balance between different demands. In the case of ICTs, as noted in the preceding chapters, there are obvious trade-offs, and ICTs—properly selected and implemented—can accelerate educational development and help countries leapfrog.

ICTs are experimented with, introduced, and integrated into many educational systems and institutions worldwide, through educational radio and television programs, open universities, virtual high schools, exciting children's software, computer-enhanced programs, and Web-based learning opportunities. The private sector has entered the field vigorously, with corporate universities, e-training programs, and educational offerings on the Internet. But many of these efforts are on the margin. Most countries are still far from reengineering their educational systems to make the best use of ICTs, and the objective of effective learning for everyone, anytime, anywhere is far from being fulfilled.

THE JOURNEY

The challenges facing education worldwide will escalate, and the struggle between needs and resources will deepen. The quest for radical solutions will intensify, and the pressure to "do something" with ICTs will keep mounting. Yet, questions about the potential of ICTs and their effectiveness will linger. Under these conditions, how can we rationally and realistically maximize the contribution of ICTs to the realization of effective learning to everyone, anytime, and anywhere?

Will we ever get there? We are like the family of nomads roaming the desert on the backs of camels. One of the children asks, "Are we there yet, father?" "We will never get there, son," replies the father, "we are nomads." Likewise, we are on a journey of pursuit, experimentation, and exploration in a domain characterized by changing landscapes, moving targets, elusive destinations, and evolving modes of transportation. We may never get there, but we can certainly get close. Five ingredients are necessary for the journey:

Hard Work

Experience has shown that effective integration of ICTs into education and learning systems is not instantaneous; it takes sustained hard and deliberate effort, keeping in mind three considerations:

- ICTs for education, like any educational activity or reform, require a long gestation period. Therefore, commitments, efforts, investments, and implementation schemes must be sustained over a long period of time. For instance, let us keep in mind that we have been experimenting with Web-based learning for far less time than it takes one cohort of students to go through school.
- Integration of ICTs into education is a radical innovation and should be treated as such. Innovations require building a solid base of knowledge and commitment, interacting with interest groups, generating and testing different options, experimentation, planning for large-scale implementation, critical mass application, and a mind open to modification and adjustment. How radical and comprehensive should an innovation be?

  > It is obvious that an incremental issue-specific approach is always superior to a comprehensive strategic approach . . . . A step-by-step approach allows experimentation and adjustment and does not have high political and institutional demands. On the other hand, this approach may lead to "low-risk" quick-fixes, and inadequate investment in terms of political capital and other resources to carry the reform off successfully. The success stories of . . . case studies have shown that to solve sector-wide problems in the context of political and economic demands, it is prudent to start with a limited incremental phase, but this should be succeeded in time by a comprehensive strategic approach. The timing and speed of this evolution should be gauged to the degree of acceptability of the reform by the stakeholders, and the implementation capacity of the system.[2]

- Educators (teachers and education administrators at all levels) are central to ensuring that ICTs will be introduced and integrated properly into the teaching/learning process. One should not assume that educators will be supportive naturally. ICTs transform dynamics of the education enterprise; they change the roles of teachers, administrators, students, and parents. At the same time, ICTs can break school insulation; they connect schools to a world beyond the immediate environment and make them more transparent to parents and communities at large. Educators need to be convinced of the benefits of ICTs for them and their professions and must be brought actively into the early stages of planning and development.

Creativity

Effective application of ICTs requires creativity in exploiting the technologies of today and imagining the potential of the technologies of tomorrow. Current technologies have not been well explored and exploited. Compared to business, commerce, and entertainment, education is very far behind. There is a whole world out there of animations,

simulations, digital pads, electronic books, virtual presentations via Webcasting, chat rooms, videoconferencing, machine translation, speech technology, handheld computers, electronic white boards, and virtual reality. Combining these technologies provides learning environments beyond our imagination, but within our reach.[3]

But strategies for using ICTs for education solutions should not be driven by the potential of current technologies alone. The world of ICTs is exploding with new inventions, and the lifetime of many technologies is shorter than the lifetime of educational reform. Yet, it is hard to imagine what technologies will exist in 10 years. Only 15 years ago, the hottest items were fax machines, a slow computer, and a dot matrix printer. There were no e-mail, Web sites, digital radio, or application CDs. Technology is moving faster than our imaginations; however, education strategists need to keep their fingers on the pulse of technological innovation. Four areas are of particular interest to educators:

- sensors connected to computers that can sense speech, physical conditions, and even brain waves;
- Internet 2, with enormous capacity and speed (the entire *Encyclopaedia Britannica* collection could be downloaded in about 15 seconds!);
- wearable PCs that will change the whole notion of computer infrastructure, networking, and configuration; and
- nanotechnology (a nanometer is one billionth of a meter), which may lead to such small computers that, by 2020, we may be able to use the Internet to download not just software, but hardware as well.

Research and Development

ICTs for education call for dramatic changes in education systems, heavy investment, and long-term commitments; yet, the knowledge base to make decisions and choices is not commensurate with the enormity of what is required. Meanwhile, educational technologies are about education and learning. While our knowledge of learning has improved significantly as a result of advancements in cognitive and brain science, research into the effect of ICT interventions on the learning process, including neurophysiology, is nearly nonexistent.

As noted in chapter 3, a significant body of research on ICTs' effectiveness is available, but it is often contradictory, difficult to interpret, and even more difficult to use in the policy-making process. What is needed is more large-scale longitudinal research, policy-related studies, comparative analyses across countries and contexts, cost-effectiveness measurements, formative evaluations of experimental projects, and piloting.

Despite its shortcomings, current knowledge tends to accumulate in the hands of a few, more often than not driven by powerful economic interests and concentrated in the hands of a few institutions (private and public). Such knowledge, to a large extent, is concentrated in economically and technologically advanced countries, and sometimes in institutions that are not traditionally part of the educational or academic community. Local, regional, and international mechanisms must be created to build a solid knowledge base of ideas, issues, research results, case studies, best practices, and resources. Such knowledge clearinghouses will offer up-to-date information and syntheses to assist decision makers and practitioners in the design and implementation of educational technology programs without reinventing the wheel or repeating others' mistakes. They also will help in identifying knowledge gaps and topics for research.

Unfortunately, however, research, broad evaluation, and development have not attracted much funding. Countries and institutions seem to be willing to invest huge amounts of money in ICT projects with little knowledge of their potential benefits, but are unwilling to invest a small fraction of these amounts in research and development to protect their large investments and improve their effectiveness. A review of government support of educational technology research and development (EdTech R&D) produced the results summarized in Table 19.1.[5]

There is a legitimate justification for public funding of EdTech R&D. A knowledge base totally derived from market supply will have many gaps, which will decrease its usefulness. Also, current conditions create distortions in the knowledge "market." For instance, some current players may have no incentive to invest in sophisticated studies. As gaps are identified and distortions in knowledge generation detected, public resources need to be invested to fill these gaps and redress these distortions.

Quality Assurance

As more educational software and entire courses of study become available via radio, TV, the Internet, or some combination of these, whether free or fee-based, the issue of quality assurance becomes acute. Regional and international cooperation is needed to establish standards, guidelines, and accreditation mechanisms. It is in the interest of all partners, including those in the economic sector, to introduce coherence and transparency into this new, mushrooming market. At the same time, ownership of knowledge, and the legal and tariff framework that governs cross-border exchange of knowledge, need to be sorted out.

TABLE 19.1 • OVERVIEW OF INTERNATIONAL INVESTMENT

COUNTRY / REGION	EDTECH R&D INVESTMENT, FY 2000
United States	285,000,000*
Canada	12,000,000
European Commission	65,000,000
South Africa	230,000
Korea	330,000
Japan	11,420,000
Australia	737,000

** Only $40 million was designated specifically for EdTech R&D.*

A Seat at the Drawing Board

The education sector has been using the technologies developed for the business and commercial sectors, and has been caught in a cycle of purchasing ever more powerful computers and software. Technologies for education, therefore, generally have been applications of "generic" technologies rather than unique responses to educational needs.

The question many are asking is: Do we really need high-powered computers, continuous connectivity, and the most up-to-date operating software to use computers for education purposes? There is no empirical answer because there has been no systematic attempt to sit down at the drawing board and set design specifications for an "education machine" that meets the pedagogical and institutional needs of the education sector within the financial parameters that govern this public, nonprofit sector. There have been some humble efforts in countries such as Brazil and India to address this issue and produce a less costly computer with a longer operating life, but what is needed is a more concerted effort in this domain.

The international development community (UNESCO, World Bank, UNDP, etc.), which is providing millions of dollars in support of ICTs in schools, should take this issue seriously and invest a small portion of these amounts in an institute or commission to explore and encourage new technologies that address educational needs specifically, have long lifetimes, and are cost-effective. Such a body should include education planners, technologists, engineers, programmers, and education consumers from the public and private sectors. Unless we take such collective and intelligent action, technologies for education and learning will continue to be vendor-driven, unattainable, and unsustainable.

A FINAL THOUGHT

Integrating ICTs into education and learning systems is an intricate, multifaceted process. The only constant in the process is change: change in the educational landscape and its demands, in technologies and their potential, in the parameters for success. The journey from where we are to where we want to be is long, unpredictable, and challenging. Every day we will be fascinated by a new technology, exciting software, and a dazzling application. We must not lose sight of the destination, however; teachers and teaching, and learners and learning.

Our insurance against this temptation is the child. It is amazing what a child can do for us as adults. We are sucked into the whirlwind of jobs, stocks, houses, recipes, and technologies . . . until we look into the face of a child. Life regains perspective. We see the mystery of life unfolding, and we realize what is important and what is marginal. So it is with technology. We are sucked into the wonders of fast chips, intelligent toys and games, and fascinating virtual domains, and we get taken by the miraculous potential of these technologies for us and our children . . . until we look into the face of a child. There we see the miraculous transformation of life at work. Only then do we see with clarity the distinction between means and ends, between tools and objectives, between touching buttons and touching hands, between technologies and learning.

The most successful technologies are those that become unnoticed. We do not think anymore of the spectacle of printing every time we read a book, the phenomenon of TV every time we watch a movie, or the miracle of the telephone every time we make a call. The ultimate success of *ICTs for learning* will be attained when we stop marveling about the *ICTs* and apply our minds and emotions to the wonders of learning.

ENDNOTES

[1] Available at: *http://www.sabian.org/alice.htm*.

[2] Haddad, W. D. (1995). *Education Policy-Planning: An Applied Framework*. Paris: UNESCO, International Institute for Educational Planning.

[3] As an example, Web technologies that either exist or are being developed create scenarios for second-language instruction that sound like science fiction, but are not. See: Jackson, J., & Costante, G. (November/December 2001). Web-Mediated Second Language Instruction: Will It Actually Work? *TechKnowLogia*. Available at: *www.TechKnowLogia.org*.

[4] Jackson & Costante, op cit.

[5] Bakia, M. (April-June 2002). Government Support of EdTech Research & Development: An International Overview. *TechKnowLogia*. Available at: *www.TechKnowLogia.org*.