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Fundamentals of Educational Planning

Developing countries in the e-learning era

Christian Depover
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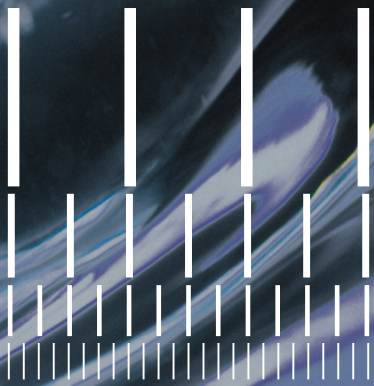

Developing countries in the e-learning era

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Fundamentals of Educational Planning

The booklets in this series are written primarily for two types of clientele: those engaged in educational planning and administration, in developing as well as developed countries; and others, less specialized, such as senior government officials and policy-makers who seek a more general understanding of educational planning and of how it is related to overall national development. They are intended to be of use either for private study or in formal training programmes.

Since this series was launched in 1967, practices and concepts of educational planning have undergone substantial change. Many of the assumptions that underlay earlier attempts to rationalize the process of educational development have been criticized or abandoned. Yet even if rigid mandatory centralized planning has now clearly proved to be inappropriate, this does not mean that all forms of planning have been dispensed with. On the contrary, the need for collecting data, evaluating the efficiency of existing programmes, undertaking a wide range of studies, exploring the future, and fostering broad debate on these bases to guide educational policy and decision-making has become even more acute than before. One cannot make sensible policy choices without assessing the present situation, specifying the goals to be reached, marshalling the means to attain them, and monitoring what has been accomplished. Hence planning is also a way to organize learning: by mapping, targeting, acting, and correcting. The scope of educational planning has been broadened. In addition to the formal system of education, it is now applied to all other important educational efforts in non-formal settings. Attention to the growth and expansion of education systems is being complemented and sometimes even replaced by a growing concern for the quality of the entire educational process and for the control of its results. Finally, planners and administrators have become more aware of the importance of implementation strategies and the role of regulatory mechanisms, including the choice of financing methods and examination and certification procedures. The concern of planners is twofold: to reach a better understanding of the

validity of education in its own empirically observed dimensions, and to help in defining appropriate strategies for change.

The purpose of these booklets includes monitoring the evolution and change in educational policies and their effect upon educational planning requirements; highlighting current issues of educational planning and analysing them in the context of their historical and societal setting; and disseminating methodologies of planning that can be applied in the context of both the developed and the developing countries. For policy-making and planning, vicarious experience is a potent source of learning: the problems others face, the objectives they seek, the routes they try, the outcomes they achieve, and the unintended results they produce all deserve analysis.

In order to help the Institute identify up-to-date issues in educational planning and policy-making in different parts of the world, an Editorial Board has been appointed comprising professionals of high repute in their fields. The series has been carefully designed, but no attempt has been made to avoid differences or even contradictions in the views expressed by the authors. The Institute itself does not wish to impose any official doctrine. Thus, while the views are the responsibility of the authors and may not always be shared by UNESCO or IIEP, they warrant attention in the international forum of ideas. Indeed, one purpose of this series is to reflect a diversity of experience and opinions by giving different authors from a wide range of backgrounds and disciplines the opportunity to express their views on changing theories and practices in educational planning.

At a time when increasing numbers of young people are completing basic and secondary education, there is rising pressure on higher education to open its doors and become more accessible to a broader public of young people and adults from more diverse backgrounds. Moreover, the demands of the knowledge economy militate in favour of broadening access to higher education and improving its quality. As countries' financial resources are unfortunately limited, a recurrent question is whether it is possible to raise the productivity of education. Is it possible to increase both the coverage and the quality of education at lower cost? What possibilities does information technology offer in this regard?

These are the questions that Christian Depover and François Orivel strive to answer in this monograph by analysing the potential of distance education in developing countries in the e-learning era. The two authors, who are leading specialists in analysis of the cost and effectiveness of using information technology in education, examine the various forms of distance education, the pedagogical models used, and the specific potential of e-learning, as well as its costs. They go on to describe the expected benefits of distance education in developing countries, giving special attention to African countries, which generally have a medium-sized population and few resources.

The Institute is extremely grateful to these two authors for their valuable contribution.

Khalil Mahshi
Director, IIEP

Composition of the Editorial Board

Preface

Distance education was long regarded primarily as a means of making education accessible to all those who could not enrol in 'normal' education owing to geographical distance, financial difficulties, or (for those in work) lack of time. Distance education offerings using traditional means of communication (post, television, radio) were developed at all levels: in secondary education (correspondence courses, remedial courses), in vocational training, in teacher training, and especially in higher education.

Information and communication technology (ICT) has opened up new horizons for distance education and enabled it to expand to an extraordinary degree. The use of the Internet has greatly facilitated access to education for a large variety of population groups around the world. Initially, distance education was seen mainly as a means of increasing the flexibility of provision – by offering a variety of choices in terms of the content, schedule, pace, and duration of education, as well as recruitment criteria and forms of certification – and hence of reducing geographical and socio-economic distance. Most importantly, however, it was also a means of reducing the unit costs of education, at a time when public funding for higher education was being cut. As a result, some distance education programmes were developed on the basis of what were clearly industrial models. The United Kingdom's Open University, for example, enrols more than 250,000 students, many of whom live outside the UK. It is one of the largest universities in Europe, along with Spain's National University of Distance Education (UNED). Some universities that have opened in developing countries have still larger student bodies. The largest is the Indira Gandhi National Open University (IGNOU) in India, with more than 1.5 million students. These institutions manage to provide education at very low cost by standardizing their programmes and restricting the most expensive components, i.e. those based on extensive interaction between students and tutors. In this type of programme, the number of dropouts may be very high.

In the globalized world of the early 21st century – a world that is increasingly urbanized and connected, where knowledge and

innovation are the drivers of development – competition among higher education institutions has increased, as has the importance of a degree. Regardless of where one lives, it is possible to enrol and participate in the courses of some of the best universities in the world. Under these circumstances, the quality of the education and support provided becomes crucial. This has changed the environment of distance education, which is becoming an additional asset in the competition among universities. The quality, relevance, and adaptability of educational programmes are becoming more important than ever. Many universities in developed countries offer distance courses in addition to traditional face-to-face education. They hope to recruit students all over the world and also earn a return on their investments in traditional programmes. Not only are course offerings and content less standardized in distance education, but distance learning is punctuated and reinforced by discussions and interaction with a tutor, and may also be supplemented by face-to-face learning sessions. The quality of learning materials and diversity of provision have also become essential. The teaching methods used are more appropriate for a broad variety of learners who can pursue the education provided at their own pace. The profile of learners can also become more diversified, with increased proportions of women and rural dwellers. This can raise the costs of distance education, and, as Christian Depover and François Orivel note in this monograph, the level and structure of costs can approach or even exceed those of traditional education. The results, however, are also better than they used to be. The coverage and level of distance higher education are improving, and this improvement can benefit traditional higher education as provided in universities.

Can developing countries organize such distance programmes? Is this justified in a sparsely or moderately populated country with limited resources? Which organizational model should they adopt, and what can they expect from it? In this monograph, Christian Depover and François Orivel give an excellent presentation of distance education in the e-learning era, that is to say, distance education using the latest information technology. They examine the various institutional and pedagogical models, the organization of a distance education system, and the structures that need to be established. They also study the expected costs and benefits of such

education, mentioning the possibilities offered by free open-source materials available on the Internet that can be used by the organizers of distance courses, as well as other ways of reducing costs.

Without being overly technical, this booklet raises all the important issues that decision-makers and educational planners in developing countries need to consider when they are deliberating whether it is necessary and desirable to set up such a system in their countries.

Christian Depover, professor at the Université de Mons, Belgium, and the Université libre de Bruxelles, is a specialist in the use of technology in education and e-learning. François Orivel, emeritus research director at France's Centre national de la recherche scientifique (CNRS) and affiliated with the Institut de recherche sur l'éducation (IREDU) at the Université de Bourgogne, specializes in cost-effectiveness analysis of new technologies and the costs of distance education. The two authors were thus particularly well qualified to produce such a monograph and to summarize the latest information on this topic.

Françoise Caillods and N.V. Varghese
General Editors

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List of abbreviations

ACREDITE	Analyse, conception et recherche dans le domaine de l'ingenierie des technologies en éducation (Analysis, design, and research in education technology engineering)
AUF	Agence universitaire de la francophonie
AVU	African Virtual University
CNED	National Centre for Distance Education
COL	Commonwealth of Learning
DE	distance education
ECOES	Espacio comŭn de educaciŏn superior
GDP	gross domestic product
ICT	information and communication technology
IFADEM	Initiative francophone pour la formation à distance des maîtres
ITU	International Telecommunications Union
LMS	learning management system
LOM	Learning Object Metadata reference model
OECD	Organisation for Economic Co-operation and Development
OIF	Organisation internationale de la francophonie
REVICA	Reviewing European Virtual Campuses project
SCORM	Sharable Content Object Reference Model
TESSA	Teacher Education in Sub-Saharan Africa project
UNISA	University of South Africa

List of tables and figures

I. Introduction

Distance education has long been solidly established in most Northern countries, and e-learning initiatives have been appearing for more than a decade. In developing countries, although projects are fewer, there have been some landmark accomplishments in distance education. In particular, in the most populous countries, such as China and India, education managers have long been aware of the multiplier effects arising from the possibility of reaching learners through various media: the written word, radio, television, and the Internet.

In developing countries, although the issues are not always the same, education specialists today are vying with one another to include distance education, in its various forms, in the educational arsenal that every modern state should possess.

Although Internet access is limited and browsing the Web a bit mysterious for some, this showcase of global knowledge appeals to people even in the most remote villages of Africa. Community-level initiatives amply demonstrate people's interest in the Internet and its new modes of access to knowledge that, thanks to interactive multimedia content, liberate communication from the straitjacket of the written word.

However, the interest and goodwill shown by some are not enough to bring about change, particularly where education is concerned. To lay the foundations for sensible development of distance learning in general, and e-learning in particular, it is vital to address all aspects of the problem and, in particular, to take account of the economic constraints on the use of technology in traditional societies.

That is the perspective we adopt in this booklet, where we aim to take a realistic look at the potential of distance education in developing countries, giving consideration to the various possibilities and, most importantly, to the accessibility of technology both today and in the future.

Apart from the introduction and conclusion, this work is in five parts, aimed at giving those involved to any extent in a distance education project some analytical tools that will help them to evaluate the possibilities and limitations of such a project. It is primarily addressed to those who are liable to have a role in decision-making, at the national or international level, in pedagogical, policy, or logistical matters.

Thus, this work is intended not for distance education experts but rather for decision-makers seeking to inform themselves about the possibilities offered today by distance learning in general and by e-learning in particular.

With this in mind, we present a number of basic concepts and a few major issues that are driving the development of distance education and current research in the field.

In *Chapters III* and *IV*, we review the main institutional and pedagogical models of distance education, as well as the main areas of coverage.

Chapter V is devoted to the structures and functions required in a distance education system and how these have changed with the arrival of new systems based on the possibilities offered by the Internet.

Chapter VI provides a detailed cost analysis, highlighting the differences in cost structure between traditional distance education and e-learning. This analysis also aims to guide decision-makers towards the solutions that have the best chance of being cost-effective.

Chapter VII considers the short- and medium-term developments expected in distance education, as well as their effects on the development of distance learning in developing countries.

II. Frame of reference

Basic concepts

Most definitions of distance education (DE) that are commonly accepted today emphasize the physical separation between teacher and learner (Keegan, 1996). Some authors argue, however, that this separation need not be continuous although it must exist during a substantial part of the learning process. This distinction makes it possible to include activities in which learners and teachers are both physically present, such as seminars, laboratory activities, and practical training sessions. In addition to this characteristic that is regarded as essential to the definition of distance education, there are others to which we will return below: an administrative body that produces learning materials and organizes their dissemination, an educational engineering body that designs courses and embeds them in appropriate media, the use of a medium (print, audio, video, or ICT) to enter into contact with learners, the fact that learners are not formed into groups for most activities, and so on.

The conception of DE reflected in this definition has gradually become more flexible in order to accept alternative forms. For example, face-to-face activities, which were long perceived as pedagogical concessions, to be granted sparingly, are now considered an integral part of a distance education system in the context of what is called blended learning. This term has gradually become accepted as defining a form of learning in which face-to-face and distant activities balance and complement each other. It is generally considered, though not always explicitly stated, that blended learning implies observing a certain balance between activities conducted in face-to-face mode and those conducted at a distance; as a result, when a programme involves mostly face-to-face instruction with only occasional activities at a distance, it will generally be preferable to speak of 'enhanced face-to-face education'.

There is a very widespread tendency today to speak of 'distance education and open learning' rather than simply of distance education, to highlight the fact that DE generally offers

easier conditions of access to learning than traditional education. The difference between DE and traditional educational institutions is particularly striking in developing countries, where access to higher education is often strongly restricted by conditions related to learners' previous education, to the diplomas they have obtained, to performance on a competitive entrance examination, etc. The term 'open' also refers to the flexibility that is often offered to learners in terms of having the option to enter the programme at any time, developing personalized programmes, or taking examinations when they consider themselves ready to do so.

Some observers tend to be of the opinion that the more open a system is, the better; but this is not necessarily true. For example, complete openness often requires extreme simplification of the pedagogical schema and avoidance of activities based on gatherings of students. Indeed, laboratory activities, face-to-face meetings, and even discussions over the Internet generally require a sufficient number of students to be at the same stage of progress in learning a subject. This paucity of social interaction, which is often seen in systems having a high degree of openness, is all the more regrettable because such socializing often helps to foster a feeling of belonging, which, as we will see below, is a key factor for motivation and perseverance in the learning process.

Similarly, the latitude granted to students to learn at their own pace strongly limits the possibility of forming cohorts, which not only facilitate management of the system but also help to foster social ties, mutual assistance, and empathy among learners.

Given these limitations, it is important that the DE system selected be allowed to develop the degree of openness that is most appropriate in view of the objectives pursued, the conditions under which learning occurs, and the target population.

Although the terms 'open' and 'distance' are often used in combination, one should refrain from thinking that they are synonyms or that one cannot be used without the other.

In fact, education can perfectly well be open without being delivered from a distance. For example, many adult education institutions are structured so as to provide open access to their

course offerings, whereas classes are taught in face-to-face mode. Some universities that offer distance courses have very strict entry requirements for acceptance at the graduate level in terms of diplomas, certification, or work experience.

Where developing countries are concerned, freedom of choice generally brings few benefits to learners, because in most cases they do not have the experience needed to take advantage of this flexibility. Moreover, systems that are considered very open are generally more costly and difficult to manage.

Although we are aware that the term 'e-learning' may be unclear for some readers, we decided to use it in the title of this booklet because it enables us to combine, in a single word, two key ideas of this work: first, that the development of ICT is changing the way people learn; and, second, that in developing countries such change will come about, at least initially, through distance education.

Contrary to a widespread notion, ICT is not simply a vehicle that transfers knowledge from an individual who possesses it to those who wish to learn it. The use of ICT – or any other medium, for that matter – modifies the message. More than 40 years ago, Marshall McLuhan (1968) was already declaring that 'the medium is the message', meaning that the effect of any communicative effort is due to the combination of the message content and the medium that bears it. When speaking of technologies, we will refer to cognitive tools (Depover, Karsenti, and Komis, 2007) to emphasize that in addition to their habitual role as vehicles for communication, they are liable to change, direct, and guide the way in which individuals learn. To paraphrase the insight of Vygotsky (1978), as reformulated by Salomon (1993), the behaviour of individuals is guided by the characteristics of the tools they use, such that students who receive distance education through a technological system that exploits the possibilities of the Internet will not only learn differently, but will probably also learn something different. More specifically, not only will they have to develop other skills to acquire the desired knowledge and know-how, but the knowledge and know-how they acquire will also be different.

The term 'e-learning' refers not only to this fundamental shift in the learning paradigm, to which we will return, but also

to a preference for the use of electronic media in learning. In the specialized literature, this term is sometimes used to designate any form of education using electronic media and sometimes, in a more restrictive sense, to refer to applications that employ communication via the Internet. In this work, we will use it in the second sense, taking 'e-learning' to mean 'online learning via the Internet'.

The term 'virtual campus' is often used to designate an institution that offers e-learning services based on the potential of the Internet. However, there is far from unanimous agreement on the use of this term. Some people prefer other terms, such as 'virtual university', 'digital university', 'digital campus', or (particularly in Italy) 'telematic university'. Moreover, for some observers the word 'campus' refers only to higher education, while others see no reason not to extend its use to primary and secondary school or the private sector.

In recent years, e-learning has seen explosive growth. According to the annual surveys conducted by the Sloan consortium, nearly 20 per cent of the United States' student population took at least one course online in 2006, an increase of about 10 per cent over the previous year (Allen and Seaman, 2007). A study based on 2009 data confirms this trend, reporting that approximately 30 per cent of students had taken at least one distance course and that the annual rate of increase exceeded 20 per cent (Allen and Seaman, 2010).

The notion of distance, its forms, and its role in learning

In speaking of the benefits of distance education, most people mention the possibility of overcoming geographical distance between teacher and learner, but they often forget benefits associated with other forms of distance that are equally important for learning, such as socio-cultural distance, temporal distance, and transactional distance.

Social distance is often evoked to explain why some people from modest socio-cultural backgrounds are reluctant to enrol in higher education: analyses of DE systems' recruitment tend to show that segregation by socio-cultural background is generally less marked than in traditional forms of education.

This ability to attract people from less wealthy backgrounds often leads observers to consider DE as a 'second chance' form of education, which enables people to resume their studies when they have already joined the workforce or after a series of failures in more traditional education.

In developing countries, enrolling in distance education is often learners' second choice, notably because of very strict admission criteria in higher education. This situation sometimes gives DE a negative image, which will have to be overcome if this form of learning is to become more widely known and to serve as a credible alternative to traditional forms of education. The support currently given to DE by various international institutions such as UNESCO, the Agence universitaire de la francophonie (AUF), the Commonwealth of Learning (COL), and the World Bank is certainly helping to improve the image of distance education in developing countries.

The term 'temporal distance' is used when speaking of the ability of distance education to overcome the time constraints associated with traditional education. In fact, the term is generally used in discussing the open learning characteristics of DE, emphasizing the freedom offered to learners to choose when and at what pace they will learn.

The notion of transactional distance proposed by Moore (1993) combines with the other forms of distance to remind us that the driving force of learning is found in interaction and that the efficiency of the learning process will depend on striking the right balance in terms of transactional distance. In Moore's view, transactional distance depends mainly on two factors: the level of interaction and the extent to which the course is structured. The higher the level of interaction and the less structured the course, the more independence and initiative will be required of the learner.

In practice, the important point is not, as some authors recommend, to minimize the transactional distance, but rather to adjust it to the characteristics of what is to be taught and to learners' strengths and weaknesses (Saba, 2003).

Other authors, such as Bernard (1999), insist that distance need not necessarily be seen as negative, as an obstacle to be overcome; rather, if one plays on the various forms of distance discussed above, it can also serve as a lever to increase the efficiency of learning.

The hypothesis of learner autonomy

Most distance education systems are based, explicitly or not, on the assumption that there exists a form of autonomy in learning that enables learners to control or guide their knowledge acquisition process. Some authors, such as Moore and Kearsley (1996), put more emphasis on the advantages stemming from the possibility of leaving considerable freedom to learners, while others, such as Garrison and Anderson (2003), stress the need to back up autonomous learning with a facilitator or tutor.

In a broad-based survey in the United States, Allen and Seaman (2007) demonstrated that the need for structured thinking and self-discipline in DE was the main impediment to the dissemination of e-learning and that, therefore, future expansion would require the development of these qualities in learners.

Many research studies address the delicate question of the appropriate balance between learner autonomy and external supervision. They tend to show that it depends on many variables, such as the learner's age, experience with distance learning, level of performance in the subject area, level of anxiety, and degree of motivation. Bandura (2003) adds another variable, 'a feeling of personal effectiveness', regarding it as strongly linked to the capacity for self-management in learning and to self-confidence.

If one accepts the idea that distance learning calls for some forms of autonomy and some ability to guide one's own affairs, it can be expected that all learners are not equal with respect to distance education, that some are more gifted and, most important, better prepared to handle or to take advantage of distance in all its forms. In particular, many studies have shown that some educational modes, or even some education systems, do more than others to develop pupils' capacity for autonomy and control in the learning process.

For example, the United Nations's *Arab Human Development Report* emphasizes that 'the curricula taught in Arab countries seem to encourage submission, obedience, subordination and compliance, rather than free critical thinking' (UNDP, 2003, p. 53). Kember (2007), in his book on distance learning in developing countries, stresses that students in such countries are poorly prepared for a learning mode that requires a high level of autonomy and the ability to learn in the absence of a teacher or of other learners.

The role of tutoring

The requirement of autonomy in learning discussed in the preceding section points to the need to support learners when such autonomy is either lacking or proves insufficient at a given moment in the learning process (Depover *et al.*, 2011). More specifically, addressing a lack of self-control can help learners to avoid bearing the consequences of inappropriate choices while also leading them to better develop their ability to take charge of the learning process.

The term most commonly used to designate the person responsible for tutoring is tutor, but others are used as well: adviser, facilitator, moderator, coach, etc. While the term used is sometimes indicative of the pedagogical approach to be employed, what is most important in a DE system is not the term but the roles actually played by this person.

In this regard, things may be very different depending on the system, but also depending on the tutors themselves and the degree of effort they put into their work. In general, tutors are supposed to assume the following roles:

- a teaching role (explaining objectives, supporting the learning process, helping to structure course content, leading discussions, provoking metacognitive thinking, evaluating, etc.);
- a role of social and affective support (appreciation of individual and collective efforts, eliciting participation, encouraging mutual assistance, supporting the feeling of belonging, encouraging cohesion of the group, promoting engagement and participation, etc.);

- an organizational support role (facilitating the division of tasks, helping with task planning, giving deadline reminders, facilitating time management, etc.).

In addition to these three roles, tutors provide technical assistance when the complexity of the system requires it.

Depending on the case, these roles may either all be played by a single person or be divided among several categories of specialists: a tutor for educational questions, an adviser for social and affective matters, and an administrative staff member for organizational aspects. Technical support will generally be handled by specialized personnel who can, if necessary, provide assistance directly at the learning site.

Another important issue relating to tutoring is that of physical implementation in terms of equipment. Depending on the technical solution selected for transmitting information from where the course is managed to the learning site, approaches may be very different. If information is exchanged by post, the tutor will have to make do with written information; if the telephone is used, there will also be oral conversations at certain moments in the learning process; if the Internet is used, tools for interaction between the tutor and learners will generally be accessed through a learning platform, which means that their interactions will be more frequent and better integrated into the learning process.

III. Institutional and pedagogical models for DE

Institutional models

DE today is highly diversified in terms of institutional characteristics. It includes not only public institutions that have long been established on the DE market, but also new institutions that draw a large share of their financing from the private sector.

Although distance education is provided at all educational levels, it must be recognized that the bulk of e-learning offerings are found in higher education and vocational training. Moreover, initiatives relating to primary and secondary education are often lacking in visibility, as they generally take the form of limited-term projects that rarely have the time to establish their position in existing institutional structures.

To describe the current supply of DE, we will therefore focus on higher education, examining the main institutional formats that can be identified.

In her book, published by IIEP-UNESCO, D'Antoni (2006) distinguishes four types of institutions, according to how they are structured to provide distance education services. We will adopt this classification for the most part, supplementing it with other criteria that allow us to draw finer distinctions in describing the institutional context of certain initiatives.

Bimodal institutions

Some traditional institutions have evolved towards DE provision. These are generally higher education institutions that have formed an entity offering courses online to accompany traditional courses. In some cases, DE provision has grown extensive enough to allow the institution to award its own degrees. The structure may take the form of a university department or a largely independent commercial organization. This widespread institutional form is known as 'bimodal', meaning that some course programmes require students to be present, while others are offered remotely.

Rumble (2004) identifies two forms of bimodal institutions: a pure bimodal model and a blended bimodal model.

The pure bimodal model is found in universities that, alongside their traditional face-to-face instruction, offer distance education that makes extensive use of e-learning. The distance offerings generally target different users (those for whom the opportunity cost of moving to the campus is too high) and lead to a limited number of degrees (in the French university system, such degrees amount to less than 10 per cent of all diplomas awarded by a given university). An example here is the recent merger of the Université du Québec à Montréal with Téluq (Télé-université du Québec, which had been wholly dedicated to distance education), to form a university based on the pure bimodal model.

The blended bimodal model, in contrast to the pure model, generally does not entail the creation of two distinct entities within universities. Rather, it involves blending, within a single degree programme, learning sequences in face-to-face mode and other sequences or modules in the form of e-learning; the latter may either be offered in both formats or be available online only. The proportions of these two modes vary from one institution to another and may be affected by students' preferences when, for example, students are offered a choice between face-to-face and e-learning formats for one or more courses. This model is tending to spread in the disciplines where it can be introduced most easily and least expensively, in the humanities and languages rather than natural sciences, engineering, and technology. Much also depends on teachers, whose inclination to expand the e-learning format will vary depending on whether they are motivated users of ICT.

Institutions specializing in DE

There are also institutions that have been created specifically to provide education at a distance. Some of them have existed for a long time – one example is the UK's Open University, founded in 1969 – while others were formed much more recently, fuelled by the explosion of the Internet, to offer education services via telecommunications networks. A study conducted by the REVICA consortium in 2009 identifies 45 institutions of this type that have been created since 1996 (Schreurs, 2009). In general, such institutions

receive public funding, but their development also depends on how vigorously they pursue other sources of finance. For example, the University of Eastern Finland, created as a multidisciplinary university, receives public funding that covers about 60 per cent of its needs, and it is responsible for raising other funds to cover the rest.

Consortia

Consortia are associations of partners interested in pooling their resources in order to offer distance education, generally in the form of e-learning. The form of the partnership can vary depending on the agreements between the partners. Consortia have been quite popular since the early 2000s. In France, for example, as of 2003 more than 400 partners had joined forces to create 64 digital campuses. Another type of partnership has been developed to form thematic digital universities that bring together specialized entities in a given field under the aegis of a consortium. The best known of these are the French Medical Virtual University and the University Association for Digital Teaching in Economics and Management. An interesting example of this trend is the creation of the Virtual University for Small States of the Commonwealth. This initiative, coordinated by COL, is aimed at providing a joint educational offering, primarily focused on occupational qualifications, to the 32 states that chose to join the consortium. Another example of a consortium is Mexico's creation of a Common Higher Education Area (Espacio común de educación superior – ECOES), which includes a division dedicated to distance education (ECOESad) and is aimed at bringing universities together to provide a joint distance education offering (Druetta, 2008).

Commercial organizations

This category consists of private initiatives based on a purely commercial model, whereas the institutional forms discussed above are all aimed at providing a public service. The quality of the service available at these institutions varies widely. Some are well known, such as the University of Phoenix Online, which has more than 200,000 students. In some cases, the programmes offered by this type of institution are accredited by the US federal authorities, which generally constitutes an assurance of quality and reliability that are certainly not found at all the institutions in this category.

Some institutions opt instead for the vocational training route, offering programmes that focus on the skills desired by the labour market but that may receive no official accreditation. According to Moeglin (2010), three out of four programmes organized by the University of Phoenix are not officially accredited. Over the last decade, institutions of this type have been proliferating, and some offer education services for export, particularly towards developing countries. Private initiatives also include campuses that were initially reserved for a company's internal use but have been gradually opened to provide external services. An example is Motorola University, which now delivers its courses in some 20 countries.

On examining the institutional forms described above, one can easily see that the growth of the Internet has played the key role in driving the institutional development of DE providers. Fuelled by the Internet, provision has not only grown but become highly diversified.

The development of consortia has led to the internationalization of provision, with programmes offered by institutions belonging to several countries. For example, in the ACREDITE master's programme, supported by the Agence universitaire de la francophonie (AUF), institutions from three countries (France, Belgium, and Switzerland) offer distance programmes intended primarily for people in developing countries. On a larger scale, U21Global is a consortium founded in 2001 by four prestigious universities (the universities of Birmingham, Melbourne, Nottingham, and Virginia), which were subsequently joined by some 20 partner universities, to offer online education programmes that are taken today by students from 72 countries.

The origin of a DE initiative, although strictly speaking unrelated to institutional structure, is worth taking into account when describing DE provision in developing countries. In fact, DE has long been provided from North to South, following the usual path of North–South transfer.

To broaden their recruitment base, many universities in the North have thus set up programmes to attract applicants from the South. For example, the UK's Open University has formed the Open University Worldwide, with the aim of exporting its services

throughout the world. The University of Phoenix, a private university in the United States specializing in distance education, has for the past ten years been forming partnerships in many countries, particularly developing ones.

Another significant example of North–South transfer in education is the African Virtual University (AVU), created in the late 1990s to broaden access to higher education for the countries of sub-Saharan Africa. The initial approach was to use the the technologies considered the most effective at the time (satellite video and follow-up by telephone) to provide access, via local learning centres, to courses delivered by Northern universities (mainly North American and Australian). Subsequently, these courses were moved to a Web platform, which gave the system more flexibility and allowed a broader scope of activities. Classes are now managed and students supervised by African tutors who are trained specifically for this purpose and based in the local learning centres. The AVU's objective is to support African institutions in the development and management of their own degree programmes.

Some more recent initiatives may be described as South–South transfer, as they involve programmes provided by developing countries to other developing countries. For example, the Monterrey Institute of Technology, in Mexico, offers DE programmes to many Latin American countries. In Africa, several distance programmes are offered with the support of the AUF. In Burkina Faso, the master's programme in maintenance and management of municipal infrastructure and equipment organized by the Institut international d'ingénierie de l'eau et de l'environnement is training its third class of students, and its student body is drawn from some 20 countries in Africa, the Middle East, and the Caribbean. In Cameroon, the École nationale supérieure polytechnique in Yaoundé has a master's programme in telecommunications, in partnership with private sector firms. This programme is delivered primarily in distance mode via a Web platform, with some face-to-face group meetings and internships in businesses. It is noteworthy that this type of blended system, which combines distance courses, laboratory activities, and internships, is used for highly specific niches in which experts are generally lacking in developing countries rather than, as is often the case in industralized countries, very general programmes that attract

large numbers of students to degrees in the humanities and social sciences, which are far from certain to lead to jobs.

Pedagogical models

DE systems – both those we see today with the development of the Internet and those that, in the past, were supported by technologies that some consider outmoded – serve as vehicles for certain pedagogical constructs – that is, certain conceptions of what makes effective education.

It is worth noting that in distance education, change in the technologies used affects the pedagogical conceptions in effect at a given moment in time. Thus, depending on developments in technology, education programme designers will defend certain pedagogical models that exploit the latest technology on the market. In distance education, as in other fields, there are 'fads' that sometimes lead experts to discard today what they praised to the skies yesterday.

One should therefore consider the models presented below with an open mind and, most importantly, avoid thinking that a model that is no longer in fashion has no educational value. On the contrary, we think that the best chance of implementing an effective pedagogical solution comes from combining models, or at least from bearing in mind what different models can contribute. The worst approach would be to make choices based on slavish devotion to a particular model or technological solution, excluding the possibility of selecting elements that, in each of these models, seem particularly well suited to the situation.

The models presented below are not always directly concerned with e-learning. For example, the industrial and mass media models, although they may perfectly well be compatible with dissemination over the Internet, generally make use of older technologies. The fact that in this booklet we have chosen to emphasize learning via the Internet does not mean that we regard this as the obligatory path for DE in developing countries. Rather, our principal aim is to enable users to make informed choices, in accordance with their specific circumstances, by providing a better idea of the possibilities of e-learning.

The industrial model

The industrial model of distance education is not, strictly speaking, a pedagogical model, but rather an organizational and managerial model aimed at cost reduction. To achieve this goal, designers generally opt for the production of standardized courses for mass distribution. Cost reduction also entails cutting the most costly human services, particularly activities related to student supervision and tutoring.

Another characteristic of the industrial model is division of labour, which is found primarily in large systems (those with thousands or tens of thousands of students). In such systems, the various functions (*Chapter V*) are divided up among a number of specialists, so that each does the work for which he or she is qualified within an often complex design and production chain. This division of labour, if implemented in compliance with strict quality control procedures, makes it possible to share the responsibility for education among a team of specialists and ultimately to make the entire organization accountable for educational performance.

Peters (2000), who is recognized as the leading theoretician of this approach, considers DE as an outcome of the industrialization of society. In his view, the industrial approach changes not only the way the learning system is managed but also, and fundamentally, the way students learn. In this sense, we can consider the industrial model of DE as not only an organizational mode but also a pedagogical model.

The pedagogical choices characterizing this approach stem directly from the concern for maximizing efficiency while minimizing costs. To achieve this, the preferred option involves concentrating on the development of learning materials, which represent fixed costs in the cost structure of distance education, as well as minimizing the variable costs, namely those relating to activities centred on the individual learner or a small group.

These learning aids should be produced using pedagogical design techniques that draw extensively on cognitivist theories affirming that a high level of efficiency can be achieved in the

learning process by relying on structured material and taking learners' characteristics into consideration (Ausubel, 1968).

Owing to its mode of operation, the industrial model entails a certain lack of flexibility where curricula and teaching approaches are concerned. Any substantial change made to a course involves mobilizing a complex production chain and convincing a number of specialists that the changes envisaged are desirable.

The most spectacular avatar of this model is what Daniel and Mackintosh (2003) call mega-universities. These universities, which are mostly located in developing countries, are wholly dedicated to distance education and enrol more than 100,000 students annually. Only one is in Africa (the University of South Africa), with the rest located in Asia (China, Turkey, Islamic Republic of Iran, Republic of Korea, etc.) and Europe (Spain).

The mass media model

This model emphasizes the ease and rapidity with which it is possible to reach large groups of learners. In this case, however, the media used are mass media, which make it possible to reach many people but offer no means of tailoring the message to the individual recipient. Similarly, these media (radio and television) are one-way tools that do not allow the recipient to feed information back to the issuer. Feedback must be handled through other media, such as the post and telephone, or through media audience measurement systems.

The use of mass media such as radio and television makes it possible to reach many people quickly but has basically done nothing to change the pedagogical approaches used. Admittedly, the dynamics of a television message allows for more carefully crafted presentation of information, and radio makes it possible to offer more realistic models of speech, but there are very few possibilities for interaction between the learner and the person supervising the learning process at the central level. The means generally used for interaction are the post, telephone, and, when circumstances allow, face-to-face meetings.

The media selected for dissemination purposes vary widely from one institution to another and, despite the rapid pace of

technological change, appear to be rather stable over time. For example, the UK's Open University has always preferred printed materials, whereas Japan's University of the Air has invested heavily in radio and television. The two institutions have different points of view on complementarity between media: at the Open University, radio and television are regarded as complementary to printed materials, while at the University of the Air the reverse is true, with all courses being based on radio and television, and printed matter usually used in support of these media (Peters, 2000).

The way media are used can vary as well. For example, whereas the University of the Air makes a considerable effort to diversify its audiovisual materials, most of the programming broadcast by the Chinese Radio and Television University takes the form of classes filmed in a single take, with no editing or overlays that might help the viewer to understand better. The spare, simple classes broadcast by the Chinese distance university could quickly become boring and discouraging for a Western learner, especially since there are almost no other learning aids. Apparently this is not a problem for Chinese learners, however, as this mode of learning is expanding rapidly (more than 900,000 new enrolments in 2009).

The small-scale model

This model is based on interaction and is quite different from the models described above. In contrast to the industrial model, in most small-scale systems a single person is responsible for designing and producing learning materials, supervising students at a distance, and evaluating them. In bimodal institutions, the same person may also teach face-to-face classes.

This shift from mass to targeted delivery reflects the development of two technologies: videoconferencing and the Internet.

Videoconferencing has made it possible to combine targeted dissemination of audiovisual material with feedback from the learner to the instructor. Most applications of this technology have basically involved disseminating lectures simultaneously to several audiences and providing for the possibility of interaction (asking questions of the lecturer) from one or more of these audiences. Initially, videoconference applications required leasing a digital

phone line from a telephone service provider. The high cost of doing so limited the use of this technology in education, particularly in developing countries.

Subsequently, the development of the Internet opened up new horizons for telecommunications, not only videoconferencing but also, and most importantly, a wide variety of means of distant interaction that could supplement the videoconference: discussion forums, instant messaging, wikis, voice over Internet protocol, etc.

With these new media, learner–tutor interaction has become quicker and, above all, more individualized. Today, instead of interacting occasionally at the end of a group session, learners and tutors engage in a constant and diversified dialogue. New forms of interaction are also appearing, such as discussions among learners during activities conducted in common (collaborative learning).

DE platforms on the Web have made it possible to create virtual campuses offering all the services pertinent to distance learning. These platforms not only provide course content but also bring together all means of interaction, integrated in a single interface that makes them easy to use.

As noted by Holmberg (2003), distance education now takes the form of an interactive dialogue that is more like a conversation than a lecture to a passive audience.

After this enumeration of the possibilities offered by Internet-based distance education, one might expect that most DE systems would adopt a structure based on exploiting the potential of the Web. In fact, this is far from true, for a number of reasons. First, for systems that have existed for decades and have tens of thousands of students, the transition from the rigid industrial model to the much more flexible interactive model is not an easy one. For such systems to undergo substantive change (as opposed to minor adjustments), strong external pressure is often required, such as a cabinet decision in the case of public initiatives or pressing demand from users in the case of projects mounted by private investors.

It also seems likely that the poor results of systems based on the industrial model – high dropout rates (only 31 per cent of students at the University of South Africa [UNISA] obtain a degree six years

after enrolling) and rather low educational efficiency – will play a role in driving the transition towards a more interactive pedagogical model. This factor will be important primarily in countries at an intermediate level of development, such as Asian countries or some Latin American countries, where large DE institutions are already established and where economic growth has engendered a need for large numbers of specialized workers.

In less advanced countries, particularly many African countries, DE initiatives are generally recent and the small-scale model naturally dominates, largely because the resources available are insufficient for an industrial approach. Although worthwhile initiatives can be observed in some countries, they exist only in higher education and target only an elite fringe of the population. As we will see in detail below, despite countries' current efforts to roll out new infrastructure, Internet access remains generally limited in sub-Saharan Africa, particularly outside the coastal areas and major cities.

IV. The coverage of DE and e-learning

As we set out to show in this chapter, the scope of coverage of distance education in general is very broad, touching all educational levels. That of e-learning, however, has in most cases been limited to higher education and vocational training, for a number of reasons that may vary from one region to another.

Primary and secondary school

For school-age children, DE is primarily used to help those who cannot travel to school or to support school-based education when there is a shortage of teachers.

A study commissioned by UNESCO in nine of the most populous developing countries concludes, however, that there are very few programmes offering the equivalent of elementary education at a distance, except in Indonesia (UNESCO, 2001).

When mass media such as radio and television are used, this is done primarily to support the activity of the teacher in a context of school-based learning. For example, interactive education by radio elicits direct participation from pupils, as they are asked to respond to what is said over the radio, answer questions, or do oral and written exercises. Evaluations have repeatedly demonstrated the positive impact of such an approach on pupils' performance.

Television has also been widely used in developing countries to help compensate for teachers' low level of qualification. As early as the 1960s, significant experiments were conducted in the Niger and El Salvador. In the Niger, the aim was to provide access to primary education for children living in villages without schools, in deprived rural areas. In El Salvador, the initiative sought to compensate for a lack of secondary school teachers.

The landmark project in this field came in the 1970s in Côte d'Ivoire, with an initiative that reached as much as 80 per cent of primary school pupils. As noted by one of its architects (Pauvert and Egly, 2001), this project broke new ground in two ways: by bringing

modern technology to places that had previously seen very little of it, and by taking a substantially different approach pedagogically, with emphasis on active teaching methods and class interaction. The idea was to use television to provide audio and visual information that piqued learners' interest, facilitated comprehension, and enhanced their environment. The project was also supposed to have an indirect effect on teachers by increasing their knowledge of the basic subjects taught and upgrading their teaching methods.

The open schooling movement supported by UNESCO and COL offers a form of education that promotes self-learning based on various learning materials, mainly in print form but also using other media, such as audiovisual documents, radio, television, and online media. The objectives of the movement are to meet growing demand for secondary education, offset the shortage of qualified teachers so as to meet this demand, and address problems of access in some areas. This approach has caught on to a considerable degree in India, where open schools today have more than 1 million pupils and thousands of learning centres to which they can go for face-to-face activities and supervision. In addition to school-age children, open schools admit adults who wish to resume their education. Open schools can be found in a number of developing countries, particularly in Asia (Indonesia, Philippines, Republic of Korea, Sri Lanka, etc.).

Internet-based open schools have appeared in many countries, among them Japan and China. For the most part, however, these schools are reserved for the wealthy and offer remedial courses that are intended to be complementary to face-to-face provision rather than to make up for a shortage of such provision.

Non-formal education

One might expect non-formal education to be an ideal area of application for DE, with a large number of potential learners who are often geographically dispersed and receptive to alternative learning methods that are rooted directly in real-life practices. In point of fact, though, DE projects in this sector are rather rare and poorly documented.

There are nonetheless a number of interesting initiatives scattered around the world. For example, in the state of Tamil Nadu, India, COL has set up a lifelong learning programme for farmers, with the ultimate aim of raising the quality of the milk they produce. To this end, the first class was devoted to a very simple question: 'How do you tell a good cow from a bad cow?' (Daniel and Mallet, 2008).

Also in India, the International Institute of Information Technology in Hyderabad has developed a teleconsultation tool to provide small farmers with advice on farming techniques. The system is based on ICT, particularly CDs, DVDs, the Internet, and mobile telephones (Bonjawo, 2011). The Digital Green project, designed by Microsoft Research India, seeks to share good practice among farmers through short videos made by the farmers themselves, with the assistance of a mediator. The videos are distributed to villagers via a laptop computer provided for the purpose. According to Bonjawo (2011), the project has proved its effectiveness, as nearly 80 per cent of the farmers apply what they see in the videos.

In Africa, the Institut africain pour le développement économique et social has set up training programmes for farmers and agricultural extension agents. The strategies used include distance education, with course materials and homework transmitted by post.

DE has also been used successfully to support large-scale operations, particularly in health education. Radio campaigns have been launched in countries such as the Gambia and Nigeria to educate the population about health issues such as HIV and AIDS and family planning.

Where e-learning is concerned, there have been only a few sporadic initiatives. The Open Academy for Philippine Agriculture has offered a number of online services for farmers, allowing them to ask questions of experts, consult an online bookstore, and learn, either informally or in a programme leading to certification.

Mongolia's Health Sciences University has used the Internet and cellphones to train rural doctors, support the diagnostic process, and form a network of medical researchers and practitioners in the area of field medicine (Latchem and Jung, 2010).

Teacher training

Distance teacher training began over 40 years ago in developing countries. It was employed in the 1960s to cope with the growth of primary school enrolment. Large-scale projects involving tens of thousands of teachers were undertaken in Botswana, Kenya, Malawi, and Uganda. In general, these projects were considered to be successful, with certification rates ranging from 83 to 97 per cent, an outcome partly due to the fact that the teachers concerned received a substantial pay rise (Perraton, 2007). Most of the projects implemented at that time combined correspondence courses, radio, and some form of supervision of classroom practice.

In the 2000s, efforts to expand basic education to meet the Millennium Development Goals led to renewed interest in distance training for teachers. According to a report by the Organisation internationale de la francophonie – OIF (Depover, 2012), currently more than 50 projects are under way in this field in countries such as Botswana, Colombia, Costa Rica, Côte d'Ivoire, Fiji, Kenya, Lesotho, Malawi, Pakistan, Sri Lanka, Swaziland, the United Republic of Tanzania, Thailand, Uganda, and the Bolivarian Republic of Venezuela. Countries that have undertaken large-scale programmes include Kenya (over 40,000 teachers), the United Republic of Tanzania (45,000 student teachers involved, of whom 38,000 have completed their training), and South Africa (more than 13,000 teachers trained through a combination of video and computer-based instruction).

Some teacher training initiatives not only provide direct training to teachers in service, combining various technologies such as MP3 players, but also develop teaching resources that they make available at no charge to the education community under Creative Commons licences (*Chapter VI*). Notable examples are the Teacher Education in Sub-Saharan Africa (TESSA) project in English-speaking African countries, run by the UK's Open University, and the Initiative francophone pour la formation à distance des maîtres (IFADEM), managed jointly by OIF and AUF in French-speaking countries. Although both projects aim to improve learning in schools, they take rather different approaches: TESSA primarily disseminates educational resources to teachers, whereas IFADEM chose to deploy

a full DE system for a targeted public while allowing free access to the system's learning materials.

Many of the teacher training projects mounted over the last ten years use Internet-related technology, for a variety of purposes. For example, Morocco initiated an interactive television project in the early 2000s that primarily focused on in-service training for teachers in rural areas, using a technological solution combining interactive satellite television and the Internet. A national distribution centre communicates with local centres through a VSAT (very small aperture terminal) satellite link, which makes it possible to send and return images through a high-speed Internet connection. More recently, it has been decided to adopt a less elaborate technological solution based, among other things, on transmitting video content by Internet streaming.

Although in-service teacher training is beginning to acquire a degree of legitimacy, it still faces a number of difficulties, notably as a result of the nature of the job, which requires that theory and practice be closely intertwined. Thus, the main problem in implementing teacher training programmes lies in the organization and supervision of classroom practices.

Taking account of the experience that teachers acquire in training as well as their grounding in actual classroom practices calls for forms of education that employ direct interaction rather than the mass processing seen in the industrial model. This is encouraging, since it promotes the use of technologies with high cognitive potential, but also worrying, given the number of teachers required to meet the Millennium Development Goals. The fact is that the costs of systems that give a large role to learner–tutor interaction, whether this interaction takes place at a distance or face to face, are off the scale compared to those of an industrial approach. Without wishing to be overly pessimistic, one may doubt that, as some observers claim, the use of DE is a viable solution for large-scale teacher training, particularly for pre-service training where learners have no classroom experience.

Higher education and adult education

Ever since its beginnings, DE has seemed particularly well suited to the tertiary level. The range of programmes is very wide, from the mega-universities described by Daniel and Mackintosh (2003) to local initiatives that, thanks to the Internet, have sometimes earned international recognition.

It is also in higher education that the impact of technology has been greatest and that e-learning has found the most fertile ground for development. Not only have the institutions already involved in DE gradually altered their strategies to take advantage of Internet-related applications, but also many new providers have entered the market. As mentioned above, there is sharp competition to attract new customers, with institutions both prospecting in the North and offering an ever larger range of education services geared to developing countries.

Over the last ten years, the supply of DE has increased considerably, and institutions on the DE market in higher education have become greatly diversified. Previously, this had primarily been the terrain of large institutions, the best known being the Open University in the United Kingdom, which has served as a model, and often as a foundation, for the creation of many open universities in quite a few developing countries, mainly in the UK/US sphere of influence.

The world's major universities are organizing today to provide a DE offering specifically for developing countries. For example, the Open University has created a branch called OU in Africa.

India's main universities recently joined forces to mount a joint project called the Pan-African e-Network to offer an e-learning system through five bridgeheads in African universities, aiming to reach about 10,000 students in 47 African countries within 5 years.

More recently, a host of small institutions have appeared, most of them stemming, more or less directly, from institutions offering face-to-face instruction. Thus, alongside the major unimodal institutions, there are now thousands of face-to-face institutions that, to varying degrees, have been converted to DE provision. To distinguish them from the former, the latter are generally called

bimodal institutions. The trend towards bimodal provision originated in Australian universities, for which the ability to reach their target population from a distance was quickly recognized as a decisive advantage. The movement then spread to the United States, Europe, and, more recently, developing countries.

Thanks to this bimodal approach, we are now seeing the emergence of DE provision by universities in the South, sometimes on their own and sometimes in partnership with Northern universities.

V. The structure of a DE system

Functions required

In drawing up a list of the functions required of a DE system, the first thing that meets the eye is the importance assumed by non-pedagogical functions.

In traditional educational institutions, the bulk of the staff is occupied with teaching functions, while other staff categories (e.g. managers, technicians, secretaries) are much smaller and hence consume only a small share of resources. DE systems are quite a different matter, particularly those that follow the industrial model based on division of labour. In this type of system, which generally is intended for a large number of learners, non-pedagogical functions account for a large share of resources because of the specialization needed to process large groups of learners, as well as the need to reach learners at their homes or workplaces.

Activities directly related to teaching are usually divided into two specific functions: design and supervision. The former concerns the development of the degree programme and learning materials, while the latter involves support and monitoring of learners. Functions other than those directly related to teaching are generally associated with the production and dissemination of learning materials or the logistical organization of activities.

Structures to be established

To perform and coordinate the functions noted above, it will be necessary, depending on the system concerned, to establish certain structures, which are not always clearly identified.

One is a *coordinating body* that establishes the programme and ensures that it is implemented. Generally, this body will be responsible for the certification that accompanies the degree programme and will set the rules for such certification. In a bimodal institution, the same body could handle these functions for both face-to-face and distance education, so as to ensure linkage between

the two modes and to ensure that face-to-face and distance offerings are equivalent in quality.

Another is a *pedagogical body* that has three main tasks: to design learning materials, to support and supervise learners, and to define the specifications that will be used as the basis for evaluation of learning and for regulating flows within the system.

The design of learning materials is a crucial function for distance education. For this reason, it generally calls on the participation of various specialists: a content expert, a didactician, a specialist in learning and mediation of content, etc. They work as a team, generally under the coordination of a project leader. Their main task is to develop course content, format it for teaching purposes, and set the conditions for mediation of this content so as to facilitate distance delivery.

As we have already noted, the support and supervision function also plays a key role in distance education. It contributes to the overall quality of the system and helps to improve the persistence of learning over time. Although support and supervision can take a variety of forms, they are generally considered to cover three areas: pedagogical, social and affective, and organizational.

Evaluation, or at least the design of evaluation, is also the responsibility of the pedagogical team. The experts will produce detailed specifications for evaluation and help to develop the tools needed to carry it out.

The *technical support body* will have two areas of responsibility: the production chain for learning materials (formatting, production, and storage) and the establishment of technical conditions for transmission of learning materials to learners and for interaction between learners and tutors. Management of this interaction may take one of two forms, depending on whether it occurs at a distance (post or electronic communication) or face to face. In the former case, the technical support staff will either use existing services such as the post and satellite television or develop specialized services (discussion forums, videoconferencing, instant messaging, etc.) to be accessed on a Web platform. For face-to-face interaction, it will generally be necessary to establish a local presence by concluding agreements, leasing premises, and recruiting competent staff.

In some cases, this body may be in direct contact with learners in order to assist them with technical and equipment problems they may encounter during the learning process, particularly when the programme involves the use of technology with which they are not familiar.

Lastly, an entity will provide *administrative and logistical support* for the system: management of enrolment, billing, human resource management, etc.

Obviously, this administrative and logistical entity will have a larger role when the system needs to process a large number of students, particularly when it comes to keeping service quality constant regardless of the physical conditions under which students pursue their studies.

New organizational models for DE

From both a functional and structural standpoint, it must be recognized that for a DE system to function smoothly, a complex structure and the observance of tried and tested procedures are required. This does not mean, however, that this form of education is reserved for large, well-endowed institutions. On the contrary, we are seeing an increasing number of small institutions, generally partnered with an existing institution, that offer high-quality distance education, exploiting niches generally neglected by larger institutions.

The development of virtual campuses on the Web has changed things greatly in this respect, because it is no longer necessary to develop a sophisticated logistical system to make contact with learners. Instead, in just a few clicks one can send learning materials, organize the dialogue between tutors and learners, and offer group activities in which learners cooperate under the benevolent gaze of their tutor.

The notion of a 'virtual campus' generally implies the use of a DE platform (also known as a learning management system, or LMS) that serves to create, manage, and distribute courses. An LMS can be acquired and distributed at no charge, an example being the open-source platform Moodle (open-source software is distributed free and can be modified by users as they see fit). Such platforms

generally provide a set of functions covering most of the aspects (pedagogical, technical, and administrative) that we discussed above.

Thus, a DE platform on the Web will offer functions for:

- developing and editing course materials,
- sending these materials to learners,
- facilitating student enrolment and record-keeping,
- communicating with learners, either directly or by pre-recorded messages,
- providing pedagogical supervision and pedagogical, psychological, and technical support to learners.

In short, the platform amounts to a DE institution in its own right, except that it disseminates its materials in electronic format only.

This does not mean, however, that selecting a platform and learning how to use it represent most of the work involved in designing and implementing a DE system. On the contrary, all that we have already discussed about the skills needed to design a course, transfer it to the desired media, and run it at a distance remains fully relevant.

Because of the above-mentioned trend towards Internet-only systems, the organizational models that are preferred today for DE are geared towards small entities partnered with existing institutions, with varying degrees of autonomy from these institutions. In this case, the staff that performs the tasks needed to run the system will be much smaller than in an institution on the industrial model. In fact, it is not uncommon for a single person, such as one of the institution's teachers, to be responsible for the design, mediation, and even production of a course, as well as all or part of the tutoring.

Another key factor in the design, operation, and success of a DE institution is quality control. Unfortunately, few institutions devote the time and resources needed to assure quality. In most cases, they tend to trust the content experts and to assume that, since they were selected for their academic skills, they can only produce courses of good quality. The problem is that developing a DE course requires many other skills that these experts rarely possess.

Various procedures may be envisaged for quality control. First, evaluation by a college of specialists or by peers generally leads to improvement in course quality. As a complementary measure, a field validation can furnish worthwhile insights on how the course is perceived by learners. This validation can, of course, be conducted at the end of the course development process, but it can also be done throughout the duration of the course. Experience shows that including external evaluation in the development process is preferable by far, since this procedure leads to continual but generally limited adjustments and obviates the need to revise the course in depth once it has been completed.

VI. Analysis of DE costs

The introduction of digital technologies in DE has profoundly changed the cost structure of this type of education. We will begin by reviewing the economic characteristics of DE before the appearance of e-learning. Next, we will examine the new economic conditions resulting from the introduction of digital technologies; these conditions have been changing steadily as the cost of the technologies has fallen. Lastly, we consider the case of the developing countries, which initially had some difficulty in adopting ICT because the costs were prohibitive, but now are seeing the barriers fall one after another and can envisage economically advantageous uses for DE.

Cost analysis before the introduction of e-learning

In the early 1980s, before the appearance of ICT, UNESCO and the World Bank led a programme of economic evaluation of non-traditional educational technologies used for either face-to-face or distance education.

This research programme began with the development of common cost analysis methods and went on to significant case studies – that is, analysis of existing experiences having a certain prominence and located mainly in developing countries in Africa, Latin America, and Asia. Ultimately, the programme produced syntheses that sought to identify factors leading to success and how costs would change depending on the media used and the number of learners enrolled.

The methodological approach involved the use of two cost classifications. The first is a functional classification in which the process is divided into four phases of development: (1) design and production of learning materials (paper format, radio and television programmes, etc.); (2) distribution/dissemination (mailing of audio cassettes and printed matter, broadcasting of programmes); (3) reception by learners (radio and television sets, student oversight by teachers and tutors, either remotely by telephone or post, or in face-to-face mode); and (4) system administration.

The second classification is more strictly economic in nature. It divides total resources expended into fixed costs, i.e. costs that are independent of the number of learners in the system, and variable costs, which are generated when any new student is enrolled. The total cost of the system is thus equal to the sum of fixed costs and variable costs. Mathematically, it can be written thus: TC = FC + (N x VC), where TC is total cost, FC the fixed costs, VC variable cost per student, and N the total number of students. The mean cost per student is thus TC/N. It should be noted that economists also speak of 'marginal' cost, which for our purposes is the cost of one additional student and hence is equal to the variable costs.

No strict correspondence exists between the two classifications, since some of the functional categories can include both fixed and variable costs. In general, however, we may say that the costs of producing learning materials are fixed costs, and the costs of reception are variable costs. A mix of the two types of cost is observed mainly in the distribution/dissemination costs: a system that sends printed documents or audio cassettes to students will generate variable costs, whereas a system that broadcasts radio and television programmes will be in the fixed costs category. The fourth category, administrative costs, is somewhat unclear, because these costs do not change 'at the margin', i.e. when a limited number of new students enter or leave the system. Thus, they are best described as fixed. However, if large flows of students enter or leave the system, it will be necessary to increase or decrease the administrative staff accordingly.

The main conclusions of this research programme tended to show that the use of technologies such as radio, television, audio cassettes, and videocassettes in schools led to a slight increase in costs (up 5 to 15 per cent) for a quality increase that was difficult to measure, except in some special cases, such as when the schools had no teachers qualified in certain subjects (e.g. mathematics education in Nicaragua, rural secondary schools in Mexico). In other words, the use of technology compensated for a structural deficit of teachers for only a modest increase in costs. This sort of substitution does not last long, however, as the deficit tends to decline as the system develops and qualified teachers are hired. An example is Côte d'Ivoire's

experiment with televisual primary schools in the 1970s, in which one of the objectives was to bring the teaching force to a more even level of quality. A few years later, when all teachers had reached a certain level, the experiment was abandoned owing to the recurrent hostility of teachers, who objected to the technical constraints of the programme. Parents were not enthusiastic about the project either, largely because their children no longer had homework.

However, the UNESCO and World Bank research programme showed that DE had demonstrated its economic legitimacy, based on the ability to reap economies of scale (UNESCO, 1977). In traditional education systems, new schools have to be built when the number of pupils increases, and their operating costs will be the same as those of existing schools. The unit costs are constant, regardless of the size of the system, and hence there are no economies of scale.

In distance education, by contrast (particularly with learning resources such as courses broadcast by television or radio or recorded on cassettes), the cost structure is initially characterized by high fixed costs, incurred for the production of learning resources (course design) and for their dissemination (radio, television, or satellite transmitters). As the student body increases, however, the cost per learner decreases, precisely because the initial costs are fixed. Economies of scale may therefore be available (UNESCO, 1980).

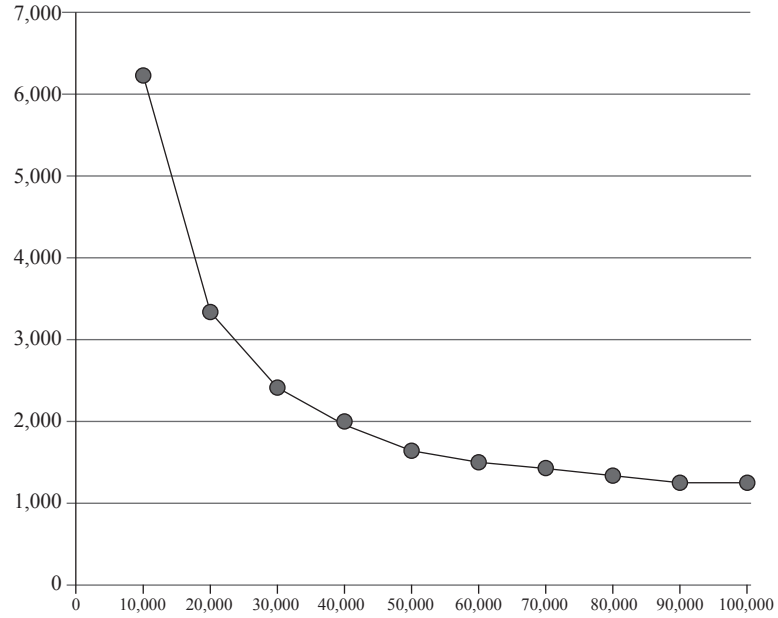
A perfect illustration of this principle is the Indira Gandhi Open University in India: when the number of students increases from 10,000 to 100,000 students, the cost per student falls from 6,251 to 1,310 rupees (*Figure 1*).

It should be noted that this configuration is characterized by decreasing returns to scale: when the institution becomes very large, the average cost approaches the variable cost, and the gains are very low.

The corollary of this mode of operation is that teacher–learner interactions are less intense than in traditional education. The student–teacher ratio ranges from 50:1 to 100:1, as opposed to 10:1 to 30:1 in face-to-face education. If DE is less expensive, it is

primarily because teacher-related costs account for a smaller share of total unit cost than in face-to-face education.

Figure 1. Unit cost and enrolment at Indira Gandhi Open University, India



Source: UNESCO, 2003.

This law of economics did not escape the notice of policy-makers faced with the problem of growing educational demand in a context of scarce resources. Thus, distance education was perceived as one of the solutions that could increase the supply of education on a tight budget. This is the argument of Daniel (1996), in his book on the large, specialized institutions that he calls mega-universities, defined as distance universities with more than 100,000 students. Daniel identified 11 such institutions worldwide, with 2.8 million students in all, an average of more than 250,000 students per institution. Mega-universities have the two characteristics that lead to lower

unit costs than in residential universities: a large student body and only a moderate number of course offerings. According to Daniel, the 11 mega-universities have mean unit costs about half those of British residential universities. In his view, this difference in costs is a serious argument in favour of expanding this type of provision (very large DE institutions) at the expense of traditional residential universities. One might even imagine a global university in which every student, using a personal computer and the Internet, could access high-quality learning resources of limitless diversity, with access systems that are compatible and interchangeable everywhere.

What do we know today about the costs of e-learning?

At the time of writing, no synthesis had been published that would allow us to draw general conclusions on the costs of e-learning. There are two main reasons for the lack of such a study: the few case studies available do not use comparable methods; and all of these studies are outdated, since ICT costs changed between 1995 and 2000, and changed still more between 2000 and the time of writing.

For evaluating the costs of e-learning, Rumble (2004) recommends a terminology that is slightly different from the one we used for traditional DE, which is described above and comprises four functional components. Rumble's approach distinguishes five components. The first two – design and production of electronic learning materials and system administration – are the same as in the other functional classification scheme. The distribution component is subdivided into three: tutoring, administrative processing of students, and provision of appropriate electronic infrastructure (servers, etc.). However, Rumble does not mention the reception component. He may have ignored reception costs because they are not paid by the educational institution, but if we wish to make a valid comparison between e-learning and traditional education, we must also include the costs paid by the student. Rumble reports on a few case studies that use his method (mainly in Australia, Japan, and the Republic of Korea), which indicate that costs per student in e-learning are sometimes higher and sometimes lower than in traditional education. In most cases, the result depends on the number of students concerned, which implies that it depends on scale economies. However, these studies examined systems in the initial

period of e-learning, when fixed costs were still high. Moreover, the fact that reception costs paid by the student are ignored obviously biases the comparison.

Curran (2008), in a book on the economics of distance education with e-learning, acknowledges that few studies on the topic exist and that often they are not comparable methodologically. This gap in our knowledge notwithstanding, Curran maintains that the costs of e-learning – both variable and fixed – tend to be higher than those of face-to-face education. Fixed costs are higher because the university needs to buy equipment and set up an *ad hoc* logistical structure, and individual tutoring consumes more instructor time per student than face-to-face courses do. Some economies of scale exist, but they are limited because variable costs predominate in the cost structure.

Coulon and Ravailhe (2003) studied the costs of e-learning projects in France. They developed methods based on the activity-based costing (ABC) approach, which leads them to identify 30 separate activities. It would be beyond the scope of this booklet to discuss them all in detail, but they raise a fundamental and immediate problem: collecting information on the costs of these 30 activities would be practically impossible, because it would require the staff involved in these projects to report which activity they have worked on every hour of every day. Such a task cannot be imposed on these employees. Coulon and Ravailhe tried to apply their method to a small number of cases, but the data were collected on the basis of the memories or subjective estimates of the participants, making the margin of error much too large. Moreover, their method is not compatible with any other existing method, which makes comparisons risky.

We have seen that economies of scale can be obtained when two conditions are met: a large number of students and a small number of programmes. This is the model followed by the mega-universities described by Daniel. It should be noted, however, that Daniel's cost estimates are not correct, since he compares the mean costs of these mega-universities to the mean costs of traditional British universities, even though a majority of the mega-universities are located in developing countries, where the costs in traditional education are much lower than those of British universities. Moreover, the

11 mega-universities cannot be called e-learning institutions, as most of them rely heavily on postal correspondence.

Ruth (2006) studied costs in two mega-universities that use e-learning intensively, the University of Phoenix and the UK's Open University. The two institutions resemble each other in a number of ways: they both have slightly more than 200,000 students, they employ an equivalent number of full-time instructors, they have a relatively large number of regional centres, and both the students and external evaluations consider the quality of their online courses to be good.

To arrive at sustainable unit costs, the two institutions base their financing on the same principle: they employ a large number of part-time teachers as tutors, while course content is produced by full-time teachers. The University of Phoenix has 9,000 part-time tutors and 1,500 permanent instructors; the Open University, 8,000 tutors and 1,120 permanent instructors.

On average, a part-time tutor responsible for an e-learning module equivalent to three course credits costs $1,500 to $2,000, or $500 to $650 per credit. A full-time instructor is paid $60,000 for 18 credits, or $3,300 per credit. Thus, the cost of a part-time tutor is only one-sixth that of a permanent instructor.

The cost gap between principal compensation and additional compensation is not specific to these two institutions. It is also observed in French universities, where remuneration for additional hours is only one-fourth to one-sixth as much as normal hours of teaching duty.

The idea that an additional teaching service should be paid at a lower rate can be explained by the fact that, for the teachers who accept it, this additional duty requires only a modest effort. In most cases, they teach a course that has already been amortized in their principal institution of affiliation, and hence they have little or no preparation time.

In addition to the differences in salary between full-time and part-time instructors, there are savings on overheads, since part-time instructors are not provided with an office, telephone, and logistical services by their principal institution of affiliation.

This model cannot be applied everywhere, however, since in order to hire competent instructors for part-time work, there must be enough traditional institutions that have hired them full-time. The model can be regarded as a parasite of the traditional system: it can survive only if traditional institutions endure.

Lastly, the University of Phoenix and the UK's Open University are also characterized by the fact that they educate students who are working towards a degree while holding a paying job. Such students are highly motivated to pursue their education, but prefer not to attend a residential university. As we will see below, this also helps us to understand the economic viability of these distance institutions.

The earliest developments in ICT for education did not start from the hypothesis that costs per student would be reduced. Rather, the primary objective was quality. The educational products offered were highly sophisticated. For example, educational CD-ROMs were developed with the help of specialists in scripting and navigation, including sequences of still or moving images produced by technicians from the audiovisual and computer industries rather than by the personnel of the education system. The cost of these CD-ROMs was very high (tens of thousands of euros), but it was hoped that they would be used by many students.

Capital costs at the time were higher than they are today. The servers required were heavy and expensive, the workstations used by students cost several times the price of today's laptops, and high-speed connections were few and immeasurably more expensive than they are now.

Institutions often took the position, however, that these sophisticated learning products were such that any student could master them without the support of a tutor and that the savings achieved on instructors' pay could justify the high initial production cost.

In 15 years, the context has changed profoundly in three main ways:

1. The teaching/learning products used for e-learning have become much simpler. Many of the resources provided to students at a distance are documents produced by their teachers,

which are similar to those used by their predecessors in DE by correspondence. Teachers are gradually becoming accustomed to putting their class notes into electronic form, and these notes produced for face-to-face instruction can also be used online, at a marginal cost that has fallen greatly; moreover, the work of transferring content to the Web is generally not remunerated explicitly.

2. The cost of IT equipment has fallen considerably, and such equipment has multiple uses. It is also used in universities that do not have e-learning offerings, because it serves for administrative and budgetary management, management of student enrolments, examination records, and research. Increasingly, students also have computers of their own, whether laptops or desktops, which they use for entertainment and cultural pursuits in their daily lives, but also to correspond, communicate, make purchases online, and, lastly, to keep informed and to learn. Computer ownership has become or is becoming a commonplace for all students, both in DE and in entirely face-to-face education. Under these circumstances, shifting from face-to-face to online education engenders no additional equipment costs. We may say that the reception costs are marginal costs close to zero. We should note that this trend concerns only students living in developed countries; it does not apply at all to students in the less advanced countries, most of whom cannot afford this type of equipment.
3. The belief that distance students could dispense with instructors and learn on their own with the resource provided has gradually faded. Whereas in previous modes of DE student–teacher ratios could be three or four times higher than in face-to-face education, the development of e-learning has gradually led, at least where the small-scale model is concerned, to ratios close to those in face-to-face education. In addition, broader access to the Internet has allowed immediate and inexpensive (at least where communication costs are concerned) interaction between the learner and the educational institution.

These three major changes have had two impacts on cost structure. First, fixed costs have fallen substantially due to the simplification of online teaching/learning products and the fact

that both instructors and learners generally have their own ICT equipment. Second, variable costs have increased at the same time, owing to the improvement in student–teacher ratios due to increased tutoring. In other words, the cost structure of e-learning is becoming increasingly close to that of face-to-face education.

When the proportion of fixed costs ceases to be the decisive factor, the issue of the minimum number of students needed for DE provision also ceases to be of overriding importance. The economic justification for mega-universities is no longer expressed in the same terms. It remains valid only if the cost of tutoring can be held at a level lower than that found in face-to-face education. There are only two ways of satisfying this constraint: increase the number of students per teacher compared to face-to-face education or adopt lower pay scales for online tutors than for face-to-face instructors, as is *de facto* the case at the Open University and the University of Phoenix.

French universities that offer online education already tend to assume that a DE student costs more or less the same as a traditional student and that there are additional costs related to operation of the platforms that manage relations between the institution and the student. Some of them use the platform of the Centre national d'enseignement à distance (CNED), which bills its services at about €750 per year for a distance student who takes the same number of modules as a residential student. This sum amounts to about 10 per cent of the cost of a residential student in a French university. Other universities use an institution-specific platform rather than that of the CNED. The same conclusion may be drawn from a 2005 survey conducted in Finland, France, and Italy (Conference of Italian University Rectors, 2006), which showed that most universities regarded e-learning not as a means of cutting costs, but rather as the source of a slight increase in costs. This marginal increase should in principle be reflected in better service quality, to the benefit of students.

The hypothesis that quality improves with the introduction of ICT is not purely speculative. A meta-analysis conducted by the US Department of Education (2009) reviewed more than 1,000 studies that sought to assess the effectiveness of e-learning

compared to face-to-face education without ICT. It shows that, on average, students who have access to e-learning resources in a blended learning context perform better than students in purely face-to-face mode. According to the authors of the meta-analysis, the improvement obtained is due not to the medium itself but to the fact that in blended systems students tend to work harder and to have access to a broader, richer range of educational resources than their counterparts in face-to-face education.

How have DE costs changed with the appearance of ICT?

First phase: an unchanged cost structure

In the 1990s, the supply of e-learning exploded haphazardly in all areas: traditional educational institutions, providers of lifelong learning, and businesses. Provision during this period was characterized by a rather short lifetime for the instruments used, since ICT itself was changing rapidly in terms of both hardware capacity and software. Few e-learning software programs developed in the 1990s are still in use today, and such a short lifetime meant that they were not satisfactorily amortized. It may be added that these pilot programmes attracted fewer users than the project developers had hoped. The instability of provision made it impossible to conduct rigorous cost-effectiveness assessments in terms of either cost analysis or of efficiency measurement.

The early 2000s saw the sudden disappearance of many projects due to a shortage of users, swelling deficits, and increasing scarcity of funding. Some of the most resounding failures were the Norwegian Distance University (the Winix project), the Danish Virtual University, and Sweden's Distum project (Paulsen, 2003). Joint projects by groups of universities, such as the California Virtual University and the Norwegian consortium Bedriftsuniversitete, created by four leading universities, failed as well. In Sweden, three consortia failed to establish themselves. In France, the Canège distance education project in economics and management, which initially comprised more than ten universities (subsequently five), was terminated at the beginning of the 2009 academic year owing to a lack of students. Private projects that failed included the Fathom

project undertaken by Columbia University in New York, which lost $25 million before it was shut down.

During this first phase, which lasted until the early 2000s, the cost structure of DE remained close to that of the previous model. On average, the fixed costs of producing course materials on electronic media were very high. An example is the production of sophisticated CD-ROMs, carried out by teams of specialists who tended to be better paid than teachers. The latter were restricted to the role of content producers, while the job of turning this content into digital teaching materials fell to ICT engineers who were not inclined to try to minimize costs. In addition, the cost of Web access was several times greater than it is today.

Furthermore, each new initiative developed its own DE platform, once again at great expense, whereas today any new initiative can rely on free open-source software (such as the Moodle platform). Among students, computer ownership was still the exception rather than the rule, and the institution had to provide the equipment. Orivel (2000) has shown that providing computer availability of one hour per week per student had a cost of $50 (excluding the cost of Internet access) and that this figure varied little from country to country. The trouble is that, while $50 was an affordable expenditure in the developed countries, which spend on average $5,000 per student annually, this was not true of the less advanced countries, where annual expenditure per student was around $50. In countries where a significant proportion of children did not attend school, the introduction of computer initiation classes meant that any pupil who benefited from this was *de facto* depriving another child of any schooling.

This analysis is no longer applicable. In 15 years, ICT costs have dropped steadily and dramatically. It should be recalled that, in accordance with Moore's law, over this period the capacity of microchips doubled every 18 months with little change in price. The drop in computer hardware prices was constantly fuelled by technological innovation, relocation of production facilities in countries offering cheap labour, and ferocious competition among producers.

Second phase: a cost structure approaching that of face-to-face education

According to Ruth (2006), the United States has entered a new phase of DE. Over the last few years, a number of institutions offering online-only programmes have prospered. Their student bodies are increasing steadily. The largest of them, the University of Phoenix, has some 200,000 students (the figure varies from one study to the next), most of whom are returning to school after a period spent working, because they wish to upgrade their occupations through further education. This is made possible by DE, which allows them to hold a job and continue their education at the same time. Students at the University of Phoenix have 13 years of work experience on average and are well over 30 years old. A majority of them state that they are satisfied with the university's distance programmes and that the quality of these programmes is equivalent to that of face-to-face education. However, online-only institutions are ranked in the least prestigious categories (3 and 4) in the US higher education classification, and three-fourths of those enrolled are in tracks that have not yet been accredited by the appropriate authorities.

In France, the situation is somewhat different owing to the centralized management of the higher education sector. In the absence of public policy initiatives, universities have little incentive to adopt the e-learning approach. Enrolment fees are tightly controlled and very low, and until recently universities had little latitude to set up paid e-learning programmes. To address this situation, the French Ministry of Education issued calls for proposals in 2000, 2001, and 2002 for the constitution of digital campuses offering distance education and open learning. Although the resources committed were meagre (less than 1 per cent of the total university budget), universities responded vigorously to these tenders, either presenting individual projects or, more often, forming consortia with other universities. Consortia were the most widespread form: the 64 digital campus projects accepted in the tendering process were submitted by ten partners, on average, for average total funding of €150,000.[1]

1. The project cost was not limited to the amount of this subsidy because the universities redeployed part of their staff, budget, and premises to the e-learning projects.

The digital campuses served approximately 15,000 students during the years concerned, or 1 per cent of the French university population. That proportion is very low, and it may be said that this type of approach was doomed from the start, because it was based on mistaken assumptions. For example, the incentive to mount projects bringing together several universities was based on the assumption that since the fixed costs of developing e-learning programmes were very high, it was advisable to pool resources as much as possible, with the apparently sound idea of not reinventing the wheel in each university. This runs counter to the French tradition, which holds that instructors should be personally responsible for designing their courses and evaluating the students who take them. The very idea of awarding degrees on the basis of content developed by someone else is foreign to most instructors. Moreover, it quickly became apparent that the assumption of high production costs for online courses was mistaken. The development of course modules for online access is all the better for being flexible, easy to modify from one year to the next, so as to keep abreast of what is happening in one's field, the publication of new articles in scientific journals, or the appearance of new textbooks. A high proportion of the documents accessible on educational platforms are updated regularly by the instructors, with no assistance from specialists in ICT or scripting.

At the same time, reception costs – that is, the costs paid by students, excluding tutoring costs – have also fallen dramatically, the chief examples being the costs of laptop computers and Internet access.

In short, over the 15 years from 1995 to 2010, we moved from a situation where fixed costs accounted for a higher share of total costs in e-learning than in traditional DE to a situation where the share of fixed costs has fallen very low, making it irrelevant to seek scale economies.

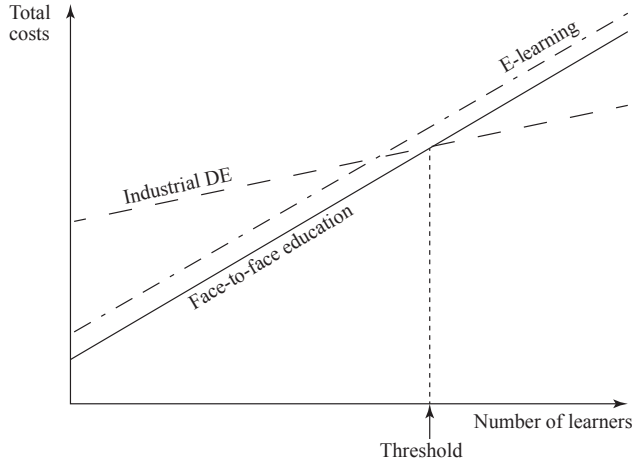
In France and elsewhere, institutions specializing in e-learning provision have not proliferated, and traditional universities have not disappeared. Rather, these universities have taken up e-learning through a variety of initiatives, increasing the supply of DE within the framework of bimodal institutions.

What are the prospects for DE in developing countries?

Cost per student in DE institutions

The main consequence of the fact that the cost structures of face-to-face and distance education have moved closer together is the disappearance of most economies of scale. Hardly any reduction in cost per student is now obtained when the student body increases, and, as *Figure 2* shows, the lines representing total cost in the two systems no longer intersect, whereas they do in the case of DE structured on the industrial model. The change in total costs for e-learning is represented by a line nearly parallel to that of face to face education but lying to its left, because the costs of DE based on e-learning remain slightly higher than those of face-to-face education owing to the additional costs engendered by ICT, even though these costs have fallen considerably.

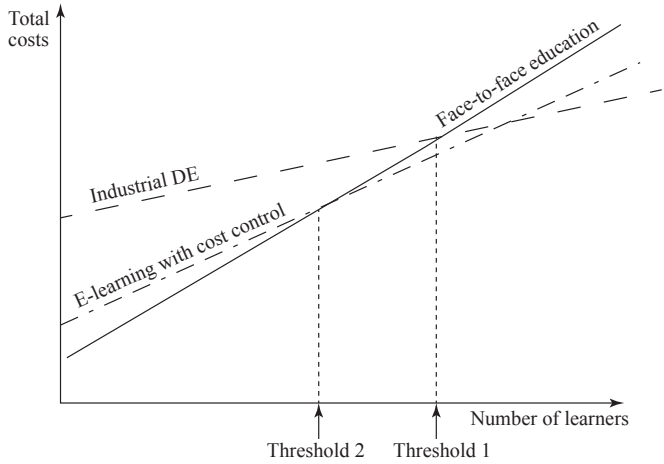
Figure 2. Total cost functions according to the number of learners



To identify any economic advantage that remains for DE, it is necessary to re-create a cost function like the one presented in *Figure 3* (e-learning with control of tutoring costs), which shows a smaller increase in the total costs associated with e-learning

compared to face-to-face education. Better cost control reintroduces a scale economies mechanism that leads to a threshold beyond which the unit costs of DE are lower than those of face-to-face education (threshold 2 in *Figure 3*). Ways of achieving such cost control are discussed below. It can be seen that this threshold is positioned further to the left, signifying a smaller student body; this corresponds to the size of bimodal universities, which is generally of the same order of magnitude as that of face-to-face universities, in contrast to the mega-universities, many of which have hundreds of thousands of students.

Figure 3. Total cost functions according to the number of learners when the costs of bimodal DE are controlled



The change in cost structure has several consequences. First, it is no longer necessary to develop mega-universities in order to optimize costs. Second, the institutional structure best suited to hosting DE is the existing network of traditional universities, which can provide DE in addition to their face-to-face offerings at a controlled marginal cost. Under such an approach, the bimodal model becomes the norm for DE provision.

To facilitate the introduction of DE in developing countries, one must seek ways of preserving its earlier advantage, which consisted in offering lower unit costs than face-to-face education. In fact, potential cost reductions exist in the tutoring component of variable costs. Generally, in face-to-face education, no distinction is made between tutors (who help learners to assimilate content prepared by other instructors) and the designers and producers of courses. In DE today, however, this distinction is crucial, because the two groups are not paid at the same scale, as we have already seen in the case of institutions like the UK's Open University and the University of Phoenix.

There are three possibilities for reducing tutoring costs that can lead to lower unit costs than in face-to-face education. One is the use of temporary tutors, as in the Open University and the University of Phoenix. Such tutors have no permanent status at the university where distance students are enrolled. They are geographically dispersed so as to be accessible to learners, and their main job is a salaried post in another education institution. They work part-time and are paid on the basis of the number of students they tutor.

A second option is peer tutoring, which consists in grouping students into virtual classes of 15 to 20 persons enrolled in the same module. Smaller subgroups (four to six students) are also formed in some cases, depending on the activity and on the learning scenario used by the tutor. The group progresses by using two techniques: instruction by the tutor and online discussions among the members of the group, who are led to interact in the context of activities that call for discussion and collaboration. This structure offers three advantages: It is pedagogically efficient (Dillenbourg, 1999); no compensation need be paid for the tutoring done by learners themselves; and, other things being equal, it reduces the number of tutors needed. Ultimately, it thus tends to reduce tutoring costs.

Finally, international cooperation makes it possible to take advantage of substantial differences in university instructors' pay scales. National compensation scales are in general correlated with the gross domestic product (GDP) per capita of the country concerned. Instructors in the developed countries are the best paid; those in the least advanced countries are paid the least; and those in

countries at an intermediate level of development are paid at levels in between the first two groups. It is beyond the scope of this booklet to discuss the reasons for or the legitimacy of these differences; we simply note the fact. From the standpoint of optimizing DE costs, the advantages of developing international cooperation in the field is immediately obvious. A country at a low level of development, whose universities do not possess certain skills needed to produce a certain type of graduate, has three options: (1) to send students to a country that offers these qualifications; (2) to enrol them in distance education at an appropriate foreign university; (3) to encourage cooperation between a local university and a foreign university to offer DE in partnership. These three options lead to very different levels of cost per student. The first is the most expensive, since it entails considerable travel and living costs. Moreover, the cost of the education provided is that of the host country, which, in accordance with the principle noted above, is significantly higher in countries where GDP per capita is high than in countries where it is low. The second solution is less expensive than the first, since it saves the cost of travel and living expenses; the cost per student is close to that of a student from the host country, i.e. several times that of a face-to-face student in the low-income country of origin. The third option is the least costly, because DE makes it possible to dissociate the costs of content design and production from the costs of tutoring. In agreements between universities, content production can be handled by a foreign university having the required competencies, while the costs of tutoring are assumed by the university in the DC, where instructors' compensation is significantly lower than in the foreign university. It is also possible to optimize content production costs by having course content developed in middle-income countries, where this type of cost is lower than in the most highly developed countries. For certain general education programmes, it is even possible to use open-access educational resources (see *Chapter VI*) made available at no charge by universities in the North.

DE thus makes it possible to reduce some of the variable costs of face-to-face education and bring the cost structure closer to that depicted by *Figure 3*.

Costs paid by learners

This cost component is too often ignored in DE projects. It is nonetheless important, since it affects the level of demand from students.

Distance learners have four main means of access to educational resources: (1) their personal computers; (2) the computers of their employers, when they hold a paying job; (3) public points of access such as Internet cafés; (4) dedicated resource centres, such as those that AUF provides for its students. In the North, the relative importance of these means of access has clearly changed considerably: in the early 2000s, ownership of a personal computer was the least common, whereas today it is the most widespread.

In the South, there are great disparities in this respect. While some countries are catching up quickly to conditions in the North, others have not yet reached the level that existed in the North in 2000.

Costs paid by students can be broken down into hardware costs and Internet connection costs.

The price of hardware has fallen steadily. In 2000, it was difficult to find a personal computer on the market for less than $1,000, whereas today, mid-range Wi-Fi-enabled computers with DVD drive can be found for $600, and lower-end computers for less than $300, without DVD drive but with USB ports enabling users to store data on flash memory devices. These devices have also fallen dramatically in price: Today, for less than $10, the market offers flash memory devices with storage capacity of several gigabytes, or even tens of gigabytes, which is sufficient to hold course documents for a full year of distance education and dozens of textbooks, i.e. more than a normal student can learn in a year. Access to documentary resources is thus possible in a low-income context at a cost clearly lower than in pre-digital DE, as the latter mainly used printed materials, which are significantly more expensive.

The downward trend in prices was far from over at the time of writing. A personal computer known as the XO has been developed

specifically for educational needs in developing countries.[2] Now in its third version, this computer is distributed in some 30 developing countries for a unit price of about $180. In another example, an Indian producer came out in 2010 with a $35 computer designed for educational purposes, and the producer has announced plans to launch a $10 computer. To be sure, the reliability of such equipment is open to question, since not enough time has passed for its durability to be assessed, but it is undeniable that hardware costs are less and less a barrier to the development of digital DE in developing countries, including the least advanced countries. We can even predict that face-to-face universities in the South will catch up to those in the North in terms of documentary resources, on better financial terms, if they opt for digital media rather than print. This assumes, however, that the widespread habit of printing out documents provided in digital format will disappear over time.

2. This computer was designed and is distributed as part of the One Laptop per Child project initiated by the Massachusetts Institute of Technology.

VII. Developments expected in DE

Change in pedagogical models

As we have noted, many DE systems are based on the assumption of learner autonomy. Most scenarios of DE implementation are designed for isolated learners who go through most of the learning process on their own. With the development of modern communication technology however, interaction has come to play a greater role in learning, and the trend towards models based on interaction and small groups has strengthened.

Although these models are in increasingly widespread use, they are generally found only in smaller systems, while mega-systems such as those discussed above in the context of higher education are still strongly attached to economies of scale and the industrial model.

While smaller, more interactive models still serve only a tiny proportion of distance learners, the idea that interaction is important in DE is making headway. As a result, we are gradually seeing renewed ambition in the DE sector, now aiming more for quality than for quantity. The phrase 'small is beautiful', taken from the title of a well-known book calling for a society on a human scale, is no longer heretical in speaking of DE. On the contrary, the era of small systems on a human scale has begun, and as we saw in *Chapter VI*, it will be economically advantageous for providers.

In addition to the arguments already advanced, several factors militate in favour of smaller systems in which personal interaction plays a central role.

First of all, many studies have shown that an approach based on interaction not only leads to deeper, more efficient learning but also improves retention and averts dropout. Now, retention rates are regarded as an important indicator of efficiency in DE, because these rates are often low, particularly in developing countries, where people have many obligations to family and community, and schoolwork habits are not very suitable for autonomous learning. For example,

Perraton and Potashnik (1997) report completion rates ranging from 42 per cent for teacher training in Nigeria to 82 per cent for an in-service teacher training programme in Nepal. The Allama Iqbal Open University teacher upgrading programme in Pakistan, which has trained more than 80,000 primary school teachers, has a completion rate of 56 per cent. In contrast, the ACREDITE programme, which offers a full master's programme at a distance using an artisanal approach (about 50 students per year), reports an average dropout rate of 11 per cent and a completion rate greater than 75 per cent. According to the managers of the programme, these rates, which are comparable to those usually observed in face-to-face education, are due both to the interactive approach used and to careful selection of applicants (Peraya, Depover, and Jaillet, 2011).

Another benefit that is sought through intensification of interactions, both with the representatives of the institution and with peers, is the development of a feeling of affiliation. According to Kember (2007), a sense of belonging to an institution can help to motivate students to find the time and make the efforts required to overcome the difficulties of autonomous or semi-autonomous distance learning.

To realize its full potential, this trend towards learning models that emphasize autonomy, interaction, and working in groups must be in phase with the learning cultures of the populations targeted by the degree programmes. Some authors report marked differences in attiudes towards working in small groups. A meta-analysis by Oyserman, Coon, and Kemmelmeier (2002) shows the Japanese, Koreans, and, especially, Chinese differing from Westerners, notably in their preference for working in groups rather than individually.

Another variable that is sensitive to cultural differences is the notion of time. Camilleri and Cohen-Emerique (1989), discussing cultural differences in the perception of time, note two ways to conceive of time: as 'monochromatic' (i.e. the same for everybody), which they see as typical of Western civilizations, and as 'polychromatic' (i.e. related to the various activities of life), which is characteristic of African civilizations. Given the importance of being in accord about timing for distance learning activities, it is clear that

these differing conceptions of time can cause misunderstandings that might make the learning process less efficient.

Ownership and availability of technology

Although Internet access in developing countries is improving, ICT infrastructure is still insufficient for massive deployment of e-learning.

As *Table 1* shows, Internet access in developing countries is much lower than in industrialized countries. A comparison of the Internet penetration rate in North America (78.6 per cent, or more than three-quarters of the population) with that in Africa (only 13.5 per cent, or slightly more than one person in ten) indicates the size of the divide separating the most developed countries from African countries.

Moreover, the possibility of Internet access in Africa varies widely from one country to another (from 36 per cent in Tunisia to less than 1 per cent in Niger), and even between regions within a single country. Access to Internet-enabled equipment can also vary considerably depending on whether one lives in a coastal city (where the fibre-optic cables generally arrive) or an inland town.

Table 1. Internet penetration rate, by region

Region	Penetration rate
Africa	13.5%
Latin America and the Caribbean	39.5%
North America	78.6%
Asia	26.2%
Europe	61.3%
Oceania and Australia	67.5%
Middle East	35.6%

Source: Internet World Stats, December 2011.

Several large-scale initiatives to develop high-speed network infrastructure are approaching finalization in developing countries. Two notable examples are the South Atlantic3/West Africa Submarine Cable (SAT-3/WASC), a project undertaken by private industry, which connects a dozen countries in West, Central, and Southern Africa and continues on to South Asia via the SAFE network; and the Eastern Africa Submarine Cable System (EASSy), a network supported by international organizations such as the World Bank, which provides high-speed connections to nine East African countries.

Local connections are for the moment available only in large cities. In this respect, there are high expectations regarding the development of wireless land-based connections, as in the case of the growth of mobile telephones, which have a penetration rate exceeding 50 per cent in Africa. One seemingly promising wireless solution is known as WinMax, which offers the possibility of high-speed Internet connection at low prices over an area several kilometres in radius. However, it seems that difficulties in implementation are currently holding back the dissemination of this technology.

Satellite Internet access, which in recent years had been losing ground to land-based links because of its higher cost, will probably be boosted by the launch of telecommunication satellites that serve primarily Africa.

To bring about significant improvements in access to communication tools in developing countries, it is urgent to undertake reforms at country level in order to promote competition among access providers and to introduce flexibility in monopolies held by public enterprises. Such reforms, however, regularly encounter opposition from those who see liberalization of the telecommunications market as entailing risks to the stability and security of their countries.

One way of compensating for the low level of access to technology in developing countries and making technology more accessible for learning purposes is to establish resource centres equipped with Internet-enabled computers. These centres may be multi-purpose halls in schools, universities, or community centres or in premises dedicated to a particular project, such as the Open,

Distance and E-learning Centres established by the African Virtual University.

In a more general approach, UNESCO has supported the creation of multi-purpose community telecentres to help communities gain access to online resources, education, and appropriate services. In this case, the services provided are not limited to education but also include trade and health services, among others.

AUF has established some 40 digital campuses affiliated with universities across the French-speaking world in order to support its DE initiatives and to help with the deployment of local projects.

In 2010, UNESCO and the International Telecommunications Union undertook an important initiative for broadening Internet access in developing countries through the creation of the Broadband Commission for Digital Development (see its report *The Future Built on Broadband*; UNESCO-ITU, 2010), which aims among other things to contribute to the achievement of the Millennium Development Goals through universal high-speed Internet access.

The scarcity of learning resources

The digital divide so often deplored by the media is due not only to poor connectivity and lack of infrastructure but also to an absence of relevant content meeting the needs of local populations.

To address the difficulty of obtaining learning resources appropriate for e-learning, considerable efforts have been made in recent years at the international level to enable the joint development and storage of 'reusable learning objects'. The most spectacular of these initiatives was taken by major US universities including the Massachusetts Institute of Technology and the University of California, Berkeley, which decided to make a large proportion of their learning resources available online at no charge.

Such an approach is promising in that it should enable teachers throughout the world to reuse and adapt these learning resources in order to include them in their own courses. The main difficulty is that of producing learning objects that are general enough to fit into different educational contexts and can be adapted to satisfy the requirements of a particular course. Apart from technical problems,

such as the difficulty of agreeing on a standard (SCORM and LOM are the most frequently used), factors related to teachers' habits are holding back the spread of such initiatives. In particular, the culture of reutilization is not really established in higher education. However, community-based digital libraries, each associated with a user community, have had more success, because they are focused on a clearly identified user group (e.g. secondary school physics teachers) whose members guide choices regarding content and are all potential users.

A few years ago, UNESCO launched an Internet portal (the Free & Open Source Software Portal) to encourage the exchange of software and courses online, but the resources available via the portal are limited and seem to be supplemented only sporadically. Other initiatives have met with highly variable degrees of success: the ARIADNE Foundation for the European Knowledge Pool in Europe, EDUSOURCE in Canada, the Multimedia Educational Resource for Learning and Online Teaching (MERLOT) in the United States, EDUCAUSE for vocational training.

Another promising approach for the dissemination of learning materials is based on the idea of free educational resources. These resources can generally be downloaded at no charge and then freely adapted and translated. In contrast to reusable learning objects, such resources need not necessarily be used on a computer; they can also be textbooks, books belonging to the teacher, audiovisual materials, etc. They are usually protected by a Creative Commons Share Alike licence, which allows the materials to be used freely as long as the sources are cited and they are not used for commercial purposes.

Benefits expected from the expansion of DE in developing countries

Among the arguments in favour of establishing a DE programme, the possibility of reaching people who experience difficulties in attending school is often presented as decisive. Their difficulties may be due to geographical distance and/or to other forms of distance.

In India, for example, provision of DE at university level has enabled hundreds of thousands of women to earn a degree, regardless of gender, caste, or social class (Latchem and Jung, 2010).

In South Africa, UNISA's Institute for Open Distance Learning contributed greatly to higher education for the black population during the apartheid era.

Virtual mobility, as a substitute for physical mobility, offers undeniable economic benefits for development policy-makers. First, the costs of distance education are low, particularly when one considers that beneficiaries can generally continue to work and maintain their social and family ties. Second, the fact that there is no sudden break with the home environment gives this form of education a better grounding in local conditions and avoids the brain drain arising from the temptation for those who study abroad to remain in the country where they were trained.

Some observers expect the dissemination of DE in developing countries to have a general effect on educational quality. Since systems for producing e-learning courses generally invest heavily to ensure that the courses are effective, it may be supposed that, over the long term, through mere imitation or through specific supporting measures, access to these courses will help to raise the general quality of education systems. Where bimodal institutions are concerned, one may reasonably hope that having the face-to-face and distance teaching staffs in close proximity will lead to rapid dissemination of good practice.

The desire to obtain a systemic effect on educational quality through various types of DE is not at all recent: Upgrading teachers' qualification levels was one of the objectives of the school television programme in Côte d'Ivoire in the early 1980s.

In the same vein, some observers think that certain learning strategies promoted by e-learning will be particularly effective because they emphasize interaction, whereas in many developing countries learning is based primarily on transmission of knowledge and imitation of the activities performed by the teacher. Thus, to return to the idea mentioned briefly in *Chapter II*, the tools used for interactive online learning could help to create the right conditions

for in-depth learning that leads to the acquisition of skills more in phase with the cognitive society for which learners need to be prepared, regardless of where in the world they live.

Broadening the supply of DE will likely have positive effects in terms of equity as well, for several reasons. First, the overall cost per learner is generally lower in DE than in traditional education, because students do not have to move to the cities or go abroad in order to pursue their education. Although for an increasing number of programmes it is necessary to have an Internet-enabled computer in order to learn efficiently, the costs of this are generally much lower than those entailed in studying abroad, especially since many developing countries currently have an active policy of establishing community centres offering inexpensive Internet access. This objective of bringing the Internet to rural areas should ultimately help to broaden recruitment of DE students to include populations that are usually neglected. To achieve the objective of openness, however, DE will need to adapt its methods to meet the needs of population groups having little education – which is perfectly possible, as shown by programmes for farmers that have been rolled out in India and China (Qiwei *et al.*, 2008).

VIII. Conclusion

Even though, as we have tried to show in this booklet, issues related to ICT have a scope far larger than the field of e-learning alone, the latter now holds a central position in national and international development strategies.

The reason is that the development of our societies is increasingly based on advances in knowledge and on means of transmitting it from a distance. According to international estimates (UNESCO-ITU, 2010), every 10 per cent increase in the spread of high-speed Internet access will bring an annual increase of 1.3 per cent in GDP.

The 2010 declaration on broadband (UNESCO-ITU), which followed on from the Geneva and Tunis phases of the World Summit on the Information Society, lays clear emphasis on the potential impact of this technology in developing countries with regard to faster achievement of the Millennium Development Goals.

Increasingly, the spread of e-learning in developing countries is accompanied by other telecommunications applications, such as telemedicine, teleworking, and teleconsultation. We can expect these new services to have a joint positive impact in the near future, not only on economic performance at country level but also, through local involvement, on people's living conditions. In this context, access to the Internet and to the new services that it engenders may be regarded as an important element in poverty reduction strategies around the world.

Where the evolution of e-learning in particular is concerned, it seems likely that the decline in hardware costs and, most importantly, the appearance of bimodal institutional models will bring about a full-fledged supply of DE that will not only benefit students from the South but also enable the learning of the South to be disseminated to all parts of the world.

As for DE costs, the trend observed in the North shows gradual convergence between the costs of DE and those of face-to-face education. We are witnessing the end of scale economies, and the

hope that DE would increase provision without raising budgets is fading. This booklet suggests nonetheless that some solutions exist and that DE systems judiciously designed to benefit the South may avoid, at least to some extent, the rise in variable costs observed in the North.

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The book

In addition to reducing geographical isolation, distance education, thanks to its more favourable cost structure, allows the monitoring of social and economic remoteness. It may thus have much to offer for developing countries. Digital technologies not only bring remote populations closer, they also permit the development of adapted and diversified pedagogical models, with an economic approach aiming at more than just economies of scale.

In this book, Christian Depover and François Orivel examine some of the ways developing countries – in particular on the African continent, where needs often exceed resources – might benefit from distance education. The authors give particular attention to the development of higher education, its quality, productivity, and cost control.

The authors

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