Informatics and the Developing World

Revolutionary developments in information technology may allow developing countries to leap-frog obstacles to development if they can successfully apply this new technology

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Rapid and far-reaching changes in microelectronics-based information technology are helping transform the global economic landscape, shifting the competitive advantage of countries, linking distant enterprises, globalizing financial services, and raising new problems and opportunities for development and growth of the poorest countries. This new technology has fundamentally changed the costs of information acquisition, processing, and communication, and if effectively applied, could substantially reduce the problems arising from pervasive “information poverty” in the public and private sectors of the developing countries. Another name for this field is informatics—defined broadly to include both the supply side (i.e., the computer and telecommunications hardware and software, and electronics-based industries) and the demand side (i.e., applications in different sectors, such as economic decisionmaking, information services and management systems, communications, electronic publishing, and automation in manufacturing services).

But there is still a yawning gap between the promise of informatics and its current use and diffusion in developing countries. To bridge this gap, developing countries have to harness the new technology and develop public policies and infrastructure that would accelerate its wider and more profitable use. Research indicates that institutions go through several stages in learning to apply this technology: first, they automate administrative functions, such as budgeting and billing, to improve efficiency; second, they improve information for decisionmaking and redesign production processes (rather than simply automate old ways of doing business) to increase flexibility and effectiveness; and finally, they create new products and services and craft new relationships with clients (through immediate communication and information sharing). Most institutions in developing countries are at the first stage and some are entering the second. Only the most advanced organizations are at the third stage. Much international assistance is still concentrated on the first stage. Developing countries need external help to move quickly toward the latter, so-called transformational uses of the technology, where returns on investment are highest.

Signs of a revolution

The seeds of the information technology revolution are in the high rate of technical change. This is reflected in the following:

- a continual annual decline of 20 percent, over the last 40 years, in the real cost of storing, processing, and transmitting a unit of information—much faster than the decline in energy costs (50 percent over 30 years) that fueled the Industrial Revolution of the 18th century;
- increasing miniaturization, diversity, and integration of information-processing and communication devices;
- the ability to present and integrate information in different forms—data, text, voice, and image—to match different needs; and
- advances in artificial intelligence (i.e., computerized decisionmaking), optical storage of information, electronic mail, computer conferencing, and databases that allow seemingly endless possibilities in support of decisionmaking, knowledge creation, and information dissemination.

These changes are creating new sources of competitive advantage, such as quick product development and delivery, while undermining traditional sources, such as cheap and unskilled labor and raw material, which hitherto allowed developing economies to compete globally. The share of labor costs in total manufacturing has declined dramatically. For example, labor costs that formerly ranged
The competitive advantage for many industries and countries will increasingly depend on the capacity to quickly identify and exploit new and changing market opportunities. Competing in time and quality is a main feature of recent international competitive strategies of corporations in many industries and services. These strategies became possible primarily through the application of information and communication systems throughout the management, research, design, manufacturing, marketing, and distribution functions.

Substantial improvements in telecommunications have facilitated worldwide subcontracting and sourcing from distant low-cost locations in industries such as automotive engineering, electronics, and information processing. These technological changes have also induced new forms of organization and interorganizational relationships, creating decentralized structures within and among organizations linked by networks, and strategic alliances among enterprises across the globe. These new structures are highly flexible and adaptable to rapid change and increased international competition. Differences in the capacity to manage this radical technological change are likely to lead to increasing polarization in development among industrializing countries.

Developing economies that have been successful at adopting the new information technology have done so by devising appropriate policies, building the needed infrastructure, and developing the human resources to exploit it. They include the Republic of Korea, Taiwan Province of China, and Singapore.

Widespread impact

While the most visible effects of informatics in the developing world have been in the area of communications (satellite television, high-speed telephone dialing, and facsimile machines, among others), the impact of this revolution is growing. The range and magnitude of this impact can be discerned by examining three key areas: industry, services, and public sector management.

Industrial transformation. Informatics and communication technologies, such as microprocessors, have been a driving force behind the radical and pervasive changes in industries in the industrial countries, and to a lesser degree in the developing world. Some economic historians have likened these changes to the invention of the steam engine and electric motor in their versatile applications and profound transforming effects. Manufacturers can now not only keep track of inventory, sales, and markets, but also use informatics to alter and coordinate production and communication networks to help the central bank’s operations and its contacts with major financial intermediaries. The project finances the first phase of a five-year program to automate the major banks—contributing to their risk management, customer account and services, profitability analyses, and liquidity management. A subsequent phase will extend automation to remote branches and facilitate interbranch data transfers. Similar projects are being studied in Poland and Czechoslovakia.

Services. Informatics has profoundly changed many service industries and created many new information-based services in the industrialized countries. Banking, financial services, insurance, marketing, distribution, travel—the list goes on—have been irrevocably changed because of the speed, reliability, and low cost of manipulating vast quantities of information. Information networks have also broken down barriers between service industries. Airlines, for example, can now make hotel reservations, rent cars, or provide inventory control systems for supplying spare parts. A growing variety of information services for businesses, such as credit information for trade finance, have become essential to participation in global trade and the development of a competitive private sector. All these developments have not been lost on the developing world.

Indeed, information technology has spread to the banking and financial services sector in developing countries, often as a concomitant of financial sector reforms supported by multilateral agencies (see box on use of informatics in Hungary). While improving management information, credit supervision, and monitoring systems of financial markets and institutions within countries, the new technology also allows rapid and secure links with the global economy. Computerization of port, customs, and external trade activities in Singapore, and the beginning of automation of national payment and clearing systems in Eastern European countries are examples of informatics applications to services in support of trade, finance, and the overall development of a market-based economy.

Developing countries increasingly are offering services for industrial country enterprises in areas ranging from engineering services to data entry and processing. Through computer-assisted design, engineering plans can be cast in distant developing country locations for use in advanced countries, with no loss of quality but with less cost, because of...
Public sector management and informatics

An increasing number of countries that borrow from the Bank are in the midst of wide-ranging reforms to extract their economies from the web of centralized decisionmaking. Shift emphasis to market signals, provide autonomy for public enterprises, establish sound financial systems, and improve resource mobilization and expenditure management. A logical and necessary complement to such reform is strengthening the capabilities of public agencies to carry out these reforms, by improving the quality of information that goes into decisionmaking and developing systems for evaluating the effectiveness of policy measures.

The Bank has financed operations in many countries with the emphasis on institutional development and the use of information technology to address institutional shortcomings in the public sector. Among these operations are recent Bank projects in Algeria, Argentina, Bolivia, Mexico, Morocco, Thailand, and Uganda. All such projects involve large expenditures on information technology.

In Morocco, for example, the Ministry of Finance is enhancing its resource-mobilization efforts by computerizing tax administration, auditing, and control. Computerized systems are also being used to manage public debt information. Both the Ministry of Finance and the Ministry of Planning are using computers and information technology to improve resource allocation and expenditure management. Computer-based modeling is assisting in macroeconomic management, external trade management, and industrial promotion.

In Algeria, among other activities, the Bank is supporting computerization efforts in the Ministry of the Economy, the Central Bank, the Agriculture Development Bank, and the water, power, transportation, and petroleum utilities. Information technology is also being introduced into other public sector areas, especially in the administration of local communities and municipalities.

Managing benefits

Experience in industrial countries and early experience from newly industrializing developing countries suggests that the benefits of informatics extend far beyond improvements in labor productivity. It increases the capacity of organizations to rapidly adapt their operations and services to changing circumstances and thus contributes to improving their effectiveness. But these advantages do not accrue automatically. They are realized only after informatics has been understood and managed successfully.

At the heart of the successful introduction and implementation of information technology are the human processes that control information and communication. Effective practices can only be adopted if a supportive institutional and policy environment exists. Studies suggest that senior managers play a key role in fostering technological change, particularly in the consequent institutional and attitudinal adjustments involving, for instance, wider sharing of information and decentralizing of decision making. Further, learning and experimentation can take place only if persons involved with the new technology are given the training, incentives, and user-support needed to make successful use of the technology.

At the national level, public policies to encourage competition, facilitate access to information and information technology, and create the necessary physical (telecommunications) infrastructure and human resources are crucial to the wide diffusion of information technology in the economy.

As they increasingly employ the new technology, developing country decisionmakers need to understand that informatics is a powerful enabling force. But to exploit its potential, they should adequately prepare the policy framework within which it is to be implemented, and ensure that investments in systems and networks are carefully planned and based on in-depth analysis of information and communication needs of sectors, institutions, and potential users. Aid agencies could play an important role in this regard by helping countries select from among the "best practices" in introducing information technology and managing information resources.

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