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e-development? Development and the New Economy

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This publication is a policy-focused summary of the UNU-WIDER projects 'Information Technology and Growth', 'Production, Employment and Income Distribution in the Global Digital Economy' and 'Information Technology and Global Economic Development', directed by Matti Pohjola.

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FOREWORD

A new world economy characterized by globalization and an increasing emphasis on knowledge has emerged over the past decade. Within the 'new economy', knowledge has become the primary driver of economic growth. The economic, social and political landscape in which future development will take place has therefore also changed. All countries—rich and poor—must now reconsider their approach to development to incorporate this new reality. Opportunities exist for poor countries to use information and communication technologies (ICT) to make rapid advances, but there also exist risks that a digital divide might widen the inequality between rich and poor.

This policy brief summarizes the results of three related UNU-WIDER projects on ICT and economic growth directed by Professor Matti Pohjola. These projects explored the impact of the new economy on development strategies and highlighted policies necessary to achieve knowledge-intensive development, or as are now termed, e-development.

The full extent of how the new economy will impact on rich and poor countries is still unknown, but this policy brief provides a timely contribution to the discussion of what governments must do to maximize its possible benefits. It will be of interest to those concerned with development and with the policies required to narrow the gap between the rich and poor in the coming years.

Tony Shorrocks
Director, UNU-WIDER
December, 2003

EXECUTIVE SUMMARY

The rise of the 'new economy'

The world economy has recently changed. A new world economy has emerged over the last decade as two long-run broad trends, globalization and advances in information and communication technology (ICT) have converged. This 'new economy' is significantly different to the 'old economy', as knowledge has replaced traditional productivity inputs, such as labour and natural resources, as the primary ingredient for economic growth. A new landscape exists and countries must adapt their approaches and policies for development to achieve progress in the future.

The truly revolutionary aspect of modern ICT is that it allows information to be unbundled from its physical carrier. In short, this means that the economics of information can be separated from the economics of physical objects. This weightless or dematerialized economy means that an increasing fraction of GDP comes to reside in economic goods with little or no physical manifestation. In the new economy, a poor country is not burdened necessarily by the 'object gap'. A lack of raw materials or physical capital is no longer the barrier to development as it was in the traditional economy. Within the new economy development policies must recognize and incorporate this new reality and focus on achieving knowledge-intensive development or *e-development*.

Development and the new economy

The future of different nations will depend on how they respond to the new economy. Current development policies remain focussed on traditional industrialization of developing economies within a global market. Yet, the new economy provides a fundamentally different global environment in which progress will occur. This environment is different from the context of recent decades and far removed from that in which the developed and even the East Asian tiger economies achieved their development. A historical blueprint for development no longer exists and new and distinctive development strategies that take account of both specific circumstances of countries and new global realities must be designed.

There is great hope that e-development within the new economy will provide a shortcut to prosperity by allowing developing countries to bypass certain traditional phases of development in the conventional, long-lasting and belt tightening process of structural change from agrarian to industrial and, ultimately, to knowledge-based service economies. Whether such hope will be realized though is still unsure.

Productivity increases and productivity paradox

The contribution of ICT to economic growth varies considerably between countries. Investment in ICT goods and services can increase overall economic growth of a country in a number of ways: (i) by the production of ICT goods and services that contribute directly to the total value-added generated within an economy; (ii) by the use of ICT capital as an input in the production of other goods and services; and (iii) by the impact of ICT industries on multi-factor productivity which is the flow-on effect of ICT production on efficiency and productivity gains to non-ICT industries. Thus, ICT production can serve as an engine for economic growth through its job creation and its contribution to GDP.

The United States has recorded the greatest productivity increases linked to ICT investment, with productivity associated with ICT investment accelerating over time. However, for countries other than the United States, determining how ICT investment has impacted on productivity, income or welfare proves rather difficult.

There are a number of possible explanations for this apparent paradox. The most obvious explanation is that most countries have not yet invested enough in ICT. The second reason is that even if they have done so, complementary investment in organizational infrastructure required to reap the benefits from ICT investment has not occurred. A third explanation of why ICT investment does not appear to increase economic growth is that the neoclassical models used to seek such evidence may be inappropriate to capture the essential elements of the new economy and the ICT revolution.

Digital divide and necessary participation

Within the ‘old economy’, poor countries and rich countries were divided by ‘object gaps’. Poor countries lacked the requisite raw materials, physical capital (engines, factories, roads) and human capital (educated labour) required for economic development. Within the new economy, a different gap exists—an ‘ideas gap’. Poor countries lack the ideas or knowledge used in industrial countries to generate economic value. These two ‘gaps’ are not mutually exclusive and poor countries can simultaneously suffer both.

Within the spectrum of possible outcomes that can be envisaged when discussing the present ICT revolution, the two extremes are worth highlighting. One is that e-development and ICT investment will allow developing countries to bridge the current wealth and capital gaps between them and developed countries. The alternative extreme is that the new economy will exacerbate these gaps leaving developing countries languishing further behind developed countries without hope of catching-up.

Both alternatives lead to the same policy imperative: developing countries must invest more in ICT, participate in the new economy and seek to achieve e-development, if not to catch-up, then to prevent being left behind.

All that is old is new again

Governments have an important role in defining and establishing an *enabling environment* in which e-development can occur. An enabling environment supports and encourages progress within a country. It sets the parameters and places public policies that encourage economic and non-economic activities that increase society's well-being. With the rise of the new economy, the enabling environment must be reviewed to ensure that progress within this new world setting can be achieved. Governments must remain focused on improving access levels and quality of telecommunication and electricity infrastructure and education.

Direct and indirect government interventions

Governments must directly support economic and non-economic activities that will encourage progress within the new economy. This support will encourage private firms to invest and participate in the new economy and involves government use and promotion of ICT, access and diffusion of the Internet, creating a domestic market for ICT and increasing levels of democracy.

In addition to direct interventions in the market place, governments can also provide indirect support to private firms by setting and enforcing policies required to boost and protect financial returns to ICT investment. However, investment in ICT does not necessarily require an especially different environment to that required by investors in traditional economies. As with all investment, investment in ICT requires functioning institutions, norms of civil cooperation, property rights and free markets. Governments must encourage an entrepreneurial spirit amongst the business communities so that investment in the new economy takes place. Whilst governments should not seek to insulate investors against all risks, they must engineer an environment in which returns to investment are reasonable given the higher than normal risks faced by investors. Undue barriers to investment must be removed and a commitment to the protection of investment must be given and enforced.

Competition policies

The benefits of the new economy will be optimal and most efficiently experienced within a free and decentralized market economy. Markets that are characterized by imperfect competition, asymmetric information or external effects result in sub-optimal

inefficient outcomes. Core industries of the new economy have the following characteristics:

- Innovation-intensive competition
- Technological scale economies and product versions
- Network externalities
- Complimentarity between systems components.

In the new economy, competition policy instruments need to be modified so as to fit not only the traditional and static views of competition, but also the dynamic features of competition in the high-technology network industries.

Avoiding technical fundamentalism

The rise of the new economy is undeniable. Yet its impact on the development process is still to be fully understood. Investment in ICT itself is not sufficient to ensure long-term improvements in social well-being but requires other factors that result in an enabling environment in which progress can be achieved. Policymakers must guard against a 'technology fundamentalism', which is the idea that ICT investment is the only need of developing countries.

Governments must balance the recognition that the gap between rich and poor could be made significantly worse if the present digital divide widens, but that a focus on achieving e-development at the full expense of present needs will probably lower current levels of social well-being. Governments in developing countries must put in place certain policies that create an enabling environment that will encourage investment participation and development within this new economy. However, they must not rely entirely on the potential of knowledge-intensive e-development to deliver them from poverty. They must not stop their present development strategies or retreat from principals of equity to encourage ICT investment. As always, designing public policies is a balancing act between competing needs. The rise of the new economy has changed the environment, but the balancing act remains.

E-development is important, but so too is traditional development. The policies that are required to support e-development also support traditional development. Perhaps then, e-development and traditional development should not be seen as mutually exclusive within the new economy but rather be seen as complementary.

Box 1

Key messages from new economy and development studies

- The new economy has emerged in the last decade, characterized by the convergence of globalization and breakthroughs in information and communication technology (ICT).
- The new economy is the new environment in which future development will take place. Within this new economy, e-development is knowledge-intensive development.
- The new economy provides opportunities for development but also poses new dangers such as widening of the digital gap between rich and poor.
- No country can avoid heavy investment in ICT or participation in the new economy if it wishes to preserve and raise its living standards.
- Although the new economy is very visible, its impact on productivity and economic growth has been surprisingly difficult to detect.
- As with traditional development, investment in physical capital and education is the key to e-development. However, the ICT content of these investments must be raised within the new economy.

INTRODUCTION

The rise of the new economy

The world economy has recently changed. A new world economy has emerged over the last decade as two long-run broad trends—globalization and advances in information and communication technology (ICT)—have converged. This 'new economy' differs from the 'old economy', as knowledge has replaced traditional productivity inputs, such as labour and natural resources, as the primary ingredient for economic growth. As such, a new landscape exists and countries must adapt their approaches and policies to achieve progress in the future.

Through the process of globalization, capitalism has become the dominant form of economic organization across the globe resulting in free flows of trade and capital. Recent advances in ICT have increased the knowledge intensity within the production process. The convergence of globalization and knowledge intensity in economic activities in the 1990s resulted in an economy now characterized by 'knowledge' as the major factor in production and comparative advantage. The central tenet of the new economy is the significance of knowledge to the global economic process. Codified knowledge can now be quickly and cheaply delivered to where it is needed, be transformed as required and be made effective in machines and other production and service delivery processes. The degree of incorporation of knowledge into global economic activity is so significant, that it has caused structural and qualitative changes in how the world economy operates. Within the new economy, development policies must recognize and incorporate this new reality and focus on achieving knowledge-intensive development or *e-development*.

Box 2

Characteristics of the new economy

- A rising knowledge intensity in all industries, including in the service sector.
- A corresponding decline in the resource-intensity of economic activity.
- A global focus resulting from increased international flows of capital, technology and skilled labour, the opening of markets, and improved transport and communications technologies.
- High and rising productivity levels in manufacturing, especially in advanced countries, together with a growing link between technology and quality and the use of technology to replace even low-cost labour.

Within the new economy, information is unbundled from its physical carrier. This is a truly revolutionary aspect of modern ICT. In short, the economics of information can be separated from the economics of physical objects. This weightless or dematerialized economy means that an increasing fraction of GDP comes to reside in economic goods with little or no physical manifestation. In the new economy, a poor country is not necessarily burdened by the 'object gap'. The lack of raw materials or physical capital is no longer a barrier to development as it was in the old economy. The opportunity for developing countries is that they might experience accelerated development by taking advantage of freedom from their 'object gap' within the new economy and achieve progress through e-development.

Through the process of dematerialization, producing and distributing bits of logic rather than atoms of physical material increasingly creates economic value. While computers and information technology form a large part of this activity, the digitization of production and consumption means that an increasing number of products and services become idea-like goods. Development policies must re-focus so that national economies increasingly become weightless, thus overcoming the traditional barriers of natural resources and other inputs of the old economy.

Traditional policies for development and growth must therefore be reconsidered in light of this new economic paradigm. Policies at both the micro and macro level must be developed and implemented to ensure that the opportunities prevalent in this new environment are maximized. However, the new economy will not automatically end poverty. Poor countries lack the current type and amount of investment required to benefit automatically from the new economy. New investment strategies and public policies are required. The new economy is simply the new environment in which public policies aimed at improving living standards and the quality of life must succeed. Whether e-development occurs is dependent on how different countries respond to this new environment.

Development in the new economy

The future of different nations will depend on how they respond to the new economy. Current development policies that remain focussed on the traditional industrialization of developing economies within a global market will fail in their objectives. The new economy provides a fundamentally different global environment in which progress will occur. It is different from the context of recent decades and far removed from that in which the developed and even the East Asian tiger economies achieved progress. A historical blueprint for development no longer exists, and new and distinctive development strategies must be designed that take account of both the specific circumstances of countries and new global realities.

The new economy has impacted upon the development process. Irrespective of the size of a country, its wealth, population or natural resources, development strategies that

have regard to this new reality must be developed. The development process is no longer linear, progressing from agriculture to manufacturing to service industries. Developing countries cannot expect positive outcomes by following the strategies and building the institutions that served the developed countries in the industrial era. The development challenge in the twenty-first century will be entirely different to the development challenges of the past century. Indeed, all countries, whether developed or developing, will need to recognize the scale of changes currently underway and design new strategies for these realities.

Box 3

European digital divide

- ICT diffusion in Europe is sharply divided between the Nordic countries, the Netherlands and the UK, and the rest of Europe.
- ICT investment led-growth occurred in some countries (UK, Ireland, Denmark, Finland, Sweden and Greece) but remain stagnant or fell in others (Germany, France, Italy and Spain).
- Europe as a whole is increasing its diffusion of ICT but within this general increase, the digital divide is increasing as two groups form: slow and fast adopters.

ICT spending as a share of GDP in Europe

	GDP shares, per cent points			
	1992	1998	2001	1992-2001
EU	5.26	5.93	8.20	6.23
Sweden	7.34	9.09	11.55	8.63
United Kingdom	7.07	7.87	9.79	7.97
Netherlands	6.39	7.76	9.55	7.39
Denmark	6.13	7.38	9.52	7.19
France	5.71	6.86	9.18	6.75
Belgium	5.37	6.60	8.26	6.36
Germany	5.26	6.15	8.23	6.07
Austria	4.87	5.66	7.46	5.52
Finland	4.63	6.42	8.01	6.16
Ireland	5.38	5.88	6.21	5.80
Spain	3.70	4.11	5.23	4.21
Italy	3.65	4.50	5.86	4.49
Portugal	2.79	5.00	6.74	4.91
Greece	2.46	5.05	6.30	4.34
USA	7.14	7.73	7.96	7.73

Source: F. Daveri (2002) 'The New Economy in Europe, 1992-2001', WIDER Discussion Paper No. 2002/70, page 7.

A prevailing view within economics is that an important driving force of economic growth is technology. As ICT is widely regarded as the current manifestation of the ongoing sequence of technological revolutions, ICT is now seen as the key factor driving economic growth in the current global economy. Developing countries can no longer rely on low-cost manufacturing to secure economic development. The success of the United States and some OECD countries indicates that the sources of competitive advantage in the new economy are now the adoption of the technological, organizational and managerial innovations that enhance productivity. ICT is the essential enabler in this process.

As the increasing intensity of knowledge in economic activity incorporates the use of knowledge within the production of goods and services, knowledge is now an important factor of production. Therefore, economic activity within the new economy is less resource dependent than traditional economic activities based on natural resources in the old economy.

The new economy is the new context within which e-development will take place. While development strategies will vary between countries and regions, central in all responses should be an emphasis on investment with a high knowledge intensity and a focus on narrowing the digital divide.

There is great hope that e-development within the new economy will provide a shortcut to prosperity by allowing developing countries to bypass certain traditional phases of development in the conventional, long-lasting and belt tightening process of structural change from agrarian to industrial and, ultimately, to knowledge-based service economies. Poor countries once burdened by the ‘object gap’ now have the opportunity to overcome the limitations of natural resources by focussing future development strategies on increasing knowledge-intensive investment. The specific policies that might facilitate e-development are discussed in later sections.

ECONOMIC GROWTH, DEVELOPMENT AND THE NEW ECONOMY

Measuring the new economy

The economic importance of ICT within the new economy is both simultaneously as an output from ICT-producing industries and as an input into ICT using industries. Part of the rise of the new economy has been that as the quality of ICT increases, so too does its price fall. Consumers respond to these changes in relative price by substituting ICT equipment, software, and services for other goods and services. It is possible therefore, for the share of ICT industries in gross domestic product to increase in spite of falling ICT prices.

Three measures of the new economy are commonly used: (i) the production, employment and export shares of ICT; (ii) the use of ICT; and (iii) the size of the Internet.

In the late 1990s, ICT industries in the developed world accounted for 3-4 per cent of employment, 6-9 per cent of value-added, 10-25 per cent of exports and 25-40 per cent of research and development expenditure. The rise of the new economy is undeniable. However, all statistics must be studied with caution. A number of countries (namely some Asian countries) have captured a disproportionately high share of global ICT production, accounting for almost 40 per cent of the value of all electronics production in the world whilst having low rates in the adoption and use of ICT themselves. At the same time for example, the United States is a net importer of ICT. Clearly, the production and trade of ICT are not sufficient in themselves to measure an economy's participation in the new economy.

When expenditure on ICT is analysed as a measure of the new economy (see Table 1), it is possible to clearly distinguish those that spend above the average ratio (of 5 per cent) and those that spend below. The disparities in ICT diffusion are quite large and a significant 'digital divide' exists. It appears that ICT spending is strongly correlated with income levels. However, further study is required before definite conclusions can be drawn about the causal relationship between these two variables.

The third measure of the new economy is the use of the Internet. The Internet links the ICT revolution and globalization. The diffusion of the Internet is still primarily limited to the developed world, with less than 10 per cent of regular Internet users being within developing countries. This uneven diffusion results in markets and people being integrated at disparate rates across the world. As people in developed countries hold more of the required infrastructure and skills, than those in developing countries, it is expected that they will benefit more from this aspect of the new economy in the near future.

Table 1
Average share of ICT spending in gross domestic product, 1992–99

Countries above average	%	Countries below average	%
New Zealand	9.3	Slovak Republic	4.6
Sweden	8.4	Portugal	4.6
Australia	8.1	Italy	4.2
United States	8.1	Spain	4.2
United Kingdom	7.8	Taiwan	4.1
Switzerland	7.8	Vietnam	3.9
Canada	7.6	Brazil	3.9
Singapore	7.6	Venezuela	3.8
Netherlands	7.1	Greece	3.7
Denmark	6.6	Mexico	3.5
Japan	6.5	Slovenia	3.3
Hong Kong	6.5	Argentina	3.3
Israel	6.4	Saudi Arabia	3.1
South Africa	6.3	China	3.1
France	6.3	Poland	2.9
Czech Republic	6.2	Thailand	2.8
Belgium	6.0	Bulgaria	2.8
Norway	5.9	Turkey	2.7
Finland	5.9	Philippines	2.7
Ireland	5.8	India	2.1
Germany	5.7	Russia	2.0
Malaysia	5.5	Indonesia	2.0
Korea, Rep.	5.3	Egypt	2.0
Austria	5.1	Romania	1.3
Chile	5.1		
Hungary	5.1		
Colombia	5.1		

Source: Matti Pohjola (2002) 'The new economy: facts, impacts and policies', *Information Economics and Policy* 14, 2: 137.

Productivity increases in the new economy

A significant interest in the new economy is whether ICT investment will change the world by boosting productivity and economic growth. A general rise in the three measures discussed above has been observed over the last decade, particularly in developed countries. As such, it is reasonable to expect that there has been corresponding productivity increases brought about by the rise of the new economy. However, an apparent paradox exists, as the productivity increases expected in the new economy are difficult to detect.

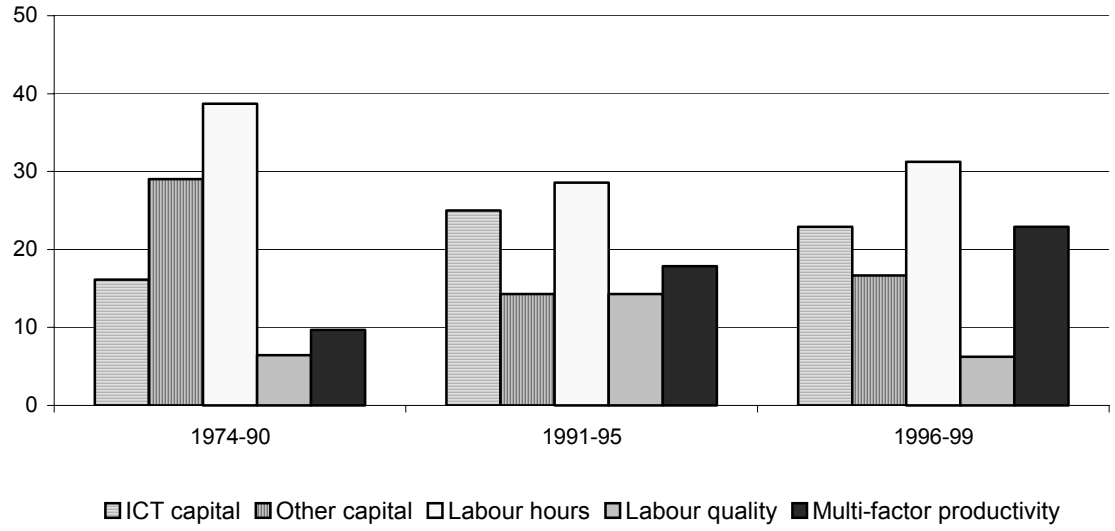
The contribution of ICT to economic growth varies considerably between countries. Investment in ICT goods and services can increase the overall economic growth of a

country in a number of ways: First, through the production of ICT goods and services that contribute directly to the total value-added generated within an economy. Second, as an input in the production of other goods and services through the use of ICT capital. Third, through the impact of ICT industries on multi-factor productivity which is the flow-on effect of ICT production on efficiency and productivity gains to non-ICT industries. As the production of ICT goods generally involves highly advanced manufacturing processes, mastering such production activities can generate higher labour productivity than that in other economic sectors. Thus, expanding the share of ICT manufacturing in economic output can increase the overall level of labour productivity of the country. (However, the problem with assigning productivity increases to ICT-led multi-factor productivity gains are that non-technology factors, such as changes in efficiency, scale and cyclical factors and measurement factors, will also be picked up by the residual.)

The United States has recorded the greatest productivity increases linked to ICT investment. The direct contribution of ICT investment to (non-farm) business output increased during the 1990s. At the same time, contributions to (non-farm) business output from non-ICT capital declined in the 1990s compared to the previous two decades.

The United States has benefited perhaps twice as much as Europe in terms of ICT contribution to economic growth. Further, within Europe itself, disparity also exists, with the UK, Sweden and the Netherlands outperforming Italy, Greece and Spain.

Figure 1
Contributions to real non-farm business output in the US, 1974–99



Source: Adapted from Jukka Jalava and Matti Pohjola (2001) 'Economic Growth in the New Economy: Evidence from Advanced Economies', WIDER Discussion Paper No. 2001/5, page 5.

It is difficult to undertake cross-country comparisons of ICT investment to investigate productivity increases within the new economy as national income and product accounts do not provide sufficiently detailed information on ICT investment, quality-adjusted price indices and measures of the ICT capital stocks. However, studies that have used secondary data on ICT investment across a range of both developed and developing countries, suggest that ICT investment is strongly correlated with income levels (though this is not yet firmly established). Richer countries tend to investment more in ICT than poorer countries. As numerous disparities exist between countries with similar income levels, other factors affecting both ICT investment and the standard of living need to be accounted for before any conclusion can be drawn about the relationship between ICT and income.

Productivity paradox

Whilst the ICT revolution is widely visible in the new economy—through the use of computers and the Internet—its impact on productivity and economic growth is surprisingly difficult to detect. As discussed, evidence from the United States indicates that ICT investment is associated with improved economic performance, but little correlation is found in other developed and developing countries. The relevancy of the new economy is dependent upon it having a visible effect on productivity, income and/or welfare. Certainly, ICT now plays an important and growing role in modern economies, but in what regard has ICT impacted on productivity, income or welfare? A productivity paradox may therefore exist.

If evidence that the new economy has increased economic growth is weak beyond the United States, how does this analysis assist in determining public policies for e-development? Five hypotheses exist to explain the 'productivity paradox' summarized in Solow's oft-quoted statement 'you can see the computer age everywhere but in the productivity statistics'.

No paradox: Declining computer prices have generated sizeable pecuniary externalities through the substitution of computer services for other inputs in production. As there is no evidence for non-pecuniary externalities generating productivity growth, there is no paradox.

Mismeasurement: The most profound impact of the new economy is that modern economies are increasingly weightless or dematerialized. That is, an increasingly greater fraction of GDP resides in knowledge products. Such knowledge products include all goods and services that can be expressed in digital form and include computer software, telecommunications, financial services, electronic databases and Internet delivery of goods and services. Thus a large proportion of ICT benefits do not appear in productivity statistics as they take the form of improved product quality, variety, timeliness, and customization. Therefore, the most significant benefits of the new economy will show up in the welfare of the consumers of knowledge products. As

such, it may be that the neoclassical models used to seek such evidence of productivity increases are inappropriate to capture the essential elements of the new economy and the ICT revolution.

Lack of supporting infrastructure: The impact of ICT investment is weak as the complementary investment in supportive organizational infrastructure is lacking. Unlike developed countries, developing countries lack mature stocks of physical infrastructure, human capital and government policies that enhance and amplify the effects of investments in ICT. Thus, economic returns from ICT investments in developing countries will be limited. However, such supportive organizational infrastructure exists in Europe in a similar manner to that in the United Sates, but it still has not experienced economic productivity increases through ICT investment. This may be explained by the telecommunications infrastructure in the United States being better suited for the transmission of data than for voice transmissions for which the telecommunications infrastructure in Europe (and Asia) was initially designed.

Diffusion delay: A critical mass of ICT investment must first be reached before the productivity benefits are apparent. Evidence suggests that a major technological innovation, such as the dynamo or microprocessor, can initially lead to a prolonged delay in productivity as it takes time to learn how to incorporate and operate a new technology. Countries currently investing in ICT may be experiencing this productivity lag.

Small capital share: As ICT is still a relatively small fraction (around 5 per cent) of existing net capital stock, the share of national income accruing to ICT is rather small and consequently even large improvements may remain lost in overall productivity figures. Developing countries have not invested enough in ICT for productivity increases to be obvious in national accounts.

Further, future productivity payoffs of investment in ICT and ICT complementary organizational infrastructure are also heavily reliant on other factors including business models market access, competitive environment, human capital and government policies. Ironically, these problems to development were also common to the ‘old’ economy.

Digital divide in the new economy

Within the ‘old economy’ poor countries and rich countries were divided by ‘object gaps’. Poor countries lacked the requisite raw materials, physical capital (engines, factories, roads) and human capital (educated labour) required for economic development. Within the new economy, a different gap exists—an ‘ideas gap’. Poor countries lack the ideas or knowledge that are used in industrial countries to generate economic value. These two ‘gaps’ are not mutually exclusive and poor countries can simultaneously suffer both. Achieving e-development in the future requires poor countries to overcome the ‘ideas gap’.

Within the spectrum of possible outcomes that can be envisaged from the present ICT revolution, the new economy and e-development, the two extremes are worth highlighting. One is that ICT will allow developing countries to bridge the current wealth and capital gaps between them and developed countries. The alternative is that ICT will exacerbate these gaps, leaving the developing countries to languish further behind developed countries without hope of catching-up.

Both alternatives lead to the same policy imperative: developing countries must invest more in ICT, participate in the new economy and seek to achieve e-development, if not to catch-up, then to prevent being left behind.

Given the apparent uneven productivity returns between nations, and the already large gap between rich and poor nations, the new economy could worsen this gap dramatically as developing nations may be excluded from fully realizing the potential of the new economy.

Over 90 per cent of Internet users come from the richest 20 per cent of the world's population, whilst the poorest 20 per cent contain only 0.2 per cent of the world's Internet users. Less than 10 per cent of the population in developing countries have access to telephone lines and less than half of *all* humanity have ever made a phone call. Low-income countries account for 40 per cent of the world's population and 11 per cent of the world's gross national income, yet only 2 per cent of the world's Internet users. Further, for developing countries without the history of information infrastructure or large domestic markets, some sectors of the ICT industry, such as microprocessors, operating systems, etc., appear closed off because of the standards being set by leading firms. Other segments require massive capital investments and specialized skills. Smaller countries are disadvantaged compared to China and India in trying to negotiate with multinationals for production of technology transfer in return for market access. Presently, no developing country has large-scale access to ICT technology. The number of personal computers and Internet users per capita is ten times higher in rich countries than in developing countries. The number of telephones is six times higher, and the number of mobile phones seven times higher. Whilst the relative divide is becoming narrower over time, the absolute differential is increasing. The contrast is even more stark when the rich countries are compared with the least developed ones. There are as many Internet users in Finland, with a population of five million, as there are in Sub-Saharan Africa, with a population of 643 million. It is arguable that technology inequality exceeds income inequality.

However, efforts to reduce this form of global inequality must be considered in light of other development priorities and other forms of global inequality. Specifically, how does digital poverty compare to more conventional forms of poverty in developing countries —lack of access to nutrition, basic healthcare, safe drinking water, and to education? Should the developing countries divert scarce resources from these sectors in order to close the digital gap? Given the changing nature of the world economy but acknowledging the current poor levels of supporting infrastructure required by ICT

investment, countries will (at least in the immediate term) have to seek to achieve traditional development and e-development simultaneously. This should be possible given the similarity of the policies required by both (as discussed in detail later).

Participation is necessary

Information and knowledge were the driving force in the United States economy long before the recent rise of the new economy. The United States has a history of a supportive environment for information-based economic growth. This environment was built on the strong protection of intellectual property rights, the large capacity of domestic markets, information infrastructure, and government support for private enterprise research and development activities. This environment might explain its success in achieving greater productivity gains through ICT investment compared to other countries. But despite the lack of productivity gains in other developed and developing countries, poor countries cannot withdraw from the new economy and hope to achieve development through traditional processes.

The new economy is important to development if it offers a faster path out of poverty. Such a path requires a link between technological investment and productivity. Whilst it is evident that a number of industrial countries (most notably the United States) have benefited from ICT investment, dramatic improvements in ICT-led productivity gains in developing countries are unlikely in the immediate term. Access to the capital investment required to participate in the new economy (primarily in telecommunications infrastructure and hardware) is very limited in developing countries, and this level of investment is a fraction of that invested in the United States, which has itself had low returns. This pre-existing digital divide may be worsened as firms in developed countries try to protect themselves and their new on-line market share and advantage. Yet, the majority of developing countries are still to make this investment or have received no obvious productivity gain from the investments they have made. Full benefits of participating in the new economy require significant investment in traditional infrastructure.

Despite this pessimistic outlook, it is not an option for developing countries to turn their back on the new economy. As yet, ICT investment does not seem to offer developing countries a shortcut to prosperity, but a development policy that views ICT investment or participation in the new economy as ‘irrelevant’ will worsen the digital divide and impoverish these nations. The success of the new economy ‘pioneers’ may not be replicated, at least not to the same extent, for the latecomers may not quite measure up

Box 4

Access in East Africa

- Participation in the new economy is dependent upon access to ICT. Access is both a factor of price and infrastructure.
- Within East Africa, the Republic of South Africa (RSA) has the greatest level of access in terms of affordable price and existing infrastructure.
- Significant investment in infrastructure is required within East Africa to increase access to the new economy.

State and costs of selected ICTS in East Africa, 1997–99

Indicators	Tanzania	Kenya	Uganda	RSA
Telephone main lines (per 1,000) 1999	4.5	10.3	2.6	125
Average cost of a 3-min local call (US$) 1999	0.1	0.1	0.2	0.1
Average cost of a 3-min call to the US (US$) 1997	3.7	11.2	8.6	–
Mobile phones (per 1,000) 1999	1.6	0.8	2.6	120
Personal computers (per 1,000) 1999	2.4	4.2	2.5	54
Internet hosts (total number) 1999	158	560	125	140,470
Internet hosts (per 10,000) 1999	0.04	0.2	0.1	33
Dialup Internet costs (20 hrs/month in US$) 1998	–	123	109	40
Radios (per 1,000) 1997	279.3	104.1	127.5	332.5
TV sets (per 1,000) 1998	20.9	22.1	27.6	129

Source: Adapted from Shyamal K. Chowdhury and Susanne Wolf (2003) 'Use of ICTs and the Economic Performance of SMEs in East Africa', WIDER Discussion Paper No. 2003/06, page 5.

to the great inventions of the past. If so, the case for investing in the new economy needs be made on a more pragmatic and piecemeal basis. E-development and traditional development must therefore occur side by side in the near future.

No country can therefore ignore the need to invest in ICT. The world economic environment has changed (and continues to do so) and this change highlights the gaps between rich and poor. These gaps will widen if developing nations do not seek to ensure their future progress in the new economy.

But, technology by itself is not a solution to any development problem; it is simply a parameter of the economic space in which development will take place in the future. The new economy provides new opportunities for countries to develop, as the 'object gap' that they suffer becomes less important than it was in the past. However, the new economy also introduces new dangers, as the widening of the digital gap can occur

quickly and will reduce the capacity of poor countries to develop. As always, governments must balance competing needs. They must engage in the new economy but accept that progress based on e-development will possibly mirror the frustrating and slow progress achieved with traditional development strategies. However, to maximize this progress, governments must establish a new enabling environment that supports ICT investment and participation in the new economy.

A NEW ENABLING ENVIRONMENT

The new economy has emerged over the past decade, and is qualitatively different from the economic paradigm that dominated the twentieth century. Whether there are markedly different policy requirements though to achieve progress is less obvious.

Public policy in developing countries is important in setting development strategies. Globalization has limited the influence governments have over economic activities within their own countries. But governments still have an important role in defining and establishing an enabling environment for development. An enabling environment supports and encourages development. It sets the parameters for economic activities and puts in place public policies that encourage economic and non-economic activities that will increase society's well-being. With the rise of the new economy, the enabling environment must be reviewed to ensure that progress within this new world setting can be achieved.

All that is old is new again

In the past, a concentration on the importance of capital was prominent within development literature. It was believed that countries developed at different rates due to their capital resources, and by building these resources, it was expected that poorer countries would catch up. During the 1950s and 1960s, emphasis was on investment in physical capital, including telecommunications and other large-scale power infrastructure. During the 1970s and 1980s, human capital was emphasized and improving education was prioritized. Whilst capital fundamentalism went out of favour due to a lack of observed success, these basic building blocks remain central to creating an enabling environment for development within the new economy.

Telecommunications infrastructure

Within the new economy, the importance of telephone mainlines is not because of their use for voice communication via telephones, but as the infrastructure for access to the Internet and associated ICT. In developing countries, telephone lines per 100 people average 2.6, compared with 66.4 in the United States. Given these limitations, it is not surprising that computer ownership is 4.4 per thousand people in developing countries compared to 511 per thousand in the United States. Table 2 highlights that the world can be divided into three broad blocks. Northern America and Western Europe have high ICT density whereas South Asia and Sub-Saharan Africa have low ICT density. The rest of the world, i.e. East Asia and the Pacific, falls in between.

Table 2
Information and communication infrastructure in the 1990s (per 1,000 people)

	Personal computers		Internet users		Telephone mainlines		Mobile phones	
Country groups	1995	2001	1995	2001	1990	2001	1995	2001
Income breakdown								
High-income OECD	188	363	34	360	455	574	89	690
Developing countries	14	34	2	37	52	104	4	94
Least developed	n/a	4	n/a	3	3	7	0	8

Source: Matti Pohjola (2002) 'New Economy in Growth and Development', WIDER Discussion Paper No. 2002/67, page 3.

Other infrastructure

Investment in physical capital is a key factor in economic development in both developed and developing countries. To secure maximum benefits from ICT investment, nations must build up a mature stock of physical infrastructure that supports, enhances and amplifies the effects of ICT.

Participation in the knowledge economy is, first of all, reliant on access to electricity and telecommunications infrastructure. Two billion people do not have access to electricity, with almost all rural populations (such as Tanzania) having a lack of access.

The future provision of an electricity infrastructure is problematic, as providing the necessary infrastructure is more expensive in the developing countries because of the high rural population levels, as well as lower returns to investments. But priority must be given to its provision despite these high costs.

Education

Literacy is a fundamental criterion for full participation in the new economy. Governments must prioritize educating their labour force to capture fully the benefits of the new economy. Investment in an educated workforce must be increased. Training in school and on-going instruction in the workplace must include training in ICT. An outcome of this investment is not only increased technical skills but complementary behavioural and interpersonal skills required for the successful adoption of new technologies. Investment in specialized ICT professionals is central to this training component.

Even if firms in developing countries do invest directly in ICT, substantial investment is also required for staff training and support. Where human capital is limited, these non-physical costs are likely to be significantly higher. Income differentials in developing (and developed) countries are increasing between those having the appropriate skills and those without them. In parts of Africa, basic computer-trained locals can earn up to

15 times that of national GDP per capita. It is likely that this differential will widened as approximately one-third of adults in developing countries are illiterate.

Unlike development strategies focussing on providing basic needs, education at the university level must also be highlighted, as a high level of specialized knowledge is required for the technical development and production of ICT. This may include supporting an initial 'brain drain' so that the brightest graduates are encouraged to travel abroad for achieving higher degrees from overseas institutions, but then encouraged to return at the completion of these studies.

Education at a non-university or specialist level is also an important policy, as a widely educated workforce can simultaneously transfer to the domestic market for technological goods.

People may be literate in their local language, but the predominance of English as the language of ICT and the Internet can still be a significant barrier to ICT use. Across a range of non-English speaking countries, the large majority of those who do use the Internet also consider themselves fluent in English, whereas those that report low levels of English proficiency also report low levels of Internet usage. Governments therefore need to prioritize English language education within the primary, secondary and tertiary sectors.

Direct government intervention

To establish an enabling environment that will encourage e-development within the new economy, governments must actively intervene in economic and non-economic activities. These actions will encourage private firms to invest and participate in the new economy.

Government promotion and use

The promotion and or use of ICT by governments, such as that implemented by the European Commission, is important. The EU's 'Promotion and Use' policy aims to introduce all citizens, businesses and administrations into the digital age and create a digitally literate community, whilst ensuring that the whole process is socially inclusive, builds consumer trust, and strengthens social cohesion. Given the developed world's initial advanced standing in the use of ICT and the emphasis for future ICT expansion, bridging the 'digital divide' between the rich and poor will be an enormous task. It will require significant investment and public policy interventions for developing countries, and developed countries will need to make ICT affordable and available in developing countries.

National governments therefore have a responsibility to promote the use of ICT. Governments must lower taxes, tariffs and other trade barriers on computer imports, encourage competition in telecommunications, become sophisticated users of ICT

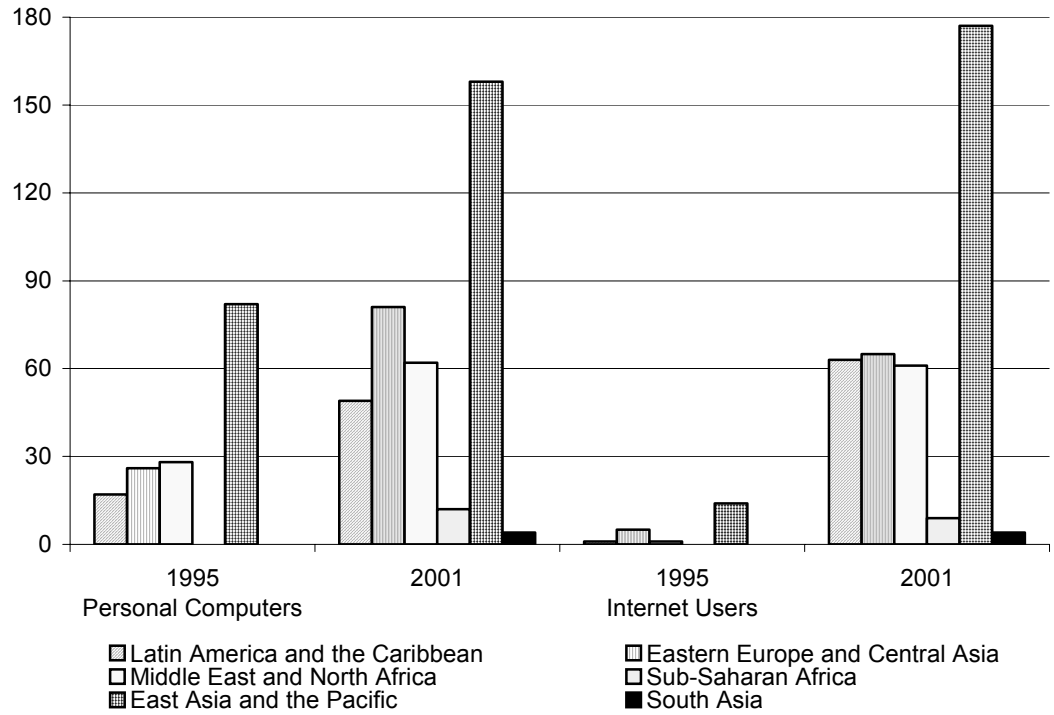
themselves, and promote the use of the Internet in schools, libraries and other public institutions.

Access and diffusion of the ICT and the Internet

Governments must enact legislation to ensure that wide access and diffusion of the Internet is achieved. Given the low level of competition in the telecommunications markets within the developing world as a whole, competition will not be sufficient to guarantee that this occurs.

Given the infinite expandability of knowledge products, the simple supply of ICT is no longer a restraining factor to economic growth. Factors that will affect growth now include consumer attitudes to sophisticated goods and supportive government policies for adoption of ICT and protection of investors through enforced intellectual property regimes.

Figure 2
Internet use and access in the 1990s (per 1,000 people)



Source: Adapted from Matti Pohjola (2002) 'New Economy in Growth and Development', WIDER Discussion Paper No. 2002/67, page 3.

Bridging the 'digital divide' requires nation states, the private sector and other key stakeholders (such as UN bodies) to act as equal partners in making ICT affordable and available in developing countries. ECOSOC have initiated a task force to investigate new and innovative policy approaches that will encourage and support technological solutions that can help developing countries leapfrog traditional technologies and stages of development. An important policy aspect, as seen in South Africa, is the creation of a more liberalized telecommunications sector. This is important, as telecommunications is the platform upon which ICT rests.

Domestic demand/market

Public agencies can play a crucial role in increasing this demand in developing countries. National governments must facilitate an environment that reduces the hedonic costs of ICT use to encourage favourable consumer attitudes to knowledge products.

For small developing countries, a significant obstacle to the uptake of ICT is the lack of a critical mass of demand for technologies. The new economy is characterized by: (i) a growing importance of knowledge products (i.e. most importantly computer software, but also other services that can be delivered digitally such as news, entertainment, music and data) in the total output of the economy; (ii) users being able to assess the value of these knowledge products only until they experience them; and (iii) the importance of networks (i.e. numbers of people using ICT). The use of networks is self-reinforcing. On the other hand, in digitally poor economies the same mechanism stifles growth. In the absence of sufficient experience, the consumption of information goods remains low. As a result, the value of information networks is small and participation is low; thus demand is low. Public agencies must act to increase this demand.

Software development

Developing countries should promote public policies that support ICT software production rather than hardware production. Rather than investing heavily in ICT hardware production, developing countries should concentrate on ICT software investment. Much of the hardware market has been shut out due to the standards being set by leading firms. Consequently, the major hope for developing countries to become engaged in the new economy appears to be through the software industry. India's success in the software industry is an important precedent. The software sector is the ICT industry's fastest growing sector and provides many opportunities for new entrants. Whether its growth is sustainable without a strong domestic market is yet to be seen.

Policies to facilitate this include the promotion of small ICT business use, the provision of financial support to software and service firms and the encouragement of partnerships between local firms and multinationals.

Adoption and imitation policies

Public policies supporting the creation of new technologies are not sufficient alone. Emphasis should also be placed on stimulating demand for new technology by speeding up the commercialization of new ideas. In many high-tech industries, the ability to imitate requires conscious investment and long-term development of a knowledge stock. In such industries the knowledge spillovers and thereby endogenous diffusion of technology are the consequences of rational investment into imitation.

Exporting companies

Exporting sectors in developing countries must adopt ICT to remain competitive in the world market. Globalization amplifies the importance of ICT use as information and communication systems provide the link to international capital markets and to international technology and production networks. Electronic commerce reduces the importance of physical distance and transportation costs, increasing the ease of small firms from developing countries in gaining access to new and large markets. Investment in ICT improves the capabilities of firms in developing countries to participate in international markets, face competition from multinational companies or form partnerships with them.

Democracy

Governments must recognize the strong correlation between democracy and Internet use. Greater political freedom is linked to higher levels of Internet use by firms and individuals. The Internet is the portal to the new economy. If it ever were, it is now unlikely that improvements in social well-being will occur in an environment of self-exclusion from the world economy. Democratic reforms will increase participation in the new economy.

Indirect government support/intervention

In addition to direct interventions in the market, governments can also provide indirect support for private firms by setting and enforcing policies to boost and protect financial returns to ICT investment. However, investment in ICT does not necessarily require an especially different environment to that required by investors in traditional economies. As with all investment, investment in ICT requires functioning institutions, norms of civil cooperation, property rights and free markets. Governments must encourage an entrepreneurial spirit amongst their business communities so that investment in the new economy takes place. Whilst governments should not seek to insulate investors against all risks, they must engineer an environment in which returns to investment are reasonable, given the higher risks faced by investors. Undue barriers to investment must be removed and a commitment to the protection of investment must be given and enforced.

Intellectual and property rights

As the new economy is weightless and wealth creation depends upon ideas more so than on physical resources, protection of intellectual property rights is paramount to ICT investment. In the old economy, governments were required to enforce the rule of law and contract to ensure property ownership was respected to encourage investment. Within the new economy, physical property has been replaced in importance by ideas and digital property. Governments must encourage investment in new technologies by both consumers and producers through the rigorous enforcement of intellectual property rights.

Financial and legal sectors

Legal and regulatory structures have a significant influence on institutional development. A thriving new economy requires a high degree of diversity in financial and legal institutions, investments and forms of control. To increase the potential for e-commerce, emphasis must be placed on increasing financial systems as access to capital and modes of finance that insulate investors from excessive risk. A distinguishing characteristic of the financing of high technology firms within the developed world is their evolving pattern of control by different investor groups. The financing of new high-tech firms appears less reliant on the stock exchange and more reliant on self-funding, families and friends. Once these means are exhausted, external equity comes from private investors. Governments must be supportive of this evolution and not constrain different types of ownership at the infancy stage of firms' development.

Competition policy in the new economy

In the new economy, competition policy instruments need to be modified so as to fit not only the traditional and static views of competition, but also the dynamic features of competition in the high-technology network industries.

The benefits of the ICT revolution will be optimal and most efficiently experienced within a free and decentralized market economy. As the core industries of the new economy are characterized by imperfect competition, asymmetric information or external effects, well-designed microeconomic policies—in the form of competition policies, technology policies or combinations of these—have the potential of generating welfare improvements and promoting social efficiency.

The new economy is fast moving and companies employ strategies different than those found in the more traditional or static sectors of the economy, and policymakers must be more attuned to these strategies. For example, demand-side economies of scale associated with network externalities are particularly important in dynamic high-tech industries and this form of economies of scale adds to traditional, technologically determined economies of scale on the supply side.

The core industries of the new economy have the following characteristics.

Innovation-intensive competition

Rapid innovation with short product cycles results in two main phases: innovation and imitation. Intellectual property rights lie at the heart of the new economy. Interestingly though, many software companies do not seek patent protection due to the pace at which generations of successively improved technologies replace each other. Firms participating in the innovation phase often acquire a dominant market position. During this phase the profit margins are protected by imperfect competition due to inherent technological entry barriers. Over time these technological entry barriers break down as intra- and inter-industry spillovers make it possible for imitating firms to enter the market profitably and successively reduce the sustainable profit margins. Thus, substantial profit margins occur only in the innovation stage.

Technological scale economies and product versions

Very strong economies of scale exist so that most costs can be considered 'sunk' in the form of 'first-copy costs'. Thus, marginal production costs are low. This characteristic shows up in increased price-cost margins, widening the gap between market equilibrium and social efficiency.

Network externalities

Information goods and services are more valuable the higher the number of consumers using them. Through these network effects, the information economy is thus characterized by strong demand-side economies of scale. Network externalities imply highly concentrated industries, which has strong implications for market structure. Network effects also affect prices, as equilibrium prices will depend on the number of users. Network externalities create switching costs and lock-in effects, whereby an incumbent firm—as soon as it has accumulated a critical mass of consumers—can expand its market share without being more efficient than its competitors.

Complimentarity between systems components

A unique feature of the knowledge economy is that electronic devices are composed of components that form systems and these complementary products are tightly bound through interfaces. Firms, therefore, expend large resources forming strategic alliances; setting standards and collaborating with partners to make sure their products work together effectively (and ineffectively with competitors systems) to comprise an overall competitive system.

Monopoly

Within standard economic theory, monopolies are bad for consumers but good for firms. However, within the innovation-intensive competition encompassed in the knowledge

economy, monopoly is a common but also short-lived phenomenon as firms rapidly replace each other in terms of new technological developments. The new economy thus features greater numbers of monopolies, but these monopolies are short-lived, therefore reducing harmful effects for consumers.

The new economy may magnify the conflict between consumer welfare on the one hand, and plausible alternative objectives such as fairness relative to competitors or the promotion of small- and medium-sized enterprises, on the other hand. The combination of economies of scale on the supply side and network effects on the demand side tends to make concentrated markets consistent with efficiency and mechanical attempts to keep the market artificially fragmented are likely to damage not only the industry, but also the consumers. In spite of the tendency for single firms to dominate high-tech industries, these firms are unable to sustain their monopoly position over time. Behind every corner are potential threats to dominance. In fact, the recent history of high-tech industries offers many examples of once-dominant firms that have failed to run hard enough to defend their dominance.

Complementary policies

For the immediate future of developing countries, achieving knowledge-intensive e-development is important, but so too is achieving traditional development. The policies that are required to support e-development also support traditional development. A focus on infrastructure, education and a functioning market place maximizes the potential benefits from both. Perhaps then, e-development and traditional development should not be seen as mutually exclusive within the new economy but rather as complementary.

The world economy has changed and the existence of the new economy is undeniable. However, developing countries as yet do not have the supporting infrastructure required to maximize the benefits that e-development offers. In addition, the productivity paradox that is evident in most countries' experience of ICT investment suggests that the pay-off from this investment does suffer significant lags. But despite these drawbacks and the arguments to ignore the new economy, developing countries must participate and begin investing in ICT to ensure they are not left on the wrong side of an insurmountable digital divide. Governments must therefore seek to achieve both e-development and traditional development simultaneously, at least in the short term. Thankfully, the policies required to achieve this do not significantly differ from one another (see Table 3).

Table 3
Summary and relevancy of various policies

Policy	E-development	Traditional development
Improve telecommunication infrastructure	Yes	Yes
Improve other infrastructure (i.e. electricity)	Yes	Yes
Improve education in all sectors (including English)	Yes	Yes
Government use and promotion of ICT	Yes	Less relevant
Increase access and diffusion of ICT and the Internet	Yes	Less relevant
Improve domestic demand for ICT	Yes	No
Encourage software development by local firms	Yes	No
Encourage adaptation and imitation by local firms	Yes	No
Encourage use of ICT by local exporting firms	Yes	Yes
Foster democracy	Yes	Yes
Strengthen intellectual property rights	Yes	Yes
Strengthen financial and legal sectors	Yes	Yes
Revise competition policies	Yes	Less relevant

Maintaining a balance—avoiding technical fundamentalism

The rise of the new economy is undeniable. Yet its impact on the development process is still to be fully understood. Investment in ICT alone is not sufficient to ensure sustained economic development. Other factors are required to ensure that an enabling environment exists to support the achievement of progress. Policymakers must guard against 'technology fundamentalism', or the idea that investment in ICT within the new economy is the only need of developing countries and that it be given priority over all other competing development needs.

Governments must balance the recognition that the gap between rich and poor could be made significantly worse if the present digital divide widens, and that a focus on achieving e-development at the expense of present needs will probably lower current levels of social well-being. Governments in developing countries must put in place certain policies to create an enabling environment that will encourage investment, participation and development within this new economy. However, they must not rely entirely on the potential of knowledge-intensive e-development to deliver them from poverty. They must not stop their present development strategies or retreat from the principles of equity in favour of ICT investment. As always, designing public policies is a balancing act between competing needs. The rise of the new economy has changed the environment, but the balancing act remains.

Development strategies must be made cognizant of the comparative ignorance of the potential impact of the new economy on development. For example, if participation in the new economy through the Internet is considered necessary to ensure businesses

remain internationally competitive, should government policy focus on ensuring business access at the cost of equitable access? Similarly with education: if exploiting the Internet requires tertiary education, should governments re-channel resources from primary education for the many to university funding for the few? Given the limited evidence of benefits, the uncertainty and the immediate equity costs of such actions, the answer should be one to support equitable access and primary education.

Overall, the largest determinant of the impact of the new economy in developing countries is likely to remain the broader environment outside the information infrastructure sector. This environment will also play the predominant role by far in determining the quality of life in developing countries. For this reason, Microsoft chairman Bill Gates' argument about the place of *direct* support to the Internet in development priorities might well be correct. Gates suggests that if equity is a central concern, then fewer resources should be spent on ensuring access to ICT and more resources spent on ensuring access to literacy and health.

Box 5

Production versus adoption in Asia

- Asian countries have generally lower levels of ICT adoption relative to their level of income than other comparative countries.
- Internal disparities within Asia are also quite high with a significant digital divide existing between Japan and the four tiger economies, and the rest of Asia.
- Asian countries are predominately greater manufacturers of ICT but not great users as industrial policies favour electronic manufacturing at the expense of promoting ICT diffusion within the service sector.

ICT use and diffusion in Asia

Country	Computers per 1,000	Internet hosts per 1,000	Telephone (main) lines per 1,000	ICT per capita (US$)
Indonesia	11	0.11	27	8.86
Malaysia	78	1.93	205	214.69
Philippines	16	0.21	32	26.75
Thailand	33	0.03	82	52.11
China	7	0.02	737	31.40
India	4	0.01	20	13.17
Japan	272	11.03	494	2,485.69
Hong Kong	310	20.09	584	1,820.13
Korea	150	4.22	467	431.95
Singapore	344	13.45	464	2,348.20
Taiwan	178	16.71	543	610.86

All data are for 1998.

Source: Poh-Kam Wong (2001) 'ICT Production and Diffusion in Asia: Digital Dividends or Digital Divide?', WIDER Discussion Paper No. 2001/8, page 8.

CONCLUSION

Three previous communication-revolutions have had significant impacts on our lives but failed to deliver on the optimistic predictions first hoped for. The railway was to spark the dictatorship of the proletariat, the telegraph was to engender world peace and the television was to revolutionize education. It is unlikely then that the rise of the ICT and the new economy alone will end global poverty.

Investments in infrastructure, physical capital and education remain the keys to economic development. This is, of course, an old policy prescription in the economics of development. What is new is the view that the information technology content of these investments should be high. The use of ICT is so widely spread in the world economy that no single country can any longer ignore the need to invest in these technologies if it wants to improve the standard of living of its citizens.

Optimists must remain cognizant that not all past 'revolutions' have had significant impacts on developing countries. Whilst ICT and the new economy will present some opportunities, most developing countries lack the requisite physical and human capital to immediately exploit these opportunities. The challenges of development will not be solved simply through ICT investment. The new economy is the environment in which future development will take place. Governments must still devote resources and political will to overcoming the harsh poverty experienced by the majority of humankind.

E-development is important, but so too is traditional development. The policies that are required to support e-development also support traditional development. Perhaps then, e-development and traditional development should not be seen as mutually exclusive within the new economy but rather as complementary.

In this regard, it seems that all that is old is new again. Investment in infrastructure, physical capital and education are still key to both traditional development and e-development.

LIST OF PUBLICATIONS

Project on 'Information Technology and Growth' (1998–99)

This project, led by Professor Matti Pohjola, empirically assessed the common view that information technology radically changes productivity and economic growth. IT certainly has many effects on the modern economy; the growth in electronic commerce is one example. However, its productivity and growth effects have been surprisingly difficult to establish.

By surveying previous studies and by presenting new micro- and macroeconomic evidence, this project demonstrated that in recent years IT investment has exerted a strong influence on productivity and economic growth in many industrial and newly industrialized countries. Admittedly, however, developing countries seem to have neither invested in IT nor benefited from such investments to the same extent.

There is concern that information is becoming a factor, like income and wealth, by which countries are classified as rich and poor. To prevent this from happening, governments need to formulate national IT strategies to promote participation in the information economy. The project identified the components of such national strategies. A key policy is to balance IT investment with investments in education, and training.

> *Information Technology, Productivity and Economic Growth: International Evidence and Implications for Economic Growth*, edited by Matti Pohjola, UNU-WIDER Studies in Development Economics, Oxford University Press, April 2001 (hardback) 0-19-924398-0.

The popular view is that information technology will change the world by boosting productivity and economic growth. But while IT has many visible effects on the modern economy, studies have found little correlation between IT investment and overall productivity.

By presenting new micro- and macroeconomic evidence, this volume shows that in recent years IT investment has exerted a strong influence on productivity and economic growth in many industrial and newly industrialized countries. It also identifies national IT strategies to promote participation in the information economy.

Working Paper series (available in PDF from www.wider.unu.edu):

WP155 Danny Quah: 'The Weightless Economy in Economic Development'

WP153 Matti Pohjola: 'Information Technology and Economic Development: An Introduction to the Research Issues'

WP152 Francis Kramarz: ‘Computers and Labour Markets: International Evidence’

WP149 Sergio Rebelo: ‘The Role of Knowledge and Capital in Economic Growth’

WP148 Petri Niininen: ‘Computers and Economic Growth in Finland’

Project on 'Production, Employment and Income Distribution in the Global Digital Economy' (2000–01)

This project is the sequel to the 1998–99 project on IT and growth and is also directed by Professor Matti Pohjola. In his contribution to the earlier project, Danny Quah argued forcefully that the most profound impact of the IT revolution is that it makes modern economies increasingly weightless or dematerialized in the sense that an increasingly greater fraction of gross domestic product comes to reside in economic goods with little or no physical manifestation (see the article by Danny Quah in the 2000/1 issue of the WIDER *Angle* newsletter). Such a weightless group of commodities includes all products and services that can be expressed in digital form—encoded as a stream of bits—such as computer software, telecommunications, biological algorithms, financial services, electronic databases and libraries, media entertainment and Internet delivery of goods and services. The thesis of de-materialization is that economic value will increasingly be created by producing and distributing bits of logic rather than atoms of physical material.

This project therefore confines its attention to the economic effects of the 'digital', 'Internet', 'weightless' or 'new' economy with the aim of deriving the implications of digital technology for productivity and growth, location of production, firm and industrial structure, employment and income distribution, and economic development at the global level. Economic policies for promoting the new economy are also considered.

> Selected papers on this topic are published in a special issue of the journal of *Information Economics and Policy*, Volume 14, Number 2, June 2002 (133-326), Special Issue on the new economy, edited by Matti Pohjola. Published by and available from North-Holland

Discussion Paper series (available in PDF from www.wider.unu.edu)

DP2001/83 Kenneth L. Simons: 'Information Technology and the Dynamics of Firm and Industrial Structure'

DP2001/77 Derrick L. Cogburn and Catherine Nyaki Adeya: 'Prospects for the Digital Economy in South Africa: Technology, Policy, People, and Strategies'

DP2001/76 Qingxuan Meng and Mingzhi Li: 'New Economy and ICT Development in China'

DP2001/73 Rune Stenbacka: 'Microeconomic Policies in the New Economy'

DP2001/20 Ashish Arora and Suma Athreye: 'The Software Industry and India's Economic Development'

DP2001/11 Sampsa Kiiski and Matti Pohjola: 'Cross-country Diffusion of the Internet'

DP2001/8 Poh-Kam Wong: 'ICT Production and Diffusion in Asia Digital Dividends or Digital Divide?'

DP2001/6 Heli Koski, Petri Rouvinen and Pekka Ylä-Anttila: 'ICT Clusters in Europe. The Great Central Banana and the Small Nordic Potato'

DP2001/5 Jukka Jalava and Matti Pohjola: 'Economic Growth in the New Economy. Evidence from Advanced Economies'

DP2001/4 Colin Mayer: 'Financing the New Economy. Financial Institutions and Corporate Governance'

DP2001/3 Edward N. Wolff: 'The Impact of IT Investment on Income and Wealth Inequality in the Postwar US Economy'

DP2001/2 Jed Kolko: 'Silicon Mountains, Silicon Molehills. Geographic Concentration and Convergence of Internet Industries in the US'

Project on 'Information Technology and Global Economic Development' (2002–03)

The fusion of computing and communications technologies—especially through the Internet—is breaking the bounds of cost, time, and distance for the world's people, businesses and governments. As yet, little is known about the way in which the 'new', 'weightless', 'digital' or 'Internet' economy operates and what its impacts are on production, employment, income distribution and welfare. This project builds on the two previous UNU-WIDER projects on IT and development. The principal activity of this project was a conference on these issues, in May 2002, that provided an opportunity to take stock of what is currently known about the impacts of the digital economy on economic development at the global level.

Selected papers presented at the conference are published in the Discussion Paper series and are available in PDF from www.wider.unu.edu.

See also the New Economy Special Issue of the *Oxford Review of Economic Policy*, Volume 18, Number 3, 2002.

DP2003/40 Stéphane Gagnon: 'E-business Model Innovation and Capability Building'

DP2003/22 Birgitte Andersen and Marva Corley: 'The Theoretical, Conceptual and Empirical Impact of the Service Economy: A Critical Review'

DP2003/07 Dietrich Domanski: 'Idiosyncratic Risk in the 1990s: Is It an IT Story?'

DP2003/06 Shyamal K. Chowdhury and Susanne Wolf: 'Use of ICTs and the Economic Performance of SMEs in East Africa'

DP2002/116 Derrick L. Cogburn: 'Emergent Global Information Infrastructure/Global Information Society'

DP2002/115 Sougata Poddar: 'Network Externality and Software Piracy'

DP2002/111 Jai-Joon Hur, Hwan-Joo Seo and Young Soo Lee: 'ICT Diffusion and Skill Upgrading in Korean Industries'

DP2002/108 Kandamuthan Subodh: 'Market Concentration, Firm Size and Innovative Activity: A Firm-level Economic Analysis of Selected Indian Industries under Economic Liberalization'

DP2002/95 Patrice Muller: 'Internet Use in Transition Economies: Economic and Institutional Determinants'

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DP2002/88 Youngsoo Lee, Jeonghun Oh, and Hwanjoo Seo: 'Digital Divide and Growth Gap: A Cumulative Relationship'

DP2002/84 Albertus Aochamub, Daniel Motinga, and Christoph Stork: 'Economic Development Potential through IP Telephony for Namibia'

DP2002/83 Samia Satti O. M. Nour: 'ICT Opportunities and Challenges for Development in the Arab World'

DP2002/79 Sagren Moodley: 'Competing in the Digital Economy?: The Dynamics and Impacts of B2B E-commerce on the South African Manufacturing Sector'

DP2002/78 K. J. Joseph: 'Growth of ICT and ICT for Development: Realities of the Myths of the Indian Experience'

DP2002/77 Mina N. Baliamoune: 'The New Economy and Developing Countries: Assessing the Role of ICT Diffusion'

DP2002/76 T. A. Bhavani: 'Impact of Technology on the Competitiveness of the Indian Small Manufacturing Sector: A Case Study of the Automotive Component Industry'

DP2002/75 Charles Kenny: 'The Internet and Economic Growth in Least Developed Countries'

DP2002/74 George R. G. Clarke: 'Does Internet Connectivity Affect Export Performance? Evidence from Transition Economies'

DP2002/73 Sandeep Kapur: 'Developing Countries in the New Economy: The Role of Demand-side Initiatives'

DP2002/72 Steve Onyeiwu: 'Inter-Country Variations in Digital Technology in Africa: Evidence, Determinants, and Policy Applications'

DP2002/70 Francesco Daveri: 'The New Economy in Europe, 1992-2001'

DP2002/69 Poh-Kam Wong and Zi-Lin He: 'The Impacts of Knowledge Interaction with Manufacturing Clients on KIBS Firms Innovation Behaviour'

DP2002/68 K. Lal: 'E-business and Export Behaviour: Evidence from Indian Firms'

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DP2002/62 Marcin Piatkowski: 'The "New Economy and Economic Growth in Transition Economies'

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