July/2003

76

ISSN: 1025-9384

The IPTS REPORT

EDITED BY THE INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES (IPTS)
AND ISSUED IN COOPERATION WITH THE EUROPEAN S&T OBSERVATORY NETWORK

CEE: XV/18

EUROPEAN COMMISSION
Joint Research Centre

ENGLISH VERSION

CONTENTS

THE IPTS REPORT
76
JULY 2003

EDITED BY THE INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES (IPTS)
And issued in Cooperation with the European S&T Observatory Network

PUBLISHED BY THE EUROPEAN COMMISSION
Joint Research Centre
ISSN: 1025-9384
Catalogue Number LF-AA-03-076-EN-C
DEPOT LEGAL: SE-1937-95

THE IPTS REPORT
is published in the first week of every month, except for the months of January and August.
It is edited in English and is currently available in four languages: English, French, German and Spanish.

SUBSCRIPTIONS
For a subscription to The IPTS Report, or to amend an existing subscription, please write with full details to:
The IPTS Report Secretariat
IPTS, JRC Sevilla
Edificio Expo
C/ Inca Garcilaso, s/n
E-41092 Sevilla, Spain
Tel: +34-95-448 82 97
Fax: +34-95-448 82 93
E-mail: ipts_secr@jrc.es
Web address: www.jrc.es/iptsreport/subscribe.html

computer-using industries such as finance, insurance and real estate did not witness high TFP growth.

Explaining the disparity between high investment in technology and productivity impact in computer-using industries is not only an important task for analysts but also for market participants. It can be argued that it was only a matter of time before malaise would set in fed by the non-realized gains in productivity, hoped for by those who invested heavily in ICTs in non-high-tech but heavily computer-using industries. Fast growth cannot be sustained – and in the present juncture will not easily pick up again – simply based on productivity gains in high-tech industries and in ICT price decreases.

The debate's essence, as mentioned above, is whether technology's impact on productivity substantially extends beyond the high-tech industry. This makes the need for more accurate measurement of productivity impacts (e.g. taking into account quality improvements across the board) fairly urgent. Providing updated indicators (technology-updated in a sense) is not only a matter of facilitating the work of analysts; it is also a key step in allowing market participants to assess and project the productivity impact of their investments in ICTs, and then see whether the Scylla of dire prospects is as unwarranted and illusory as the Charybdis of exuberant optimism on the all-encompassing and transforming impact of new technologies of the late nineties.

Notes

1. A substance supposed by 18th-century chemists to exist in all combustible bodies and to be released during combustion.
2. Jorgenson, D and Wessner, C., *Measuring and Sustaining the New Economy.* Appendix A. National Academy Press, Washington DC, 2002.

Contact

Dimitris Kyriakou, IPTS
Tel.: +34 95 448 82 98, fax: +34 95 448 83 39, e-mail: **dimitris.kyriakou@jrc.es**

rence to be treated at home (Friedewald and Pion, 2001). Elderly people appear to be more keen on spending money on technology aids that keep them in their homes and make them less reliant on other people than on spending (usually) more than is absolutely necessary on long-term care in an institutional environment. Also, certain telecare applications can increase the knowledge and awareness patients and their carers have of their particular health condition thereby allowing some involvement in decision making over the treatment or even some degree of self-care.

A third reason is the ageing of the population, which is expected to have a multiplying effect on the demand for such services. With a significant rise in average life expectancy gains and with more citizens passing this critical age threshold the required public finances for covering healthcare costs are expected to continue to grow. The provision of health and social care services to individuals on a mobile basis or at home over electronic networks receives considerable attention among policy-makers and health practitioners as it provides opportunities for independent living, increased security and greater social integration for the people in need.

The technological dimension

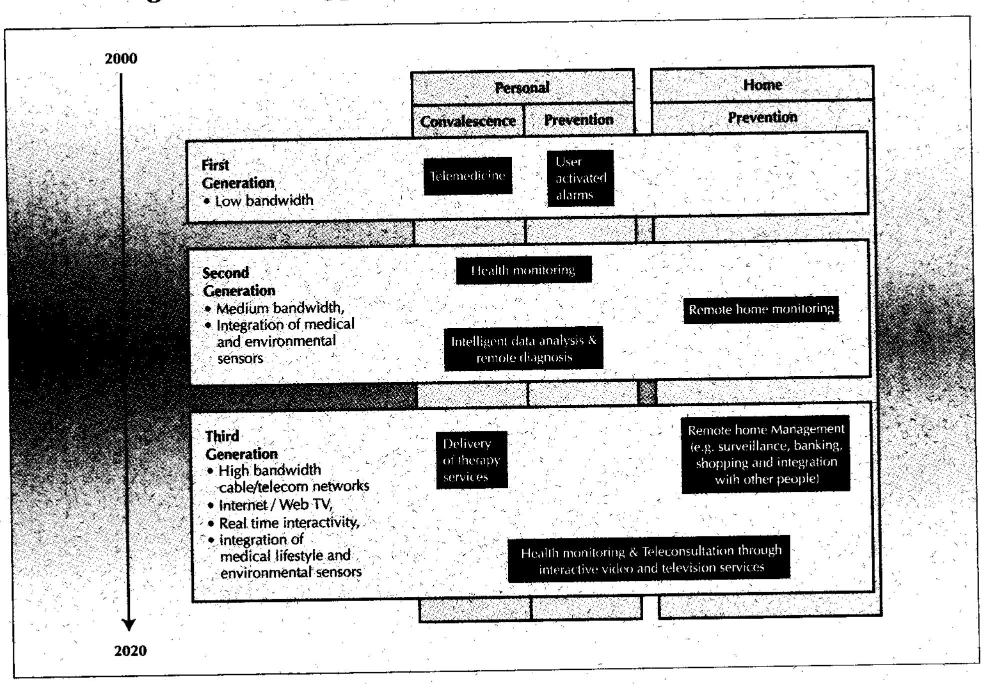
Three generations of telecare systems can be identified as shown in Figure 1.

The first generation includes user-activated applications with no embedded intelligence and no special requirements in terms of public network infrastructure or home wiring. The second generation is more 'intelligent' and uses environmental and personal sensors for the continuous monitoring of a patient's behavioural and medical condition. The third generation is characterized by real-time interactivity between care providers and recipients that can be possible over broadband networks and digital interactive TV platforms.

From the users' side, there is demand for telecare among the elderly and disabled, as it allows them greater independence and the possibility of remaining in their own home. In the context of an ageing population, this demand is likely to increase yet further

The first generation of telecare applications includes user-activated devices with no embedded intelligence and no special requirements in terms of public network infrastructure or home wiring

Figure 1. A typology of telecare applications



Source: Based on Doughty et al.(1996) and authors' elaboration.

nomic question for telecare stakeholders is whether the benefits from investments in telecare can outweigh the high costs incurred in their development.

There is currently a shortage of cost-benefit analyses into the acclaimed economic benefits of telecare. This is partly due to the limited take up of such applications and partly due to the difficulty in measuring and assessing the indirect benefits from their deployment. One example of the constraints entailed in the cost benefit analysis of a telecare service has been the economic analysis of the NHS Direct initiative in the UK[1].

NHS Direct provides medical assistance and advice to recipients over the phone. Teletriage can be performed by the receiver at the control centre, who is normally a nurse trained to prescribe treatment or call in the ambulance service.

The analysts involved in the exercise identified the following drawbacks in their effort to estimate the total economic cost (initial capital investment and operating costs) to the NHS of providing the service. First, although the service has been designed with the aim of reducing demand for other care services, in practice there was some evidence that individuals who might otherwise have provided self-care after contacting NHS Direct contacted their doctor. At the same time, it was found that the new service provides reassurance to callers through disease information, increased opportunity for self-care, and better response time to emergency situations, all of which were indirect benefits which were difficult to quantify and include in a costing exercise. The analysts concluded that the overall impact of the new service is likely to be felt in a time horizon of between five to ten years when real economies of scale are expected to reduce its costs as a result of (a) less need for spare capacity due to increased predictability in the demand patterns; and (b) the operation of 'virtual call centres' which are expected to reduce traffic congestion of incoming calls.

Naturally, not all telecare services face the same high set up costs. Costs vary according to the sophistication of the service provided, the type of infrastructure required for its operation, the size of operation (local, regional, and national), and the size of labour costs involved. For example, providers of first generation mobile care systems offering telecare services on an individual basis bear relatively low capital costs compared to other first generation services. In the case of a nationally available telephone helpline, such as NHS Direct, the costs of installing and operating the necessary IT infrastructure (software and hardware) are substantial. As the IT infrastructure and databases need continuous monitoring, feedback, and updating in order to provide an acceptable level of service to callers, capital costs rise in line with usage although overall they remain lower than the respective labour costs incurred. Overall, it would be over-optimistic to maintain that the deployment of technology would bring strategic benefits to patients and their carers if it fails to generate and sustain an acceptable level of revenues or cost savings that offset the high costs of service development (Kibbe, 2001). In this respect, economic analysis is a necessary first step that provides a guiding tool to policy-makers regarding the pace and direction that technology-based reforms can be introduced into the health care system.

Another economic aspect relates to the reimbursement of costs for both practitioners and end users. Issues such as what should be the on-line service charges of practitioners; how, and to what extent care recipients can be refunded by public social security organizations, and what should be the role of private insurance coverage demand immediate attention. Given that the development costs of a telecare system are high and do not provide immediate profit to the funding body, it is unlikely for the private sector alone to proceed in providing advanced telecare services. Private organizations and state authorities need to cooperate

The real economic question for telecare stakeholders is whether the benefits from investments in telecare can outweigh the high costs incurred in their development

Measuring the costs and benefits of telecare systems has proved difficult, partly because it is difficult to place an economic value on the indirect benefits such systems deliver

Given that the development costs of a telecare system are high and do not provide immediate profit to the funding body, it is unlikely for the private sector alone to proceed in providing advanced telecare services and resources. The voluntary sector could also become engaged in initiatives of this kind designed to bring care services closer to citizens.

Conclusion

ICTs have the potential to dramatically change the work processes and delivery of health and care services. The promotion of technologies for telecare has been on the top of the policy and research agendas of the European Commission and the Member States as a means to improve healthcare support and amplify inequalities in accessing health-care.

However, in Europe today, the use of ICT systems in the delivery of care services remains rudimentary despite the critical mass of scientific and technological knowledge that has accumulated in this area. Technological factors, including the limited supply of broadband access, the multiplicity of technology platforms and standards used in pilot test beds, and the fragmented nature of national health information infrastructures represent major barriers to the effective development of telecare applications.

This article has argued that efforts to abridge the technological barriers to telecare should in parallel be accompanied by the orchestrated efforts of State authorities to explore the economic, institutional, and organizational aspects of telecare deployment. These efforts should be made on the understanding of national technological, socio-economic, and cultural specificities and on the recognition that telecare practices complement rather than replace traditional methods of health-care delivery. Starting from the most simple telecare applications of the first generation and gradually proceeding to the more complicated ones allows for effective learning processes to take place within the communities of major stakeholders. Policy-makers have a critical role to play in opening up opportunities and creating the appropriate institutional environment for the effective launch of telecare. A clear legal and regulatory framework needs to be established for the development and delivery of these applications and the reimbursement of the key actors involved, including a framework of practice for health and care professionals. This is necessary in order to enhance users and practitioners' confidence in telecare technologies given the concerns about the potential misuse of medical and personal data. Such a framework would also provide for the transformation of the current paper-based medical record into electronic form. Electronic health records can be accessible by health-care providers and patients and contribute to the reduction of administrative costs, prevent duplicate treatments, and reduce medical errors. In this sense, they are an essential component in the delivery of telecare.

In the short term, policy efforts should concentrate on increasing user awareness and understanding of the benefits of telecare. The latter could be achieved through State-organized events, seminars, and open public workshops. The provision of health-care technology devices to specific target groups (e.g. people suffering from kidney deficiency, diabetes, etc.) that can be easily deployed in individuals' homes according to their evolving needs could be another opportunity to raise awareness. Public authorities also need to invest in the training and education of health and care professionals to advance their ICT skills and capabilities and alleviate their mistrust over their use. Such policies are expected to accelerate the process of change and the transformation of health and social care provision into an IT-driven, knowledge-based system.

Biofuel Production Potential of EU-Candidate Countries

Boyan Kavalov and Peder Jensen, *IPTS*

Issue: The European Commission (EC) has set indicative targets for the market penetration of biofuels, but the agriculturally-based biofuel production potential of the current 15 member states of the European Union (EU-15) appears to be insufficient to meet the targets under the prevailing production conditions. It is sometimes assumed that EU-candidate countries (CCs) have a large, presently unexplored potential to produce biofuels which could be tapped as a way of reaching the indicative biofuel targets within an enlarged EU.

Relevance: The EU is heavily dependent on imported energy resources and especially on oil. Transport is one of the main oil-consuming sector in the EU. Therefore, the EC is developing an alternative fuel policy for transport and in particular for road transport. The EC is proposing biofuels as a viable short-term alternative enabling the energy supply for road transport in the EU to be secured and diversified, and a directive on measures to promote the use of biofuels was agreed on by the Council and the Parliament in March/April 2003. The directive sets out the framework conditions, but needs to be filled out by policies in other areas such as agriculture and by initiatives in the member states.

Introduction

The EU is heavily dependent on imported energy resources and especially on oil. If no measures are taken, the EU's dependence on imported oil could increase to 90% by 2020. Transport is one of the main energy-consuming sectors, responsible for about 67% of the final oil demand in EU, and additionally, it is almost entirely dependent on oil-based products (98%) (EC, 2000; EC, 2002). It is forecast that international energy markets will become increasingly volatile over the next 20-30 years, therefore action needs to be taken now to start addressing a shift in demand away from oil (EC, 2002c). Thus, finding alternative energy sources for transport represents a main challenge for the energy policy of the EU.

The EU is heavily dependent on imported energy resources and especially on oil. If no measures are taken, the EU dependence on imported oil could increase to 90% by 2020

Liquid biofuels are considered to be a promising short- and medium-term alternative to conventional automotive fossil fuels because they require little or no modification to current fuel and engine technologies (EC, 2001a; IPTS, 2002a; IPTS, 2002b). Thus, promoting biofuels in road transport has become a priority of the EU energy policies for transport. Indicative target market shares of bio-

The views expressed here are the authors' and do not necessarily reflect those of the European Commission.

those production levels will require significant input from EU-15, among other things, in terms of crop technology to allow for higher yields.

When assessing the OTP potential, the market situation is not considered. Basically it is assumed that a biofuel market will exist. This could for example be created via obligatory minimum requirements on biofuel content in fossil fuels. Thus, this scenario is not constrained by taxation, agricultural or other framework regulations, affecting the area and as such represents a relatively optimistic scenario.

The potential of the CCs to produce a certain amount of biofuel as a share of the enlarged EU automotive fuel supply is presented in the graphs (see Figures 1 and 2). The absolute shares are accompanied by a curve indicating the "fair share" to be expected from the CCs. The "fair share" is defined as "the expected contribution of a region based on the area of that region as a percentage of the total enlarged EU area". In other words a region covering 10% of the EU-25 could be expected to produce 10% of the EU-25 target. If this target is 5% of transport fuels then this region's "fair share" should be 0.5% of the EU-25's fuel consumption. The Utilized Agricultural Area[1] is used as a measurement of the available cultivatable land.

Biofuel production potential of the CC-10 as part of the EU-25

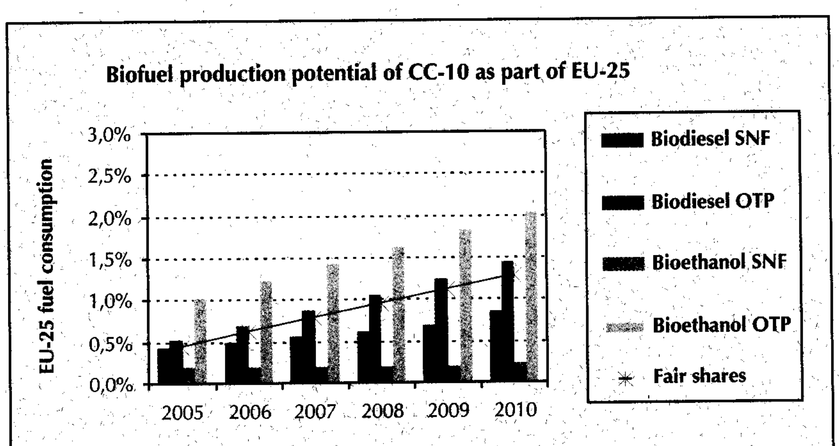
The comparisons of the biofuel potentials of the CC-10[2] with the EU-25's automotive fuel consumption and with the CC-10 fair share in the EU-25's biofuel target are shown in Figure 1.

The following key observations can be made from Figure 1 and the analysis behind it:

- The national forecasts for biofuel production (SNF scenario) are quite modest and well below the fair shares required to meet EU targets – less than 0.9 % for biodiesel and about 0.2% for bioethanol. Modest market expectations certainly play a role here, but another key reason is that the availability of fallow land in the CC-10 is more limited than expected, and because the land which is standing idle, is doing so more due to poor soil quality rather to economic reasons. In addition, six countries from the CC-10 (Cyprus, Estonia, Latvia, Lithuania, Malta and Slovenia) have less favourable climate

The OTP scenario assumes optimal exploitation of all the resources which potentially could be made available for producing biofuels in candidate countries without disturbing their national agricultural balances

Figure 1. Biodiesel and bioethanol production in the CC-10 under the SNF and OTP scenarios, compared to the EU-25 automotive fuel consumption and to the CC-10 fair share in the EU-25 biofuel target, over the period 2005-2010



The national forecasts for biofuel production (SNF scenario) are quite modest and well below the fair shares required to meet EU targets – less than 0.9 % for biodiesel and about 0.2% for bioethanol erate for biodiesel (maximum values of up to around 2%) and relatively promising for bioethanol (up to around 3%) simultaneously.

- As was the case for the CC-10, the national expectations in the CC-12 for the production of biofuels are not sufficient to meet the CC-12's fair shares of the EU-27 biofuel supply. The OTP biofuel output, on the other hand, is generally sufficient to reach the CC-12's fair share of the EU-27 biofuel supply. Compared to the CC-10, the lower biodiesel surplus of the CC-12 is compensated for by a larger bioethanol surplus. Thus, the aggregate "fair share" contribution of the CC-12 to the enlarged EU-27 biofuel supply is larger than the aggregate "fair share" contribution of the CC-10 to the enlarged EU-25 biofuel supply. Thus under optimum conditions agricultural based biofuel production can cover part of the target for the EU-15.

Cost of biofuel production in the Candidate Countries

Present production costs –excluding taxes and subsidies– per litre of biofuel in the CCs vary significantly – 0.41-0.75 EUR for biodiesel and 0.36-0.60 EUR for bioethanol. On the other hand, these figures are similar to the average current production costs of biofuels in the EU-15 – 0.56 EUR for biodiesel and 0.36-0.54 EUR for bioethanol. Thus, at present the CCs do not offer cheaper biofuel production compared with the EU-15.

At present biofuel production costs are not significantly lower in the candidate countries than in the EU-15

Cultivation costs of the biofuel feedstock constitute around 80% of final production cost of biofuels in the CCs on average. Therefore, the main means of decreasing the overall production costs of biofuels in the CCs are tied to improving cultivation and increasing yields per hectare, rather than to improving post-harvesting processing technologies.

Given the large share of agricultural related costs in the final production cost of biofuel, agricultural parameters plays a significant role for the final price. It is possible to assess the impact of changes in yields on the price. This is illustrated in Figure 3 where production cost as a function of yields of 4 crops compared to the EU-15 average yields (IPTS, 2002a; IPTS, 2002b) are shown.

Figure 3. Projections of the CCs' biofuel production costs for different feedstocks, depending on the yields as a percentage of the corresponding EU-15 average yields, compared to the average production costs of biofuels in the EU-15 (IPTS, 2002a; IPTS, 2002b). All figures in EUR/litre fossil fuel equivalent[4]