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ABOUT THE IPTS REPORT

The IPTS Report, launched in December 1995 on the request and under the auspices of the Commissioner for Science, Research and Development, Edith Cresson, has now completed its pilot phase. What seemed like a daunting challenge in late 1995, appears now in retrospect as a crucial galvaniser of IPTS energies and skills.

The Report has published articles in a number of areas, keeping a rough balance among them and exploiting interdisciplinarity as much as possible. Articles are deemed 'prospectively relevant' if they explore issues which are either not yet on the policymaker's agenda (but due to be there sooner or later), or aspects of issues which although on the agenda their importance has not been fully appreciated.

The thorough drafting and redrafting process, based on continuous interactive consultation with our collaborating network of institutes, which will progressively become even more involved in the process, guarantees quality control.

The first, and possibly most significant, indicator of success is that the Report is being read. Issue 00 (December 1995) - of which 2000 copies were printed in what seemed to be an optimistic projection at the time - has become a collector's item. Since then circulation has risen to 6000. Requests for subscriptions have come not only from all over Europe but also from the US, Japan, Australia, Latin America, N Africa, etc.

The positive comments our efforts have received have been highly gratifying and the constructive and engaging criticism of our readership has formed part of the ongoing process of improvement. The comments we have received range from the informal, formal communications (in paper or electronic form), and also include the result of a Reader Survey commissioned by IPTS.

Readers' direct engagement with the content of the report's articles has led us to include a Letters-to-the-Editor section, which started in the June issue.

The rising esteem in which the publication is held is also making it increasingly attractive for authors from outside the Commission. We have already published contributions by authors from such renowned institutions such as the TNO in Holland, the VDI in Germany, the ENEA in Italy, the Council of Strategic and International Studies in the US, etc.

The Report is produced simultaneously in four languages (English, French, German and Spanish), by the IPTS, to these one could add the Italian translation volunteered by ENEA (yet another sign of the Report's increasing visibility). The fact that it is not only available in several languages, but also largely prepared and produced on the Internet's World Wide Web, makes it quite an uncommon undertaking.

We will continue to strive to meet the expectations of our very diverse readership, to avoid the traps of oversimplification, encyclopaedic reviews or the inaccessibility of academic journals. The key is to remind both ourselves and our readers, that we cannot be all things to all people, that it is important to carve out our niche and keep on exploring and exploiting it, hoping to illuminate topics under a new, revealing light, for the benefit of the readers, to prepare them to manage the challenges ahead.

P r e f a c e



*I*n this issue of *The IPTS Report*, I feel it is important to draw your attention to the formal proposal for the 5th Framework Programme presented to the European Council and Parliament by the Commission.

The current political situation forces us to rethink community research policy. The existing Framework Programme only partially meets society's needs, particularly given its complex decision-making structure. This is due to three factors in particular: the requirement that it satisfies at the same time the criteria of unanimity among Member States and co-decision with the European Parliament; the burden of an excessive number of control and approval procedures, which hinder rapid reaction to unexpected situations (for example, the 'Mad Cow' disease case) and the excessive number of programmes and committees.

This state of affairs must be set to rights. The first measure to take is, in my view, to introduce the principle of adopting the Framework Programme upon a qualified majority vote on the occasion of the Intergovernmental Conference (IGC).

Preparation of the 5th Framework Programme has drawn upon, among other things, the research-industry task forces that I launched with Commissioners Martin Bangemann and Neil Kinnock. The idea that it is worth making the Commission services, researchers, industrialists and users think and discuss matters together has gradually caught on. This reflection process makes it possible to better co-ordinate research activities related to the same subject spread out over different programmes. The experience has proved positive, and this will be developed in the next framework programme under the name of 'key actions'. These key actions will have to find their place in the reduced context of the Commission's project to reduce the number of specific programmes to six.

- On the one hand, three thematic programmes, corresponding to the main research areas: living resources and the ecosystem resources, information society and supporting competitive and lasting growth;
- and on the other, three 'horizontal' programmes, corresponding to the following thematic programmes: innovation and participation by SMEs, support for human potential for research and international co-operation.

The evidence suggests that the 5th Framework Programme cannot be simply a continuation of its predecessors. In an ever-faster changing world the pure and simple extension of the past can only lead to regression. A new approach is needed. This is the overall direction of the proposal made by the Commission, at the drawing to a close of the consultation process involving all the actors concerned.

The content of the next Framework Programme is essentially an expression of a collective point of view; Member States, the European Parliament, the evaluation panel of the 4th Framework Programme, chaired by Etienne Davignon, and numerous organizations, both European and national, have all had their say.

Through the 5th Framework Programme, the Commission's absolute aim is to place European research on a new track. The research policy that we wish to promote is that of action adapted to a rapidly-changing world, a new context of competition and a society which demands ever more from science and technology.



THE IPTS REPORT CONTENTS

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4 Editorial

Environment

5 **The Significance of Environmental Technology for Economically and Ecologically Sustainable Development**

The effect of environmental policy on economic performance is complicated by the fact that environmental technology, particularly of the end-of-pipe variety, has become a burgeoning industry. Nevertheless, the effect of integrated technologies, which offer better prospects for sustainability, is less direct and harder to quantify.

Information and Communication Technology

12 **Electronic Access to Public Information: Government On-line**

The potential to offer improved services at lower cost is encouraging many governments to go 'on-line'. However, this step needs to be considered within the context of equal access for all citizens, and security and confidence criteria. Moreover, the interactivity offered by electronic access may make it the ideal opportunity to rethink positions on information access and transparency.

20 **The Web of Babel?**

Although current growth in the World-Wide Web has shifted away from the English speaking world the English language still dominates information available on it. Achieving the Web's potential as a global market place for SME's depends to some extent on linguistic diversity being handled appropriately. This could involve both setting multilinguality standards and looking again at the machine translation options available.

Industrial Competitiveness

28 **Decision support systems in the service of policy makers**

The orthodox theory upon which many decision support systems are based attempts to find a single best solution by eliminating criteria. However, multi-criteria systems offer advantages where conflicting interests have to be considered. Moreover, research into comparing imprecise information and factoring in the points of view of different stake-holders and their interactions has made it possible to come closer to the complexity of real world problems.

Regional Development

36 **EU and the Mediterranean Region: a Future Dilemma?**

The creation of supra-national trading blocks, such as the Euro-Mediterranean Free Trade Area, freeing up movement of people, capital and technology, is seen as an antidote to some of the negative effects of market globalization. However, such blocks often cross regions with very great socio-economic variations, and the effect of this needs to be considered.

E D I T O R I A L

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The first paper in this issue examines two aspects of the environmental policy problem. First it presents evidence in favour of the position claiming that the impact of environmental regulation on the economy and, more specifically, employment is positive. Then it goes on to suggest that in both environmental as well as in economic terms a shift from end-of-pipe to integrated environmental technologies would be beneficial. Closing the loop, it is precisely economic policies/instruments, it is argued, that block or foster such a change of emphasis.

The second article argues that information technology allows government to communicate more effectively and more efficiently with citizens, making public information more easily available and offering improvements in internal administration communication. The key to the successful adoption/implementation of such methods will be the preparation of co-ordinated approaches by policymakers, in order to make available a large variety of delivery mechanisms, to improve accessibility, and to guarantee security of information.

The following article focuses on the World Wide Web (WWW) and the commercial opportunities it presents. It argues that although the WWW is growing faster in the non-English-speaking world than in English-speaking countries, the content in the WWW is still overwhelmingly in English. European SMEs cannot exploit the full potential of the WWW since often neither they, nor their customers, can communicate in English. The existence/promotion of multilingual standards for the WWW, and research on practical, specific scope versions of machine translation could afford European SMEs

a larger potential market, aside from the more obvious beneficial impacts in terms of cultural/linguistic diversity.

The fourth article takes its cue from an article published recently in the IPTS Report on decision support systems. It focuses on an approach favouring multicriteria analysis instead of single-criterion optimisation. This approach, it is argued (and examples are furnished), is more appropriate for fuzzier, less clean decision-making instances - which would describe many of the real life problems faced by policymakers). Instead of aiming at presenting the best solution the approach presented in the article allows a richer set of possible outcomes in various orderings depending on selected preferences (or actor participating in the decision formulation process). The approach, it is argued, facilitates coalition and consensus building, as well as ultimately also conflict resolution.

The final article looks at the Mediterranean region and its development and trade patterns. It argues that the differences between the EU and the Mediterranean littoral may jeopardize the success of the institutions being created (such as the Euro-Mediterranean Free Trade Area to be completed by 2010). It is argued that in the absence of successful technology transfers and appropriate redistributive mechanisms within less developed countries, the displacements suffered by large parts of the population in these countries may result in destabilization and further migratory pressures, particularly when the largest employer - i.e. agriculture - is exposed to competition by more efficient producers (a pattern which has already become evident in recent years). It is suggested that appropriate technology transfer could alleviate such pressures

The Significance of Environmental Technology for Economically and Ecologically Sustainable Development

Reinhard Coenen and Sigrid Klein-Vielhauer

Issue: The overall impact of environmental policy on employment and the economy as a whole is under discussion. Evidence seems to suggest a small positive net impact. The overall environmental and economic impact depends on whether end-of-pipe or integrated environmental technologies are used.

Relevance: The impact of environmental policy on the environment and the economy depends on the kind of approach adopted and/or promoted, in a spectrum ranging from end-of-pipe to integrated environmental technology.

Introduction

In the current debate on environmental policy and economic development two basic positions can be differentiated. They can be roughly characterized as follows:

- Position I claims that a demanding environmental policy does not only lead to environmental improvements, but can also have very favourable economic effects by creating new jobs and developing new markets for environmental technologies. Therefore it is argued that a demanding environmental policy can be combined successfully with economic and employment policies
- Position II claims that taking the lead in environmental policy can endanger a country's economy because the implementation of higher environmental standards compared to other countries would raise compliance costs and overall production costs and thus weaken international economic competitiveness.

Environmental and Economic Benefits of Environmental Policy

Throughout Europe and for other industrial countries of the Western World more empirical evidence exists in support of position I. In many industrial countries success was achieved throughout the 80s and 90s in combating various environmental problems by the use of technology. This applied most notably - although to varying degrees - to the reduction of mass pollutants SO₂, NO_x and dust, the improvement of the quality of surface water, the reduction of the volume of waste and its more environmentally friendly management. At the same time it can be observed throughout Europe that environmental policy has not necessarily had a negative economic impact. Environmental protection has created additional employment. According to a recent study of four leading German Economic Research Institutes (Sprenger) employment induced by environmental policy in Germany amounts to nearly one million jobs in 1994. However, in relation to total

Opinions on environmental policy are divided between those who believe that it creates employment by opening up new markets, and those who believe it reduces employment as it places an extra burden on companies

In Europe the evidence suggests that environmental policy has generally been beneficial to economies

There is evidence that in Europe displacement effects do not outweigh the benefits to employment

Forecasts for the volume of the environmental technologies market vary greatly, depending which technologies are included in the calculations

employment the environmental induced employment is fairly small. According to OECD estimates, it stands at around 1-2 percent on average, and is as high as 3 percent in the US (OECD). These figures include employment in the public sector; environment industry employment is in all countries below 1 per cent of total employment (see Table 1).

Furthermore one has to take into account, the fact that such figures represent gross effects, ie. it cannot be ruled out that displacement effects have taken place. Such displacement effects can be caused by many factors, eg. by losses of economic competitiveness due to higher compliance costs in certain industrial branches, by postponement of investments to increase capacities or by migration of industries with high compliance costs to countries with lower environmental standards. However, there is some empirical evidence throughout Europe that displacement effects do not outweigh the positive employment effects. According to the OECD, most macro-economic

studies on the link between environmental expenditures and employment suggest that net employment effects are positive, but that the linkage is fairly weak. It is possible that negative employment effects may increase in the case where a country implements much more demanding environmental protection requirements than those in competing countries.

Employment effects also depend on the extent to which a country succeeds in gaining additional market shares on the world market for environmental technologies. Forecasts for the volume of this market are very optimistic, however they differ considerably because of different definitions of the environmental industry. Some forecasts only include end-of-pipe technologies and clean-up services, whereas other forecasts include in addition energy-saving technologies, renewable energies etc. Therefore forecasts indicate a range between 300 billion US dollars up to 580 billion US dollars for the world market in 2000 compared to 200-255 billion US dollars in 1990.

Table 1. Environment industry employment, 1992

	EMPLOYMENT (THOUSANDS)¹	SHARE OF TOTAL EMPLOYMENT (PERCENT)
United States	1070.0	0.91
Canada	65.0	0.53
Japan	580.0	0.90
France	110.0	0.49
Germany	171.5	0.48
Italy	12.7	0.06
Netherlands	24.4	0.37
Finland	15.0	0.69
Norway	4.2	0.21
Switzerland	15.6	0.45
Australia	11.0	0.14

1) Employment values relate to different years (1990, 1992, 1993), and are based on widely differing national definitions, usually covering only part of the industry.

Source OECD, 1996

Invariably south-east Asia, East and Central Europe and Latin America are seen as the most promising markets, although the growth of the markets in the latter two regions will depend on the economic development in these regions. Leading competitors, on the world market for environmental products and services are the US with a market share in international trade of 19%, Germany 18.5%, Japan 13% but also other European countries have reached comparatively strong positions on this market. It has to be expected that the competition in this market will become tougher, as several countries have implemented deliberate policies to strengthen their position on this market, especially the US, Japan, and South Korea.

End-of-pipe technologies and integrated environmental technologies

The employment effects and the markets for environmental technology and services discussed so far are largely based on end-of-pipe technologies and clean-up technologies and services. However, these technologies which I would like to describe as conventional environmental technologies are rapidly coming to their limits. Moreover end-of-pipe technologies are often connected with the shifting of environmental problems from one environmental medium to another, eg. the application of control technologies for SO₂ or dust or waste water purification technologies leads to the creation of solid waste and thus to waste management problems. Furthermore end-of-pipe technologies do not offer economically justifiable solutions for such urgent environmental problems as global warming and the depletion of the ozone layer.

Therefore, a more ecologically sustainable development requires a change of paradigm in the engineering approach to environmental protection, ie. from an emission-oriented or end-of-pipe approach to a source-oriented approach, directed at

avoiding emissions and wastes by reducing the energy and material flows in production and consumption processes. This approach is so-called integrated environmental technology, which from the very outset reduces emissions and the volume of waste by reducing the use of energy and other resources in manufacturing processes and products.

The difference between end-of-pipe technology and integrated environmental technology can be described as follows:

End-of-pipe technologies can be characterized as an engineering approach by which special devices or installations are added to existing production processes in order to transform raw emissions into other substances which are easier to handle or to control. It is very important to stress firstly that raw emissions are not reduced but only transformed by end-of-pipe technologies and secondly that the production processes and properties of products remain essentially unchanged when using end-of-pipe devices. Therefore it is fairly easy for companies to comply with new environmental requirements by using end-of-pipe technologies.

On the other hand, integrated environmental technologies are characterized by an engineering approach in which the raw emissions are reduced. However it is difficult to find a simple definition, although one can characterize integrated environmental technologies by different attributes, such as.

- reduced input of energy and materials in production processes and products
- process integrated recycling of materials, water; use of waste heat
- replacement of hazardous substances by other, more environmentally sound substances
- consideration of the entire life-cycle of products in the engineering process
- more durable and easily repairable products and processes

Environment 7

Estimated employment benefits are mostly a result of end-of-pipe technologies, although a sustainable approach requires a shift from end-of-pipe to source-oriented approaches

End-of-pipe technologies use special devices or installations which are added to existing production processes to transform raw emissions into other substances which are easier to handle

Integrated environmental technologies are characterized by an engineering approach in which the raw emissions are reduced

Environment

Integrated environmental technology usually has lower production costs due to lower consumption of energy and resources, whereas end-of-pipe technologies tend to increase production costs

Despite the advantages of integrated environmental technologies end-of-pipe technologies still dominate environmental protection

Environmental and economic efficiency of environmental technologies

It can be shown that integrated environmental technology has both economic and ecological advantages compared to end-of-pipe technologies (see Table 2). From the ecological point of view, the use of resources is reduced and with them, the raw emissions, not only at the stage of manufacturing, but at the preceding stages of resource extraction and refining whereas more resources and energy are needed in the case of end-of-pipe technologies to operate the additional emission control devices; the problem of shifting of environmental problems from one medium to another is reduced, too. Integrated environmental technology also offers solutions where end-of-pipe technology fails, eg. in the reduction of greenhouse gas emissions. From the economic point of view, integrated environmental technology usually has lower production costs due to

lower consumption of energy and resources, while end-of-pipe technologies tend to increase production costs through operation costs for end-of-pipe devices without any increase in the volume of production. The application of integrated environmental technology is connected with an improvement of the ecological and resource efficiency and can also lead to an increase in overall productivity.

Against the background of these principal environmental and economic advantages of integrated environmental technologies, one has to raise the question why the use of end-of-pipe technologies still dominates in environmental protection. In Germany for instance, 80% of all investment expenditure goes into end-of-pipe installations; however, this figure may be somewhat misleading because it is difficult to separate the investment costs for integrated environmental technologies from the total

Table 2. Environment and Economic Efficiency of Environmental Technology

ENVIRONMENTAL EFFICIENCY	
End-of-pipe technology	Integrated environmental technology
<ul style="list-style-type: none"> - shifts of environmental problems from one environmental medium to another - increased input of energy and materials to operate the additional End-of-pipe installations - no or low potentials for mitigating some urgent environmental problems (Greenhouse-effect, depletion of the ozone layer) 	<ul style="list-style-type: none"> - lower input of energy and materials associated also with lower environmental pollution on proceeding stages of production processes - raw emissions are reduced - potentials to mitigate environmental problems which cannot be tackled with End-of-pipe technologies (Greenhouse-effect, depletion of the ozone layer)
ECONOMIC EFFICIENCY	
End-of-pipe technology	Integrated environmental technology
<ul style="list-style-type: none"> - additional capital and operating costs for the End-of-pipe installations without increasing the production output - reduction of total productivity 	<ul style="list-style-type: none"> - reduced costs for energy or materials because of higher energy and material efficiency - increase in total productivity

investment costs. Therefore investment in integrated environmental technologies may be being underestimated in official statistics.

Barriers to the use of integrated environmental technologies

But nevertheless the fact is that end-of-pipe technologies still dominate in current environmental protection because the increased use of integrated environmental technology is faced with barriers to innovation and investment in most Western countries. Most important among these are the following:

- the dominance of very inflexible command and control regulations in most industrialized countries as instruments of environmental policy, whose standards are oriented toward the performance standards of end-of-pipe technologies,
- higher investment costs compared to end-of-pipe technologies
- so-called sunk costs in the case that the entire plant or considerable parts have to be shut down prematurely if a company wants to meet new environmental requirements with integrated environmental technologies
- higher transaction costs, operational risks in the application of new manufacturing processes based on integrated environmental technologies, new know-how, not available from the staff of the company may be needed
- low certainty of planning for companies due to a lack of long-term planning in environmental policy.

Measures and Instruments of environmental policy

In order to overcome these barriers and to promote the diffusion of integrated technologies it is essential to shape environmental policies so that

- more flexibility is given for companies in complying with new environmental requirements
- economic incentives are offered to implement technological solutions which are superior to end-of-pipe technologies and
- guidance for entrepreneurial planning is given through long-term environmental goals and norms.

The following measures seem to be appropriate in this respect:

Firstly, the introduction of long-term environmental planning can be essential for an increased use of integrated environmental technology because it ensures long-term planning security. We believe that the Dutch National Environmental Policy Plan is a good example of long-term environmental planning with concrete long and middle-term quantified environmental goals and specific time frames. Other EU member states like Austria, Denmark and Sweden have also introduced long-term environmental planning.

Secondly, flexibilization and dynamization of command and control regulation, together with the additional introduction of economic incentives can be favourable for integrated environmental technology. Examples are for instance the early announcement of the introduction of new or stricter environmental standards, or licensing procedures which take into account overall environmental efficiency and resource efficiency and not only emissions like the planned EU guideline on Integrated Pollution Prevention and Control (IPC). In order to set economic incentives the introduction of emission charges or emission trading for emissions which are allowed under current emission limitation standards could be complementary measures.

Inflexible command and control regulations in most industrialized countries favour end-of-pipe technologies

The introduction of long-term environmental planning can be essential for an increased use of integrated environmental technology as it ensures long-term planning security

Flexible financial instruments such as eco-taxes offer incentives to companies to realize advanced environmental technology solutions

Eco-auditing and eco-labelling can promote the diffusion of integrated environmental technologies as they improve a company's understanding of its environmental impact

Thirdly, the use of integrated environmental technology could be in general increased by the introduction of economic instruments, such as eco taxes, input or emission charges, and emission trading, because they offer flexibility and economic incentives for companies to realize advanced environmental technologies solutions.

Fourthly, voluntary agreements and commitments of industries as another instrument can favour integrated environmental technologies, because they offer the largest flexibility possible for companies to implement environmentally sound technical solutions in fulfilling environmental goals. However stringent control procedures are essential for the efficiency of this type of instrument.

Last but not least, such instruments as eco-auditing and eco-labelling can promote the diffusion of integrated environmental technologies as they improve a company's understanding of the environmental effects of its processes and products and of the possibilities to improve its environmental performance.

Concluding remarks

It is quite obvious, that the broad diffusion of integrated environmental technology can contribute to a more environmentally sustainable development, but what are its economic impacts?

Firstly, the increased diffusion of integrated environmental technologies may have in the long-term negative consequences for the conventional environmental industry. But there will be always a market for end-of-pipe technologies and clean-up technologies, because end-of-pipe technologies and integrated environmental technologies are not alternatives. There will be always emissions which have to be controlled and wastes which have to be treated; eg. one will always equip a fossil fuel power plant with desulphurization and

denitrification installations or cars with catalysts also in the case that future fossil fuel plants or cars may be much more energy efficient than today. Therefore it is still important for countries to further develop end-of-pipe technologies in order to secure competitiveness in this market.

Secondly, end-of-pipe technologies may be attractive in the short-term because of employment effects, but in long-term it is essential for countries and companies to offer products and production processes with advanced, that is to say integrated, environmental technology, in order to ensure general competitiveness on the world markets. It is expected that in the future environmental performance of production processes and products may become an equally important factor for international competitiveness as prices and functional performance.

Thirdly, the broad diffusion of integrated environmental technologies may have negative employment effects because of employment cut-backs in the conventional environmental industry and in energy and material production industries; however in order to ensure international competitiveness and to avoid the loss of markets for other goods and thus employment-cutbacks in other industries it is essential for a country to develop and to offer products and processes on the world market which integrate advanced environmental solutions. Whether the increased use of integrated technologies will lead to more employment will largely depend on the extent to which new markets for production processes and products with superior environmental performance can be developed by a country's industry.

Fourthly, the promotion of the use of integrated environmental technologies is surely a very important element of a strategy towards ecologically sustainable development, but calculations of the reductions of energy and resource use and of

emissions needed to reach ecological sustainability made by ITAS, the Wuppertal Institute and the Dutch Sustainable Technology Development Programme (STD Programme) show that such gains in energy and resource efficiency are far beyond what seems technically possible in the next fifty years. Therefore technological fixes, that is to say purely technological solutions to reach ecological sustainability, cannot be expected. This leads to the conclusion that strategies to reach sustainable development must combine policies to improve

environmental efficiency of technologies with so-called sufficiency policies which aim at changing environmentally detrimental economic structures and life-styles.

Strategies to reach sustainable development must combine policies to improve environmental efficiency of technologies with so-called sufficiency policies which aim at changing environmentally detrimental economic structures and life-styles.

Keywords

Integrated Environmental Technology, End-of-pipe technology, environment and employment, sustainable development, Environmental instruments, Environmental Efficiency

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the economy as a whole

and for individual areas of the economy and society

and the policy instruments to influence them

Electronic Access to Public Information: Government On-line

Dr Puay Tang

Issue: Effective use of information technology can result in cost savings for governments and taxpayers. This has formed a major catalyst for governments to adopt electronic delivery of information services, with the twin aims of improving its internal administration so as to provide better information services to the public, and making public information widely available and accessible. Achieving these aims will require a strategic and co-ordinated approach by policy makers, taking into consideration different communities of users and categories of uses, and with an emphasis on ensuring that there is a wide variety of delivery mechanisms to disseminate public information.

Relevance: Government can harness the vast range of information technology applications now available, enabling them to deliver public information widely, efficiently and quickly. This has important consequences for improving information exchange between government and citizens, and thus for the democratic process. A full range of delivery mechanisms for public information will help to ensure that no one group of citizens is disadvantaged.

Government agencies and departments, and intergovernmental bodies have begun to use the Internet on an increasing basis for dissemination of a variety of public information

Most countries recognize that information provision is a core government activity and wide dissemination of public information can be readily enhanced by electronic means

Introduction: Electronic delivery of government information services

Several governments have begun to harness information technology (IT) to (1) reorganize their internal administration so as to provide better information and more efficient services to citizens and businesses; and to (2) secure cost savings for the taxpayer through improved delivery mechanisms. In particular, government agencies and departments, and intergovernmental bodies have begun to use the Internet on an increasing basis for dissemination of a variety of public information, such as on legislative, policy and regulatory developments. Governments also have begun to use electronic services, such as for tax filings and procurement.

Several reasons underpin the move by governments to adopt electronic information services. Above all, most countries recognize that information provision, inter alia, is a core government activity and wide dissemination of public information can be readily enhanced by electronic means. At the same time, the uncomfortable but real need to cut administrative costs as a result of fiscal pressures, reinforced by an intensified demand for more responsive, productive and efficient, and less costly government, are spurring governments to review and reform their modus operandi.

Furthermore, buttressed by the prevailing wisdom that the initial high cost of installing IT systems is offset by steadily improving cost-performance ratios and the increasing user-friendliness of these

technologies, national administrations are accelerating their adoption (Office of Technology Assessment 1993).¹ Governments also realize that use of electronic information delivery provides an important means of fostering the development of the 'information superhighway'.

These factors have formed the main impetus toward the public adoption of IT applications for public information services. Government White and Green Papers, blueprints and reports present 'visions' of the Information Society, of which an integral component comprises governments 'going online.'² With specific regard to the public use of electronic delivery, the US Government, in 1993, presented its seminal idea of 'reinventing government' in *Creating a Government That Works Better and Costs Less: Report to the National Performance Review*. Since then, a variety of useful US government information has been widely and freely available on the Internet. In late 1996, the UK Government published its Green Paper *Government Direct* which also focused specifically on the electronic delivery of public services³. Policy implementing this public service reform is not expected until 1998, by which time the UK Government hopes to have completed gathering submissions from the public as to what services should be delivered and how.

The degree of adoption of electronic information services diverges widely among countries as many governments are still grappling with the 'right' strategy for their implementation. There is a catalogue of requirements that policy makers could consider in their formulation of an effective 'government on-line' strategy.

Ingredients for a 'government on-line' strategy

First, a government on-line strategy enjoins government to be clear about the goals for the

adoption of electronic information services. Importantly, these goals should include not only defining what is being delivered but why it is being delivered to the public. The definition of these objectives involves identification and consistent promotion of a coherent information agenda within government-wide management initiatives which recognises that the transition to new procedures entails 'institutional instability' and therefore, opportunities for departmental and interdepartmental adjustments. Training, and interdepartmental co-operation and co-ordination also should be provided (Bellamy and Taylor). Failure to institute team work will lead to fragmentation and short-sightedness which will be detrimental to the development of a well-formulated policy.

Second, a government on-line strategy should attempt to link goals with technical options, operational realities and opportunities for delivery offered by the existing telecommunication infrastructure and mass media means. Attention also could be paid to the possibility that government could have a role in promoting the development of delivery mechanisms.

In countries, such as those in the European Union, which are in the process of liberalizing their telecommunication infrastructures, interoperability of the network systems to ensure end-to-end connectivity between government departments or agencies and public users is an important issue. Open systems, using commercially available standardized equipment and software, should be adopted as a common delivery platform and they are consistent with a well-designed information system.

Third, the provision of useful and relevant information which serves the disparate needs of citizens requires that the public knows that it has a right to such information. In this context, countries

A variety of useful US government information is widely and freely available on the Internet

A 'government on-line' strategy enjoins government to be clear about the goals for the adoption of electronic information services. Moreover it should link goals to technical options

Open systems, using commercially available standardized equipment and software, could be adopted as a common delivery platform

No copyright subsists in the US on public information, and this is an important factor in explaining the widespread and free access to, and use of, electronic public information

User involvement includes the engagement and the soliciting of feedback on new services and products from various communities

Accessibility encompasses not only the means to receive the information, but should include the attainability, comprehensiveness, timeliness and usefulness of the information provided

that are less familiar with a culture favouring 'open government' may need to consider reconciling their 'less open practices' of information sharing and dissemination with the realities of an environment in which electronic information services are becoming more widely diffused.

It can be argued that the US is the leading proponent and 'practitioner' of such a culture, firstly, because of its legislated Freedom of Information Act, and secondly, of the large amounts of information that is freely available on the Internet (Tang 1996). For instance, the Department of Commerce maintains 'Fed World' which connects users to more than 135 government bulletin boards. All press releases available to the White House press corps are also available on line, and the public can e-mail the President and Vice President. This could facilitate greater transparency in government. Similarly, a Government Information Locator Service, established in December 1994 helps to identify public information resources throughout the Federal Government, describes the information available, and provides advice on how to obtain the resources. Unlike UK Crown copyright which subsists in UK government documents (usually in print form) which largely have to be paid for, no copyright subsists in US public information, and this is an important factor in explaining the widespread and free access to, and use of, electronic public information.

Another necessary aspect of a coherent strategy for the successful implementation of electronic services delivery is user involvement. User involvement includes the engagement and the soliciting of feedback on new services and products from various communities, such as employees, citizens, customers and recipients of the services. It also entails the promotion of private sector partnership in the development and testing of a diversity of delivery mechanisms which could

be less costly and more effective in the long run, than selecting or focusing on a 'winning' technology at the outset. To secure the participation of users, government could undertake a concerted awareness raising campaign prior to the introduction of electronic service delivery, as well as plan for public education and outreach activities so as to gain involvement and support from users.

Two other requirements for a well devised strategy deserve separate consideration and have been the foci of much attention, namely accessibility and security. Accessibility entails that there must be easy, affordable and widely available access to delivery points so that no particular group of citizens is explicitly disadvantaged. Security dictates that the architecture must be in place to support the obligations of government to protect information from being manipulated, pirated, or modified, and to ensure reliable delivery.

Delivery Points of Access: Plugging the gaps

The availability of a delivery infrastructure is a sine qua non condition for any form of information delivery. Accessibility encompasses not only the means to receive the information, but should include the attainability, comprehensiveness, timeliness and usefulness of the information provided (Bouwman 1996). In a sense, then, access must also include raising citizen awareness to the availability of public information services.

There are several categories of users and uses of information services. Recognition of this underpins a vital ingredient for the 'right' strategy for the implementation of public delivery of information services. At a recent workshop on The Economics of the Information Society organized by the OECD and the Korean Information Society Development Institute in Seoul, experts

highlighted the importance of a variety of delivery mechanisms so as to avoid deepening the existing information gap between the 'computerised' and the 'computerless'.

Several electronic delivery points of access can be identified. The home clearly constitutes the most significant point of access, but this presumes that most households own computers and modems, which is currently not the case. Instead, governments also could focus delivery of information through audiotex (telephone); voice and data information services, recordings, voice-based interactive services, teletext and interactive television services, fax-based services, or as in France, through the use of state-provided terminals, such as Mintel

The second point of delivery could be through schools, colleges, universities and libraries. As with the home, services can be delivered directly to schools and libraries. Access to services through education institutions and libraries will likely satisfy the 'computerless but computer-interested' consumer; and these locations can serve as 'tutorials' or 'practice runs' to acquaint and familiarize interested parties and potential users with the use of electronic information services. Other means of information delivery, such as those noted above, also could be considered. For instance, in early 1997, the US Government Printing Office opened its first gateway site in Northwestern University Library giving the public free access to many Federal documents and databases via an Internet connection or a phone call to the GPO Access Services.

Similarly, as most offices and businesses own computers, services can be delivered directly to them, and workers and employees can begin to use these services at the workplace. At stores and banks, electronic benefits transfer, for instance, can be used to deliver public assistance or other benefits

(social security, pension and unemployment payments) to the public using automated teller machines and point-of-sale terminals in stores. Through these delivery mechanisms, the less advantaged citizen can come to realize the utility and availability of these information services.

Neighbourhood electronic kiosks can be effective delivery points. As an 'information dispatcher', electronic kiosks comprise computer stations that combine text, sound, video, and graphics to provide services in a central location. According to IBM, kiosks are a leading multimedia market for the company in Europe (Multimedia Business Analyst 1994 p. 12). The local authorities in Manchester in the UK, for example, are experimenting with employment opportunities kiosks in an effort to expedite job searches for those in the area. Kiosks can be located in public places, such as shopping malls and post offices.

Local projects such as the UK Cambridge Childcare Project in the north of England which provides a 'one-stop-shop' for information on child care, jobs, training and benefits is an outstanding example of community one-stop service centres and users regard this as a successful example of useful and comprehensive government information service (Tang 1997). Mobile and remote access also can be provided through cellular telephones, satellite receivers or laptop computers to those living in remote places where it might be costly to set up a community one-stop service centre. The possibly limited range and quality of the information services may be offset by guaranteed faster access than would be possible without them. Voluntary and self help organizations could be provided with these facilities which also can serve as a form of 'grass roots educational facility.'

Small business innovation, training and development centres, such as the UK Technical Enterprise Councils and Business Links, could be

A variety of delivery mechanisms is important to avoid deepening the existing information gap between the 'computerized' and the 'computerless'

Access to services through education institutions and libraries will likely satisfy the 'computerless but computer-interested' consumer

The local authorities in Manchester in the UK, for example, are experimenting with employment opportunities kiosks in an effort to expedite job searches for those in the area

Although computer networking is generally singled out as the delivery mechanism, it is important to avoid relying on networks as the sole mode of service delivery

The growing number of Web sites that have been hacked into could reduce users' confidence in Web-based public information

Cryptography is more relevant to commercial transactions and financial information than to information dissemination

In countries where government information is the such as the UK, governments may have to reform the law or tighten copyright protection for digital material

established to help regional small and medium sized businesses enterprises with a number of business related issues. In Canada, France, the US and the Netherlands, for instance, information to assist smaller businesses tackle the bewildering administrative procedures for export, import and tax filings, business and export opportunities, and regulatory developments is widely available.

In sum, the delivery infrastructure is integral to the realisation of public delivery of information. Although computer networking is generally singled out as the delivery mechanism, caution must be exercised against putting all 'the eggs in the basket of computer networks' as a mode of electronic service delivery. Importantly, the diversity of delivery mechanisms will serve different communities of users and categories of uses, thereby providing effective and equitable access to the public.

The Security Challenge: Plugging the cracks

While the provision of public information could be delivered through a dedicated network, in reality, this will not be the case in most countries. This being so, a secure and reliable delivery infrastructure which delivers accurate information will be required to help instil the confidence of users about the authenticity and integrity of the information. Users, sophisticated and lesser, must feel assured that the information they are receiving has not been tampered with, or modified. The growing number of Web sites that have been hacked into, including lately the UK Labour Party Home page, does not bode well if it means users are increasingly suspicious of public information. For instance, facts and analysis with, and of, policy decisions require accuracy, authenticity and reliability.

Dan Farmer, one of the developers of SATAN (software which scans computer networks for their security from outside interference), used it to

conduct an unauthorized survey of 2200 Web sites in late 1996 and found that more than 60 per cent of them could be broken into, with minimum effort. These sites included banks, the US government, credit unions, newspapers and companies trading over the Internet. Disturbingly, Farmer reported that sites used by banks, government departments and companies were the most susceptible to hacking (Ward 1997, p. 4) Although cryptography — the scrambling of information into unintelligible sentences and unscrambled with a private key (string of codes)— is possibly not the optimum measure for securing public information that is to be disseminated, other software-based applications, such as the use of identifiers (headers), the construction of firewalls and interference-detection software, may accord a higher degree of security than there would be without some of these protective devices.

Cryptography, however, is more relevant to commercial transactions and financial information, all of which reasonably require a high degree of confidentiality, security and non-repudiation. Cryptography, however, could be considered to secure both information and payment for government electronic publications that are to be paid for electronically. The continuing focus on enhancing the security of electronic payment systems addresses the possibility that electronic commercial transactions will not flourish unless the participants are convinced that the risks are acceptable, given the level of security provided in the delivery infrastructure.

In countries where government information is copyright, such as the UK, governments may have to reform copyright law or tighten copyright protection for digital material. There is robust debate over copyright government information and it is widely contended that the licensing of works produced by taxpayers' money should be freely available to the public. Otherwise, charging

for government information will limit its availability. To increase information exchange and accessibility, governments may want to consider giving up the copyright on their documents; in the case of the European Union, this may have to be harmonized. Free public information will still require security of delivery and content.

Government on-line is an international issue: Multilateral initiatives

A defining characteristic of electronic delivery is that it is not subject to spatial constraints. The borderless nature of electronic delivery has, in large part, provided an impetus for a number of international initiatives aimed at developing a global electronic information infrastructure. Three of these deserve mention: the European Commission Interchange of Data between Administrations (IDA) programme; the G7 On-line project and the OECD-led initiative for the formulation of Cryptography Policy Guidelines.

European Commission Interchange of Data between Administrations Program

The Bangemann High Level Group, a committee of prominent industrial representatives from the IT and telecommunication industry, led by Commissioner Martin Bangemann of DG XIII, in Europe and the Global Information Society, identified the need for a truly interoperable trans-European public administration network as a top priority.⁴ To achieve this, the Group recommended strengthening and speeding up the IDA programme.

The aims of the IDA programme are:

- (1) to contribute to the implementation of trans-European telematic networks for the exchange of data between administrations;
- (2) to ensure the smooth functioning of the Internal market and European Union policies, and faster circulation of information between

Member State Administrations and European institutions so as to support the Union decision making process between its institutions and Member State Administrations; and (3) ensure co-ordination and harmonization between all partners, and where necessary, provide European Union support for critical sectoral projects (DGIII 1994, p.1).

Since 1993, a range of activities has been undertaken to ensure interoperability, identify missing links and address legal issues. The IDA programme also supports various European organizations, such as the European Environment Agency in Copenhagen and the European Medicine Evaluation Agency in London. In addition, the majority of the Directorates of the European Commission and their associated agencies are making extensive use of the Internet to disseminate Union information.

The G7 On-line Initiative (GOL)

The GOL is one of eleven collaborative projects launched by ministers under the G7 Information Society Initiative, after the Ministerial conference on the Information Society in February 1995. The Initiative aims to identify projects where international co-operation would be an asset to the development and deployment of electronic information infrastructure.

A principal aim of the GOL is to provide fully interactive on-line services to allow the public both to obtain and provide information from a variety of locations, including the home. In developing these services, the project focuses on making government information widely available, developing on-line transaction processing for the support and delivery of routine services, facilitating information exchange between governments and stimulating interaction between business and government.

The IDA programme seeks to implement trans-European telematic networks for the exchange of data between administrations within Europe

The G7 GOL initiative aims to identify projects where international co-operation would be an asset to the development and deployment of electronic information infrastructure

Cryptography is widely acknowledged as the best means of enhancing the security of information delivery

To date, the G7 GOL has 20 participating administrations, including the European Commission and a number of non-G7 countries. In July 1996, the co-chairs of the project reported that international co-operation and common actions for information provision and information exchange have been successful. Significantly, it is now possible to obtain a wide range of information on the activities of the G7 Initiative through the Internet, particularly on projects requiring the participation of the private sector.

OECD Work on Cryptography Policy Guidelines


Cryptography, as noted earlier, may not be appropriate for the security of widely disseminated public information. Nonetheless, it is a critical method of protection of sensitive, classified or confidential information, much of which is generated by government, and it is widely acknowledged as the best means of enhancing the security of information delivery.

Under the auspices of the Committee of Information, Computer and Communications Policy (ICCP), extensive work on cryptography technologies has been carried out since 1989. The prime aim of this continuing exercise is to assist decision makers in the development and implementation of coherent national and international policies for effective use of cryptography. The Group of Experts formed by the ICCP, and which involves a broad spectrum of representatives, is charged with the task of devising guidelines and a framework for the international harmonisation of cryptography policies. It is well

understood that such multilateral co-ordination is essential for secure global delivery of electronic information.

The Group expects to complete its recommendations by early 1997. As with the previous OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data (1980) and the 1992 Guidelines on Security of Information Systems, both of which relate to the uses of cryptography and which were well received by Member governments, the forthcoming guidelines by the Group is expected to contribute substantially to the international harmonisation of cryptography policies.

Policy Implications

Many governments are aspiring to go on-line. To do so, they will need to have a coherent strategy for the implementation of electronic information services and ensure wide accessibility to information sources. To this end, there has to be a variety of delivery mechanisms for different users, and their availability must be promoted. To increase information accessibility, governments also may want to revisit the issue of copyright of their publications. To increase transparency, governments may want to encourage citizens to communicate directly with them, such as through electronic mail or to institute a 'freedom of information' act. Attention should also be given to the security and reliability of the delivery infrastructure so as to build user confidence. Inadequate consideration of these elements will significantly slow down access to public information. 

Keywords

Electronic information services; electronic information infrastructure, open government, security, accessibility

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Notes

1- While it has been argued that it is difficult to quantify the benefits of electronic delivery, resulting thereby in only indirect references, for instance, in official US departmental budgets, there is a widespread belief that electronic delivery potentially offers considerable savings to service recipients and providers, especially when the value of their time is included. Computer bulletin boards and trials of electronic kiosks have demonstrated these savings.

2- Examples of these publications include the Netherlands Actieprogramma Elektronische Snelwegen (Action program electronic highways - from metaphor to action), Sweden's Information Technology: Wings to Human Ability, Networking Australia' Future; Denmark's Info-society 2000; Japan's Reforms toward the Intellectual Creative Society of the 21st Century: Programme for the Establishment of High-performance Info-communications Infrastructure; Singapore's Information Technology 2000: A Vision of an Intelligent Island; the European Commission's Europe and the Global Information Society: Recommendation to the European Council, Bangemann Group, and the G7 Ministerial Conference on the Information Society: Theme Paper.

3- Available on <http://www.democracy.org.uk>

4- See also Commission of the European Communities, *Europe's Way to the Information Society: An Action Plan*, COM(94) 347 Final (Brussels: 1994).

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The Web of Babel?

J. Stamm'ler Jaliff, M.T. Carrasco Benitez, I. Urquhart

Issue: The explosive growth of the Internet and the World Wide Web shows no signs of abating. New users and servers are turning up everywhere, particularly in non-English-speaking countries. However, an overwhelming part of the information content available is in English. There is a shortage of products to cut today's high costs of multilingual information storage, retrieval, exchange and translation. Current international initiatives for higher-level software standards could help.

Relevance: As the backbone of the emerging multimedia Information Society, the global information highways will shape tomorrow's way of life. Three different linguistic communities are appearing: the truly multilingual, the English (sometimes plus a local language) and the purely local. European SME's risk falling into the latter group. There is a short time window to influence the outcome, before a baggage of legacy data makes change difficult.

The Web could quickly develop into a Tower of Babel where user communities are unable to communicate efficiently with one another unless they share a common language

The World Wide Web keeps growing at a steady pace in terms of server sites, web pages and Internet users. There is a growing awareness of its potential for inter alia interpersonal communications, research, education and electronic commerce. By connecting people and organizations electronically through computers, the Web provides a unique opportunity to extract benefits from language diversity. But unless advantage is taken of those computers, the Web could quickly develop into a Tower of Babel where user communities are unable to communicate efficiently with one another unless they share a common language.

In order to materialize benefits, it is necessary to lower the cost/benefit threshold of multilinguality through services, tools and standards that better support the creation, management, operation and

accessibility of multilingual sites, as well as the concomitant translation process. For example, international initiatives in this direction were presented recently at WInter96, the Web Internationalization & Multilinguality Symposium, held in Seville, 20-22 November 1996 (co-organized by Sadiel, Seville, Spain and W3C, the World Wide Web Consortium with chapters in the USA, Europe and Japan; supported by the European Commission as part of the G7 Project 'A Global Marketplace for SME's).

Government action can influence the way this situation develops. The European Council decided on November 21, 1996, the adoption of a multiannual programme to promote the linguistic diversity of the Community in the information society, and the European Commission has launched the Multilingual Information Society

Programme (1996-1998). We will now present issues related to Web multilinguality from a broader perspective, and discuss some immediate concerns for policymakers.

Multilinguality and the Web

The predominant language on the Web is English. Experienced Web users rank it subjectively at 95% of all available information, but this is difficult to measure objectively. Research based on hit ratios for the same term in different languages indicates some 80% dominance of English; for scientific subjects, it is close to 100%.

However, one must take into account that the countries with highest Internet connectivity growth rates are outside the English-speaking world. Furthermore, some users were, until not long ago, virtually forced to communicate in English due to the lack of support for their language's character set in their e-mail systems, editors, browsers, printers, etc. A better indication of individuals' present interest and demand for other languages in the Web at large is the abundance of on-line discussion groups: more than 60 different languages are active.

This is good news for Europe seen from two aspects. Firstly, it suggests that the Web is more likely to protect national languages than to kill them. Secondly, it hints that people do indeed prefer to conduct business in their native language, even on the global information highways. This should give European suppliers a competitive edge, considering the 'localisation' of their products to overseas markets which speak European languages.

But there is bad news too. Firstly, support for multilinguality in the form of cost effective tools, services, and software is not yet adequate. Secondly, in the case of the European software

industry at least, interest in multilinguality seems to be less than that of the American. Most of the participants at the aforementioned Seville symposium represented US companies, as was the case at the recent Unicode conference in Mainz. Indeed it may be argued that one of the factors in the global success of the US software industry is the attention that it has paid to issues of multilinguality and multiculturalism, to the extent that most of the major US IT companies derive more than 50% of their revenue from localized products sold on the international market. If the analogy of the software industry can be applied to other industrial sectors, then it appears that, despite European experience of the Single Market, US companies may be able to better exploit multilinguality and multiculturalism as elements of competitive advantage.

Software Standards

W3C: "The World Wide Web currently has a severe bias toward English and the Western-European writing system. But modern business, research, and interpersonal communication are increasingly conducted in other writing systems and languages. The Web must be enhanced to meet the needs of the global community".

W3C, the unofficial Web standard-setting organization, is currently promoting the internationalisation of basic software standards. For HTML (HyperText Markup Language), internationalisation takes place at two levels:

- (1) the characters in the text (apart from the markup) should be able to represent non-western alphabets, such as Cyrillic, Arabic, Hebrew, Japanese, etc.;
- (2) in addition, for correct display and other operations, it is sometimes necessary to explicitly set the language of a text fragment. For HTTP (HyperText Transfer Protocol), a new version that can do 'language negotiation' is proposed.

The predominant language on the Web is English, although the countries with highest Internet connectivity growth rates are now in countries where English is not the first language

People appear to prefer to communicate in their own language where possible. The Web is more likely to protect national languages than to kill them

W3C, the unofficial Web standards organization, is currently promoting the internationalization of basic software standards

If action is not taken soon the bulk of 'legacy data' will make change difficult

Machine translation has remained an elusive goal, partly because of computers' inability to recognize context

One can say that the most basic internationalisation issues relating to the transmission and presentation of multilingual information have been solved. Attention is now turning to issues relating to multilingual information content, such as translation, and information retrieval and extraction. A few remaining basic issues are nevertheless significant. For example, it is important to introduce multilanguage tagging capabilities into the Web (for instance to allow language sensitive document linking). Higher-level standards would reduce the amount of administrative and maintenance work for web sites serving documents in multiple languages. At present, the tagging work must be repeated manually for each new language. Furthermore, it would be highly beneficial to adopt document standards that support automatic transfer of text to and from computerized translation services on the Internet.

A further essential element which is lacking in the basic Web technology is the capability for a given Web user to signal his or her location and regional preferences, such as currency and weights and measurements systems, which are often related to, but can vary independently of, the user's language. There is no way of determining, for example which currency a speaker of French uses. Although this facility would have many different applications, it is of special importance in the context of electronic commerce on the Web, since it would allow a vendor of products to present information adapted to currency, weights and measurements schemes, and local regulations of the potential customer.

The opportunity window for the introduction of such standards is very narrow. Multilingual sites are already being produced, even at small organizations (for example, read this report in four

languages at <http://www.jrc.es/iptsreport>). Once the amount of legacy data becomes substantial, adoption of new standards will be difficult.

Translation Technology

Once multilingual documents can be stored efficiently as we discussed, how will they be produced cost-effectively? The answer must lie in translation services on the Web. Translation aided by computers has been a prime subject of research for the last 40 years. However, the technology is not quite mature, and Information Society needs shed new light on it. The principal alternatives to traditional manual translation include: partially or fully automatic translation, machine aids for translators, and fully or partially automated production of parallel texts in several languages.

The reasons why translation has resisted efforts to automate it for such a long time are complex, but not a mystery. The most important problem concerns the distinction between meaning and interpretation.

Machine Translation (MT): all techniques for automating translation. Initially, computer programs had only limited success, producing mechanical, word-for-word translations. More recently, by incorporating more semantic and syntactic understanding, they have produced better results, particularly when 'trained' for a specific subject domain. *Human-aided machine translation (HAMT)* refers to the techniques which rely on a real automation of translation, with some human intervention in pre-editing, post-editing or interaction. *Machine-aided human translation (MAHT)* refers to machine aids for translators and revisers.

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MT examples: some products for ready-made translation of specific subject matter are already available. The PaTrans system translates patent texts from English into Danish. Its technology evolved from the European Commission's EUROTRA project, and it will handle more language pairs in the future. The Meteo system routinely translates Canadian meteorological bulletins between English and French. The University of Montreal has further developed it to eliminate input text altogether and directly translate weather data into parallel natural languages. Such an approach could, for instance, help European enterprise produce multilingual product catalogues.

These must be machine translations!

-  The lift is being fixed for the next day. Under that time we regret that you will be unbearable. (sign on elevator)
-  Specialists in women and other diseases. (sign on doctor's practice)
-  Our wines leave nothing to hope for. (at a restaurant)
-  Customers will be executed in good order. (at a shop)

Interpretation depends on context, and should remain invariant after translation. This proves very difficult to computerize.

In recent years, work on MT (see boxes) has been most vigorously pursued in Japan. Both interlingual and transfer systems have been developed. The first translate to and from a reference language, whereas the latter work in language pairs. For the 11 official EU languages, transfer techniques require 110 directions of translation, whereas only 22 interlingual translations are necessary.

However, interlingual technology is more difficult to develop for general-type applications.

Multilingual Information Retrieval

Current Web search services are not particularly helpful in handling very specific queries, even within a single language, in that they do little more than identify string patterns in free text. Information in the same language can only be found if exactly the same words are used in the query and in the document, and documents in different languages can only be found by formulating different queries in different languages. Recall is poor because many relevant documents are not found. Likewise, precision is poor because documents are often returned which are irrelevant to the purposes of the query, but which nonetheless contain strings mentioned in the query. Identifying relevant texts among those selected documents can be a very time-consuming task for the user, because he or she has to manually filter out those documents which are not actually desired.

Queries can of course be improved by the use of Boolean expressions such as most of the search services provide. However, this is a highly unnatural form of interaction which is often beyond the capabilities of the user, and does not really address the underlying problem, which is one of language and language awareness.

Indeed one of the key advantages of the Web is that information is expressed primarily in natural language. A search system which recognized this would allow for the retrieval of concepts rather than strings, and complement this with navigation help, in the form of assistance with query formulation, identification and resolution of ambiguities, and the presentation of possibly more appropriate search terms, etc.

Current Web search tools work by simply matching strings. Thus, as well as often passing over relevant information, they are unable to find matches in more than one language

Indexing by concepts rather than strings provides not only a much more efficient and natural form of interaction within a single language, it also provides a powerful mechanism for handling specifically multilingual information

The Internet is widely regarded as being a marketplace of tomorrow for SMEs world-wide. The Web constitutes an electronic showroom for a company's products, as well as the information highway for electronic commerce

Indexing by concepts rather than strings provides not only a much more efficient and natural form of interaction within a single language, it also provides a powerful mechanism for handling specifically multilingual information, in that concepts necessary to support one language can be mapped to equivalent terms in other languages.

A search infrastructure of this nature would then easily allow for cross-language retrieval, in which a query expressed in one language could return texts in a different language. Such a capability appears an essential building block in ensuring the principle of equal access to information, since it is unrealistic to assume that all information will be translated. It needs of course to be supplemented by tools and services which make retrieved multilingual information intelligible to the requesting user. A variety of such tools and services may be envisaged, ranging from transliteration, automatic dictionary look-up, through to machine and human assisted translation.

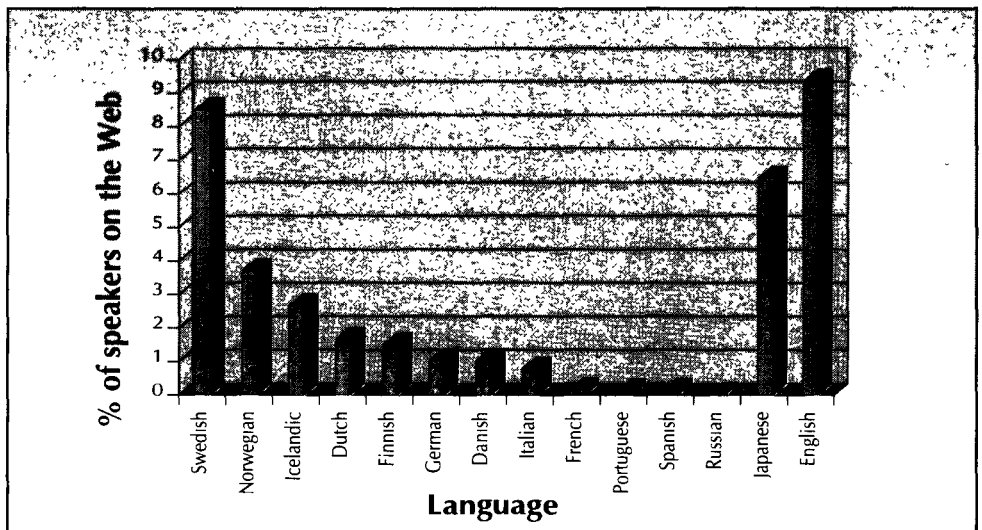
Economic Drivers

The Internet is widely regarded as being a marketplace of tomorrow for SMEs world-wide.

The Web constitutes an electronic showroom for a company's products, as well as the information highway for electronic commerce. An important component of the latter is Electronic Data Interchange (EDI). Other ones are product catalogues, user and operation manuals. The latter must be translated into the language of the product's purchaser, as part of EC directives for consumer protection and product liability. In general, companies will not be able to market their products ahead of global competitors unless they can localize them to the language of the customer.

For centuries international trade has recognized the need to respect the languages and cultural traditions of the markets addressed. As electronic commerce on the Web expands, the basic principle that 'the language of selling is the language of the customer' suggests that multilingual provision will increase. Indeed, it also seems that the cost/benefit considerations which have applied to multilinguality in the past are overturned on the Web. If the costs are limited to the translation of a few Web pages, as is the case for products such as books and clothing which can be purchased on the Web on a mail order basis, then it may even be cost

Figure 1: Web users per language community (as percent of corresponding speakers)



effective to translate these few pages for language communities which are relatively small in absolute numbers, but which are well represented on the Web. Swedish, with an estimated 800,000 speakers on line, represents a case in point. The potential gains, of course are even greater when numbers of speakers can be measured in millions or hundreds of millions, especially when accompanied by technological and economic advance in the geographical areas concerned. Even now, there are large and relatively untapped markets among speakers of French, German, Spanish, Portuguese, Italian, and Japanese on-line. These are being joined in increasing numbers by speakers of Chinese, Arabic and Russian. Simple market considerations therefore speak for a higher level of multilinguality on the Web. It should be noted, moreover, that companies operating in a single linguistic area can expect increased competition from providers from other parts of the world.

Three supplier segments can be conceived on the basis of transaction language: multilingual, English-speaking and local. Multinational corporations, including American ones, are usually the first to localize products multilingually. At the other end, an estimated 75% of businessmen in the EU do not speak English. These businesses are crying out for affordable and timely translation services, for which the Web is a perfect venue. The economics of translation today are as follows: it costs one translator-hour and 20 reviser-minutes to translate a technical page, some 250 words.

Take screening translation as an example: translation of written material for gathering information. The output can be used to get an idea of the content, in one's own mother tongue and without revision. This is the case of a SME looking for a new customer or partner on the Web. There are already working systems, such

as SYSTRAN, used by the European Commission for several language pairs (200,000 pages translated in 1995).

For diffusion translation (strict and objective translation, in particular of technical documentation), there are also working systems which can provide output for a reviser to work on. They are characterized by their specialisation to certain kinds of texts. Some use particular techniques, such as translation memory, which could also aid in product localisation by correctly replacing legal clauses, for example. The economic break-even point to adapt such an existing system to a new text domain is around 10,000 pages.

A third situation for which computerized systems will be cost-effective in the near future is for specialized technical translations to a large number of languages, where the author would serve as the occasional translator.

For all types of translation, as well as for cost-effective server administration, a prerequisite is a seamless multilingual document interface between Internet users and Web sites, as discussed above. An aim should be an ATP-chain (Author, Translator, Publisher).

Social Drivers

In addition to the economic drivers provided by electronic commerce, there are trends towards multilinguality in the Information Society (IS) at large which also call for Web and translation support. Their importance cannot be measured in terms of purchasing power, but rather as part of a European vision of the future.

Perhaps the most apparent one refers to the prevention of social exclusion. It is recognized that the older generations are a group which is being bypassed by the IS, basically due to their lack of

A distinction can be drawn between diffusion translation, intended for publication, and screening translation, intended for gathering information

In addition to the economic drivers provided by electronic commerce, there are trends towards multilinguality in the Information Society

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familiarity with computers. For them, multilingual tools for on-line information search and screening translation on the Web are necessary in order not to stay on the periphery.

Another important trend is the internationalization of education. Once every classroom in Europe is connected to the net, how will they be able to communicate with children in other countries? Can they get information for their term paper on Russia, directly translated, from schoolchildren there instead of from the encyclopaedia? Still another phenomenon which can be observed regards the mandatory use of the local language for certain types of information on the Web in some countries, such as France. Web support, including translation aid, would be highly beneficial to some organizations concerned.

Discussion


The rapidly advancing Information Society provides an opportunity to shape the future. With minor but timely extension of Web software standards, an Internet-based translation services market could develop and the cost of developing and maintaining multilingual sites could decrease substantially. At the same time, the provision of language aware and multilingual search tools and services, supported by the newly emerging translation services, will support the aim of universal access to information resources.

Few informed people still see the original idea of fully automatic high-quality translation of

arbitrary texts as a realistic goal for the foreseeable future. But integration and deployment of already existing machine translation products on the Internet would give SME's and ordinary citizens better access to new markets and more information.

Such technology could benefit consumers in even more direct ways. For example, some suppliers today do not sell certain industrial products in smaller European countries due to the high costs of documentation localisation. Computerized access to new technology can help to change the cost/benefit equation.

Government action can help change the situation. The European Council decided on November 21, 1996, the adoption of a multiannual programme to promote the linguistic diversity of the Community in the information society, and the European Commission has launched the Multilingual Information Society Programme (1996-1998).

Concerted government action is called for, and some EU initiatives and programmes have already been mentioned. National government administrations and enterprises, particularly SME's, could also actively shape their procurement of software and services so as to demand multilingual support in browsers, servers, etc., and lead the way with multilingual Web sites. European SME's are the ones who stand to benefit the most economically from multilinguality. 

Keywords

multilingual information society, Internet, software standards, machine translation

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Decision support systems in the service of policy makers

M. Paruccini, P. Haastrup and D. Bain

Issue: Increased complexity of policy decision making, for instance in the environmental field, presents an increasing challenge to policy makers. The increased complexity may lead to decisions being taken which subsequently are found to be problematic or impossible to implement.

Relevance: The use of IT based Decision Support tools can significantly increase the effectiveness and efficiency of decision making, providing a rich set of choices for the decision maker, and facilitating negotiations and conflict resolution.

Orthodox decision theory focuses on finding the best solution to any decision problem by assuming that competing criteria can be reduced to a common denominator and traded off against one another

A single criterion is normally insufficient in most policy-making decision situations

Introduction

In a recent article by Hernandez and Canarelli (The IPTS Report, issue 10), the use of data and the role of knowledge based tools in Decision Support Systems (DSS) is explored. The article is an excellent introduction to this important area and focuses on the data aspects of the decision making process and the integration of these data.

Orthodox decision theory focuses on finding the best solution to any decision problem. In doing so, the theory employs analytical tools and specific theoretical language rooted in the paradigm of substantive rationality using constrained optimization. The optimizing approach is based on the assumption that different objectives can be expressed with respect to a common denominator by means of trade-offs (complete commensurability), so that the loss in one objective can be evaluated against the gain in another. Thus the orthodox approach is firmly based on a single-criterion approach.

However, from an operational point of view, the value of the optimising approach is rather limited, because the specification of a community welfare function requires complete information, which is rarely available, about the actions, the trade-offs and about the constraints prevailing in the decision-making process.

In fact, most policy makers would agree that the norm in policy making is decision making in situations where a single criterion is not sufficient - ie. multiple criteria are needed. During the last two decades, further support has emerged for the view that a decision is a multidimensional concept (Bana e Costa, 1990; Nijkamp et al., 1990; Paruccini, 1994).

From the point of view of the decision maker, it is also clear that, the moment a decision has been made, the multi-dimensional problem, with a large number of possible solutions, has in fact been reduced to one solution.

The role of decision support systems is in facilitating the process of the necessary reductions.

Thus the most important distinction between the different types of Decision Support Systems is whether they can handle single or multiple criteria: clearly multi-criteria systems offer several advantages for policy decisions, where conflicting interests have to be considered. A second important distinction between decision support systems is whether they are distributed or not.

A large number of multi-criteria evaluation methods have been developed and applied for different policy purposes in different contexts. As a tool for conflict management, multi-criteria evaluation has demonstrated its usefulness particularly with regard to environmental management problems (Paruccini, 1992).

In general, a multi-criteria model presents the following aspects:

- There is no solution optimising all the criteria at the same time and therefore the decision-maker has to find compromise solutions.
- The relations of preference and indifference are not enough in this approach, because when an action is better than another one for some criteria, it is usually worse for others, so that many pairs of actions remain incomparable with respect to a dominance relation.

Thus the concept of 'decision process' has an essential importance. The final outcome is more like a 'creation' than a discovery. With a multiple criteria decision aid the principal aim is not to discover a solution, but to construct or create something which is viewed as useful to an actor taking part in a decision process (Roy 1985).

Supporting decision-making: information gathering

To illustrate the approach, an example from the field of management of (scarce) water resources was chosen. The issue of water management, in the broader sense, is a problem which transcends the boundaries between water, land and environment, and interrelates water with broader policy questions associated with social and economic development. Water resources should be managed and used so that development may be sustained over centuries. At this level the interest encompasses the role of water in producing hydroelectricity, in facilitating transportation of goods and in serving as an input to industrial manufacturing, agricultural production or domestic use.

In the real world fragmented and shared responsibilities are realities which are always likely to exist. As a result, it is often accepted that integration will lead to co-operation and co-ordination which in turn could lead to overall improved effectiveness. If co-ordinated management of water resources is to be achieved a two-stage strategy must be employed.

At the strategic level, a comprehensive viewpoint is desirable which implies scanning the widest possible range of information. For the scientific support function this implies access, via Information Technology, to all possible theories, data and knowledge bases and scientific results. However, at the operational level, a more focused approach, with more appropriate scale and time frame, should be utilised. This approach requires a two-stage implementation using a distributed information system and a decision support system respectively.

The distributed information system permits users to find relevant information, as identified and connected to the network. The network will

As a tool for conflict management, multi-criteria evaluation has demonstrated its usefulness particularly with regard to environmental management problems

An example of the management of scarce water resources was chosen to illustrate the approach

The distributed information system permits users to find relevant information on the network

Progress has been made recently by including fuzzy logic to handle verbal data and replacing the single decision maker model by a plurality of stake-holders

Pair-wise linguistic evaluation of alternatives is used, based on the semantic distance between qualifiers

connect the information centres and allows data retrieval. The system supports navigation through the information supplying hyper-textual problem-oriented tools, which must be developed

This is the first stage of supporting decision-making. Academics, researchers and representatives of local authorities, who have a common interest/need for the data, for the analysis tools, and for any results available to be used for water resources management could gather this information provided by various bodies (their own included), that can be accessed remotely from different locations.

The capabilities of the distributed system include access to data in the form of catalogues, reports, relational data-bases, geographic information systems (GIS) and tools for the modelling and analysis of data. The next step is to link the data identified to a decision support system.

Decision Support Systems in fuzzy, imprecise and conflict situations

When the necessary, or rather available, data has been collected and linked together, the decision maker needs to form an overview of the problem in hand. Often it is realized that the information available ranges from very specific models through imprecise background data to vague verbal statements. Similarly it is often the case that severe conflicts are related to the decision to be taken.

Recently it has been realized, that the combination of the capabilities for handling fuzzy, imprecise and crisp variables for the decision criteria, together with an analysis of coalition and conflict resolution provided decision makers with what amounted to a scientific breakthrough, able to significantly reduce conflict and improve the decisions made.

This breakthrough came in two parts. Firstly research into how to compare imprecise information, typically verbal statements, combined with fuzzy logic, resulted in a comprehensive framework for comparing all types of information about a given criteria. Secondly it was realized that, when a single decision maker is replaced by the (political) stake-holders, a detailed analysis of the different views allows the identification of which coalitions are in favour or against a given solution.

The method developed on the basis of these two insights is called NAIAD (Novel Approach to Imprecise Assessment and Decision Environments) and was originally developed in a project at the Joint Research Centre of the European Commission. It is a discrete multi-criteria method, based on some aspects of the partial comparability axiom (Munda 1994).

Since, in a fuzzy context, any attempt to reach a high degree of precision of the results tends to be somewhat artificial, a pair-wise linguistic evaluation of alternatives is used. This is done by means of the notion of fuzzy relations, based on 'semantic' distance between linguistic qualifiers (the distance between qualifiers like 'good', 'better' etc.).

As indicated, NAIAD also performs conflict analysis. This is done with the creation of an 'equity matrix', which gives a linguistic indication of the stake-holder groups' judgement for each of the alternative actions. A similarity matrix is then computed, which gives an index, for each pair of the stake-holder groups, of the similarity of judgement over the proposed alternatives.

So, at the end of the process, the DSS supplies the decision maker with two pieces of information: a ranking of the alternative actions based on the selected decision criteria, and a second (normally different) ranking of the 'acceptability' of these alternatives by the stake-holder groups.

Application to a real-world case study

Returning to the remarks made earlier, a case study related to water management is used for illustration, namely the utilisation of the waters of the Anapo river basin in Sicily, Italy¹. This is a typical example of conflict between the different users of a resource. Since there is a natural scarcity of the resource, the problem has greatly increased over the last 15 years. The case should be seen as an illustration of the methodology, which can be applied in a large number of different policy situations.

For simplicity, the data gathering phase is not described in detail here; the resulting alternatives are simply listed in the following table, in matrix form. Seven criteria for evaluation of the alternatives have been chosen; the number of criteria can be larger or smaller depending on the problem under study. Similarly, of course, the number of viable alternatives may be larger or smaller than the eight possible alternatives shown in the table. The alternatives in this case range from a base case scenario (A. Actual situation), through various (more or less popular) options for changing the current water use.

Table 1. Alternative water supply management options

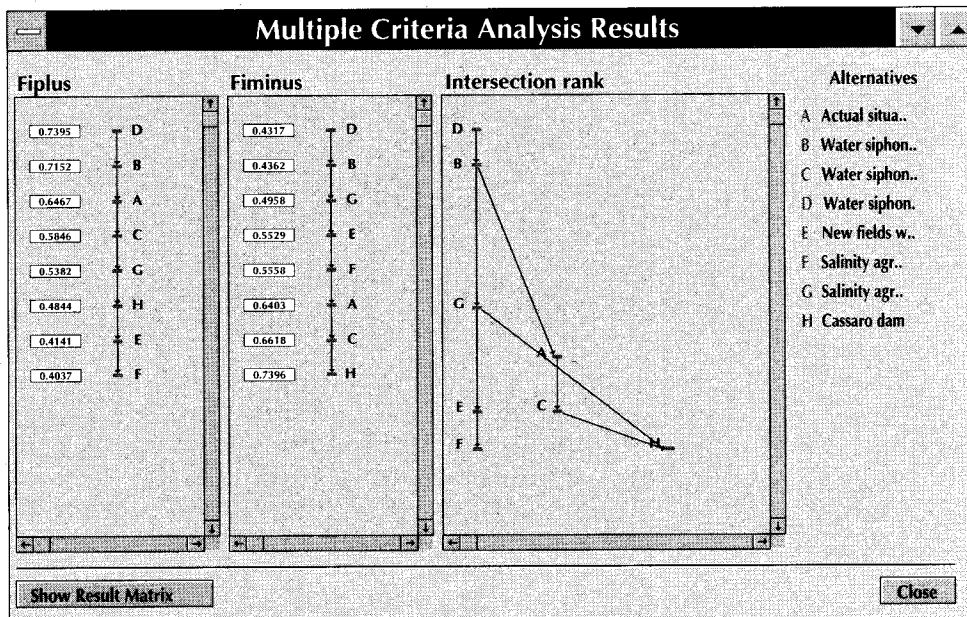
Alternative Criteria	A Actual Situation	B Water siphon Anapo + decrease in agricultural use	C Water siphon Anapo+ severe decrease in agricultural use	D Water Siphon Anapo	E New Fields well	F Salinity in agricultural water (1500)(s/cm)	G Salinity in agricultural water (3000)(s/cm)	H Cassaro dam
Cost of new infrastructure (billion lira)	0	71	76	71	41	41	41	180
Cost of management (billion lira)	127	208	218	160	164	164	164	218
Agricultural production	Maximum	None	None	None	Maximum	Maximum	Maximum	None
Level ground stratum	Very bad	Good	Moderate	Very good	Very bad	Very bad	More or less bad	Good
Quality drinking water in Syracuse	Very bad	More or less good	More or less bad	Very good	Very bad	Very bad	Bad	More or less good
Environmental impact new infrastructure	None	Mediumlow	Mediumlow	Mediumlow	Very low	None	None	High
Catchment from Priolo groundwater (mn/y)	50	23.4	17.8	38.2	35	38	41.3	35

Based on this matrix, the NAIADE methodology performs a pairwise comparison of all alternatives, and provides the result of the final

ranking of alternatives both in the form of a numerical matrix and graphically, as shown in the next figure (Figure 1).

At the end of the process, the decision support system supplies the decision maker with a ranking of the alternative actions based on the selected decision criteria, and a ranking of their 'acceptability' to the stake-holder groups

Figure 1: Results of Multiple Criteria Analysis



The NAIADE methodology performs a pairwise comparison of all alternatives, and provides the result of the final ranking of alternatives both in the form of a numerical matrix and graphically

Note that alternative D, characterized by a new water siphon on the Anapo, is the best compromise solution because it dominates all the other alternatives. Also, the second best alternative B is identified unambiguously. Then between alternatives G, E and F and alternatives A, C, and H there is some incomparability. As the decision-maker's perceptions of the problem develop, ie. changing the decision preferences, values can change in response to new requests and so lead to different results. In this way it is possible to explore the whole problem space, constructing the most suitable compromise decision.

NAIADE also allows analysis of the acceptability matrix of the individual planning alternatives, for any social group concerned. Following various discussions with decision-makers and staff of various public corporations and private and social groups, we compiled the following table that summarises the judgements of the alternatives in a way that is consistent with the interests of the individual stake-holder. The corresponding NAIADE variables have been associated to these, as shown in the table below.

As the decision-maker's perceptions of the problem develop values can change in response to new requests and so lead to different results. In this way it is possible to explore the whole problem space, constructing the most suitable compromise decision

Table 2. Subjective valuations of the supply management options

Alternative	A	B	C	D	E	F	G	H
Stake-holder	Actual Situation	Water siphon Anapo + decrease in agricultural use	Water siphon Anapo+ severe reduction in agricultural use	Water siphon Anapo	New Fields well	Salinity in agricultural water (1500[ls/cm]	Salinity agricultural water (3000[ls/cm]	Cassaro dam
Sogreas	Very bad	Fairly good	More or less good	Excellent	More or less bad	More or less bad	More or less bad	Fairly good
Lisimelic land-reclamation syndicate	More or less bad	Fairly good	Good	Good	More or less bad	More or less bad	More or less bad	Excellent
Land-reclamation farmers	Fairly good	More or less bad	Bad	Very bad	Fairly good	More or less bad	Very bad	Bad

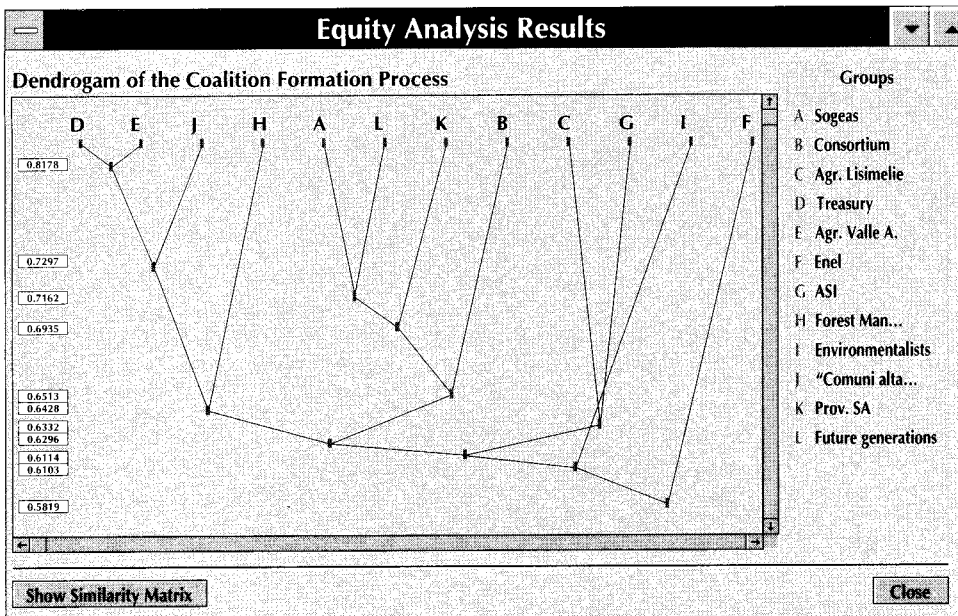
continued overleaf...

Table 2. Subjective valuations of the supply management options (continued...)

Alternative Stake-holder	A Actual Situation	B Water siphon Anapo + decrease in agricultural use	C Water siphon Anapo+ severe reduction in agricultural use	D Water siphon Anapo	E New Fields well	F Salinity in agricultural water (1500µs/cm)	G Salinity agricultural water (3000µs/cm)	H Cassaro dam
Technical revenue office	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Farmers of the Anapo valley	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
ENEL	Good	More or less bad	More or less bad	More or less bad	Good	Good	Good	Fairly good
ASI of Syracuse	Fairly good	Bad	Bad	More or less bad	More or less bad	More or less bad	More or less bad	More or less bad
Department of forestry	Fairly good	More or less bad	More or less bad	More or less bad	Fairly good	Fairly good	Fairly good	Very bad
Environment alists	Bad	More or less bad	More or less bad	More or less bad	Bad	Bad	Bad	Extremely bad
Towns council of Anapo upper valley	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Province of Syracuse	More or less bad	Moderate	More or less bad	Good	More or less bad	More or less bad	More or less bad	Fairly good
New generations	Extremely bad	Good	Moderate	Good	Bad	Bad	Bad	Good

33 Industrial Competitiveness

Figure 2: Equity Analysis Results Dendrogram



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Palle Haastrup is head of the ISIS Technology Assessment Sector. He holds an M.Sc. in Chemical Engineering and Ph.D. in Risk Assessment from the Technical University of Denmark. His background is in environmental risk management, particularly with regard to transportation of dangerous substances and his recent work has concentrated on building DSS for environmental management and for transport systems.

Arriving at this point, a way of representing the views of the various stake-holders in the process was needed. It was decided to use a 'tree structure', a dendrogram, which represents graphically the formation of possible coalitions between the social groups. Basically each of the alternatives was ranked according to the preferences of the stake-holders. The data for such a ranking is readily obtained by means of short interviews.

Note that the technical revenue office and the farmers of the Anapo valley, have analogous positions with regard to alternatives, and can readily form a coalition. It is interesting to note the 'radical' positions of environmentalists and ENEL (the national body for electricity supply) do not make for an alliance with anybody.


Finally, SOGEAS (Local authority for water) and the province of Syracuse are very interested in forming a group with future generations, underlining the level of public interest in the conservation of water resources.

Conclusions

The main features of our approach for developing decision support systems is the use of multi-criteria models in conjunction with

appropriate information and communication technologies, so that they make it possible to consider a large number of data, relations and objectives which are generally present in a specific real-world decision problem. Thus the decision problem at hand can be studied in a multidimensional fashion, including socio-economic aspects.

The major strength of multi-criteria methods is their operational ability to address problems marked by various conflicting evaluations since real-world problems are generally not direct win-lose situations and a certain degree of compromise is needed. Multi-criteria evaluation techniques cannot solve all conflicts, but they can help to provide more insight into the nature of conflicts and into ways of reaching political compromises in case of divergent preferences in a multi-decision maker or committee system, thus increasing the transparency of the decision process.

The scientific break-through linked to the ability to evaluate fuzzy and verbal statements about a given alternative, combined with the stake-holder analysis may radically transform future decision support systems and improve their penetration into policy making. 

Keywords

Decision theory, decision support systems, multi-criteria approach

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Notes

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EU and the Mediterranean Region: a Future Dilemma?

Matteo Bonazzi and Sergio Gomez y Paloma

Issue: there is a strong tendency in current policy towards the construction of supra-national institutions such as the Euro-Mediterranean Free Trade Area, due to be established by 2010. At the same time there is evidence to suggest that economic disparities affecting the Euro-Mediterranean space —and corresponding differences in techno-economic systems— may jeopardize the implementation of these processes and widen existing gaps.

Relevance: these prospects imply that current socio-economic profiles, including demographic and migration gradients, of entities —eg. EU Member States as well as Southern and Eastern Mediterranean Countries— which are involved in the process will be radically affected. In this light the role of technology and its prospects for reducing economic disparities could play a central role in forthcoming policies in the Euro-Mediterranean context.

Globalization versus Euro-Mediterranean Partenariat

Statistical evidence suggests that (i) during the last three decades globalization has brought about contradictory results for “less developed” countries seeking to catch up with the more advanced ones, some —most notably in Asia—have grown, whilst others —such as Africa— have not fared so well; (ii) technological change has progressively accelerated the substitution of labour by capital.

The main actors in globalization are the Trans National Corporations (TNC), which have been very powerful in recent decades,¹ and have contributed significantly to the dramatic increase of the international trade flows as well as of Foreign Direct Investment on a world scale.

Yet, economic and financial figures reveal that industrialized and post-industrialized economies have been increasing their mutual economic interactions —triadic globalization, ie. among EU, USA and Japan (Amoroso, 1996; Gomez y Paloma, 1993)— reversing the old model according to which the less industrialized world attracted investments from the industrialized one on account of both its abundant and cheap labour and its raw materials. The resulting marginalization consists of the progressive exclusion of less industrialized economies from certain very profitable phases of economic activity.

In the case of the Euro-Mediterranean space these developments have consisted of growth accompanied by only moderate job creation in the EU in the late eighties (UNDP, 1993) and unemployment without growth in most Southern

Globalization seems to have had contradictory results for countries seeking to catch up

and Eastern Mediterranean Countries (SEMC), eg. per capita GDP growth decreased from 2.8% —yearly average 1960-1970— to -0.8%— yearly average 1990-1994— in Egypt; the same downward trend affects most of the biggest SEMC, ie. Algeria, Tunisia, Morocco and Turkey (Bensidun and Chevalier, 1996, p53). At the same time unemployment has increased sharply all over SEMC since the 1980s, eg. it reached about 20% in the aforementioned SEMC countries in 1993-1995 (Bensidun and Chevalier, 1993, p20).

At the same time, at institutional level the international policy agenda is pervaded by a wave of proliferating supra-national institutions embracing meso-regions, eg. Independent Community States, Union du Maghreb Arabe, NAFTA, Mercosur etc. In line with this process, EU policy is implementing actions intended to set up the Euro-Mediterranean Free Trade Area by 2010. All these institutions —which are being constructed and run by national and international public bodies— as far as they are forms of mutual protectionism among groups of countries, have been created with the more or less explicit purpose of promoting a 'virtuous' economic cycle within the weakest economic pole and a fortiori minimizing negative effects of triadic globalization.

In this context it is essential to explore the recent orientations underlying EU Mediterranean policy which have been outlined in the EU Council Conference of Cannes (Conseil du 8 mars, 26-27 June 1995) and epitomized in the Barcelona Conference and its following Declaration (Barcelona Conference, 27-28 November 1995). The challenge underlined in these documents is to define a multilateral framework dedicated to creating a 'common space of shared prosperity', peace and security, which is the prerequisite for a wider political, socio-economic, human and cultural dialogue

(Speech by Manuel Marin, Euro-Mediterranean Conference, 1995) between the EU and the 12 SEMC —from Turkey to Morocco, excluding Libya— aiming to promote both sustainable growth and stability right around the Mediterranean basin. This space of co-operation has been defined as the Euro-Mediterranean Partnership, and it is based on three main pillars:

- (i) dialogue on policy and security,
- (ii) economic and financial co-operation,
- (iii) human and cultural exchange (Barcelona Declaration, p 9, 10,11).

Despite the wide spectrum of topics approached in the Partnership the actions which will mostly affect the future socio-economic and political dynamics in the Euro-Mediterranean context are expected to be

- (i) the progressive liberalization of the movement in capital, goods and services, ie. the Euro-Mediterranean Free Trade Area (FTA) by 2010, (Barcelona Declaration, pp. 9, 11, 13)
- (ii) the increasing mobility of selected labour force, eg. young people, officials, students, professors, entrepreneurs, businessmen and sportsmen, all around the basin (ibid. Programme de Travail, pp. 16, 19, 20).

As a consequence, the implementation of these actions raises new questions as to their repercussions for local economies and societies. An overview of the main socio-economic profiles of the Euro-Mediterranean space may help in sketching the broad context of the Euro-Mediterranean playing field.

The Euro-Mediterranean gap: socio-economic profile

The Euro-Mediterranean context is characterized by relatively broad disparities from the economic, social and demographic standpoints. The economic level is the most obvious issue which separates the EU from the SEMC.

Supra-national regions dominate the international policy agenda. The intention being to create 'virtuous cycles' of growth to offset the negative impacts of globalization

The Euro-Mediterranean partnership is based on (i) dialogue on policy and security, (ii) economic and financial co-operation, (iii) human and cultural exchange



Even on the basis of adjusting GDP to overcome its limitations as a means of comparing the economic situation of widely differing countries, considerable gap still exists between the EU and the SEMC

Although the population of the EU and SEMC are of the same order of magnitude, the ratio between the per capita Gross Domestic Product (GDP) of these two groups of countries is about 20 to 1. GDP has limitations as a means of expressing the potential of an economic system, ie.

- (i) it includes only the exchanged goods and services which appear on the official accounts, and does not include the informal economy, ie. exchanged goods and services outside of the official economy as well as those produced for self-consumption;³
- (ii) GDP per capita does not give any information about the income distribution, making statistics potentially misleading;
- (iii) straightforward comparison of GDP per capita of different countries gives a inaccurate impression of their relative living standards as it does not take into account their relative purchasing power.

This obstacle has been overcome by adjusting GDP per capita on the basis of the cost of living in each of the different countries, thus scaling it to

the US equivalent, ie. GDP per capita using purchasing power comparison. Although this reduces the disparity between the EU and the SEMC, the gap between EU and SEMC averages remain very high, with ratio of about 4 to 1.⁴

Since one of the main pillars of the Euro-Mediterranean Partnership is the opening of the Free Trade Area, the Euro-Mediterranean trade balance has been examined in order to verify in terms of trade the level of economic differences between the EU and SEMC (Figs.1 and 2).

The trade balance — the sum of exports and imports — has been normalized to GDP in order to take into account the different economic weight of the two groups of countries. This makes it possible to sketch out a number of points:

- (i) the EU has a relatively level trade balance, ie. imports are quite well counterweighted by exports to other groups of countries, among which the SEMC represents its main export partner; on the other hand, the SEMC trade balance is totally negative;
- (ii) despite the fact that trade in both the EU and the SEMC depends heavily on their top major

Figure 1: EU Trade Balance normalized to GDP (1992)

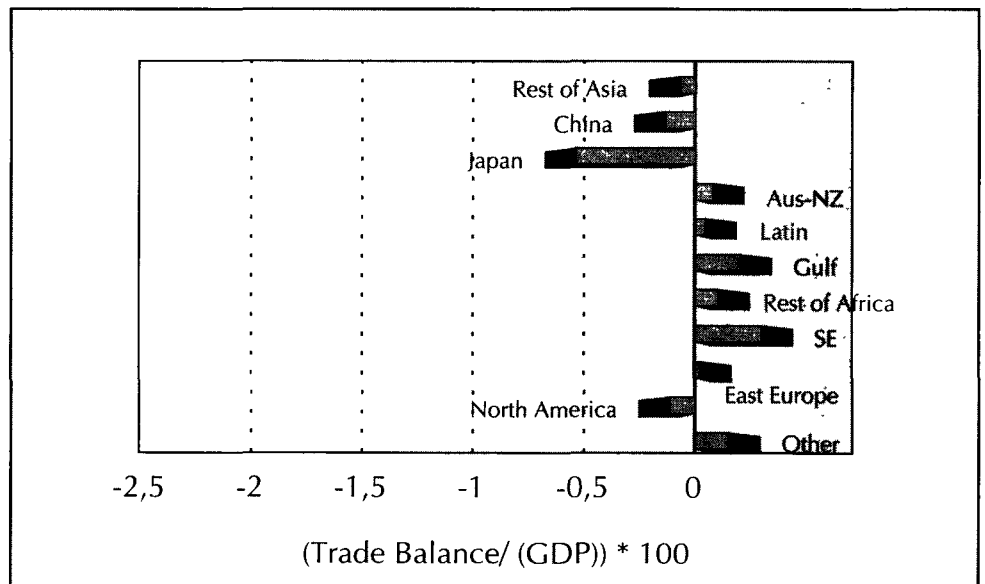
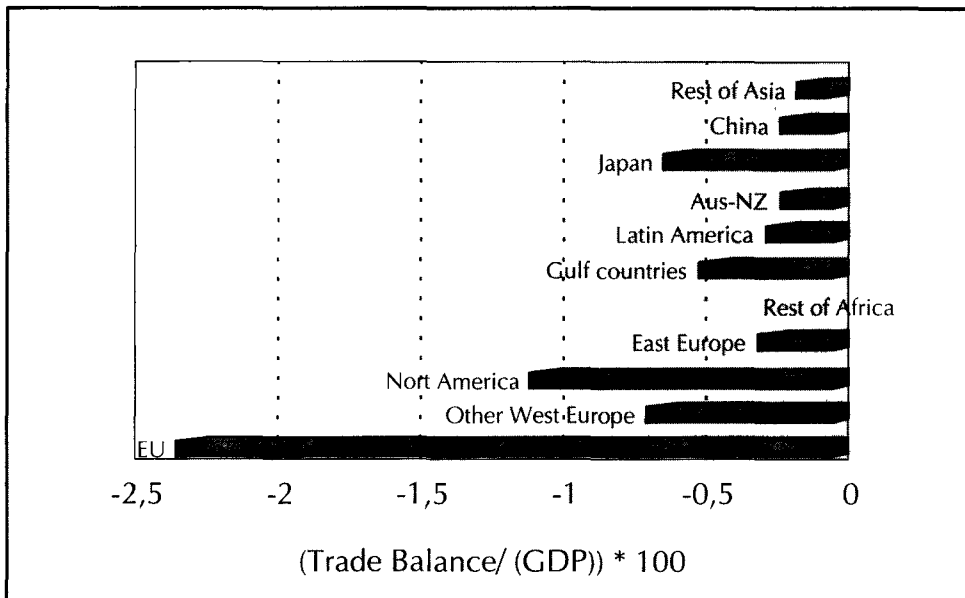


Figure 2: SEMC Trade Balance normalized to GDP (1992)



trading partner — about 40% of their respective trade bulk — the trade dependence of the SEMC on their top trading partner, ie. the EU, is five times greater than the corresponding figure for the EU, ie. trade with Japan — in other words, the EU is five times more important *vis à vis* the SEMC than Japan *vis à vis* the EU. The sectoral structure of Euro-Mediterranean trade deserves analysis (Fig 3.1). The overall trade balance between the EU

and SEMC is characterized by net energy imports vs net exports of manufactured goods; other industries such as agro-food and minerals are less significant. The main export from Algeria and Egypt toward the EU is energy, while Turkey, Morocco, Tunisia export mostly manufactured goods (Fig.3.2), and a process of specialization of the textile/clothing sector is apparent, which marked comparative advantages are leading to

Manufactured goods have taken an ever more important place in the SEMC economies, often specializing in particular sectors

Figure 3.1: Euro-Mediterranean trade in 1992

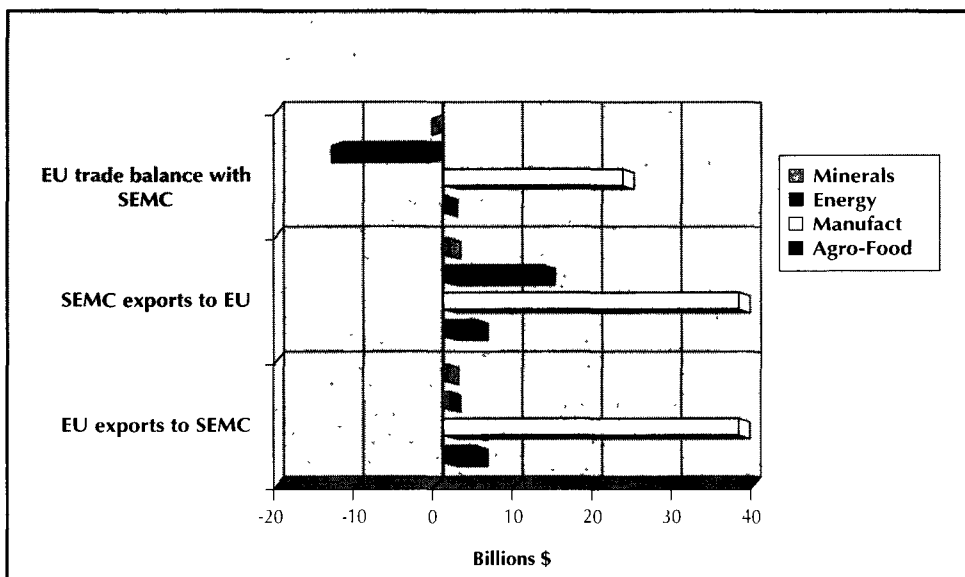
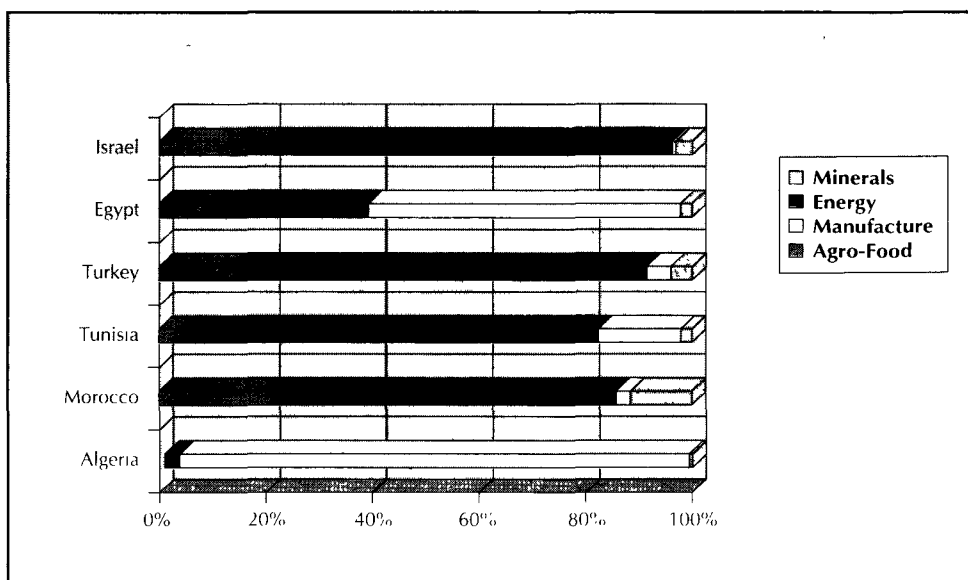


Figure 3.2: Sectoral composition of main SEMC exports to the EU (1992)



The agro-food sector has been losing importance in Euro-Mediterranean trade, some SEMC countries becoming net importers. Nevertheless, the EU remains an important market for selected, high-added value foods

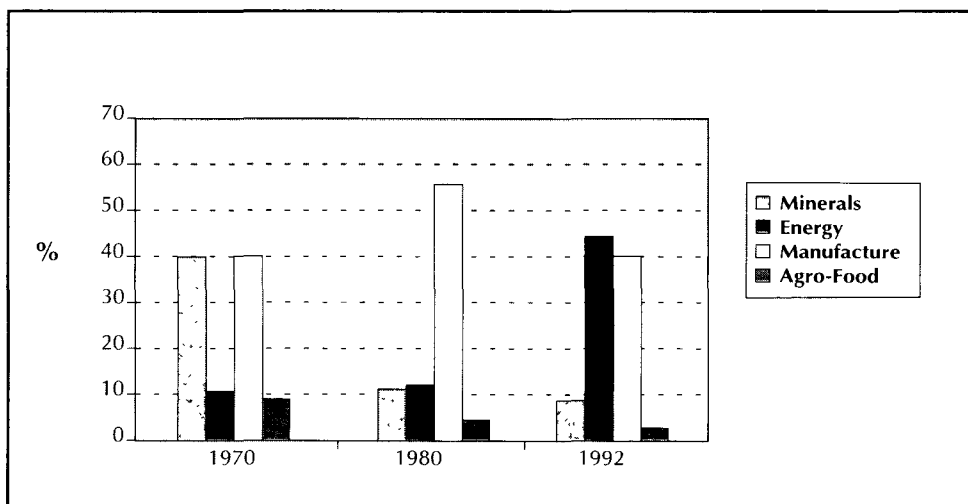
geographical and sectoral concentration — Tunisia, Morocco and to a lesser extent Turkey are at the forefront of these phenomena among the non-Triad countries.

The sectoral composition of SEMC exports has changed over the last two decades. In 1970 SEMC exported essentially agro-food products (41%) and energy (40%); the first oil-price shock caused the rise of the energy share of exports, while the following drop in the oil price has taken the energy

share back to previous levels (39%). On the other hand, manufactured goods have progressively eroded the previous share of agro-food products, now representing half of the SEMC exports (Fig. 4.) (Bonazzi, 1997, p36).

In fact, the agri-food sector has been losing importance in Euro-Mediterranean trade, and this happened together with the increase of the food dependence of most SEMC. During the last 20 years only Turkey and Morocco have been able to

Figure 4: SEMC exports to the EU



maintain a positive food trade balance, while all the other SEMC have become highly dependent on food imports. This dependence has been quantified by normalizing SEMC Agro-food Trade Balance on the related agro-food trade (agro-food TB),⁵ eg. Egypt, Algeria and Syria passed from markedly positive to strongly negative values of this indicator.

This evolution has been determined by a confluence of various factors including demographic growth, different technological levels, competition from the main world producers (including EU), lack of agriculture-oriented national policies and little technological advance or transfer.

The agro-food deficit of the SEMC depends more on the rest of the world than on the EU. Nevertheless, the EU is a very important market for the selected, high added value Moroccan, Israeli and Tunisian agro-food products, especially citrus fruits. These products have been tailored by the SEMC to meet the demands of the EU market, but they have to face all the instruments of protection intended to guarantee preference to community produce. In fact, in the case of fruit and vegetables the SEMC products are in competition with those of Mediterranean EU countries, especially following recent improvement in access by some of them to the EU market — Greece, Portugal and Spain.

It is very important to highlight that the agro-food sector — despite its declining importance relative to other industries in terms of trade — still plays a very important socio-economic role in the SEMC, which is strongly labour-intensive and accounts for a large share of jobs, most of which are concentrated in agricultural production. In fact agricultural population in SEMC comprises 40% of the total SEMC labour force — 25 million jobs in 1991 — which is very much higher than

the corresponding EU figure of 6%. Additionally, agriculture accounts in SEMC for a significant share of GDP (about 9%) excluding the informal agricultural economy that in some regions accounts for an additional share estimated to be of up to half of the overall agricultural production.

It is important to underline that among the SEMC, Turkey and Egypt are the giants in terms of agricultural jobs, accounting together for about twice the total agricultural labour force of the EU with some 18 million of agricultural workers in 1991 (Bonazzi, 1997, p47). Moreover, these two countries are expected to become the two demographic giants in the Mediterranean, together accounting for about 180 million people at the horizon 2025 (European Commission, 1994). This clearly must alert Euro-Mediterranean policy agenda on the dimension of the social issue involved in SEMC agricultural activities.

The Outlook

The opening up of the Euro-Mediterranean Free Trade Area is supposed to gradually liberalize trade between the EU and most SEMC countries, which are characterized by a marked gap in terms of labour productivity especially in the agricultural sector, where the ratio is about one to ten (Bonazzi, 1997, p46).

This raises important questions about the perspective of the Euro-Mediterranean space in terms of socio-economic and demographic dynamics. The experience of the creation of the NAFTA free trade area space is enlightening. The removal of agricultural tariffs under these agreements has boosted imports of cheap food from the US: this development benefited only Mexico's higher classes — less than 10% of the population — but it has made the future uncertain for millions of small-scale farmers who cannot compete with the foreign producers nor afford the imported food. According to the National Union of Regional Autonomous

Agriculture in the SEMC is highly labour-intensive and accounts for a large share of total employment

The shift from crops for home consumption to cash-crops for export has undermined the ability of many countries to meet internal demand

The social consequences of the liberalization process have tended to be that only a small share of the population benefits whilst it undermines the economic subsistence of much of the agricultural population

Climate, low labour productivity and land-ownership patterns militate against agricultural efficiency in SEMC countries

Use of appropriate technology can clearly play a key role in bringing the SEMC up to par

Peasant Organization — a Mexican campesino umbrella group, — up to 80% of rural Mexican producers are caught in this bind (Renner, 1997).

Through a similar process a drop in international cereal prices has been brought about through generous subsidies in developed countries — comparable to the juxtaposition of two production systems with a high gap in labour productivity — and this has provoked the substitution of cereals by export vegetable and fruits in dry irrigated valleys of many other Latin America countries. The upshot of this has been the inability of many countries to meet their internal demand for basic food grains, while the production of higher added value crops has grown steadily. This has also had environmental repercussions: these crops make inefficient use of natural resources, in particular soil and water. Thus the distortion caused by international market constraints has had severe consequences for the natural resource stocks (Syers et al, 1996, p488). Finally in both cases the social consequences have been similar: the benefits of liberalization depends on how many displaced workers find jobs in other areas and, more importantly, the redistributive mechanisms that are in place.

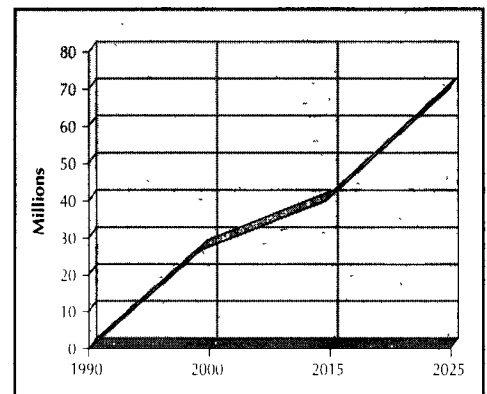
Just as in the above mentioned Latin America cases, SEMC economies may be severely affected by FTA implementation in all industries where the current high labour productivity gap vis à vis the EU will persist, (ie. among traditional and labour intensive agricultural production systems (Renner, 1997)). In fact, the actions outlined by the Euro-Mediterranean FTA could exacerbate the lack of competitiveness of traditional, labour-intensive agricultural production systems in the SEMC, and consequently render them even more fragile. This could aggravate the already ongoing phenomenon of rural depopulation in many SEMC, among which Turkey and Egypt are likely

to be the most affected in terms of job losses in agriculture, on account of their lowest agricultural labour productivity.

More generally, low labour productivity in SEMC agriculture is due both to environmental and socio-economic factors, ie.

- (i) a very small land fraction is under cultivation because of relatively difficult climatic and soil conditions compared to those in Europe and, furthermore, the irrigated surface is small compared to the crop needs — which again depends upon the dryness of the climate;
- (ii) fragmentary small-holdings on the one hand and over-concentrated estates on the other, both make farms and firms distant from their optimal size for efficiency (judged in terms of the input combination which maximises the productivity of a given economic process).

Figure 5: Increase in the labour force supply in SEMC



These dynamics are expected to be reinforced by the growth of the overall labour force supply in the SEMC, where at least 75 million people will enter the job market by 2025 (Fig. 5), when there will be at least 20 million legal migrant workers around the Mediterranean.

Looking at it from this point of view technology — ie. the pattern in which human societies organize production systems, utilizing capital, labour, natural resources and physical

techniques — can clearly play a pivotal role in bringing different levels of agricultural labour productivity existing between the EU and SEMC up to par, i.e. by the use of appropriate technology. Accordingly, the prospects for technology transfers all around the Mediterranean region as a supporting tool in a global process of restructuring the Common Agricultural Policy (which, in any case, is not permanent and unchangeable) would be highly desirable, thus contributing to including it in a broader context of agricultural Euro-Mediterranean policy.

On the other hand, the opening up of the FTA in the Euro-Mediterranean space may further enhance SEMC exports towards the EU

in certain manufacturing sectors, some of which have been increasing their competitiveness during the last twenty years thanks to the somewhat smaller productivity gap existing between many SEMC and EU industries, eg. textiles in Tunisia Turkey and Morocco.

In this light political strategies to promote (i) agricultural labour intensive activities — that can attenuate the food dependence and curb rural depopulation — and (ii) selected manufacturing industries — that could be competitive in the free market context foreseen by the Euro-Mediterranean Free Trade Area — would be desirable.

Keywords

Globalization, Mediterranean Free Trade Area, production systems, technology, EU policies

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Notes

- 1- Nowadays, in many cases the economic size of a Trans-National Corporation is bigger than that of a Country, e.g. at the beginning of the 1990s General Motors (GM) turnover was roughly double Algerian GDP, i.e. one among the biggest south-east Mediterranean economies—GM turnover was 96,640 Millions ECU in 1990 (Panorama of the EC industry 1993, Eurostat, Luxembourg); Algeria GDP was 48,700 Million USD in 1992 (Atlaséco, Paris, 1994). This quantitative relation may legitimate the question of a structural imbalance today existing between private economy and public national bodies.
- 2- It should be borne in mind that the period 1990-94 was a recession.
- 3- This share accounts in some regions for up to 30% of GDP.
- 4- Moreover, Israel, Cyprus and Malta show a figure very close to that of southern EU countries i.e. Spain, Portugal and Greece.
- 5- $TB = [(Exp - Imp) / (Exp + Imp)] * 100$.

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