Developing Sustainability within the Information Technology Industry

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Introduction

This FactSheet attempts to review the challenges facing the Information Technology (IT) industry with respect to the requirements and problems of sustainability. For the purposes of this FactSheet, IT refers to the combined industries of hardware for office machines, data processing equipment, data communications equipment and of software and services. ICT (Information and Communications Technology) includes the above plus telecommunications equipment and telecommunications services.

Sustainability

Probably the most widely known definition of sustainability is that defined by the World Commission on Environment and Development which emphasises the importance of ensuring the satisfaction of present need without compromising the ability of future generations to meet their own ones.[1]

Since 1970 -1998, energy consumption by individual sectors has changed substantially; there have been rises of 90% for transport whilst consumption by industry has fallen by 44%. The increase in transport has slowed while the fall in industry has stopped and has even increased slightly in recent years.[2]

Sustainable development in a business context is difficult to quantify and measure. If we are to define and solve the problems posed by the sustainable imperative in the context of IT, we first need to understand where we are today, where we are going, how fast, and what we need to do about it.

The ICT Industry

Growth of the ICT (Information and Communications Technology) market is being fuelled in part by the need to revise business practices in order to take advantage of developments in electronic commerce. In 1998, the overall market for ICT has increased by nearly 9%, a rate that has continued to grow since 1996. Such a growth rate is difficult to match in any other sector of the economy comparable in scale or importance with ICT.

EITO 1999 [3] confirms that the growth rate of the IT markets in Europe has become very close to that in the US. The European ICT market is expected to maintain its growth rate over the years. The drivers for this growth are:

- Increasing impact of Internet technology for internal knowledge management applications and for business-to-business E-commerce.
- Incorporation of Web-enabling capabilities into applications and databases, enabling easier and effective upgrade of legacy systems into networked intranet/extranet application environments.

- Incorporation of Web-enabling capabilities into end-user devices and transmission technology enabling easier access to the Web from any type of end-user (from personal computers to mobile phones).
- The adoption of Internet Protocol (IP) gradually becoming the preferred platform for fixed and mobile services integration and enabling more cost-effective voice and data integration.
- Reduced cost of data communications, as a result of increasing availability of broadband technology and new generation packet switch technology.

Market Size and Structure

The Western European ICT market was 392 billion ECU in 1998, or 5% of the GDP. See Fig 1. *(Source: EITO 1999)*

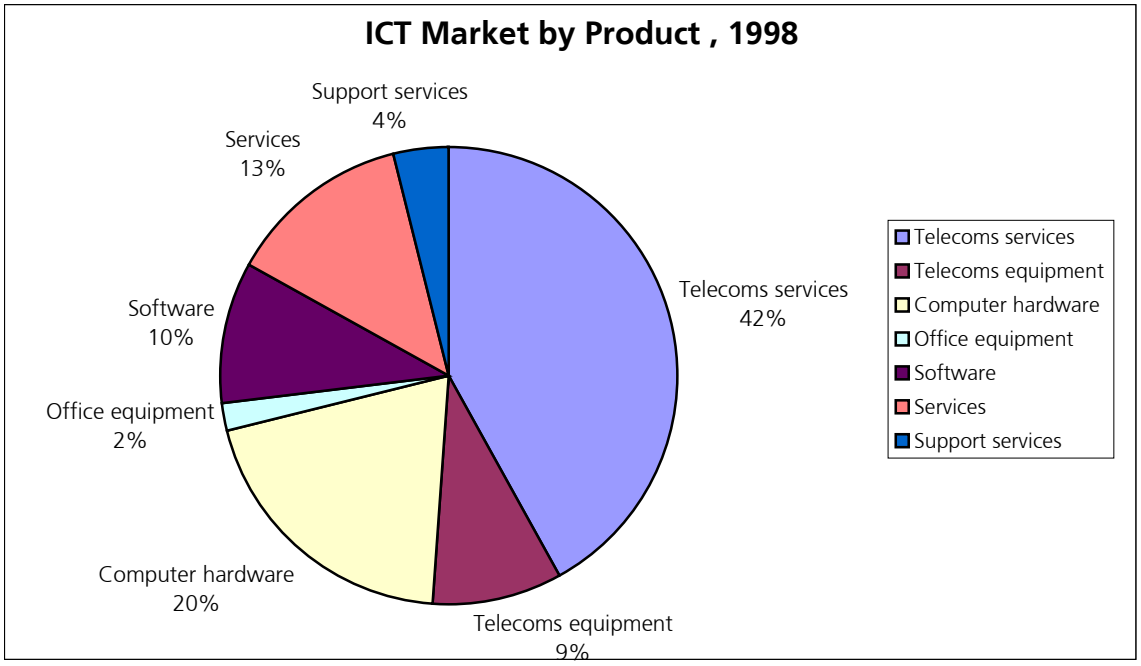

Fig 1: ICT market by product.

Information technology (including office equipment, electronic data processing equipment, software and services) accounted for 193 billion ECU, while telecommunications equipment and services contributed 199 billion ECU. Western Europe ICT market growth was 8.9% in 1998 and figures of 8.2% are expected for 1999.

The European share of the ICT market accounted for 30.2% of the world-wide ICT market in 1998.

Trends by product segment

The IT hardware market grew by 5.9% in 1998, with a 5.5% growth is expected for 1999. This growth was boosted by high increases in the server and PC client segments. The Western European server market grew by 8.0% in 1998, and represented 29% of the total IT hardware market (28% in 1997). Both the introductions of the Euro and the Y2K issue led to greater investments in servers. The shift towards smaller systems and the use of merchant chip types have created an expectation of rapid annual improvements in price/performance in the server area. This in turn in shortening the average life cycle of servers and making the market more like the PC area, increasing annual sales as a result.

PC market accelerators include the following.

- Desktop upgrading in large/medium enterprises to Pentium II/NT.
- Year 2000 and Euro issues hastening upgrading of PCs in large organisations.
- ERP software supporting general growth.
- Web PC sales.
- Targeted marketing campaigns encouraging SMEs to upgrade.

The desktop PC Market grew above expectation in 1998 both in units and in value terms, reaching a 76% of the total PC market. A big threat to home PC shipments is expected to come from the development of the information appliance market eg Net TVs, screen phones, Internet gaming consoles, Internet smart hand-held devices. During 1998, the information appliance market has been poised on the edge of mass-market acceptance. Although information appliances represent some 2% of total Internet access devices in Europe, strong growth is expected through 2002 as they fill the market opening for easy-to-use, low-cost access to Internet-based benefits. In 2002, shipments of consumer-used information appliances are expected to outstrip those of consumer-used desk-top PCs. Software sales rose by 12.1% in 1998, and are expected to grow by 12.8% in 1999.

However, as 2001 draws to a close, the global economy is heading towards recession. The world's two largest economies - the United States and Japan - are simultaneously in retreat, and Europe's growth is poor. Telecommunications spending has evaporated world-wide. A number of large manufacturers of telecommunications equipment are cutting their workforce by significant numbers, and are reporting substantial losses.

Europe as a consumption area

Banking was the most active adopter of ICT during 1998, and it is expected to continue to invest heavily in 1999. The Manufacturing sector has continued its restructuring process; streamlining and cost-cutting were the major aim of this trend. Companies' efforts to create new organisational structures have caused reviews of their information systems. Integrated enterprise applications and

networking technologies (Intranet, extranet) were therefore the major drivers of IT growth for the European Manufacturing industry. Demand for business services is booming. Consulting companies are benefiting the most due to the Euro and Y2K issues. However, growth could be inhibited by skills shortages. Government IT continued to be weak in 1998 with the exception of UK central and local government.

Impact of the Intranet.

Significant investments have been made in the European Internet infrastructure and in the development of Internet connectivity and value-added services. Most of the effort is still geared towards solving security, capacity and privacy issues in Europe, with a longer term vision of turning the Internet into a multi-media platform supporting voice, video, image, broadcast entertainment and commercial transactions. The following trends have been identified:

- The number of devices accessing the Web in Western Europe will grow from 14.2 million by the end of 1997 to almost 58 million by the end of 2001;
- The number of Internet/online active accounts will grow from 27 million at year-end 1997 to 68 million at yearend 2001.
- Germany and the UK are the largest Internet market in Western Europe, each with an Internet population of over 5 million Internet/online-active accounts at yearend 1997.
- The percentage of active accounts buying goods and services on the Web is expected to grow modestly, reaching 34% for home accounts and 20% for business ones by yearend 2001.

Figures 2 and 3 illustrate the EU IT market value and the number of PCs shipped between 1996 and 2000. Figure 4 shows the percentage increase in EU IT hardware shipments over the period 1994 to 1999.

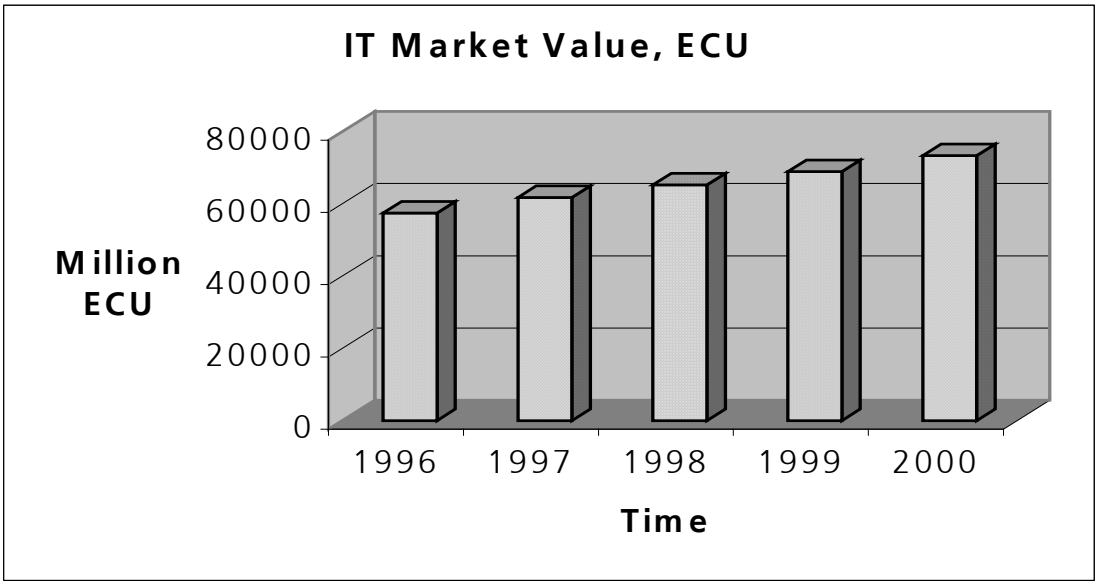

Fig 2: EU ICT market value.

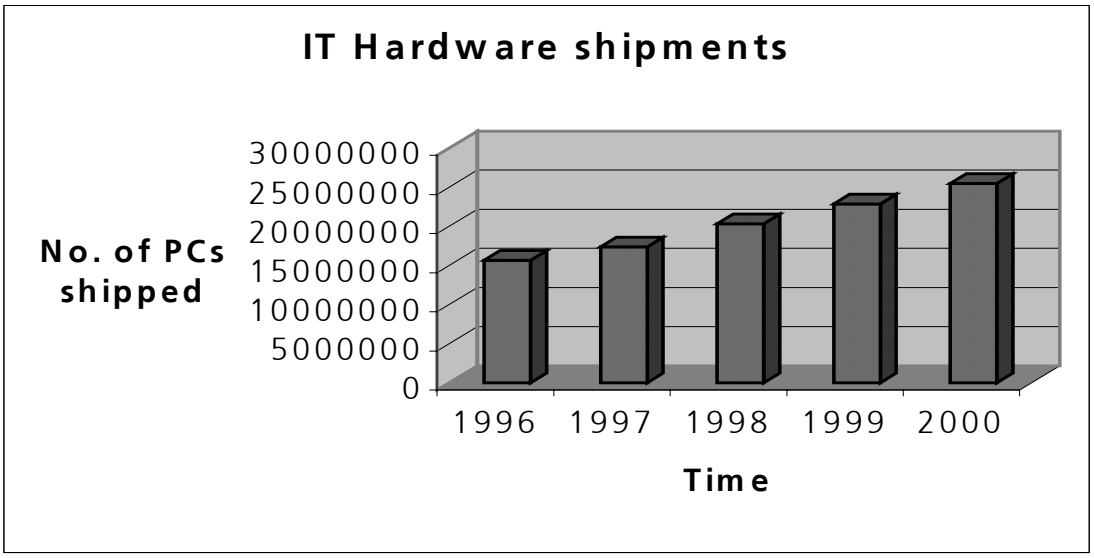

Fig 3: EU IT hardware shipments.

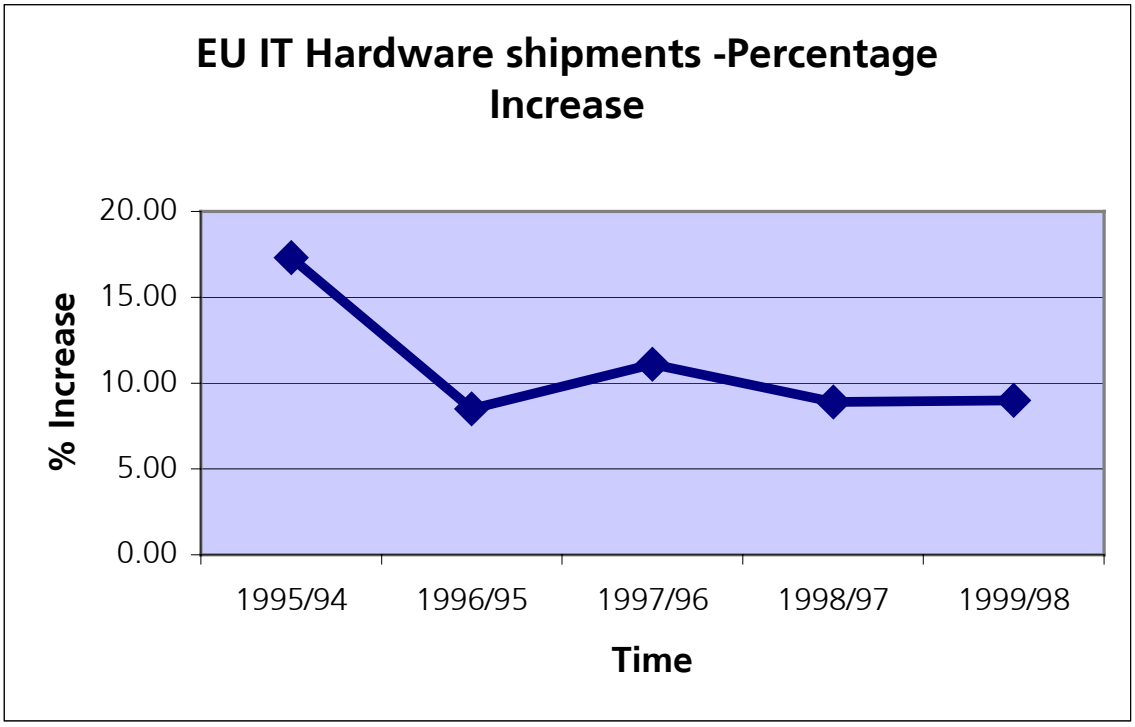

Fig 4: Percentage increase in IT hardware shipments in the EU [4]

Impact of the Internet

Significant investments have been made in the European Internet infrastructure and in the development of Internet connectivity and value-added services. Most of the effort is still directed towards solving security, capacity, and privacy in Europe, with a longer term vision of turning the Internet into a multimedia platform supporting voice, video, image, broadcast entertainment and commercial transactions.
Currently, 35% of the Western Europeans who use the Internet from work or from school also use it from home. This overlap between business and home users is expected to increase steadily, reaching 55% in 2001.

Impact of ICT on the environment

Computers are contributing to a better understanding of man's impact on natural resources through the collection, storage and analysis of information from a variety of sources. For example, as the power of computers has increased it has become possible to construct reliable weather and climate models, without which the impact of global warming gases could not have been calculated. The Internet has allowed much greater dissemination of information more quickly than was possible using other media.

However, a fundamental culture change of everyone in the developed world will be required in order to even approach a sustainable society. Some steps have already been taken.

Eco-efficiency

The concept of eco-efficiency was promulgated at the 1992 'Earth summit' as the way forward for companies individually, and business collectively, to contribute towards sustainable development. Subsequently the World Business Council for Sustainable Development (WBCSD) has done much to develop the concept into a meaningful principle which business can readily adopt. The following definition has been agreed:

'Eco-efficiency is reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the earth's estimated carrying capacity.'

WBCSD has identified seven elements of eco-efficiency:

1) reduce the **material** intensity of goods and services;
2) reduce the **energy intensity** of goods and services;
3) reduce **toxic** dispersion;
4) enhance material **recyclability;**
5) maximise sustainable use of **renewable** resources;
6) extend product **durability;** and
7) increase the **service intensity** of goods and services.

It has been projected that material and energy consumption, and burdens on the earth's life support systems will have to be reduced by a factor of between 10 and 20 per unit of output, by the year 2040 to support a sustainable consumption of the world's goods and services. To put this in context, a ten-fold improvement over 30 years is equivalent to an average 8% gain every year.

These elements of eco-efficiency are a suitable basis for the development of performance indicators of sustainable development. If one were to measure a company's performance now, then an 8% per year improvement will represent a significant step towards an ultimate sustainable development goal, provided that the improvement is also factored for production volumes - clearly an 8% gain in eco-efficiency would be completely offset by an 8% increase in output.
Much work remains to be done on the development of these indicators; performance so far in the context of the IT industry is summarised below:

Material Intensity

Some progress had been achieved. For instance, a laptop computer weighing less than 5kg has more processing power than a 1970s mainframe weighing 5 tonnes. This represents an eco-efficiency gain per unit of 1000 in 20 years.

It should be noted, however, that these gains may be off-set by the increase in IT hardware.

Energy Intensity

Progress is similar. For example, today's laptop typically operates at a power rating of 50 watts or less, compared with up to 500 kVA for the 1970s mainframe. This represents a gain of 10,000 in 20 years for the same computing power. Equally, a far more powerful mainframe in the 1990s consumes only as much power as a tumble dryer. Large capacity disk storage has achieved a reduction of 50 in power consumed per gigabyte stored over 15 years, while small discs have achieved the same gain in only 5 years.

The IT industry also took a lead by agreeing with the US Environmental Protection Agency the criteria for the Energy Star Award, whereby PCs have to go into standby mode after a given period of inactivity. The Energy Star Award is well on the way to becoming an international standard, and the use of such products is predicted to dramatically reduce the overall power consumption of such products.

Toxic Dispersion

The most conspicuous toxic dispersion by the IT industry arose from the use of CFCs as cleaning agent for electronic components. Once CFCs were identified as environmentally detrimental, the industry moved quickly to eliminate their use. One company reduced CFC emissions from over 200 tonnes per year in 1989 to zero in 1993. Other measures of performance demonstrate similar improvements. Toxic Release Inventory (TRI) emissions in US microelectronic plants have shown a factor of 10 reduction per unit of production in the 4 years 1991 to 1994, while hazardous waste generation per unit showed a factor of 5.8 reduction in the same period.

World wide efforts are now underway to find more environmentally friendly replacements for the heavy metals lead, mercury, cadmium etc and halogenated flame retardants currently finding widespread use in ICT hardware.

Material Recyclability

The main components of IT products are metal, plastic and glass. The entire industry is fully committed to the use and reuse of materials and components. In Europe, EICTA (European Information Communication Technology Association) has

taken the lead in the international debate on how best to deal with electronic waste. Most major IT manufacturers in Europe run voluntary takeback schemes, and typically are achieving a reuse and recycling rate of 90%. IT products are making increased use of recycled components and materials.

Use of Renewable Resources

Products are designed to encompass reusable and interchangeable modules and components. Where possible, used parts are assembled into new products and sold as Equivalent to New (ETN). Also, used products are refurbished where appropriate, and sold as ETN, thus reducing the requirement for virgin raw materials.

Product Durability

The average life of an IT product in Europe is 10 years. However, its 'first-use' life may be as short as two years, and this is likely to decrease even further. This significantly exceeds its shelf life which can be as little as one year. It is also double its viable life without upgrading. Barely 25% of products shipped 10 years ago are finding their way into the waste stream.

Service Intensity

In the early days, 80% of a customer's investment in IT was due to hardware. Today that figure is nearer 20%, with over 50% accounted for by software and services. Yesterday's customers bought hardware on which they ran programs which they had written. Today's customers buy a solution to a business problem.

Conclusion

It can be argued, with some justification, that many of the environmental improvements in the IT industry have come about for other reasons, more to do with improving the product and company profitability. Nevertheless, the application of eco-efficiency indicators demonstrates that the concept works. Consistent progress will only be made when the primary driver for change is environmental rather than business.

Further developments can be expected as a result of three Directives proposed by the European Commission on:

-Waste Electrical & Electronic Equipment (WEEE);

-the impact on the Environment by Electrical & Electronic Equipment (EEE); and

-Restrictions on the Use of Certain Hazardous Substances in Electrical & Electronic Equipment (RoH)

and the national regulations required to implement their requirements.

References

[1] European Environment Agency (*http://org.eea.eu.int/documents /Issuerep/envcom/alternative.htm)*

[2] UK Energy in Brief, Dec 1999. DTI

[3] European Information Technology Observatory (EITO) 1999.

[4] European Information Technology Observatory (EITO) 1998.