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Rethinking the European ICT Agenda

Ten ICT-breakthroughs for reaching Lisbon goals

Ministry of Economic Affairs

The Netherlands

Directorate-General Telecommunications and Post

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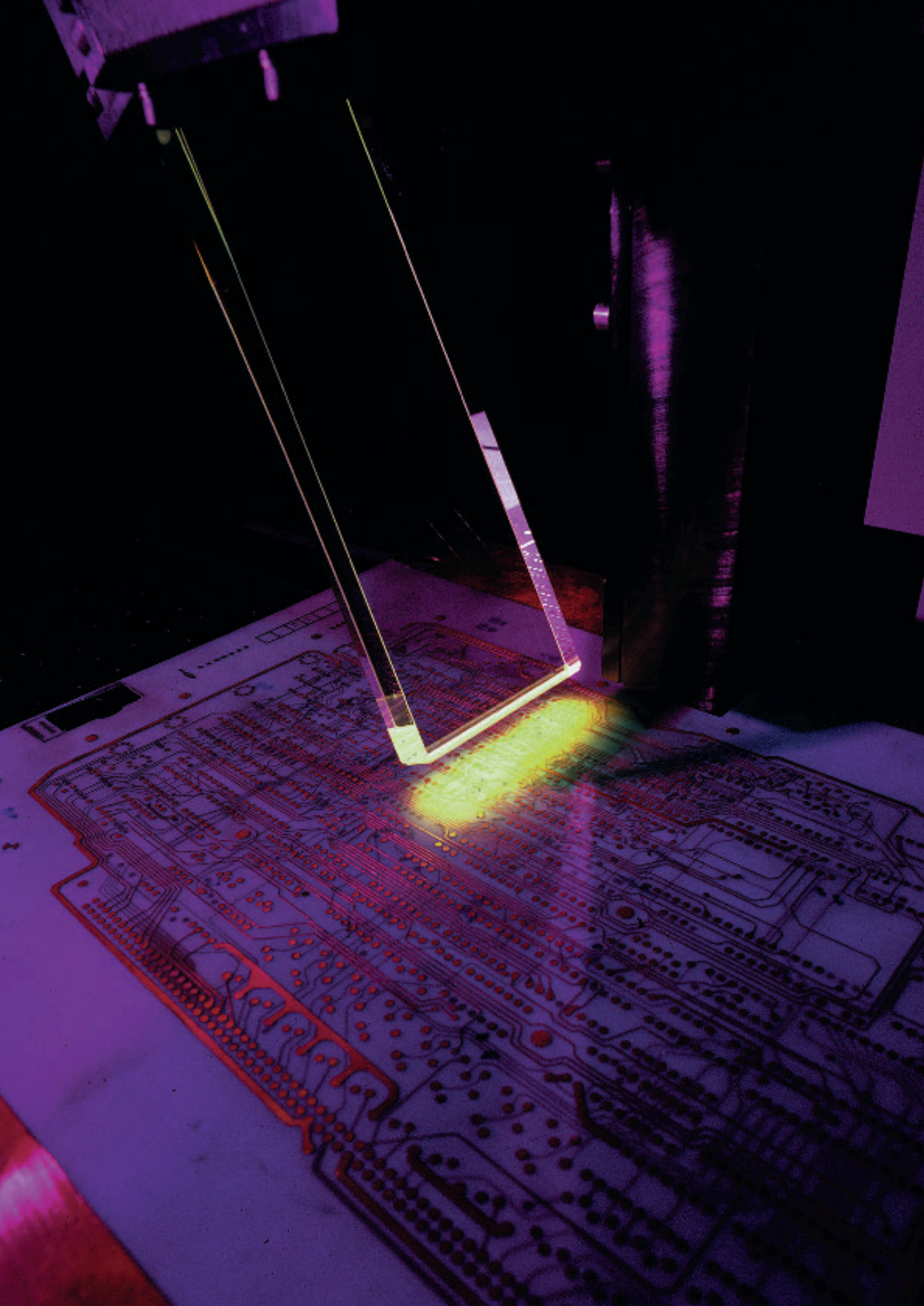
Rethinking the European ICT agenda

Ten ICT-breakthroughs for reaching Lisbon goals

The Hague, August 2004

PricewaterhouseCoopers is responsible for the content of this report which is based on a thorough desk-top study and interviews with ICT thought leaders. The publication does not seek to provide advice, and should not be read as if it does, but raises a number of issues and theme's that would be well advised to discuss around the new European ICT agenda.

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Preface
Now is the time for breakthroughs!

The Netherlands 2004 Presidency of the European Union is marked by a unique period in the history of the EU: this will be the first full presidency with the 10 new EU Member States, an enlarged European Parliament has recently been elected and a new enlarged European Commission is just now being appointed. These developments provide us with the opportunity to move forward with a new agenda to stimulate productivity growth and competitiveness of the European economy to create jobs and more prosperity for our citizens. Now is the time to think about the future. Now is the time for breakthroughs!

This report is tentative and provocative. It is meant to inspire you to re-think and revitalize the Lisbon agenda and especially the European ICT agenda. Over the past years we booked important results with relatively modest means: the implementation of the ONP-guidelines and the exchange of innovative ideas and best practices (as part of the e-Europe Action Plans). It brought us a more open market for electronic communications, and stimulated the roll out and take up of new ICT-infrastructures and services. It made clear once more how tight the take up of ICT is related to innovation and sustainable economic growth. But we will not attain our targets by merely continuing in these tracks. The burst of the IT-bubble, new Member States, new technological possibilities and the rise of competing powers from Asia to America, - they all require a fresh look at our targets and the way to achieve them.

Time is right to enter a new phase in the integration of ICT in our economy and society. From the period of roll out and installation of ICT-infrastructures and applications we are moving towards the phase of deployment. We have moved away from a technology-push approach and have emphasized the importance of now better reaping the benefits of ICT. Today, we are better connected than ever. But how can we use these connections to reach our goals? How should we transform the processes of production and distribution of goods and services to embed ICT in an effective way? How can we make a successful transition to a network economy and a knowledge-based society? Do we share a European culture as a foundation for a flowering EU content industry or for a fruitful exchange of knowledge, R&D and science? Can ICT provide us with the means to build a European community while retaining our national identities?

As I pointed out above, this report is tentative and provocative. I have initiated this report to start the discussion about the future European ICT agenda. PricewaterhouseCoopers is responsible for the content of this report, which presents a list of breakthroughs that we may need to achieve our Lisbon-goals. During the Dutch EU Presidency in the second half of 2004 I would like to stimulate the debate on these issues as a basis for the renewal of the European ICT-agenda. There will be excellent discussion opportunities at the international high level conference on future European ICT policy in Amsterdam (29-30 September 2004) and also at the Telecoms Council in Brussels (9 December 2004). However, I sincerely hope that the debate won't be limited to these occasions. I look forward to the discussions that will be ignited by this report and surely hope you will be among the participants!

Laurens Jan Brinkhorst
Minister of Economic Affairs

Management summary

Europe has set itself the highest target, it wants to become the most competitive and dynamic knowledge-based economy, to have sustained and accelerated economic growth with full employment and a modernised social protection system. But everyone agrees that the Lisbon targets are still far away. Structurally, the economic growth rate and worker productivity are lower than in many comparable countries such as the USA. The key technology to stimulate growth in Europe is ICT. Although the ICT developments in the last decade have been spectacular, the potential contribution of ICT to economic growth and the quality of life is still enormous. However, it is necessary to take account of the ICT paradigm of today and proven best practices in an international setting to achieve the best results in the future.

There are several countries that are very successful with their creation and implementation of ICT. The few that were investigated in this study: Korea, India, China, USA and Japan all outperform the EU in many respects. These countries have bold initiatives and dare to improve their position in the field of ICT with proactive industrial policies.

Europe too can be successful. Present policies are very useful but not instrumental enough to enable Europe to catch up with other economic powers. We have to reconsider the present policies to identify the issues that are obstructing further progress and consider further the breakthroughs that could be achieved. In this study we have identified ten of such potential breakthroughs.

Breakthrough 1: Shift the e-Business and e-Government policy from connectivity to taking up complex ICT applications

- A crucial condition for more economic growth is a broad deployment and use of ICT by enterprises and public institutions. Therefore the EU needs national strategies that focus on flanking investments in skills and organizational transformation. Special attention is needed for small and medium-sized enterprises.

Breakthrough 2: Standardize ICT environments in Europe to trigger and enable new business

- Standardization is a prerequisite for a broad deployment and use of ICT, and will trigger and enable new business. Pan-European interoperable solutions for electronic authentication and electronic payments are needed to boost innovation and economic growth significantly.

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Breakthrough 3: Accelerate the introduction of disruptive technologies

• The speed with which new technologies are accepted and put to work has a serious impact on economic growth. The EU needs to play a key role by accelerating the introduction of new (disruptive) technologies like smart tags and Voice-over IP.

Breakthrough 4: Realize the vision of 'any content, anytime, anywhere, any platform'

• Content is considered an important engine for future economic growth and employment. The EU needs to fuel this engine by realizing the vision of 'any content, anytime, anywhere, any platform' by e.g. introducting multiplatform access for content producers and new digital rights management regimes.

Breakthrough 5: Go for global platform leadership in the ICT industry

• An excellent and competitive European ICT industry is a crucial condition for economic growth and employment. The EU needs to define a strategy towards global leadership in specific areas, for example by stimulating a (new) European standards policy (in cooperation with the market) and making an explicit choice for e.g. the future of 3G mobile telecom in Europe.

Breakthrough 6: Develop a strategic response to job migration to low-wage countries

• Economic growth and employment can be seriously affected by the accelerated job migration to low-wage countries. The EU needs to develop a strategic response.

Breakthrough 7: Remove barriers for the development of an innovating European electronic communications sector

• The electronic communications sector is a proven source for economic growth and employment. The EU needs to anticipate in an early stage the barriers for investments in next generation networks.

Breakthrough 8: Move to a new and flexible model of spectrum allocation

• The spectrum is one of the major battlefields for innovation and new business. Modernization of spectrum policies will have a large economic impact. Therefore the EU urgently needs to make its rigid spectrum allocation model flexible.

Breakthrough 9: Enforce real solutions for consumer confidence and security

• A crucial condition for a broad deployment and use of ICT by business and consumers is user confidence. Therefore the EU needs to enforce structural solutions for viruses and spam by creating liabilities, give priority to cybercrime within law enforcement and ensure the availability of critical infrastructures.

Breakthrough 10: Shift e-Inclusion policy from 'access for all' to 'skills for all'

- A crucial step for a broad deployment and use of ICT by consumers is that Europe's e-Inclusion policy does not only focus on broadband access, but also on the skills Europeans need to participate in the information society. Therefore the EU needs to redefine the current universal service obligation and adopt strategies for improving ICT skills.

Résumé relatif à la gestion

L'Europe s'est fixé l'objectif le plus ambitieux: elle veut devenir l'économie basée sur la connaissance la plus compétitive et la plus dynamique afin d'enregistrer une croissance économique soutenue et accélérée, caractérisée par le plein emploi et un système de protection sociale moderne. Néanmoins, tous s'accordent à dire que les objectifs établis à Lisbonne sont encore loin d'être réalité. D'un point de vue structurel, le taux de croissance économique et la productivité des travailleurs sont inférieurs à ceux de nombreux pays comparables, tels que les Etats-Unis. Les TIC (technologies de l'information et des communications) sont les technologies clés qui permettront de stimuler la croissance en Europe. Bien que les développements en matière de TIC aient été spectaculaires au cours de la dernière décennie, leur contribution potentielle à la croissance économique et à l'amélioration de la qualité de la vie demeure énorme. Il convient quoi qu'il en soit de tenir compte des paradigmes actuels des TIC et des meilleures pratiques internationales éprouvées pour atteindre les meilleurs résultats à l'avenir.

Plusieurs pays enregistrent d'importants succès sur le plan de la création et de l'implémentation de TIC. Ceux que nous avons étudiés dans le cadre de cette étude, à savoir la Corée, l'Inde, la Chine, les USA et le Japon, surclassent tous l'UE sous de nombreux aspects. Ces pays ont mis en place des initiatives ambitieuses et osent améliorer leur position en matière de TIC par des politiques industrielles proactives.

L'Europe aussi peut connaître le succès. Ses politiques actuelles sont très utiles mais pas suffisamment décisives pour permettre à l'Europe de rattraper les autres puissances économiques. Nous devons revoir les politiques présentes afin de mettre le doigt sur les éléments qui entravent la progression et envisager plus en profondeur les percées qui pourraient être réalisées. Dans cette étude, nous avons identifié dix progrès technologiques importants potentiels.

Progrès 1: Faire évoluer la politique du commerce électronique et du gouvernement électronique de la connectivité à l'incorporation d'applications TIC complexes

• Le déploiement et l'utilisation intensifs des TIC par les entreprises et les institutions publiques sont des conditions essentielles à une amélioration de la croissance économique. L'UE doit donc développer des stratégies nationales visant à favoriser les investissements ayant pour but d'améliorer les aptitudes et de transformer les organisations. Une attention toute particulière doit être accordée aux petites et moyennes entreprises.

Progrès 2: Standardiser les environnements TIC en Europe pour stimuler un nouveau mode de commerce et permettre son développement

- La standardisation est un pré requis au déploiement et à l'utilisation intenses des TIC. La standardisation va stimuler un nouveau mode de commerce et permettre son développement. Des solutions paneuropéennes caractérisées par l'interopérabilité permettant l'authentification électronique et les paiements électroniques sont nécessaires pour relancer de manière significative l'innovation et la croissance économique.

Progrès 3: Accélérer l'introduction des technologies disruptives

- La rapidité avec laquelle les nouvelles technologies sont acceptées et mises en place présente un impact de taille sur la croissance économique. L'UE doit jouer un rôle majeur et accélérer l'introduction de nouvelles technologies (disruptives), telles que les smart tags et les Voice-over IP.

Progrès 4: Réalisation de la vision 'n'importe quel contenu, n'importe quand, n'importe où, n'importe quelle plate-forme'

- Le contenu est considéré comme un moteur important de la croissance économique future et de l'emploi. L'UE doit alimenter ce moteur en réalisant la vision 'n'importe quel contenu, n'importe quand, n'importe où, n'importe quelle plate-forme', par exemple par l'introduction de l'accès multiplate-forme pour les producteurs de contenus et de nouveaux régimes de gestion des droits numériques.

Progrès 5: Viser un leadership sur la plate-forme mondiale dans l'industrie des TIC

- Une excellente industrie européenne des TIC compétitive est une condition essentielle à la croissance économique et à l'emploi. L'UE doit définir une stratégie de leadership mondial dans des domaines spécifiques en stimulant par exemple l'adoption d'une (nouvelle) politique de normes européennes (en coopération avec le marché) et en opérant notamment un choix explicite relatif à l'avenir de la téléphonie mobile de la 3G en Europe.

Progrès 6: Développer une réponse stratégique à la migration du travail vers les pays à bas salaire

- La croissance économique et l'emploi peuvent être gravement affectés par l'accélération de la migration du travail vers les pays à bas salaire. L'UE doit donc définir une réponse stratégique en la matière.

Progrès 7: Supprimer les obstacles au développement d'un secteur européen innovant de la communication électronique

- Le secteur des communications électroniques est une source éprouvée de croissance économique et d'emploi. L'UE doit anticiper au plus tôt les obstacles à l'investissement dans les réseaux de la prochaine génération.

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Progrès 8: Mettre en place un nouveau modèle souple d'affectation du spectre

- Le spectre est l'un des principaux champs de bataille en matière d'innovation et de commerce de type nouveau. La modernisation des politiques en matière de spectre aura un impact économique considérable. Par conséquent, l'UE doit assouplir de toute urgence son modèle rigide d'affectation du spectre.

Progrès 9: Mettre en place des solutions réelles sûres engendrant la confiance du consommateur

- La confiance de l'utilisateur est une condition incontournable au déploiement et à l'utilisation intensifs des TIC par les entreprises et les consommateurs. L'UE doit mettre en place des solutions structurelles de lutte contre les virus et les courriers électroniques publicitaires non sollicités (spams) par la définition des responsabilités, accorder la priorité à la lutte contre les cyberdélits dans le cadre de l'application de la loi et garantir la disponibilité des infrastructures requises.

Progrès 10: Faire évoluer la politique d'inclusion électronique de l''accès pour tous' aux 'aptitudes pour tous'

- En vue du déploiement et de l'utilisation intensifs des TIC par les consommateurs, il est essentiel que la politique européenne d'inclusion électronique se concentre non seulement sur l'accès à large bande mais également sur les aptitudes que les Européens doivent posséder pour pouvoir participer à la société de l'information. Dès lors, l'UE doit redéfinir l'obligation de service universel actuelle et adopter des stratégies pour améliorer les capacités en matière de TIC.
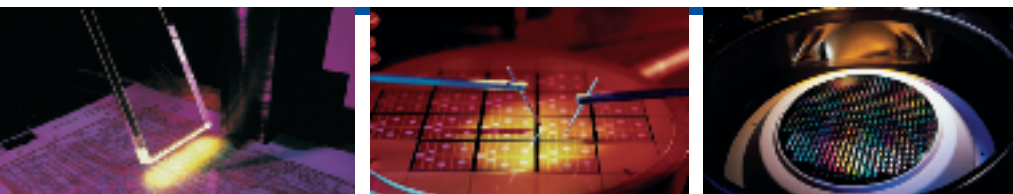
Executive summary

Europa hat sich ein äußerst ehrgeiziges Ziel gesetzt: Es will die wettbewerbsfähigste und dynamischste wissensbasierte Ökonomie der Welt werden, ein dauerhaft hohes Wachstum und Vollbeschäftigung erreichen sowie sein Sozialsystem modernisieren. Indes besteht kein Zweifel, dass der Weg zu den Zielen von Lissabon noch weit ist. Die Wachstumsraten und die Arbeitsproduktivität sind strukturbedingt niedriger als in vielen vergleichbaren Ländern wie etwa den USA. Die IuK sind die Schlüsseltechnologien zur Belebung des europäischen Wachstums. Obwohl die IuK sich im letzten Jahrzehnt stürmisch entwickelt haben, ist ihr potenzieller Beitrag zu wirtschaftlichem Wachstum und höherer Lebensqualität noch längst nicht ausgeschöpft. Indes müssen die aktuellen IuK-Paradigmata und international bewährte Bestpraktiken berücksichtigt werden, damit in der Zukunft optimale Ergebnisse erzielt werden können.

Einige Länder können in Sachen Entwicklung und Anwendung der IuK auf herausragende Erfolge verweisen. Die wenigen in dieser Studie untersuchten Länder (Korea, Indien, China, die USA und Japan) sind der EU in vieler Hinsicht weit überlegen. Sie ergreifen kühne Initiativen und scheuen sich nicht, zur Verbesserung ihrer Position im IuK-Sektor proaktive industriepolitische Strategien zu verfolgen.

Auch Europa kann erfolgreich sein. Die gegenwärtigen Politiken sind zwar sehr nützlich, reichen jedoch nicht aus, um Europa in die Lage zu versetzen, den Abstand zu anderen Wirtschaftsmächten zu verringern. Wir müssen die derzeitigen Politiken überprüfen, die Hindernisse identifizieren, die weiteren Fortschritten im Wege stehen, und wir müssen uns ausführlicher mit den realisierbaren Durchbrüchen befassen. In dieser Studie haben wir zehn Bereiche benannt, in denen Durchbrüche möglich sind.

Erster Durchbruch: Die Politiken zur Förderung von e-Business und e-Government von Konnektivität auf die Übernahme komplexer IuK-Anwendungen umstellen

- Eine entscheidende Voraussetzung für mehr wirtschaftliches Wachstum besteht in der breiten Ausrüstung von Unternehmen und öffentlichen Institutionen mit IuK sowie ihrer Nutzung. Daher braucht die EU einzelstaatliche Strategien, die sich auf flankierende Investitionen in Qualifikationen und organisatorischen Wandel konzentrieren. Dabei bedürfen die kleinen und mittleren Unternehmen besonderer Beachtung.

Zweiter Durchbruch: Das europäische IuK-Umfeld standardisieren, um neue wirtschaftliche Aktivitäten auszulösen und marktfähig zu machen

- Standardisierung ist eine Voraussetzung für die breite Ausrüstung mit IuK und ihren Einsatz. Zur wirksamen Stimulierung von Innovation und Wirtschaftswachstum sind europaweit dialogfähige Lösungen für elektronische Authentifizierung und elektronische Überweisungen erforderlich.

Dritter Durchbruch: Die Einführung von disruptiven Technologien

- Die Geschwindigkeit, mit der neue Technologie akzeptiert und angewendet werden, wirkt sich unmittelbar auf das wirtschaftliche Wachstum aus. Daher muss die EU bei der Beschleunigung der Einführung neuer (disruptiver) Technologien wie „Smart Tags" und „Voice-over IP" eine Schlüsselrolle übernehmen.

Vierter Durchbruch: Die Vision 'any content, anytime, anywhere, any platform' verwirklichen

- Inhalt gilt als wichtige Lokomotive für Wirtschaftswachstum und Beschäftigung. Die EU muss diese Zugmaschine betanken, indem sie die die Vision 'any content, anytime, anywhere, any platform' verwirklicht, z.B. durch die Einführung von „Multiplatform Access" und neuen Regimen für das Management von digitalen Rechten.

Fünfter Durchbruch: Weltweite Plattform-Führerschaft in der IuK-Industrie anstreben

- Eine leistungs- und wettbewerbsfähige europäische IuK-Industrie ist eine entscheidende Bedingung für Wirtschaftswachstum und Beschäftigung. Daher muss die EU eine Strategie zur Erringung einer weltweiten Führungsrolle in bestimmten Bereichen ausarbeiten, z.B. indem sie - in Zusammenarbeit mit den Märkten - eine (neue) europäische Normenpolitik vorantreibt und klare Entscheidungen trifft, etwa für die Zukunft von 3G-Mobiltelekommunikation in Europa.

Sechster Durchbruch: Eine strategische Antwort auf die Delokalisierung von Arbeitsplätzen in Niedriglohnländer entwickeln

- Wirtschaftswachstum und Beschäftigung können durch die beschleunigte Abwanderung von Arbeitsplätzen in Niedriglohnländer schwer beeinträchtigt werden. Die EU muss eine strategische Antwort entwickeln.

Siebter Durchbruch: Hindernisse ausräumen, die der Entwicklung eines innovationsstarken europäischen elektronische Kommunikationssektors entgegenstehen

- Der elektronische Kommunikationssektor ist erwiesenermaßen eine Quelle von Wirtschaftswachstum und Beschäftigung. Die EU muss frühzeitig die Hindernisse ausräumen, die Investitionen in Netzwerke der nächsten Generation im Wege stehen.

Achter Durchbruch: Zu einem neuen flexiblen Modell der Spektrumallokation übergehen

- Das Spektrum gehört zu den entscheidenden Schauplätzen des Kampfs um Innovationen und neue wirtschaftliche Aktivitäten. Eine Modernisierung der Spektrumpolitiken wird weitreichende wirtschaftliche Folgen nach sich ziehen. Daher muss die EU dringend ihr rigides Modell der Spektrumallokation zugunsten eines neuen flexiblen Modells ändern.

Neunter Durchbruch: Echte Lösungen zugunsten von Verbrauchervertrauen und Sicherheit durchsetzen

- Eine entscheidende Bedingung für eine breite Ausrüstung der Unternehmen und Verbraucher mit IuK sowie für ihre tatsächliche Nutzung besteht im Vertrauen der Nutzer. Daher muss die EU strukturelle Lösungen für Viren und Spam finden, indem sie Haftungstatbestände schafft, der Bekämpfung der Cyberkriminalität Vorrang in der Strafverfolgung einräumt und die Verfügbarkeit der kritischen Infrastrukturen sichert.

Zehnter Durchbruch: Bei der Bekämpfung der digitalen Spaltung die Politik des „Zugangs für Alle" durch eine Politik der „Qualifikationen für Alle" ersetzen

- Ein entscheidender Schritt für die Ausrüstung der Verbraucher mit IuK und ihre Nutzung besteht darin, dass Europas Politik zur Bekämpfung der digitalen Spaltung sich nicht allein auf Breitbandzugang konzentriert, sondern sich auch den Qualifikationen widmet, die die Europäer brauchen, um an der Informationsgesellschaft teilhaben zu können. Daher muss die EU die geltende Universaldienstverpflichtung neu definieren und Strategien für die Verbesserung von IuK-Fertigkeiten beschließen.

1 ICT is key to reaching Lisbon goals

1.1 Lisbon goals are still far away

the ambitions of the EU are high

101   In March 2000 the European Council stated its ambition to become 'the most competitive and dynamic knowledge-based economy in the world by 2010'.[1]

> The Lisbon Agenda includes the following key political objectives to realise this ambition:
> - to establish an inclusive, dynamic and knowledge based economy;
> - to produce accelerated and sustained economic growth;
> - to restore full employment as the key objective of economic and social policy, and reduce unemployment to the levels already achieved by the best performing countries;
> - to modernize our social protection systems.

102   The policy strands to accomplish these goals are to pursue economic reform to prepare the knowledge economy and to strengthen the European social model by investing in people.

and were developed during the internet boom

103   The Lisbon Agenda was developed in a period of high expectations and was ratified at the height of the high-tech internet boom (see figure 1).
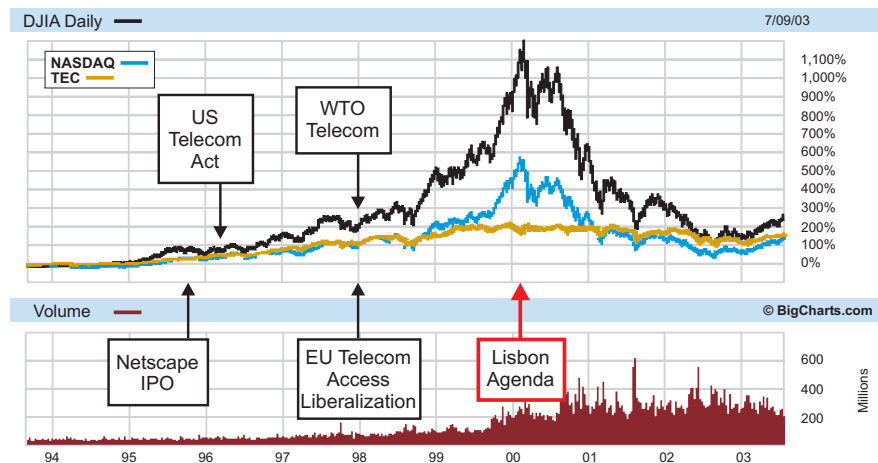

Figure 1, major telecom events in the context of US stock market developments[2]

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1   DOC/00/7. The Lisbon European Council
2   BigCharts.com 2004

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***but progress on its Lisbon
targets is sluggish***

104   At present, in the aftermath of the internet bubble, it is broadly recognised
that progress with respect to realising the Lisbon goals has so far been sluggish[3],
particularly as regards the objective to produce accelerated and sustained
economic growth. As the figures below show, Europe has not performed that
well over the past decade in comparison with other major world economies. Its
Gross Domestic Product (GDP) per capita is well below that of the USA and
Japan. If the European Union were a state in the USA it would belong to the
poorest group of states. France, Italy, Great Britain and Germany have a lower
GDP per capita than all but four of the states in the United States. This income
gap is mainly caused by differences in productivity and labour participation. E.g.
while the productivity level of Europe is relatively high, Europeans seem to make
a different trade-off between work and leisure. The rapidly aging European
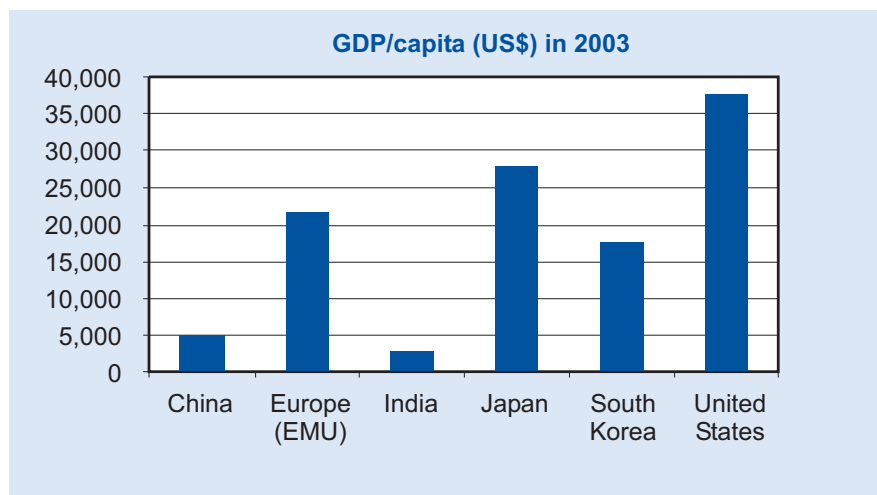population is putting more pressure on the need to improve productivity growth.

GDP/capita (US$) in 2003

Figure 2, GDP per capita per region in 2003[4]

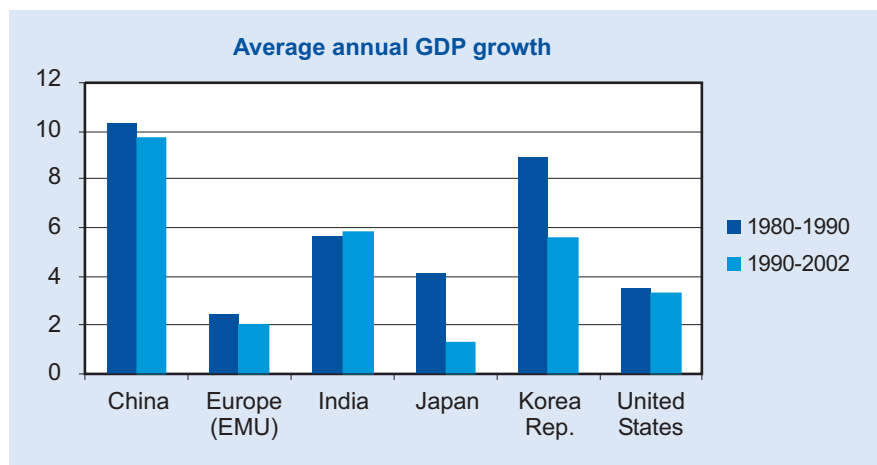**Average annual GDP growth**

Figure 3, Europe also has a lower growth than many of its rivals[5]

3   e-Europe advisory group: update e-Europe action plan 2005

4   The European Information Technology Observatory (EITO) annually publishes a market report. For this report we extensively
used the 2004 issue

productivity growth is key for Europe

105   Since the growth rates of the European economy are structurally lower than those of the USA, the income gap is not likely to disappear quickly. In Lisbon 2000, it was pointed out that welfare, competitiveness and employment can only be sustained in the long run if they are based on productivity growth and innovation. This is particularly difficult for Europe that lags behind the USA in the area of technological innovation[6].
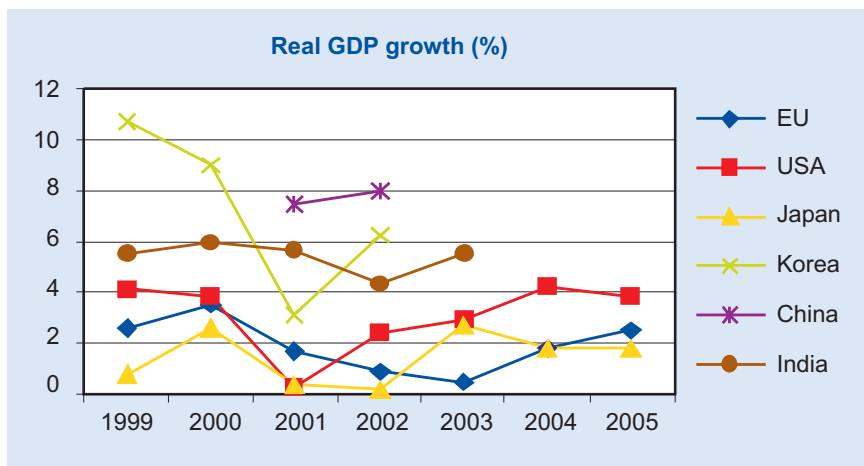
Real GDP growth (%)

Figure 4, real GDP growth (EU 15).[7]

106   Therefore, the need for Member States "to commit more firmly to pursuing the reforms defined since the Lisbon council" was emphasized during the 2004 Spring European Council Progress Review[8] . The slow progress on realizing the Lisbon goals means there is now a pressing need to review options to improve European productivity and economic growth, and to identify potential breakthroughs that could bring about structural improvements.

1.2   ICT is key to reach Lisbon goals

ICT has a direct and substantial impact on productivity growth

107   The impact of ICT on productivity is undisputed. This impact goes beyond a direct return on investment. Scientific research[9] in the USA demonstrates that computers are often the catalyst for bigger changes. Information and communication technology (ICT) is not only the technological basis for a fast growing industry sector but also an indispensable enabler and driver for an inclusive, dynamic and knowledge based economy and a modern social society.

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5   EITO 2004

6   Commission's Innovation Scoreboard

7   EITO 2004

8   COM (2004) 29 FINAL. Report from the Commission to the Spring European Council

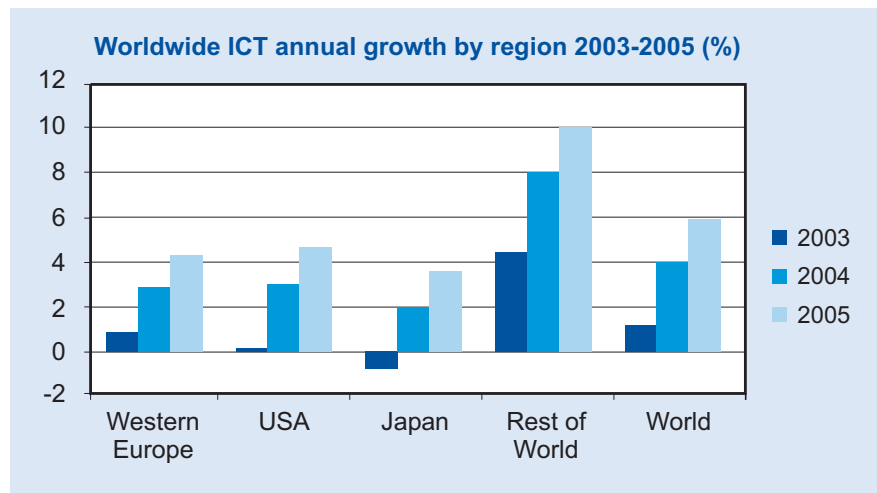9   Brynjolfsson and Hitt, MIT (1998): Beyond the productivity paradox

Worldwide ICT annual growth by region 2003-2005 (%)

Figure 5, ICT contributes significantly to economic growth, but there are national differences[10]

capital deepening, a growing ICT sector and multifactor productivity all contribute to economic growth

108   ICT has turned into a key technology for pursuing sustained economic growth, in various ways[11]:
- Investments in ICT infrastructure, networks, productive equipment and software (capital deepening) creates economic growth. OECD estimated that in the last decade ICT investments have typically produced an annual GDP growth of between 0.3% and 0.8%. This was a significant contribution to overall economic growth viewing an average European GDP growth of approximately 2% (figure 3).
- The growth of the ICT sector itself produces economic growth. After the burst of the Internet bubble, the ICT sector experienced a few difficult years, but at present it outperforms many other sectors. Some countries have very strong ICT sectors that contribute significantly to the GDP growth (annual contribution in Korea, Ireland and Finland: approximately 1%).
- Firms that increase their efficiency by using ICT (multifactor productivity) create economic growth. The USA for example has obtained an annual average productivity growth rate of 1.4% (1996-2001). As a 'general purpose technology' ICT has a strong impact on a wide range of industries and it often is an enabler for major innovations in non-ICT sectors. The communications sector itself has been the largest contributor to labour productivity and is a key asset. The sectors that heavily depend on ICT, such as financial services, have also benefited a lot from such investment.

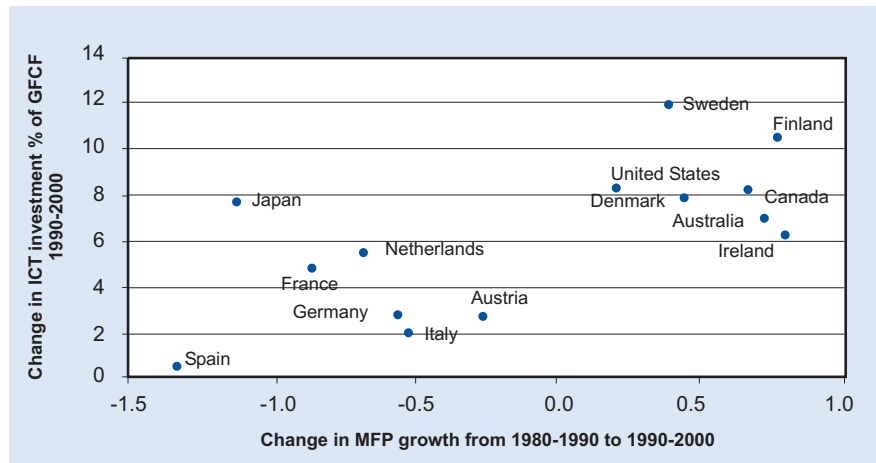
10   EITO 2004

11   EITO 2004
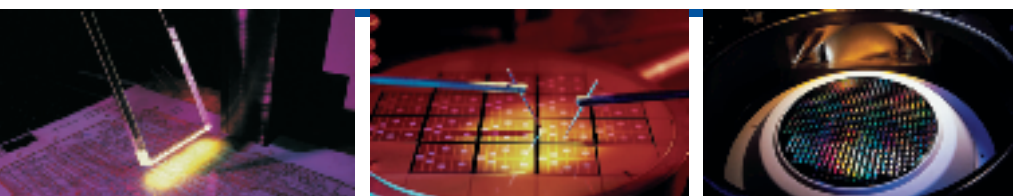
Figure 6, correlation between productivity growth and ICT investment (Multi Factor Productivity change against change in Gross Fixed Capital Formation)[12]

109   The contribution of ICT to economic growth has been researched recently by a study[13] in the USA that shows that in the short run (1 year) computerization in industries makes a measured contribution to productivity and output growth that is consistent with normal returns on computer investments. However the output and contributions associated with computerization are up to five times greater over longer periods (5 years). This suggests that the contribution of ICT is accompanied by relatively large and time consuming investments in complementary inputs such as organizational capital.

110   Regarding the employment goal, ICT has proven to be one of the largest generators of employment over the last decade. The ICT sector (hardware, software, communication services) continues to generate jobs (6% growth between 1996 and 2001), in spite of fears of job losses as a result of liberalisation, largely due to the emergence of new markets for mobile communications. At present employment in the ICT sector is substantial, in 2002 for example, 7.2% of French employment was in ICT. Many other member states have similar percentages[14].

ICT is also a strong contributor to the European social model

111   Regarding the strengthening of the European social model, and in a wider sense, of the quality of life, ICT has proven to be a valuable tool[15] for any government that wants to provide new and efficient services to its citizens. Society has rapidly become very dependent on ICT. This not only pertains to individual users and companies but also to public services such as the transport and energy sectors. There is no part of society that functions without ICT or is not benefiting from ICT. The 3rd Report on cohesion[16] showed the strong

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12   OECD, (2003): ICT and economic growth

13   Brynjolfsson and Hitt, MIT Sloan School of management (2003): Computing productivity: firm-level evidence, paper 139

14   CGE&Y / Strategy Academy / Zenc. (2003): ICT Innovatie in Nederland - Een strategische analyse van het Nederlandse ICT-Innovatiesysteem

15   e-Europe 2005 Action Plan: An Update, extended impact assessment

16   A new partnership for cohesion, February 2004

contribution that on-line public services can make to raise the access and availability of services and employment. On-line provision can be a catalyst for e-Inclusion by offering new and better services. On-line health services, which are targeted by a specific e-Europe Action line, can provide particular benefits for disadvantaged people. On-line services can foster cultural identities and, hence, social integration. ICT can also help to overcome linguistic barriers.

1.3   The largest part of the contribution of ICT has yet to come

the internet crisis has put ICT sector on its natural growth path

112   Despite these insights in the last few years doubts have arisen about the benefits from ICT. The bursting of the internet bubble has hit many people; many organizations have seen their turnover and margins decrease, became bankrupt or were acquired. Many have interpreted this as a break away from the future we once expected. However, viewed from a distance, it is more likely that we have experienced a strong adjustment that brought the ICT sector back to its natural growth path. The "boom and bust" period of the past only seems to have accelerated the maturation of the sector. It has been overestimated what can be achieved in the short term but grossly underestimated what can be achieved in the long run.

113   This maturation process has been subject to scientific research. Similar to many technologies in the past, ICT can be observed to follow a certain "life cycle" (see figure 7). The frenzy and the following bursting of expectations (the "internet bubble") was not unique to the ICT sector but is a phenomenon often seen in the maturing of other technologies. Having learned from these earlier maturation processes, ICT is right now considered by many to be at the "turning point"[17] of the ICT-driven techno-economic paradigm.

114   In the period before the bursting of the internet bubble (the installation period), the technological revolution was fuelled by high risk, short-term, financial capital (e.g. stock market, venture capital and speculative capital). During this period, the ICT sector was characterized by hypercompetition[18], in which industries tried to outpace their competitors with speed of innovation. They considered time to market and the first mover advantage so important that business innovations were implemented hyper fast (quick and dirty), often with insufficient attention for constructing well conceived business models, interaction with customers and at the cost of a high cash burn rate. Executives, consultants and academics believed that the primary reason for acquiring ICT was to achieve rapid, exponential growth with radical new business models.

17   C. Perez (2002)

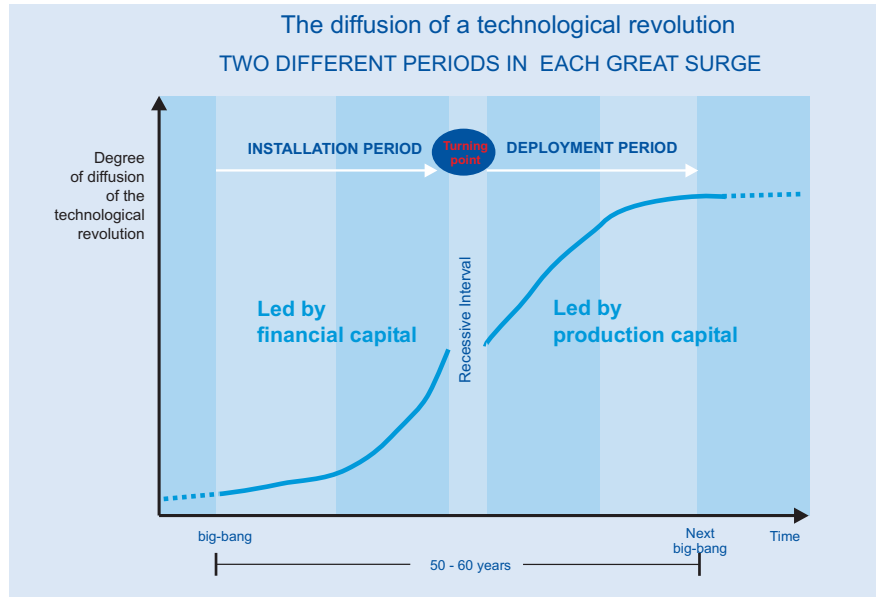18   D'Aveni, R. (1994), Hypercompetition, Free Press, New York

The diffusion of a technological revolution
TWO DIFFERENT PERIODS IN EACH GREAT SURGE

Figure 7, the life cycle of the ICT revolution[19]

115   The bursting of the technology bubble came as a shock to many high-tech companies. The collapse caused a shift in attitude and changed expectations fundamentally. The turmoil led to widespread consolidation in ICT based sectors.

ICT now is entering the deployment phase with a large economic potential

116   After the collapse (the deployment period) the paradigm has been shifting from achieving fast growth to enhancing growth and the e-enablement of core business processes, with an emphasis on visible and measurable impact. The emphasis shifted towards the ICT-dependent sectors (such as financial, retail, media, and services sectors) as well as consumers. The focus is now concerned with the use of ICT to improve business performance, with a shift from the earlier automation of stand-alone business processes towards fully integrated supply chains and supply networks. It is this period in the "life cycle" in which ICT becomes common practice, investments in ICT rise and hence has the largest economic potential.

there is a new ICT-paradigm that fits this phase

117   But the way to be successful in the period after the bubble bursting likely differs from the earlier period ("the economy of the Internet bubble"). History has shown what is likely to be required to initiate a period of prosperity which is to establish a set of regulations and policies that are coherent with the new techno-economic paradigm.

"Each technological revolution is different, each paradigm is unique, each set of solutions needs to be coherent with the problems to overcome and with the logic of the techno-economic paradigm, its opportunities and its best practices" (C. Perez)[20].

This is both the challenge and the opportunity for policy makers at the mid-way point of the Lisbon implementation period.

19   C. Perez (2002)
20   C. Perez (2002)

2 Europe has to put ICT to work

2.1 Introduction

201   Many governments want to benefit as much as possible from ICT as a contributor to economic growth and quality of life. In order to understand where the big gains for the future can be found, the present policy efforts of Europe and its main reference countries have to be known and understood. This may provide lessons that can be learned (what worked, what did not) but it is also important because it may directly impact the European competitive position. The outlines of the present efforts of the European Union as well as some of its main reference countries, as presented in this chapter, have been developed on the basis of desktop based-study, interviews and analysis.

2.2 Europe's 'Information Society for all'

2.2.1 European ICT policy: mildly regulating and stimulating aimed at a strong social cohesion

European ICT policy is aimed at an "information society for all"

202   European ICT policy is aimed at developing an 'Information Society for all'. It can best be characterized as a mildly regulating and stimulating policy aimed at a strong social cohesion. It contains the following elements[21] (see also text blocks):
1. Regulation
2. e-Europe
3. R&D

Regulation

Regulation plays an important part in shaping the European Information Society. Particular initiatives are the adoption of harmonised standards such as GSM, the liberalisation of the telecommunications sector and the creation of the Single Market. The new 'electronic communications regulatory framework', was launched in July 2003 and provides an extended legal framework for continuing the development of the industry. It was designed to stimulate competition, create growth and safeguard public and user interests. As part of the new framework the EU's new 'spectrum policy' was launched, covering a broad area, from television broadcasting to mobile telephony and from satellite positioning systems to scientific research.

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21   http://europa.eu.int/information_society/policy/index_en.htm

e-Europe

The central policy initiative is the e-Europe 2005 Action Plan. The overall aim is that, by the end of 2005, Europe will have modern, on-line public services (e-Government, e-Learning, e-Health) and a dynamic e-Business environment, based on a widespread availability of broadband access at competitive prices and a secure information infrastructure. The action plan focuses attention on and pushes forward progress in seven 'e-Europe policy priorities':
- Broadband,
- e-Business,
- e-Government,
- e-Health,
- e-Inclusion,
- e-Learning
- Security.

The e-Europe action plan 2005 was preceded by the e-Europe 2002 Action Plan, which focused on connectivity, i.e. getting Europe on-line. e-Europe 2005 measures its progress through a set of over 30 policy and supplementary indicators. Reaching the goals stated in the action plan calls for far reaching commitments from the commission member states and the private sector.

R&D

Research and technological innovation (RTD) is aimed at supporting European industrial competitiveness and at providing support to other EU policies.

With most research in Europe fragmented into national programmes, the European Information Society Technologies priority within the EU's Sixth Research Framework Programme focuses on bringing together public and private research groups across Europe to create the critical mass in the field of R&D that is required to compete internationally.

### 2.2.2   The results of the EU ICT policy so far

203   The core of European ICT policy, the e-Europe 2005 action plan was reviewed in 2004[22]. Significant progress was made towards targets in e-Government services, but also in e-Health and e-Learning. However, the review communication reiterated the well-known barriers to getting services on-line and in use. The results so far on the main policy areas of e-Europe are[23]:

EU's broadband policy has paid off

- **Broadband**: this stays at the top of the political agenda. The EU takes a technology-neutral approach both in terms of regulation and of policy developments. The role of governments is to stimulate supply and demand and to provide the right environment for the market to flourish. Therefore the Commission made the proposal that national broadband strategies should be developed. All EU15 Member States have drawn up national strategies, while new Member States agreed to do so by the end of 2004. Although data show that the broadband market is growing at significant pace, the difference between availability and effective take up in most Member States shows the importance of stimulating demand by removing barriers to the development of new innovative content. The Commission consequently set up a High-Level Group to address the issues relating to Digital Right Management systems. The Group issued a report which is currently under open consultation. Where private investment in the information infrastructure in less favoured areas is held back by fears for its profitability, there is a risk that Europe will not meet

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22   e-Europe 2005 Action Plan Update, COM (2004) 380 final
23   e-Europe mid term review
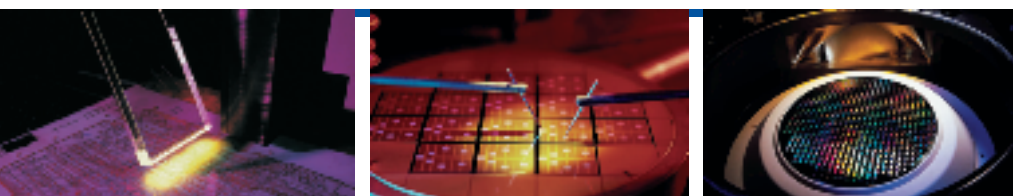
its goal to develop an "information society for all". Therefore specific actions have been taken, articulated around the use of the Union's structural funds and the European Initiative for Growth, to overcome shortfalls of demand in rural and remote regions and economically disadvantaged urban areas. The Commission is currently analysing this issue through the Digital Divide Forum and is expected to report by the end of 2004.

focus of e-Business policy shifts towards integration of ICT into business processes

- **e-Business**: Interest in e-Business is broadening from focussing on e-Commerce (buying and selling on-line) to wider concerns about the integration of ICT into business processes. Policies are in place to support the development of e-Business. Also Member States have launched initiatives to stimulate the take-up of e-Business by Small and Medium sized Enterprises (SME's). The European e-Business Support network (eBSN) helps in this line. It brings together policy makers to foster cooperation and to exchange best practices between European initiatives. The legal framework for e-Business is consolidating with the transposition of e-Signature, e-Commerce, Copyright Directives and the adoption of the legislative package of procurement. The results of an on-line consultation on 'legal problems for enterprises doing e-Business' confirms the need for initiatives such as the e-Business legal portal. However, one break to further take up and development of e-Business seems to be the issue of confidence in e-Commerce and e-Business.

progress on e-Government policy is overtaken by the increasing demand

- **e-Government**: It is now widely acknowledged that e-Government is a key tool for public sector reforms towards better governance. Several policy tools have been used to stimulate e-Government, which include benchmarking, exchange of good practice, cooperation and financial support. Although the review shows that 80% of users are happy with the quality of public e-services, data on e-Government demand are still insufficient. Moreover, from the evidence available, it seems that progress in e-Government supply is not being matched by a proportional increase in demand. To address this problem, two different strategies for improvement of services have been identified: process integration (back office) and service delivery (front office). Both strategies need to be further refined to match the supply and demand of e-Government.

- **e-Learning**: significant progress was made towards its three goals (virtual campuses for all students, a university- and research-supported cooperative system).

- **e-Health**: there are two target areas: (1) how to address common challenges and create the right framework to support e-Health and (2) pilot actions to jump-start the delivery of e-Health. On these areas new initiatives are taken like the development of standards for a common approach to patient identifiers and electronic health record architecture. Furthermore, in the context of its Public Health Programme, the Commission is preparing the establishment of a European Union-wide public health portal that will provide a flexible information technology platform to disseminate evidence-based information on public health relevant to European citizens, and to provide a single point of access to information on health. However, these are examples of plans for the near future.

internet access is lagging in rural areas and people tied at home

- **e-Inclusion**: Member States have adopted measures and plans for target groups. Internet access has grown but nevertheless is lagging amongst people who are home based and in rural areas. The High Level Group on "Employment and Social Dimension of the Information Society" (ESDIS) will continue to analyse the e-Inclusion situation and provide policy guidance.

there are worries about consumer confidence and trust

- **Security**: Important actions on the security issue are: the development of some Member States of national strategies and the strong emphasis on electronic signatures. Also the proposal to establish a European Network and Information Security Agency (ENISA) has been adopted. But there is concern. Recent research shows that almost 80% of the European citizens are sufficiently concerned about data security to stop them from buying goods and services over the internet[24]. Also on the business side only half of the companies surveyed had a formal security policy and over a quarter of the organisations have been affected by security breaches.

- **Benchmarking**: The e-Europe Action Plan aims to set common targets and then to track progress towards them by benchmarking. Generally benchmarking has been seen as an effective policy tool. However because of its administrative burdens, in the recent Council Conclusions on the mid-term review communication, Member States expressed their will to retain but not expand the current set of benchmarking indicators.

the EU chooses for readjusting rather than large revisions

204   Main options for improvement are suggested in the 'e-Europe 2005 Action Plan update'[25] that opts for readjusting rather than revising the course of e-Europe. Its results are summarized in the table below.

Domain	Changes
Broadband	Extend National Broadband Strategies to EU25. Tackle Digital Divide in territorial coverage
e-Business	Up-date actions to reflect emergence of new issues such as spam, consumer confidence and mobile payments
e-Services	Targeted exchanges on best practice in e-Learning; e-Health and e-Government
e-Inclusion	Raise profile of e-Inclusion as an issue in both Information Society and Social Inclusion policy
Security	Mainstream security actions into all action lines
Benchmarking	Target a high profile public image for e-Europe by repositioning the benchmarking exercise as the one-stop reference portal on the Information Society in Europe
Review and reflection on mid-term of Lisbon	Evaluation and impact assessment of e-Europe in light of Lisbon process

Table 1, main options for improvement suggested in e-Europe 2005 Action Plan Update[26]

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24   SIBIS, Security and trust, Topic Report No. 3, March 2003
25   COM (2004) 380 final
26   e-Europe 2005 Action Plan Update

2.3   The ICT policy of the main reference countries

2.3.1   India: building a huge software industry aimed at export

the achievements of India's software industry followed a policy change in the eighties

205   India is particularly relevant because of its strong software export industry built on a focussed **policy** set by India's Government, aiming at liberalisation and stimulating the software industry by creating favourable conditions for investments. India's Government has created a fruitful environment for ICT industry, in particular the software industry. In 1986, the Indian Government chose for a new policy designed to serve as a catalyst for the software industry. The reforms were aimed at positioning India in the world economy: the foreign direct investment process was streamlined, new sectors were opened up to foreign direct investment and ownership, and the government exempted the ICT industry from corporate income tax for five years. As a result, the Indian software industry grew from a mere USD 150 million in 1991-1992 to a staggering USD 9.5 billion in 2002-03.[27]
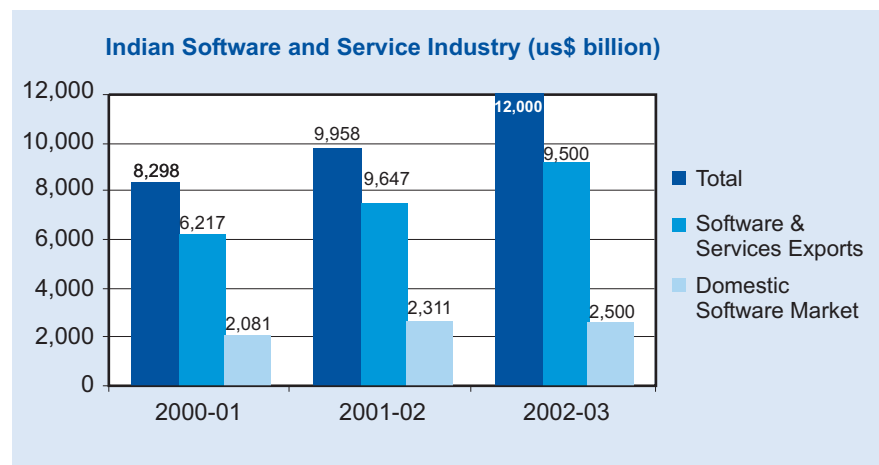

Figure 8, growth Indian Software and Service Industry[28]

206   India's **success** in software is rooted in a combination of factors:
* The availability of a large low-cost and highly educated, English speaking labour force;
* Low entry requirements in terms of investments;
* Favourable treatment of the sector by the government, for example through tax exemptions and;
* Strong connectivity with the U.S. computer industry.[29]

207   These success factors have helped India to become increasingly integrated into the global economy through growth in the export of software and skill-intensive software services. There remain however **challenges**, including the perception of an unfavourable regulatory climate, an overloaded judicial system, poor infrastructure and costly access, and limited use of ICT in the domestic market.

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27   http://www.nasscom.org/artdisplay.asp?Art_id=1959
28   http://www.nasscom.org/artdisplay.asp?Art_id=1959 #2
29   E.g. interview Arunachalam, India Institute of Technology & Science - Carnegie Mellon University, Bangalore, 2004-05-14.

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2.3.2   South Korea: a 'killer cocktail' of vision and ability to execute

Korea's choice for ICT as economic stimulus paid off

208   In its **policy**, the Korean Government has combined vision with vigour to set up an ICT industry and create a broadband infrastructure that is leading globally. Korea was one of the early countries to select ICT as an economic stimulus. Between 1998 and 2001, Korean Government doubled its ICT spending and came up with different types of funding mechanisms and policies.
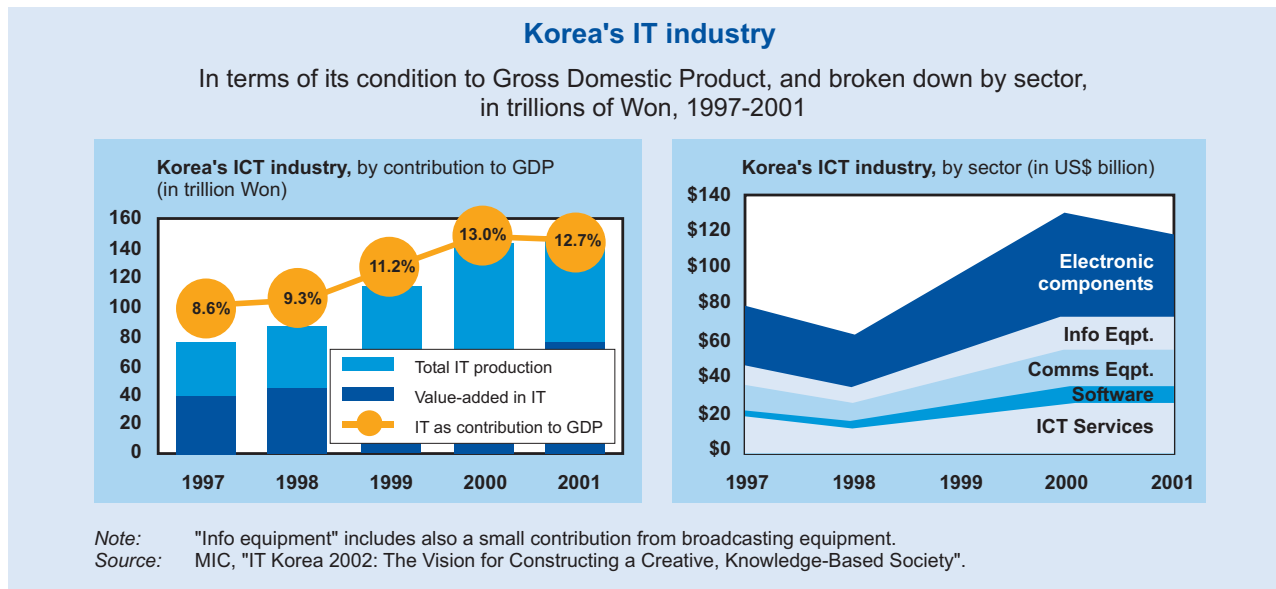

Korea's IT industry

In terms of its condition to Gross Domestic Product, and broken down by sector, in trillions of Won, 1997-2001

Note: "Info equipment" includes also a small contribution from broadcasting equipment.
Source: MIC, "IT Korea 2002: The Vision for Constructing a Creative, Knowledge-Based Society".

*Figure 9, ICT industry in Korea is oriented to hardware and relatively large*

209   In 1999, Korean Government set up a fund with very low interest rates for investment in broadband access networks, specifically for less densely populated areas. A new scheme ('e-Silk road') supports Korean software companies in establishing themselves as export industries. Government also contributed to the growth of the ICT sector by being one of the private sector's best clients. With 10 million subscribers, Korea currently has the highest penetration of broadband.[30]

210   The **success** of ICT in Korea is a result of[31]:
*   A clear policy on the supply side (ICT industry) and demand side (broadband);
*   A focused industry. KT (formerly known as Korea Telecom) followed through on government telecom policies by investing in infrastructure;
*   Specific Korean conditions: a large part of the population living in high-rise apartment buildings in the capital, which is ideal for broadband deployment and;
*   A strong culture of closely following the 'neighbour next door', and a competitive attitude with a great appetite for on-line games.

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30   International Telecommunications Union, (2003): Broadband Korea, a case study

31   E.g. interview Bureau, Vectis International; Seoul, 2004-05-17
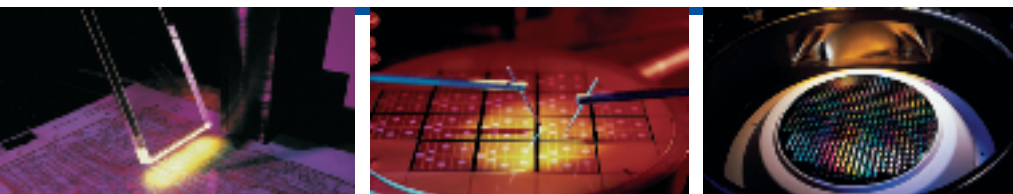
Korea still faces problems with the uptake of ICT by SME's

211   One of the main current **challenges** is that Korea's small businesses (making up a very large share of total establishments and employing around one-third of total workers) are not fully exploiting the advanced broadband environment, for reasons such as awareness, a lack of skilled personnel and a lack of specialist services. Less than half of the small businesses have a computer and Internet access, and even when equipped with both the smallest business often do not use them in business operations and processes.

212   Anticipating to its shortage of ICT specialists, the Korean Government has set up an active ICT education and retraining policy. Korean educational policy goes beyond simply providing access to ICT. It also provides applications and content and produces on-line educational material.

2.3.3   China: orchestration for prosperity

China's key tools for building ICT industry are foreign investment and standardization

213   China's Government has shown dedication through an orchestrated industry **policy**: foreign knowledge is attracted and retained by allowing foreign investment only through joint-venture business models. Furthermore, a very strong standardisation policy aims to stimulate domestic standards, for instance China's 3G mobile standard.

China's ICT-industry is growing fast

214   The ICT industry in China has experienced an explosive growth and is at present one of the pillars of the economy. In 2002, the Chinese telecom sector contributed 2.69% of GDP. It is the third largest telecom sector worldwide. In the same year, the revenues of the telecom sector amounted to USD 168.7 billion, which is a rise of 20% compared to 2001. Hardware production is booming. In 2002, the production of mobile telephones increased to 120 million, with foreign companies Nokia, Siemens and Motorola still in the lead, but Chinese companies are rapidly increasing their market share; from 2% in 1999 to 30% by 2002.

215   The Chinese Government announced in 2002 its support for the domestically developed 3G standard TD-SCDMA. This standard is competing with WCDMA and CDMA2000 to be adopted as China's 3G standard. China has been delaying the issue of 3G licenses, partly to give the TD-SCDMA standard time to be further refined, and also because of the slow deployment of 3G services in Europe.[32]

216   The **success** of the ICT industry in China is a result of:
• The availability of a huge pool of low-cost labour;
• Deliberate government policies to use Joint Ventures as vehicle for Foreign Direct Investments and Technology Transfer; and
• A very competitive manufacturing industry aimed at export, which can now also serve the gigantic domestic market.[33]

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32   http://www.umtsworld.com/industry/china.htm and http://www.asia-links.com/news/article.asp?articleid=15785
33   E.g. interviews Story, INSEAD, Fontainebleau 2004-05-04 and Pipe, Global Information Infrastructure Commission, Washington, 2004-05-06

217   The **challenge** is now to develop the Chinese software industry, which is small and underdeveloped, compared with its ICT hardware industry and compared with India's software industry. An important difference between the Chinese and Indian software sectors is China's close link to domestic users, notably industrial and commercial users. This has fostered intensive learning in the area of product development for a large and rapidly growing domestic market.

2.3.4   Japan: a techno-cultural fit

Japan is considered a lead market for mobile communications services

218   Japan is relevant because of its strong linkage between ICT and consumer electronics and successes in mobile applications, that are a close fit to socio-cultural circumstances: the Japanese are information-maximizers, 'gadget happy' people that value the intensified communication, without the psychological and ritual complexities of a direct physical meeting.

219   Broadband access is a major topic on the government's ICT **policy** agenda. Fast development of broadband is considered a key enabler of economic growth. The main instruments that Japanese Government offers to stimulate broadband access are a financing package with low interest rates for broadband network operators. At the same time, there are significant tax benefits for companies that invest in broadband networks.

220   Japan has an excellent telecommunications infrastructure. Until recently, its domestic system was under the unchallenged control of Nippon Telegraph and Telecommunication (NTT), the world's largest telecom with USD 71 billion in annual sales. In addition, Kokusai Denshin Denwa Co., Ltd. (KDD) was the only carrier to offer international communication services.

221   Although PC and Internet use in Japan lags behind those of the USA, the markets for these sectors have been growing fast over the past three years. Household PC possession and the use of internet over fixed lines have started relatively late; the catch-up rate has been impressive.
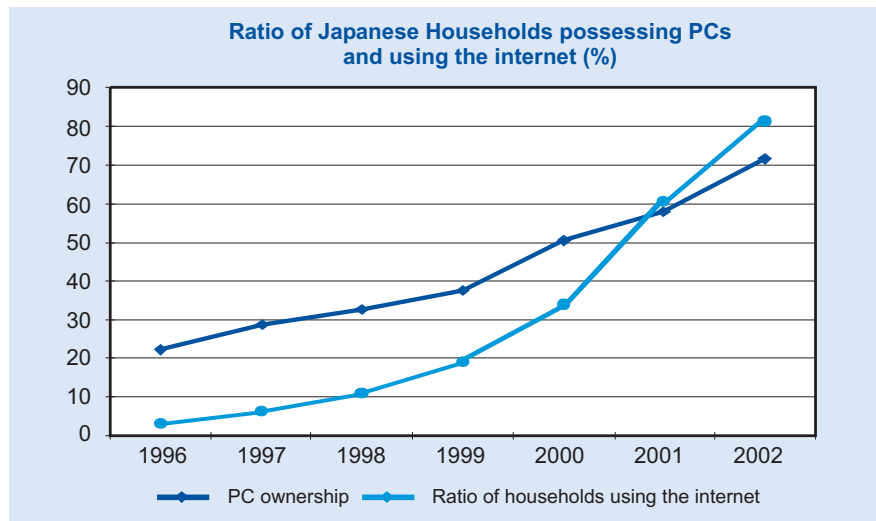
Ratio of Japanese Households possessing PCs and using the internet (%)

Figure 10, fast growth of PC usage and Internet usage[34]

Japan's key success factors have a strong cultural dimension

222   The basis for Japan's **success** in ICT is[35]:
- Coordination between the systems partners (operator, network and terminal vendors) working at a common vision aimed at users that are;
- Curious, information-maximizers and 'gadget happy'; and
- That value the intensified communication, without the psychological and ritual complexities of a direct physical meeting.

223   Still suffering from a prolonged economic slump which began in 1989, the main **challenges** are market inflexibility and a rapidly aging population: Japan is expected to have the oldest population in the world by 2005. However, Japan maintains high its potential in educational standards and technological capability.

2.3.5   USA: freedom and support for the ICT industry

USA's ICT industry is unmatched globally

224   The USA avails of a strong and growing ICT industry (see table). The key differentiator of the US Government's ICT **policy** is the stimulation of high-tech entrepreneurial culture, creating a homogeneous and flexible labour market while acting as a launching customer for new technologies. Industry is characterized by a high-tech attitude and a close cooperation with universities. This has led to several strong regional ICT clusters in Silicon Valley, New York, the Research Triangle Park (North Carolina), Pennsylvania and the Greater Boston Area. Each of these clusters has a critical mass of research universities, industry labs, labour pool, spin-off companies and large ICT players.

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34   Japanese Information and Communications Policy Bureau, MPHPT, Communications Usage Trend Survey

35   E.g. interviews Naoe, Chuo University of Tokyo 2004-5-10 and Pipe, Global Information Infrastructure Commission, Washington, 2004-05-06

Segments within ICT	1996	1997	1998	1999	2000
Hardware	171,1	197,5	210,9	225,4	251,7
Software and services	131,5	153,9	185,6	214,0	245,7
Communications equip.	32,4	43,9	46,7	51,4	61,5
Communications services	186,9	193,2	203,7	227,4	237,8
Total	522,0	588,4	646,9	718,2	796,6

Table 2, IT-producing industries by sector (in US$ billions): gross product originating (GPO), 1996-2000)[36]

225   Particular support for the American ICT sector comes from the government sector. Government departments of the defence and the American space industry have been important customers for the US ICT industry. This trend is continued through the new Homeland Security Initiative. The US education system to provide for skilled and educated workforce is highly supported by industry. As Bill Gates phrased in an interview with ITI: "Meeting the ever changing demands of a high-tech economy and maintaining our global leadership and stimulating further growth will depend largely on our ability to produce and expand a competitive workforce. The lifeblood of our industry is not capital equipment, but human capital".

key success factors are the large and homogeneous market and its entrepreneurial culture

226   The **success** of the ICT industry in the USA is created by:
• High-tech entrepreneurial culture with close cooperation between industry and public research;
• Strong public and private R&D in the field of ICT;
• US Government Departments that acts as a launching customer;
• Large domestic market and;
• Export being facilitated by the Federal Government.

227   The public R&D is oriented towards a number of areas that are considered the application areas of the future or that are earmarked as national priorities (the "grand challenges"). These challenges are listed in the next table.

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36   CGEY, (2003): International ICT benchmark study

Grand Challenges	
1	knowledge environments for science and engineering
2	clean energy production through improved combustion
3	high confidence infrastructure control systems
4	improved patient safety and health quality
5	informed strategy planning for long term regional climate change
6	nanoscale science and technology (atoms and molecules)
7	predicting pathways and health effects of pollutants
8	realtime detection, assessment and response to threaths
9	better transportation systems
10	anticipate consequences of universal participation in a digital society
11	collaborative intelligence: integrating humans with intelligent technologies
12	generating insights from information at your fingertips
13	managing knowledge intensive organisations in dynamic environments
14	rapidly acquiring proficiency in natural languages
15	Simuniverse: learning by exploring
16	virtual lifetime tutor for all

Table 3, USA R&D is oriented towards "Grand Challenges"[37]

228   The USA faces **challenges** in the declining number of US-born top researchers but has a strong attraction for foreign talent. The USA is said to be benefiting too little from trans-border knowledge sharing. To conclude, telecommunication regulation remains a source of disputes and has experienced major problems.

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37   NITRD, (2003): Grand Challenges report

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2.4   Lessons to be learned from the reference countries

229   In many areas the reference countries have surpassed Europe. They have become leading both on the supply side (the ICT industries, hardware, software, services and infrastructures) and on the demand side (application and content for users), assisted by a clear ICT policy that addresses breakthroughs on key differentiators in each country and combines vision with the courage to make choices and commitment to execute. Some particular observations, described below, should in our view be guiding for future initiatives of the EU.

### Choice for, and impact of, an industrial policy of several countries

reference countries all have a pronounced industrial policy

230   The ICT industries of Korea, India and China have achieved tremendous progress in a short time span. Each of these countries has a conscious and deliberate policy to develop its ICT industry. Indian Government has taken major policy steps towards an ICT industry, with a focus on software development for export. Korean Government doubled its ICT spending, set up a fund with very low interest rates for investment in broadband access networks, and a new scheme (e-Silk road) to support Korean software export. China aims to build a domestic ICT industry through Joint Ventures and is highly protective of its own markets. Government support for the ICT industry is not restricted to these upcoming markets. Also the USA Government provides its ICT sector with government support through large contracts coming from its Department of Defence, the homeland security initiative, etc. European ICT industry lacks such European support, which creates an uneven playing field.

Preparedness to make choices and shape the future

and they all have made choices that put them in the lead

231   The countries assessed show a strong preparedness to make choices and shape the future. The Indian Government has selected ICT industry with a focus on software development for export and has taken far-reaching measures: the government permitted foreign equity of up to 100% and duty free import on all inputs, created technology parks and offered professional labour services to clients. Korea, like Japan, has shown an early commitment for broadband and has created the financial incentives for them. These choices have paid off: the countries now avail of ICT sectors that are highly dynamic and have the best prospects for the future.
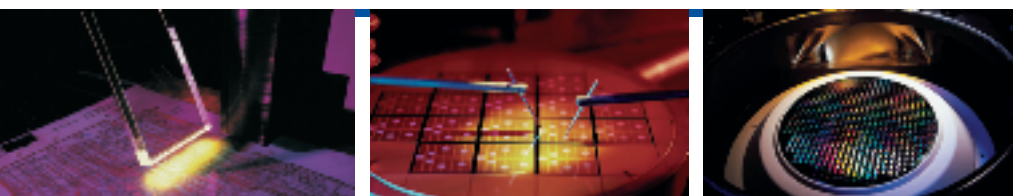
3 Ten ICT breakthroughs to resume the pace of growth

need for breakthroughs

301   The reference countries that we investigated have made particular choices and commitments and they have made a lot of progress. Europe should not loose ground to the investigated reference countries and doesn't need to for it has a well established ICT-sector, strong assets and a large growth potential. The desired growth however will not be achieved with a "middle of the road" policy. Regaining lost ground requires clear policy choices and commitment: Europe needs breakthroughs.

need for choices

302   The concerns regarding the slow economic growth and the consequent need for breakthroughs and choices in these areas were discussed with, and shared by a wide range of executives and opinion leaders in industry, governments and users that were interviewed in the course of this study (see also annex D). Their notion for a need for breakthroughs is in line with the conclusion of the Informal Competitiveness Council held in Maastricht 1-3 July 2004 that European growth in the coming years must, to an increasing extent, come from structural reforms.

need for structural reforms

303   The interview partners were asked about potential policy breakthroughs. The results of the interviews have been used to compile a long list of policy issues that require attention. The range of policy issues resulting from the interviews was clustered on the basis of the picture below and is described in annex C.
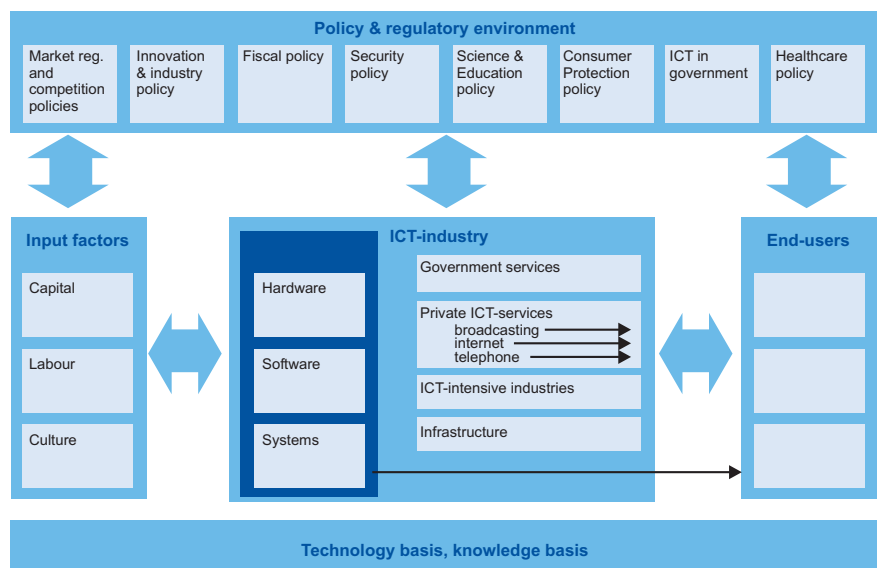

Figure 11, basis for clustering results of interviews[38]

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38   PricewaterhouseCoopers, (2004)

304   In order to find those issues that can make a real difference in achieving the Lisbon goals, the list of policy issues was further clustered and ranked by assessing the newness, feasibility and its potential impact of each issue on the Lisbon goals. The ranking process was carried out with the aid of several workshops with international attendance (see annex E). We have selected the top ten policy issues (table below) that can change the trend towards the Lisbon goals (breakthroughs) and that should be the focus of the discussion regarding the future of ICT policies in Europe. Each of the issues allows for a breakthrough, either because there is a 'stalemate' that is currently holding up developments in the ICT domain, or because an offensive strategy can be conceived, or a structural improvement of certain elements of the policy can be achieved to create a better match with Europe's transition to a knowledge-based society.

305   Because of the limited length of this report, many important policy issues are not on the list. Sometimes they are indirectly addressed (such as is the case with broadband). It has to be emphasized that unlisted issues can be very important and that we have not wanted to suggest that they don't deserve policy attention.

we have identified 10 breakthroughs for which Europe could choose

306   It should also be noted that this set of 10 breakthroughs is not aimed at achieving a complete coverage of the ICT field and that each of the demands deserves a thorough study in order to determine the best way forward.

Breakthroughs	
1	Shift the e-Business and e-Government policy from connectivity to uptake of complex ICT applications
2	Standardize ICT environments in Europe to trigger and enable new business
3	Accelerate the introduction of disruptive technologies
4	Realize the vision of 'any content, anytime, anywhere, any platform'
5	Go for global platform leadership in the ICT industry
6	Develop a strategic response to job migration to low-wage countries
7	Remove barriers for the development of an innovating European electronic communications sector
8	Move to a new and flexible model of spectrum allocation
9	Enforce real solutions for consumer confidence and security
10	Shift e-Inclusion policy from 'access for all' to 'skills for all'

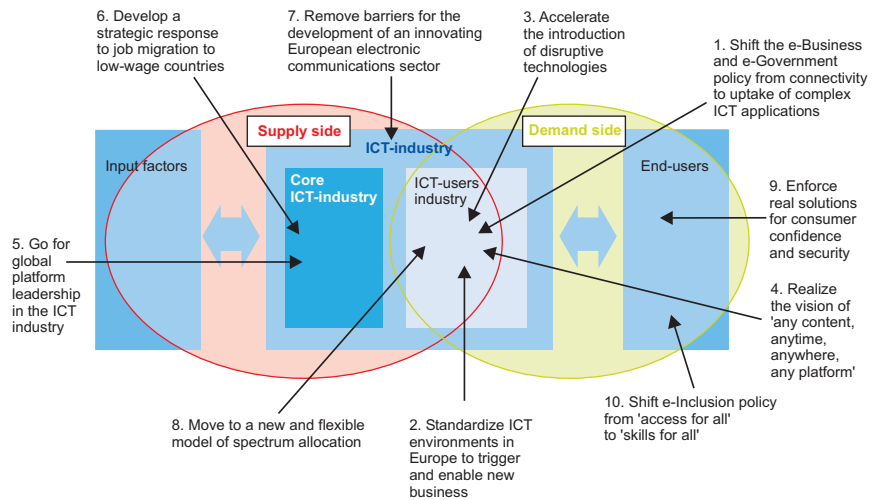*Table 4, ten breakthroughs needed to move towards Lisbon goals*
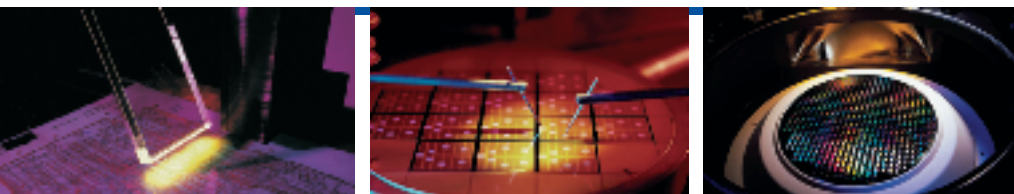
Figure 12, the breakthroughs are related to the supply-side as well as to the demand-side of the ICT market[39]

Breakthrough 1: Shift e-Business and e-Government policy from connectivity to uptake of complex ICT applications

more production growth through better use of ICT

307   European productivity growth could be significantly accelerated if organisations made more and better use of ICT in their organisations and production processes. To reap the productivity benefits of ICT, investments are needed in the reorganization of companies and administrations and in skills. Recent economic literature[40] shows that European economies have invested both less and later in ICT in comparison to the USA. The diffusion of new technologies is often slow. Firms often take a long time to adopt the new technologies, changing organisational arrangements and implementing effective business processes. At present the gap in productivity growth between the USA and Europe can largely be explained by a difference in the use of ICTs in the ICT-using industries and the services sector[41]. A recent study for the English DTI confirms the scope for improvement in the uptake of ICT (see figure 13).

39   PricewaterhouseCoopers, (2004)

40   ECFIN 391 (2003): The EU Economy, 2003 Review

41   Gelauff, G.; Klomp, L.; Raes, S.; Roelandt, T. (2004): Fostering Productivity

Figure 13, Average performance of EU countries (France, Germany, Italy, Ireland, Sweden)[42]

there is a lot to be gained in the adoption process

308   Considering the slow productivity growth, that gap is not being reduced. The lower contribution of ICT to productivity is not necessarily a result of the availability of computers and connectivity to telecom infrastructures.

several factors that influence the level of ICT usage and the ability to generate the benefits

309   There are several factors that influence the level of ICT usage and the ability to generate the benefits ICT can provide:
- Skills play an important part. This does not only pertain to the basic education and the way ICT is integrated in the formal education system, but also to the training and encouragement provided by companies to their employees. In general, Japanese and American companies spend significantly more than their European counterparts, with SME's in particular being at the low end of the spending profile;
- The flexibility of the labour market plays a part. Social legislation may block business process re-engineering and full utilization of ICT potential. American companies are less hindered by such barriers and can more easily and rapidly implement ICT;
- Diffusion of knowledge and best practices plays a part. Also active dissemination of best practices to turn them into common practice, and technology transfer from research institutes to using industries. US industry is an earlier adopter of and experimenter with the application of new technologies to resolving business problems,
- Poor decision making and poor deployment of technology may result in low returns on investment in ICT; and
- As the use of mobile in Japan and the use of broadband in Korea show, demanding customers also play an important part. Demanding customers will drive ICT to increase competitiveness.

42   Adapted from Booz Allen & Hamilton, (2003): Business in the Information age (Benchmark)

industry improving its usage of ICT is the most effective contribution to the Lisbon goals

310   Industry improving the usage of ICT is probably the most effective contribution to the Lisbon goals that is available. Present policy initiatives recognise the importance of this fact. The e-Europe Action Plan extensively addresses e-Business. A ministerial conference, organized by OECD in June 2004, recommended among others matters to move beyond policies for basic connectivity and e-readiness to facilitate the widespread taking up of complex ICT applications to encourage early and aggressive adoption; strengthening of government and private sector investment to improve basic ICT skills.

however the current pace is not enough to close the productivity gap

311   However, the current pace with which ICT is embraced is not enough to close the productivity gap. Therefore, additional initiatives need to be taken. Such initiatives should relate to the recommendation made by OECD to move e-Business and e-Government policy goals from connectivity to the use of ICT. The major breakthroughs would be for Europe's Member States to develop appropriate national policies. The European Commission should push the member states towards developing such policies. Elements of said policy change could include:

- European-wide dissemination activities that accelerate the process from best practice to common practice;
- Supporting the absorption and application of the results of R&D;
- Support to organisations (and especially SME's) to improve the balance between investments in ICT and associated investments in skills, reorganisation, retraining. It is noted that the private sector in Japan currently spends 3 times and in the USA 5 times the comparable amount that is spent in Europe. Educational programs on ICT should progressively move from learning how to use ICT towards exploiting ICT in entrepreneurship and using ICT as a tool for business improvement;
- Support to industry, and especially SME's, as a demanding customer. Some countries have a policy in which government bodies have the legal obligation to award a fixed percentage of their budget to SME's. In this way SME's will be stimulated to comply with high-quality standards; and
- Innovative government services (especially in complex production chains) that can serve as an example to others.

312   To shift the focus from connectivity to the uptake of ICT is consistent with the present ICT paradigm that is all about putting ICT to work and achieve measurable results. It also recognizes that investment in ICT needs to be accompanied by relatively large and time consuming investments in complementary inputs such as organizational capital.

A crucial condition for more economic growth is a broad deployment and use of ICT by enterprises and public institutions. Therefore the EU needs national strategies that focus on flanking investments in skills and organizational transformation. Special attention is needed for small and medium-sized enterprises.

The crucial questions for the EU are:
1. Is the EU widely enough connected to move its eBusiness and eGovernment policy focus from connectivity to the use of ICT?
2. What can Member States do to speed up innovation and competitive growth in business networks through the use of ICT _between_ organizations?

Breakthrough 2: Standardize ICT environments in Europe to trigger and enable new business

horizontal initiatives enable and trigger innovation in vertical domains

313   A crucial step to enable and trigger industries and organisations to implement new ICT-based solutions is to confront and support them with state-of-the-art European-wide standardised ICT environments. Pan-European solutions for electronic authentication, electronic payments and security would have a real impetus on the absorption of ICT and the in-company reform processes. The value of such 'horizontal initiatives' is:
• That it can add to the 'vertical initiatives' such as e-Learning, e-Health, e-Business and e-Government;
• That it helps to solve typical problems of vertical approaches such as fragmented application solutions that are incompatible with similar applications from other verticals;
• That it stimulates the development of new business models; and
• That it creates the necessary "scale". For applications such as authentication, where attaining volume is a critical success factor, it will become crucial that solutions are interoperable across domains.

there is a clear need for horizontal initiatives in the field of authentication, payment systems and security

314   Horizontal open and flexibly accessible solutions in the field of electronic authentication, electronic payments and security are critical to the realisation of Lisbon goals as they are a main driver of the application of ICT growth. Trust is a basic requirement in any transaction. An independent and fully open system for payments may lead to increased competition, lower entrance thresholds and thus a more dynamic innovation pattern. Although the industry plays an important role in the design, development and implementation of solutions, there is such a wide range of stakeholders with different, often opposite interests, that government has the natural role of breaking through status quo's which are not in the interest of users. As the issue is of a cross border nature and requires international coordination, the involvement of the EU is appropriate.
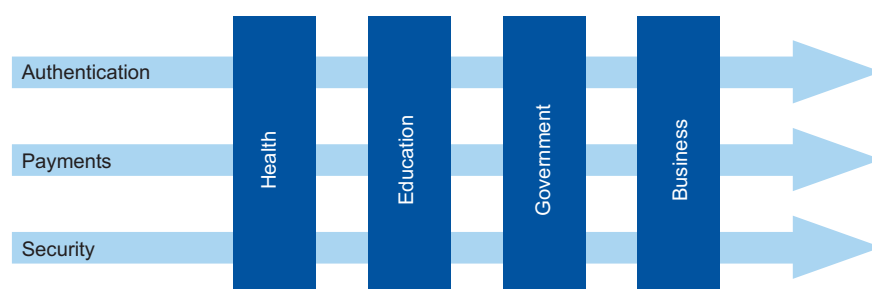

Figure 14, cross sector horizontal issues[43]

provide a 'breakthrough environment'

315   The breakthrough that is needed is an increased ICT utilization by providing a 'breakthrough environment' by establishing:
• Authentication: Pan-European interoperability (minimum) or standardization (preferred) of authentication systems/platforms;
• Payment systems: Pan-European interoperability (minimum) or standardization (preferred) of e-Payment systems/platforms; and
• Security: Pan-European emphasis on security standards in relation to access, identity theft and secure transactions.

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43   PricewaterhouseCoopers, (2004)

online authentication as a key enabler

316   On-line authentication was identified as a key enabler for e-Business and e-Goverment many years ago. The electronic signature directive from 1999 has been implemented in most EU Member States. Several countries have implemented electronic identity devices. Yet, due to the costs involved, the complexity and the lack of critical mass, PKI based solutions have not been successful. Therefore, many organizations have started private initiatives. These initiatives are having results for their particular application, but this will inevitably lead to a myriad of incompatible solutions and the feared 'identity silos' and 'digital key chains'. This will hamper the free flow of products and people around Europe - thereby restraining economic growth. The vision that should drive future actions should be the creation of an interoperable European framework for Identity Management. The aim should be to create an interoperable solution for authentication on a pan-European level. Whether the authentication device is a smart-card, software token or an embedded chip, and whether the authentication service provider is a government entity, a bank or a telco should make no difference.

create an interoperable solution for authentication on a pan-European level

317   The technology already exists, many authentication providers are already active. Governments should create the right environment and conditions for broad deployment, e.g. through a decentralized, federated infrastructure. Perhaps the EU can facilitate this development by establishing a European platform for the definition of the protocol requirements.

harmonize payment systems

318   An array of payment methods is available for on-line transactions, which causes uncertainty for consumers and service providers. Consumer confidence and an environment to invest in e-Business services being crucial, convergence of payment standards is expected to become essential. While the market is expected to drive this convergence process, government could facilitate a platform for discussions and create an atmosphere of trust, appropriate controls and regulation and cooperation between payment providers to work towards standards for on-line payments. For instance micro payments are defined differently across Member States. Hence, they fall under different legislative or supervisory regimes, which in its turn frustrates a 'borderless' development of new value added services.

319   Interoperability through harmonization across the EU is required. However, the involvement of the respective governments should be technically neutral and be limited to correcting a level playing field and avoid unnecessary regulation of payment products in order not to inhibit innovation. Harmonization at the European level of the conditions, relating to the right to provide payment services to the public, and establishment of the principle of mutual recognition should enable and stimulate the cross-border use of pan-European payment solutions.

real solutions for consumer confidence and security are needed

320   A "breakthrough environment" should include real solutions for threats to consumer confidence and security. These solutions are needed at the user side and the supplier side (see Breakthrough 9 for more details).

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321   To create horizontal structures is consistent with the current ICT-paradigm in which cross sector automation and information and a shift from coordination 'within the firm' to coordination 'along the value chain/network' are key to productivity.

> *Standardization is a prerequisite for a broad deployment and use of ICT, and will trigger and enable new business. Pan-European interoperable solutions for electronic authentication and electronic payments are needed to boost innovation and economic growth significantly.*
>
> **The crucial question for the EU is:**
> 1. Is the European Union prepared to take fierce action to remove barriers for interoperability and open standards?

Breakthrough 3: Accelerate the introduction of disruptive technologies

the long-term impact on society of new technologies may not always be apparent

322   A crucial step for a broad deployment and use of disruptive ICT technologies is understanding and accepting new technologies. This process is often obstructed by the absence of a proper dialogue between industry, government and society stakeholders on the merits of the new frontiers of technology. The implications of new technological developments may well extend beyond the responsibility and interests of the producers and responses by society and the long-term impact on society may not always be apparent or readily understood. And at the early stages of emerging technologies, society not always judges the possible threats in their proper proportions. There is a natural role for the European Commission to initiate and stimulate the discussion between all stakeholders involved, thus accelerating the introduction of said technologies.

323   In some Member States, such debates between industry and society are initiated timely, but they are often limited to a national level. This ultimately limits the contributions of members and slows the adoption and application of new technologies.

324   Since national and regional authorities have the best connection with local society and industry, and since they have to align interests at a national level, their involvement is crucial.

major examples are RFID and VoIP

325   Particular examples at this point of time that deserve said dialogue are:
• 'Smart tags' or radio-frequency based identification (RFID). After the invention and use of bar codes, 'smart tags' are the next major breakthrough in the retail and logistic sector. They provide possibilities ranging from the tracking and tracing of manufactured products through to improved food safety. However, the use of ad hoc networking and RFID chips may not be limited to the use of tracking and tracing of products in the manufacturing and delivery process. They could easily transgress into our personal domain, even without the subjects being aware of it. The privacy implications are evident, and the relationship between citizens, the state and industry interests are at stake. RFID already features as a top priority item on the ICT policy agenda of Japan[44]; and

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44   Ibid. MPHPT, (2003)

- Voice-over IP (VoIP), providing for a lower-cost implementation of voice communication using the flat rate Internet infrastructure. Hence, from an economic perspective VoIP is attractive to society at large. However, it will probably significantly impact the current business models of telecom operators, which are primarily built on per-minute voice call revenues. In 2003 Japan already provided '050' as pre-fix for the completion of VoIP calls[45]. In Europe, life line services, such as the European 112 service, are not yet a feature in some VoIP offerings. The surveillance and other security related features implemented in the telephony network in support of law enforcement are not standard in the Internet either (e.g. caller identification). These arguments should however not be used as an argument to protect vested interests.

326   Furthermore, there is an ongoing concern regarding health and the possible impact of the use of radio-based communication technologies, which may become an element of broader discussion.

the EU could play an important initiating role

327   Breakthroughs in this area would be that the European Commission and the national authorities initiated a high-impact and high-visibility discussion at national/local/regional level in Europe between stakeholders (industry, society, regulatory Government) in order to address and prevent problems surrounding the introduction of new and state-of-the-art technologies. Specific results to be achieved through a discussion on RFID and VoIP would be:
- Successful introduction of 'smart tags' by early engagement of all stakeholders to address and resolve potential roadblocks for society; and
- Benefit from increased competition and innovation and from lower cost communication offered by VoIP through the minimization of the barriers for its introduction.

328   For the Lisbon goals, a timely acceptance and uptake of disruptive technologies is of enormous importance. With the exception of a few Member States, this subject is not sufficiently addressed in Europe. Specifically, disruptive technologies such as RFID and VoIP have an enormous economic impact on logistics and the telecom industry and its clients can be expected to have a real contribution to European productivity. A timely embedding of new technologies in social and cultural frameworks can have enormous economic benefits.

329   Improving the dialogue surrounding the introduction of new technologies is consistent with the present paradigm of ICT investments, in which the impact of new technologies is maximized by a thorough preparation process.

The speed with which new technologies are accepted and put to work has a serious impact on economic growth. The EU needs to play a key role by accelerating the introduction of new (disruptive) technologies like smart tags and Voice-over IP.

The crucial question for the EU is:
1. **Is the EU prepared to put embeddedness at the centre of its actions with regard to disruptive technologies (e.g. by creating facilities for social impact experimentation)?**

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45   MPHPT, (2003)

Breakthrough 4: Realize the vision of 'any content, anytime, anywhere, any platform'

the economic potential of the content market is undisputed

330   Content and internet/broadband are interlinked: the internet is widely regarded as a content delivery system[46]. But historically connectivity has mattered much more than content. At present, the economic value of connectivity still is much higher than the value of the content it transports. However broadband offers new opportunities for the European content industry and can as such be of crucial importance for growth of economy and productivity. The content market is expected to grow by 6.3% annually for the next years[47]. ICT also facilitates the creation and dissemination of privately created content and the distribution and exploitation of government information. In addition, as a potential high-growth area, the creative industries (including gaming and content) are an important piece in the game for economic growth and productivity.

331   At present, the content market operates in two converging ICT areas: the telecom market and the broadcasting market. Because of the dedicated nature of their networks, telecom regulation and broadcasting regulation have always been two different domains within national and regional politics. This convergence of communications, content and computing enables the creation of new types of supplementary content as well as multiple new distribution channels with non-space restricted access. This represents opportunities for new value creation as well as enhancement of quality of life. The process of convergence brings forward the need to address content in relation to infrastructure. This technology-driven convergence will challenge the current institutional framework and changes will be required. One challenge concerns the increase in regulatory certainty as regards TV over ADSL.

332   The future of the content market is generally described as a vision of 'any content, any platform, anywhere, anytime'[48] in line with the internetworking as part of the techno-economic paradigm. The initiative of a Europe wide reception of TV programs is closely related and it may become implemented through the Internet, rather than through broadcasting. The vision also entails the development of a European cottage industry in the field of content. Europe might be a much better breeding ground for this than other countries such as the USA and Japan, some argue that the diverse and multi-linguistic nature of Europe is a big stimulus for the creativeness that is deemed to be a critical success factor for such industries to properly flourish.

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46   Andrew Odlyzko, AT&T labs, (2004): Content is not king
47   Global Entertainment and Media Outlook: 2004-2008
48   Of course excluding illegal content which is dealt with in breakthrough 9
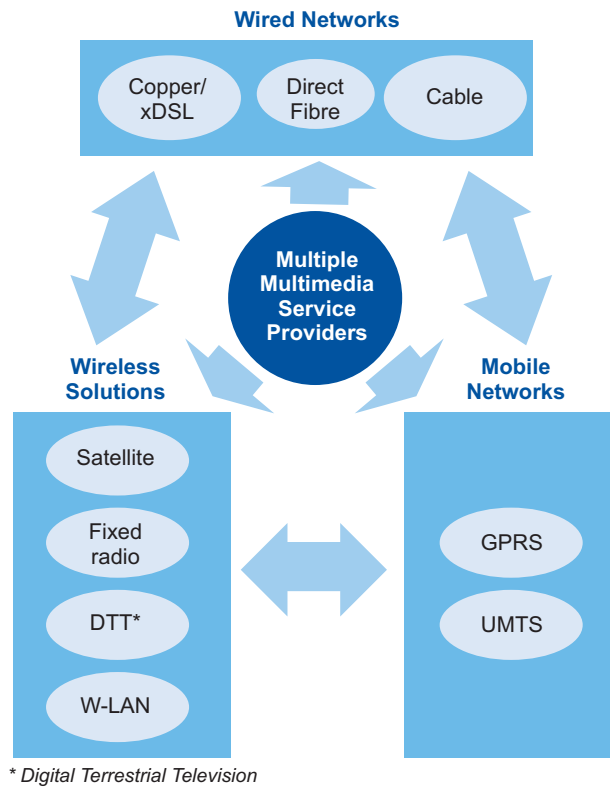
Digital Terrestrial Television

Figure 15, competing open platforms will provide a basis for the delivery of broadband content and services[49]

it takes the right conditions for the content market to prosper and grow

333   The content market is however growing at a slower pace than desirable. It takes the right conditions for a content market to prosper and grow. A distinction[50] can be made between the requisites, without which a content market cannot function, and the motivators, that both stimulate and attract content providers and users.

many of the main requisites for a developing content market are not in place

334   The requisites for the development of the content market have been discussed at a round table conference that was held during the Irish Presidency[51]. Many of the main requisites for a developing content market are not yet in place. The following proposals for government policy were made:
- A timely implementation of effective regulatory frameworks relating to spam, privacy and security;
- Ensure extensive Europe-wide availability of competitive broadband access;
- Europe-wide government implementation of broadband in provision of key public services;
- Timely implementation of the digital services regulatory framework throughout Europe;

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49   Alcatel, (2004): Broadband; The way to make ICT once again the motor of economic growth (presentation)
50   Greg Garrison, PwC Menlo Park Europe
51   PricewaterhouseCoopers, (2004): CEO round table to the EU telecommunications ministers on critical policy requirements, Dundalk 22 april 2004

- EU Commission to work with industry stakeholders to address the need to enable development and adoption of compelling pan-European broadband content and services while protecting the digital content intellectual property rights (IPR) of digital content producers; and
- Implementation of a number of key fiscal and funding initiatives to stimulate broadband content and services innovation.

EU also has to work on the key motivators that create a demand pull

335   But there is also a lack of motivators that encourage, inspire and attract the content providers and users to the digital domain. Such motivators can for example be found in games (the market size of games is larger than the Hollywood content industry), in the educational system and in making government information and cultural assets of Europe available in digital format. Although government initiatives have been initiated to date further discussion and action are now deemed to be necessary.

well development content market important for reaching Lisbon goals

336   A well developed content market can be an important contribution to the Lisbon objectives.
- Earlier studies of PricewaterhouseCoopers[52] have shown that the content market is one of the major drivers of economic growth; and
- A well developed content market is also an important contribution to the quality of life of citizens. On-line provision of government services can be a catalyst for e-Inclusion by offering new and better services, social cohesion, a better health care and education system.

vision, digital rights management and IPR

337   A breakthrough is needed for an accelerated development of the content market in Europe. The EU should:
- Drive developments towards the vision of 'any content, any time, any where, any platform'; and
- Establish a digital rights management regime for content that balances the interest of the owner and the consumer, that recognizes the shift from institutionally created content to privately created content, that provides a simple (pref. standard) user interface and that can be customized to the specific needs of content owners and their clients. It should operate in a cost-effective and 'borderless' manner. Different national systems to collect the proceeds associated with IPR may need to be harmonized to create a 'borderless' European market. The perceived incompatibility between the EU IPR directive and the EU data protection directive will have to be resolved.

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52   Global Entertainment and Media Outlook: 2004-2008

338   Enforcing an open and interoperable content market is in line with the new ICT paradigm because it provides the institutional reform essential for creating succes in the deployment phase of the techno-economic paradigm.

Content is considered an important engine for future economic growth and employment. The EU needs to fuel this engine by realizing the vision of 'any content, anytime, anywhere, any platform' by e.g. introduction multiplatform access for content producers and new digital rights management regimes.

The crucial questions for the EU are:
1. Does the EU think it is necessary to choose for the EU content market as one of the main drivers for the transition towards a knowledge based economy? If yes, should the European content market receive specific support?
2. Does the EU think it is necessary to give priority to removing barriers that obstruct the production and distribution of new content, even if this interferes with the established community of interest?

Breakthrough 5: Go for global platform leadership in the ICT industry

Europe has to be ambitious regarding its ICT industry

339   Many interviewees have mentioned the need for a strong European ICT industry to realize economic growth, improve productivity and build the Information Society. This specifically includes the hardware sector. Although many ICT related innovations originated in Europe, it is home to only a few leading global ICT firms. At a global scale, the European ICT-producing sector is small compared to other economic regions:
*   The largest semi-conductor hardware companies are found in the USA (Intel, 2002 turnover of $23 billion) and Korea (Samsung, 2002 turnover $9,18 billion and growing fast). Europe has three large semi-conductor hardware manufacturers, ranking 3, 6 and 9 on a global scale of turnover: ST Micro, Infineon, Philips;[53]
*   Most of the leading multinational IT software companies are based in the USA. One of the few European software firms that is a leading global player is the German SAP in the Enterprise Resource Planning (ERP) software market; and
*   Traditionally, the communication systems providers were national champions and with Alcatel, Ericsson and Siemens as having evolved into leading players in Europe. But most of the firms leading in the Internet area are located outside Europe. With Nokia and Ericsson, Europe has some strong players in the field of mobile communication systems. With Vodafone, Orange and T-Mobile, Europe has strong players in the field of mobile service providers.

340   The current weak position of the European ICT industry is not necessarily a result of the lack of innovation relating to education levels, infrastructure or scientific knowledge[54]. Many of the present principles and systems were conceived in Europe (e.g. CD at Philips; html and the www at CERN[55]; LINUX[56] [57] in Finland, WiFi and Bluetooth in The Netherlands, ATM and GSM in EU-programmes).

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53   iSuppli: http://www.digit-life.com/articles2/digests/0212.html
54   Lester Thurow, MIT, Innovation Lecture 2002 - Closing the gap
55   Cassidy. (2002). Dot.con - The real story of why the internet bubble burst
56   Castells & Himanen. (2002). The Information Society and the Welfare state - the Finnish Model.
57   CGEY, Strategy Academy & Zenc, ICT Innovation Project (2003): Also the Swiss based Esmertec providing robust software platform for mobility application, based on the research of Nicolaus Wirth is another example

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Europe has to accelerate the development of the right entrepreneurial climate

341   The discrepancy largely stems from differences in attitude towards business risk and failure. Europe lacks a climate in which first-time and second-time losers can be third-time winners. Entrepreneurship and flexible labour laws need to go hand in hand to create such a climate. Moreover, the availability of venture capital is a major factor that enables entrepreneurship. Additionally, market conditions play a significant role. Despite all efforts, there still are important trade barriers between countries. In some respects the European market still functions as 25 sub-markets.
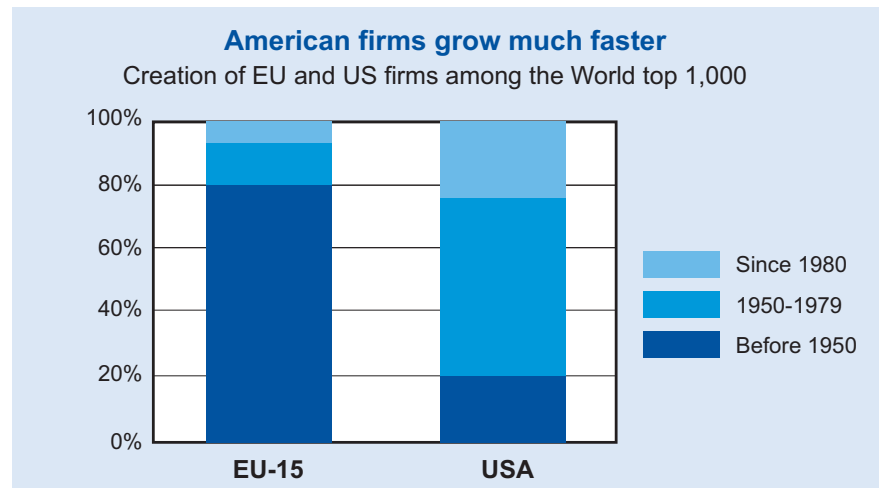
American firms grow much faster
Creation of EU and US firms among the World top 1,000

*Figure16, the difference in growth between American and European companies[58]*

342   There are particular threats to the European ICT industry such as the current discussion on the patent on software. The mild regime of IP protection in the past has led to a very innovative and competitive software industry with low entry barriers. A software patent, which serves to protect inventions of a non-technical nature, could kill the high innovation rate. However, opinions on software patent in its current proposed form vary a lot. Many large companies operating on a global scale, including European ones, seem to be in favour of a software patenting regime. But most small enterprises are strongly opposed. Only very few European companies have prepared themselves for the consequences of a software patent regime. It raises the question how the introduction of the European software patent interacts with a European strategy based on widespread use of ICT's.

and should make choices to which it commits itself

343   Aiming for platform leadership is critical to the Lisbon objectives. An ICT industry that provides global platform leadership is a major competitive strength, viz. the success of Intel and Microsoft[59]. As such industries are often very R&D intensive, they are also a source for innovation and they can attract the best researchers worldwide. The effects of such leadership can most notably be observed in the Scandinavian mobile equipment manufacturers, who were able to achieve such leadership in a relatively short timeframe. As was concluded during the Informal Competitiveness Council in Maastricht 1-3 July 2004, business champions should be European winners, instead of nationally picked, as they are competitive on a global level.

58   Lester Thurow, MIT, Innovation Lecture 2002 - Closing the gap

59   Gawer & Cusumano (2002)
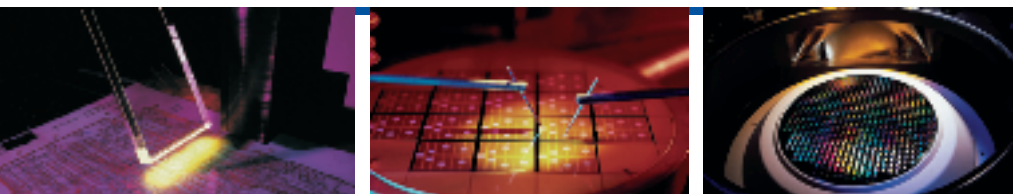
344   The breakthroughs required are:
- Making explicit choices and define and implement a common strategy towards global platform leadership;
- Use the standardisation process and interoperability as a potential leverage for market growth and acceptance; and
- Leveraging governments as demanding launch customer.

345   The benefit of making explicit choices can be seen in many countries. India has chosen explicitly for its software industry and has achieved tremendous growth rates. Korea has made choices for the hardware industry, focusing on mobile hand sets, and broadband, and it has become a global leader in the space of only a decade. Also Europe has its winners, particularly in the form of the Scandinavian telecom equipment manufacturers. But there are important choices to be made. 3G mobile communications have not progressed as rapidly as was originally anticipated. European governments have not dealt as effectively with the present situation as they could have. Many of the key issues are dealt with by the recent communication of the European Commission regarding mobile broadband services[60]. Some other topics deserve specific attention. European governments should particularly ask themselves whether they wish to continue the 'permissive' attitude with respect to compliance with the conditions of the 3G licences, in line with market conditions, or whether they wish to enforce conditions and at the same time support the industry to resume leadership, from 2G/2.5G to 3G.

a more pro active attitude towards standardization and interoperability

346   A more pro-active and strategic attitude towards standardization and interoperability could provide the confidence the industry needs to invest in particular technologies. GSM is an example of an active cooperation between industry and governments to create a new standard and to build the industry. Interviewees have proposed that governments should take a pro-active and strategic attitude towards the standardization process and the opportunities they offer for the European industry. Obviously one has to be aware of the adverse effects: it could partially and temporarily block innovation. And there are many accounts of failures where governments have made the wrong choices[61]. But many interviewees felt that at present there is an imbalance between leaving it to the market and setting standards: governments should take a more prominent role.

government as a launching customer

347   Governments can influence developments by making use of its strength as a launching customer. For instance, by only buying products that have been developed using 'open standards'. To reach a maximum impact, one of the challenges will be the harmonization of the procurement process across numerous organizations and departments, at national, regional and local level. Those organizations often have high autonomy with respect to the buying decisions. Additional efforts will be required and a sense of urgency will have to be created to leverage governments' buying power.

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60   COM (2004) 447

61   An example in the field of ICT in Europe that is often quoted is TETRA

348   Pursuing these breakthroughs is in line with the current ICT paradigm that stands for a knowledge society that is founded on, connected with and interacts with a strong ICT-sector.

An excellent and competitive European ICT industry is a crucial condition for economic growth and employment. The EU needs to define a strategy towards global leadership in specific areas, for example by stimulating a (new) European standards policy (in cooperation with the market) and making an explicit choice for e.g. the future of 3G mobile telecom in Europe.

The crucial questions for the EU are:
1   Is the EU prepared to use aggresive (but not protective) policies that are available for the development of ICT-based industries in Europe?
2   On which ICT domains or platforms does the EU wish to play a leading role and what kind of instruments should be applied to realize this?
3   Is Europe really prepared to give priority to a strategy based on widespread use of ICT's, and to what extent does this interfere with the present proposal for a European software patent?

Breakthrough 6: Develop a strategic response to job migration to low-wage countries

349   'Off-shoring' of jobs is currently probably the most debated issue of all ICT-related issues. Lessons learnt from the past and economy suggest that off-shoring (job migration) is a process that should not and cannot be stopped:
• It should not be stopped since it is a trend that will in the long run bring prosperity to Europe as well as to the countries to where the jobs move; and
• It cannot be stopped since the underlying economic forces are simply too strong.

offshoring can damage the European ICT industry and economy

350   Although this is a process that offers investment opportunities to many large European companies, it can in the short run potentially damage the European efforts made to achieve the Lisbon goals, specifically regarding employment, and may in the short run also cause structural harm to the European ICT industry. Properly responding to the job migration to Asia and brain-drains in general is essential for economic growth and the realisation of the employment goal. Whereas Europe faced a similar threat in the sixties and seventies as a result of the emergence of Japan as a low-cost and low-quality supplier of consumer goods, and as Europe was able to adjust to it, the current challenge is at least twice as serious. Moreover, like in Japan and Korea it starts with-low cost labour, but soon these nations will move up the value chain and become competitors across the full range of products, including the high end. Hence, great urgency and determination are required in addressing the challenges posed by China, India and other low-wage countries.

Europe urgently needs consensus on the response to job migration

351   Europe does not have consensus on its response to job migration, which obstructs effective actions to counter the trend. It is therefore an important breakthrough for Europe to jointly formulate a strategy in this area. Europe is best served when making sure that job losses are not caused by unnecessary shortcomings of the European labour market and the business climate. The main answer, however, lies in creating new jobs, which requires making investments in R&D, innovation and entrepreneurship. The current explosive job migration should be countered with an acceleration of initiatives in these areas, in other words, achieving the objectives of the Lisbon Agenda is more important than ever.
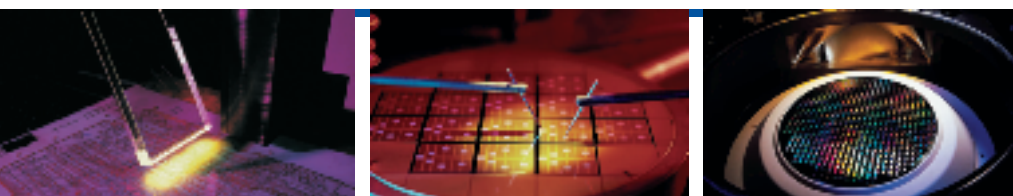
352   Elements of a European strategy could be:
- Reinforce support for European high-tech entrepreneurship;
- Accelerate the European reform program of labour and product markets;
- Stimulate the R&D spending in the ICT-producing and the ICT-using sectors to innovate and create new job opportunities;
- Stimulate the spending on ICT related training and skills development;
- Leverage the opportunities provided by the new Member States for economic growth and job creation; and
- Stimulate foreign direct investments, in particular from China and India, through special development zones providing favourable conditions e.g. fiscal regimes, skilled labour force and communication facilities.

Economic growth and employment can be seriously affected by the accelerated job migration to low-wage countries. The EU needs to develop a strategic response.

The crucial questions for the EU are:
1. How soon can the EU have a shared view on the strategic response to the outsourcing issue? Which instruments should be applied?
2. How can Member States respond to the short term effects on employment? Which policies can at the same time alleviate the social consequences and speed up the necessary transformation of the economy and the labour force?

Breakthrough 7: Remove barriers for the development of an innovating European electronic communications sector

although a big step forward, the problems around the new telecom directive are beginning to show

353   The new telecom directive on electronic networks has introduced a more elaborate and interpretive framework using principles of competition law in an ex ante mode. Many believe it to be a framework that, better than its precursor, is capable of delivering tailor made solutions to market imbalances.

354   The new framework requires the National Regulatory Agencies (NRAs) to investigate the relevant markets (the European directive suggests 18 markets) and assess market dominance based on actual performance and anticipated developments. Although in many countries the national legislation has only just been aligned with the new telecom directive, the major bottlenecks are already discernible, causing uncertainty and hence 'regulatory risk'. This influences the decision making process of telecom infrastructure investments made by existing players and potential new entrants. There are several problems:
- While the new framework allows for more nuance and forward looking interpretation, NRA's have to take multiple decisions and their assessments may be appealed in national courts. Legal proceedings are often time-consuming and hence increase the 'regulatory risk';
- National assessment under the common framework may lead to divergence of interpretations across Europe, which is another possible ground for appeal. The US experience with the Telecom Act of 1996 is a case in point;
- The new framework prescribes a regular review of the market for significant market power (SMP). The initial implementation of the new framework that is now taking place, suggests that extensive market research is required and a long cycle will be the result (one year or more). Considering the fast pace of e.g. technological developments the ensuing cycle may last too long for NRA's responding adequately to new developments;

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- Old laws on telecommunications in many Member States did not cover for the regulation of the Internet, as they were addressing the telephony network. This has been rectified through the transposition of the new directive on electronic communications networks. However, much of the regulation of the Internet is based on self-regulation by the industry and transparency to the stakeholders and fundamental user rights may be at risk; and
- One of the principles pursued through the new directive is technological neutrality in combination with competition 'between infrastructures'. Although very valid, this principle may not be viable for infrastructures with high costs such as Fibre-to-the-Home (FttH).

tackling these problems in an early stage is important for maintaining a dynamic and innovative communications sector

355   Ensuring a proper functioning of the electronic communications sector and a sustained investment in next generation networks is probably one of the most important issues for the telecom sector and hence for the competitiveness of the European society and its Lisbon goals. Also for the quality of life of European citizens, a thriving, investing and innovating telecom sector is of great importance. It would therefore be wise not to wait a few years with respect to learning the lessons but to assess the current implementation problems at an early stage and to take appropriate actions.

356   To create a climate that is conducive for the electronic communications sector to invest is necessary to tackle the problems of the new regulatory framework. The breakthrough required is to reduce the regulatory costs by making concrete steps towards a true European market without national differences and, if necessary, a European regulatory agency and to tackle the said existing implementation problems. In particular, the regulatory framework needs to be amended and additional efforts need to be made by Member States to provide for a faster response cycle to changing market conditions.

The electronic communications sector is a proven source for economic growth and employment. The EU needs to anticipate in an early stage the barriers for investments in next generation networks.

The crucial questions for the EU are:
1. Do we really want a true European market for electronic communication without national borders and regulatory burdens?
2. Does the EU think it is necessary to stimulate the transition towards the next generation networks and therefore create the indispensable investment outlook for the market?

Breakthrough 8: Move to a new and flexible model of spectrum allocation

flexible use of spectrum is key to innovation and new products and services

357   Mobile technology and mobile communications continue to gain importance. Various new technologies have entered the market or will do so in the near future. Efficient use of the spectrum is of increasing importance. The frequency spectrum is a resource of considerable value as demonstrated through the 3G auction process. The spectrum is also a rich source of innovation. Next to slow developments being made in the licensed bands, formidable progress is made in the unlicensed band through e.g. WiFi and more recently Wi-Max. It is often said that at present, the spectrum policy is not efficiently used, mainly because of the historically grown inflexible spectrum allocation policies.
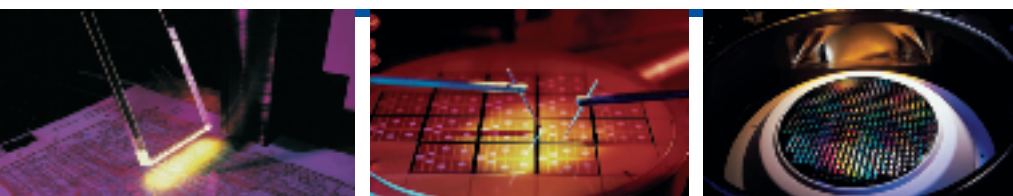
358   The allocation of spectrum to specific applications or use is a matter of coordination at a global level under the auspices of the ITU. Implementation and licensing go partly through legislation and regulation at national levels. The market for mobile communication is increasingly a regional and even a global affair as a result of the consolidation process of mobile operators. The limitations on the trading of licences is preventing the emergence of a European market and prohibiting innovative developments. The question is now to what extent a harmonised approach by European countries is required.

time to rethink spectrum allocation policies

359   The time to rethink spectrum allocation policies is nearing. First, existing licences will be coming up for renewal in a few years. This provides a great opportunity for reviewing the objectives of European spectrum policies, with ample lead time to develop new and appropriate policies. The experience with the 3G license process, albeit argued by many economists as appropriate considering the conditions and the objectives, gives rise to a fundamental rethink of the objectives, ways and means. Furthermore, recent studies suggest there may not be spectrum scarcity anymore, when the transition from analogue to digital techniques is factored in.

360   This transition provides for a 'digital dividend' in the use of free air spectrum. There may be no spectrum shortage in general, only 'spectrum congestion' at specific locations, e.g. around airports.[62] This suggest a possible new way of looking at spectrum use, possibly as a new 'commons', with rules of use more similar to those of shipping routes at sea rather than of roads on land. Generally it is accepted that a mixed system is needed, consisting of 'spectrum rights' and 'commons'. Moreover, the emergence of new technologies, especially Ultra Wide Band (UWB), also forces a reflection on spectrum policies.

361   The importance of modernizing spectrum policies in the light of Lisbon goals is clear: Optimal use of the spectrum creates mega-opportunities for innovation, the European ICT industry, as developments in the unlicensed band demonstrate. In addition, European citizens are the ones that will benefit most from such new developments.

Europe needs a new and flexible spectrum allocation model and should push the analogue switch off of broadcasting

362   A breakthrough in the field of spectrum policies will entail the following;
• Change the present rigid spectrum allocation model designed based on scarcity to a new flexible model using basic principles of a European spectrum space, trading of spectrum and shared use; and
• Encourage or enforce early retirement of analogue broadcasting systems to encourage innovation and build leadership position in the digital space.

363   Such changes are currently considered at different international levels, for instance by the European Radio Spectrum Policy Group (RSPG), which plays a coordinating part for spectrum management. RSPG is responsible for harmonization efforts and also for improving the access to European spectrum policies. However, there are some doubts as to the yield of further harmonization efforts, without making fundamental changes to the spectrum management process.

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62   Stratix Consulting Group, (2004)

RADIO SPECTRUM REQUIREMENTS FOR COMMUNITY POLICIES
• Radio spectrum for wireless electronic communications access platforms • Convergence of wireless electronic communications and broadcasting • Space strategy (spectrum needs Community Space Strategy (Galileo, GMES, satellite communications)) • Road safety • Short range devices (SRD, such as wireless tags, medical telemetry) • Public Protection / Disaster Relief • Single Sky Policy • Maritime Policy • Scientific use of spectrum
PRACTICES AND DEVELOPMENTS IN RADIO SPECTRUM MANAGEMENT
• Spectrum trading • Information on availability and usage of radio spectrum • Spectrum refarming and relocation issues • Allocation guidelines • Adapting regulatory legacy at Community level to new radio spectrum policy approach • Technology developments impacting on radio spectrum management

Table 5, policy issues RSPG[63]

364   In the beginning of 2003 a discussion was started about secondary trading in spectrum. In February 2004, RSPG started a consultation round on this topic. More importantly, a study has been launched by the Commission to assess the feasibility of removing the fixed assignment of frequencies to specific applications. The RSPG has also conducted a public consultation on the 'digital switchover'.

The spectrum is one of the major battlefields for innovation and new business. Modernization of spectrum policies will have a large economic impact. Therefore the EU urgently needs to make its rigid spectrum allocation model flexible.

The crucial question for the EU is:
1.   **Does the EU have to stipulate that national governments move at a higher pace towards a fundamentally new and flexible way of allocating spectrum?**

Breakthrough 9: Enforce real solutions for consumer confidence and security

consumer trust and confidence are severely affected and need to be addressed

365   The great benefits of the Internet also entail a 'darker side', e.g. the ability to spread viruses, spam, pornography, privacy violation and cybercrime. These threats affect consumer (private-business-public) trust and confidence and hence form a barrier to the development of the Information Society in general and the content market specifically (see also breakthrough 4). Moreover, they seriously can threaten the proper functioning of the economy.

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63   http://rspg.groups.eu.int/activities/work_programme/index_en.htm

366   The importance of these issues increases with the progressive openness and interconnectivity of our ICT systems and the convergence of various infrastructures to IP standards. The wide-spread use of powerful PCs and the "always on" nature of the Internet, have replaced what were previously modest, stand-alone systems in predominantly closed business environments.

367   As the graph below illustrates, a wide variety of issues is connected to consumer confidence. In the future the threats will without any doubt be more sophisticated and the remedies more complex. Recent issues that will affect user confidence and that will need to be addressed in the near future are 'identity theft'[64] and 'dynamic pricing'[65] applied on the Internet.
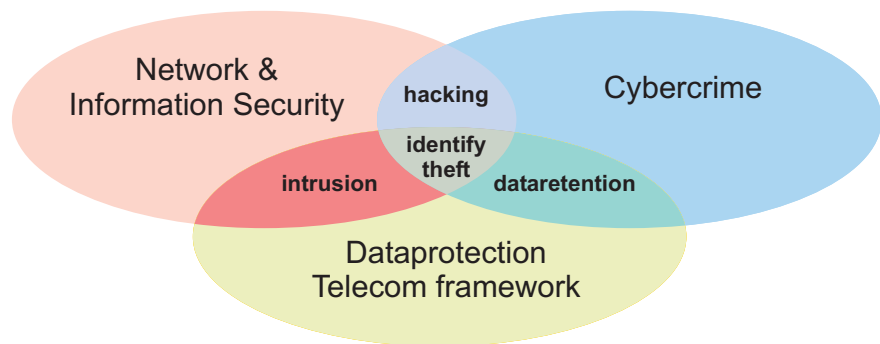

Figure 16, Issues connected with culture of security[66]

European consumers have less confidence than those in the US

368   Consumer confidence is influenced in many ways. Whereas consumers in the USA are mostly confident in using their credit card for doing transactions on-line, many European consumers are not. Significant improvements have been made with respect to consumer confidence towards the Internet in domestic transactions, but many consumers still think that paying via the Internet is not entirely safe when it comes to cross-border transactions.

369   The development of purchasing via the Internet will depend on the ability to enhance consumers' confidence relating the security of payments made on-line. However, 100% security can and never will be guaranteed - and a balance must be found between security, complexity and the costs involved. This notion is supported by past failures like the SET (Secure Electronic Transaction) infrastructure, which is very secure, but has proven to be very complex and costly to implement.

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64   Identity theft is when someone uses your personal information such as your name, Social Security number, credit card number or other identifying information, without your permission to commit fraud or other crimes

65   By using the plethora of information gathered from customers - ranging from where they live to what they buy to how much they have spent on past purchases - dynamic pricing allows on-line companies to adjust the prices of identical goods to correspond to customers' willingness to pay

66   Communication on Network and Information Security COM (2001) 298 final

370   Consumer confidence also relates to the functioning of the internet as a critical infrastructure. The dependence of the economy and society on ICT in general and the Internet in particular has increased tremendously over the recent years. Public services like transport and electricity are increasingly dependent on and interconnected with ICT. In 2003, Korea experienced a black-out of 9 hours that seriously impacted business. Such threats to the reliability of the Internet adversely impact the development of the Information Society.

at the user side, the culture of security needs to be created

371   These threats to consumer confidence should be addressed at the user side and at the supplier side:
- At the user side, by creating a "culture of security". E.g. by stimulating the users of the ICT infrastructure to take precautions to reduce their vulnerability; and
- At the supplier side, by designing products and services that are less prone to 'security attacks'.

372   Improvement of user confidence is of high relevance for realising Lisbon goals. ICT is a main driver of growth and full utilization of ICT potential is critical for the realisation of the Lisbon goals. Non-use leads to non-added value and hence to less contribution to economic growth. Consumer confidence will have a notable effect on on-line commerce.

role for government: confidence and security issues

373   The problems that stand in the way of user confidence cannot be solved by one single party: consumers on their own are not able to stop the problems, neither is the anti-virus industry or the providers of communication services and providers of infrastructure. It appears that the required coordination will not emerge autonomously. Addressing the issues raised and resolving them effectively is beyond the capability of individual (or groups of) users or individual (or groups of) suppliers. Consequently, there is a role for Government to contribute to resolving this issue.

374   Regulations are required that will have to be enacted and enforced. Self regulation of the industry is not expected to provide the required results. Hence, there is a role for government to act. In improving the 'culture of security', a systematic approach aimed at prevention and repair is required. International cooperation is essential as the phenomena are of a global nature. Offenders move quickly across the Internet and they defy national boundaries and legislative structures. Moreover, the centre of gravity of the anti-virus industry is located outside Europe, hence involvement of the EU is required.

375   Specific initiatives to stimulate end-users to take preventive actions have received ample attention recently. The OECD has issued guidelines to create a culture of security that was adopted by the European Commission. Similar initiatives were undertaken by other organizations, such as the United Nations[67].

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67   Resolution, adopted by General Assembly 57/239, on the creation of global culture of cyber security
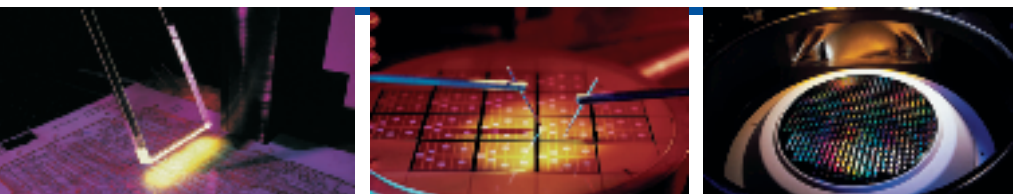
at the supplier side, mechanisms need to be created that work against the threats

376   The breakthrough that is needed to seriously approach a "near 100% consumer confidence" would be the introductions of 'mechanisms' that systematically work against threats. Options for such an approach are:
- To create liabilities in the event of non-compliance;
- To enforce regulation more effectively; making use of the 'control points' along the communication chain;
- To create economic principles, such as an 'e-Stamp' for e-mail, to deal more effectively with spam; and
- To assure security of supply of the Internet by strengthening government control and/or ownership of certain parts of critical infrastructures.

A crucial condition for a broad deployment and use of ICT by business and consumers is user confidence. Therefore the EU needs to enforce structural solutions for viruses and spam by creating liabilities, give priority to cybercrime within law enforcement and ensure the availability of critical infrastructures.

The crucial questions for the EU are:
1. How much time the EU is willing to give to the market to (collectively) come up with structural solutions concerning internet security?
2. Is the EU prepared to create liabilities to enforce market players to find real solutions for 'the darker side' of the internet?
3. Is the EU prepared to give priority to cybercrime (over and above other tasks) within law enforcement?

Breakthrough 10: Shift e-Inclusion policy from "access for all" to "skills for all"

377   One of the main Lisbon goals is "to create an Information Society for all". Dependency of citizens on the Information Society is rapidly rising, and is adding an 'information divide' to the existing 'financial divide'. ICT can provide for the access to information and the communications which are considered necessary to fully participate in the Information Society but there are specific groups within society that are not sufficiently able to connect and benefit. This is not always caused by a lack of availability of computers and communication facilities but also by a lack of education and skills to use them and the willingness to actually use such new technologies.

e-Inclusion problems are more and more caused by skills rather than by availability

378   e-Inclusion and the digital divide evolve dynamically. In the past, the 'analogue divide' was addressed quite effectively through the Universal Service Obligations (USO) enforced upon telecom operators, with the objective to deploy the telephony network in economically non-viable, rural and other sparsely populated areas. At the start of the digital era, the digital divide was shaped by the availability of computers and communication facilities. Increasingly, computers and communication facilities are becoming available to European citizens, although there may be significant differences in quality, e.g. broadband and wireless communication.

379   At present the focus is very much on the availability of broadband and IPv6. A recent IDATE study shows that across the EU, urban areas have DSL access rates exceeding 90%. In rural areas, however, the access rates are much lower. The digital divide that is growing at present is however not only about computer deployment and access to infrastructure, but has much more to do with the education, skills, motivation and the actual use of ICT.

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380   The above is not so much determined by personal characteristics such as income, education, sex, age, profession or ethnicity. Although certain groups may indeed lag behind, research suggests that such backlogs are far from static and such digital divides may disappear over time[68]. It is a matter of early and late adopters. Instead, non-participation appears to be much more determined by the degree to which people participate in social networks, are part of the labour force and participate in training and skills development.

e-Inclusion policy should focus on skills and participation in social networks

381   Social inclusion is a standing concern and subject of government policy and is as such a part of the Lisbon goals. To address the issue is in line with the social responsibility towards groups that are lagging behind. The effects may however be broader than just participation in society: connecting more people to Information Society will also lead to economic participation and will influence economic growth.

382   There is a serious risk that e-Inclusion is treated as non-critical and does not get the fundamental policies it deserves. The breakthroughs that are required to turn e-Inclusion from an "intention" to a commitment are:
- To redefine the current Universal Service Obligations; and
- To focus on skills development and the use of IT by investing in education/training.

A crucial step for a broad deployment and use of ICT by consumers is that Europe's e-Inclusion policy focuses not only on broadband access, but also on the skills. Europeans need to participate in the information society. Therefore the EU needs to redefine the current universal service obligation and adopt strategies for improving ICT skills.

The crucial questions for the EU are:
1. Does the EU think it is necessary to add a 'skills for all' strategy to the 'access for all' policy?
2. Does the EU think it is necessary to drastically reconsider the current interpretation of the Universal Service Obligation?

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68   Frissen, V. (2000): Cultuur als confrontatie, de mythe van de digitale kloof

4 Changing Europe's ICT future requires full revision

401 ICT is undeniably a crucial technology for economy and society. In the present decades ICT is the technology that drives and shapes the economy and society. Its more than average contribution is proven not only by many recent academic studies but also by the experience of the past years that shows the fast rise of ICT-based economies and ICT industry and the increasing dependency of society on ICT.

the ICT future will offer a lot of new chances

402 ICT however has changed over the last few years. There has been a crisis that has affected many and has changed insight in the way ICT should be dealt with. The paradigm is shifting, we have learned more about the formula for success. The awareness has grown that best results with ICT are often not achieved anymore by quick and dirty, radical new approaches that aim for fast growth but by well conceived implementation along the supply chain, with a clear eye for tangible and measurable results.

reference countries have outpaced the EU

403 In the past decade there have been several countries that have made enormous progress compared to the EU. Some have completely outpaced the EU on particular ICT-areas and have become globally leading, negatively impacting the European ICT-industry and economy in the process.

404 But there still are many chances for Europe, ICT still has a lot in stock. Many new market segments will probably see a big growth for which particularly Europe is well positioned, such as the content market and the creative industries. A leading position in these new growth areas is crucial if Europe wants to play in the first league of productivity and economic growth, combined with a strong social system.

Europe will not regain the lead with a middle of the road policy

405 However, in our view the present approach does not qualify to grab those chances. There is no time to loose. If the EU is serious about reaching the Lisbon goals set for 2010 it needs structural changes. With middle of the road policies nobody, including Europe, will be able to take a leading position. The results achieved by other countries over only the last ten years show that it pays off to make choices and to invest in the future of ICT. Europe will not see results without changes and investments.

406   In chapter 3 we have presented a package of potential breakthroughs that deserve to be discussed in detail. Of course there are many more options for breakthroughs and one should not discard the enormous importance of present policy initiatives that build the right environment for ICT in a gradual way rather than through breakthroughs. But we feel that this set of ten breakthroughs has a particular good chance for the future. The stakeholders will have to discuss and decide what progress Europe can achieve in each of these areas. We are convinced that taking up each of these great European ICT-challenges will lead to tangible and measurable results that are so dearly needed on the road towards the Lisbon goals.

Breakthroughs	
1	Shift the e-Business and e-Government policy from connectivity to uptake of complex ICT applications
2	Standardize ICT environments in Europe to trigger and enable new business
3	Accelerate the introduction of disruptive technologies
4	Realize the vision of 'any content, anytime, anywhere, any platform'
5	Go for global platform leadership in the ICT industry
6	Develop a strategic response to job migration to low-wage countries
7	Remove barriers for the development of an innovating European electronic communications sector
8	Move to a new and flexible model of spectrum allocation
9	Enforce real solutions for consumer confidence and security
10	Shift e-Inclusion policy from 'access for all' to 'skills for all'

Table 6, the ten breakthroughs

ICT is a most crucial option for achieving Lisbon goals: economic and social progress

407   At present ICT is a most crucial card the European Union avails of to achieve economic and societal progress. If well played, its impact can come relatively swift, as has been shown by several other countries over the last years and also by the European success story of GSM. However it is the preparedness to use the card that matters.

408   It is clear that each of the issues we have put forward has many dimensions and can be perceived from many perspectives. In this report we have only been able to highlight the problems, propose a breakthrough idea and hint at some of the related policy tensions and questions. Providing the solution and the best way forward are the challenges lying ahead of us.

"Whether the actual responses are timely or delayed, adequate or inadequate, will depend on a multitude of cultural, economic and other factors, including the specific conditions of national economies and the world economy and the previous decisions made by the more influential actors. (...) The design of appropriate policies at each turn requires identifying the direction of change by understanding the paradigm and identifying the phase of the surge. Neither task is simple and both the willingness to understand and the goals pursued when responding are politically conditioned[69] (C.Perez)".

the ambition is there, now it is time for action!

409   In Lisbon Europe has set its ambitions, now it urgently needs to build a shared vision on the competences with which it is going to achieve the ambitions!

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69   C. Perez (2002): Technological Revolutions and Financial Capital - The Dynamics of Bubbles and Golden Ages
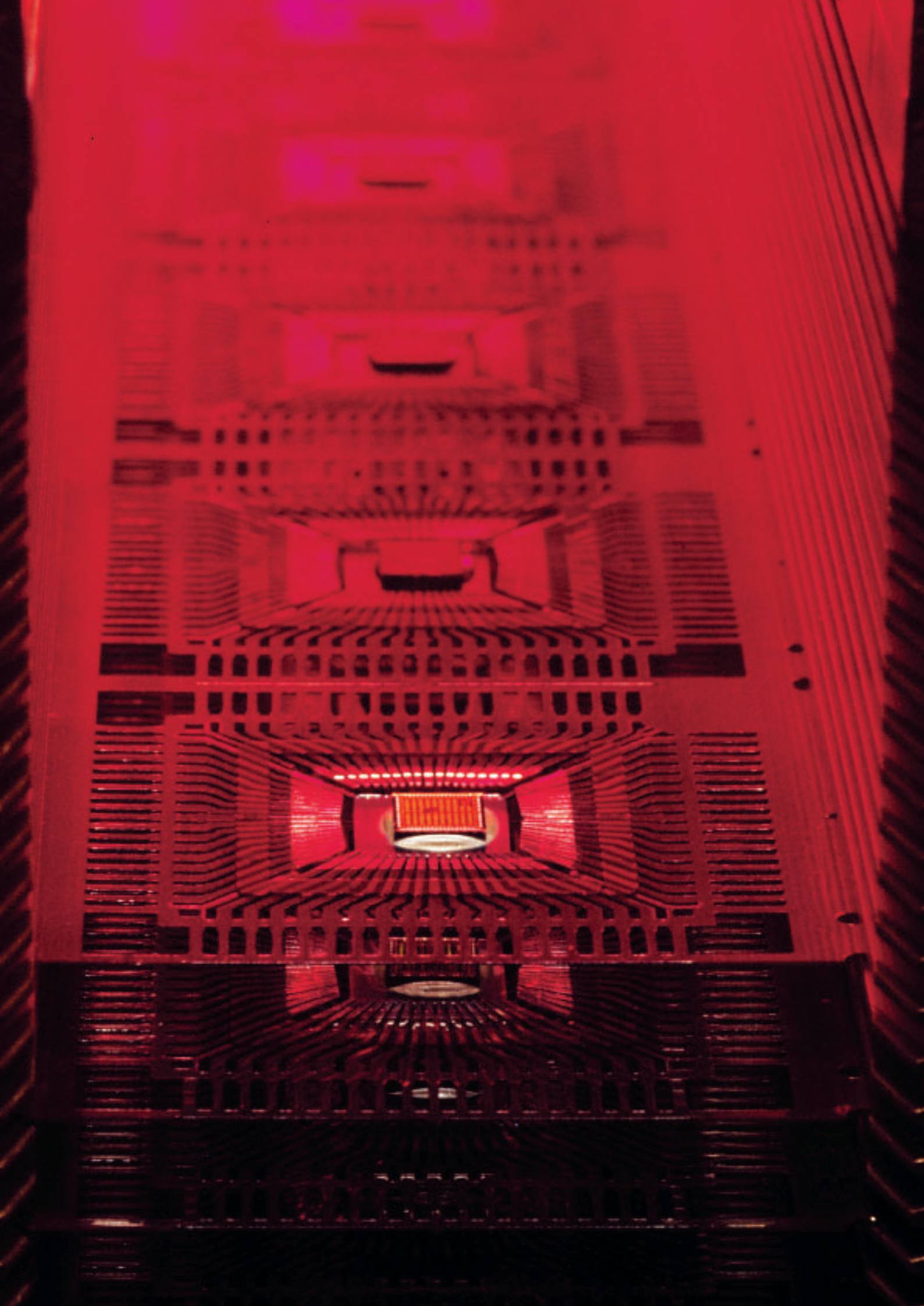
A Reference Countries

India, building a huge software industry aimed at export

1   India is particularly relevant because of its strong software export industry built on a focussed policy by India's Government, aiming at liberalisation and stimulating the software industry by creating favourable conditions for investments.

State of the Art of India's ICT industry

2   In spite of relatively low literacy rates among the general population, India has several key advantages in human capital: a large English-speaking population and world-class education, research and management institutions - a direct result of investment in self-reliance in science and technology. However, one of the biggest challenges to the Indian software industry remains the difficulty in attracting and retaining talented professionals.

3   India has created a good environment for ICT industry. It developed a well-established framework for protecting intellectual property rights which has been an important inducement to business investment: well-known international trademarks have been protected by Indian laws, even when they were not registered in India.

4   Public-private partnerships, catalyzed by the IT Ministry, have played a key role in India's ICT-related development. One of the positive results of this effort has been the IT Act of 2000, which is based on the recommendation of the National IT Task Force, and aims to set the overall strategy for the IT sector. In addition, the government and the private sector are starting to come together to foster ICT development. For example, a joint effort by the Computer Science Automation Department at the Indian Institute of Science and a private company based in Bangalore have developed Simputer, a cheap micro-computer that enables illiterate users to browse the Internet.

5   Much of the initial domestic demand stimulus for ICT and ICT services industries in India has come from government: 28 percent of total IT spending to date can be attributed to government and public sector expenditure. Major areas of government expenditure include: financial services, taxation, customs, telecommunications, education, defence and public infrastructure. As a result of the growth in ICT use in India, the ICT industry itself has also increased its domestic economic activity, for example, a number of ICT companies have developed accounting and word processing packages in Indian languages. The potential impact of this growth on the domestic economy is much broader than developing software for export only.

6   Infrastructure is still poorly developed: Teledensity in India has reached 3.5 percent of the population. Approximately 1 percent of households have fixed line connections, compared to 10 percent in China. The mobile sector has approximately 3 million users, growing at 100 percent per annum, and is expected to outstrip the fixed line market in the near future. The number of Internet accounts is around 1.5 million, growing at 50 percent per annum. India also has very high penetration rates of terrestrial TV, cable and radio. Voice and data wireless solutions, for both domestic and export markets, are increasingly produced and used locally.

7   In the field of content and applications, India has a strong domestic movie industry, but is also facing similar problems to Europe. India has a large population with great linguistic diversity. Creating and maintaining locally relevant content for a country with 418 languages is a challenge. Nevertheless, local language content is slowly making ICT more relevant and accessible to a broader cross-section of the population.

India's ICT policy

8   In the past, Indian Government has taken major policy steps[70] in relation to the ICT-industry, with a focus on software development for export; telecommunications policy reform; privatization of the national long-distance and mobile phone markets; and development of a more comprehensive approach to ICT. Challenges-including the perception of an unfavourable regulatory climate, an overloaded judicial system, poor infrastructure and costly access, and limited use of ICT-remain.

9   India's focus on self-reliant industrialization in the 1970s and 1980s has been replaced with reforms aimed at positioning India in the world economy: the foreign direct investment process has been streamlined, new sectors have been opened up to foreign direct investment and ownership, and the government has exempted the ICT industry from corporate income tax for five years. These reforms have helped India to become increasingly integrated into the global economy through growth in the export of software and skill-intensive software services.

10   In 1986, the Indian Government announced a new software policy designed to serve as a catalyst for the software industry. This was followed in 1988 with the World Market Policy and the establishment of the Software Technology Parks of India (STP) scheme. As a result, the Indian software industry grew from a mere US$150 million in 1991-1992 to a staggering US$9.5 billion in 2002-03.[71]

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70   Digital Opportunity Initiative, (2001): Creating a development dynamic

71   http://www.nasscom.org/artdisplay.asp?Art_id=1959

11   The establishment of the Telecommunications Regulatory Authority of India (TRAI) was a key step towards effective implementation of telecommunications reforms. In 1992, the mobile phone market was opened up to private operators, in 1994 the fixed services market followed, and finally in 1999, national long distance operations were opened to private competition. Prior to these reforms, the Department of Telecommunications had been the sole provider of telecommunications services.

12   In addition, to attract foreign direct investment, the government permitted foreign equity of up to 100 percent and duty free import on all inputs. Government-created technology parks and also offered professional labour services to clients, a cost-effective program for India since ICT labour is so inexpensive by global standards.

South Korea: a 'killer cocktail' of vision and ability to execute

13   The Korean Government has combined vision with vigour to do large investments in broadband deployment, to become a global leader in broadband access. Korea was one of the early countries to emphasize the importance of ICT as an economic stimulus. Between 1998 and 2001, Korean Government doubled its ICT spending and came up with different types of funding mechanisms and policies.

State of the Art of South Korea's ICT industry

14   Korea is facing the challenges of moving from high levels of new ICT infrastructure availability to ensuring effective use and reaping the economic benefits from ICT diffusion to business. It has had very high rates of growth and labour productivity growth, led by manufacturing, and most recently by R&D intensive manufacturing and has high levels of R&D in ICT industries. In terms of ICT diffusion across the economy, levels of basic ICT "readiness" in telecommunications and PCs are around the OECD average, although it is clearly the world leader in broadband infrastructure and has high levels of consumer use.

15   However, business diffusion appears uneven despite rapid progress, ICT investment and use remain around the OECD average in general, and ICT impacts on business may be lower than expected. This is partly due to the size distribution of Korean business, with small and very small establishments making up a very high share of total establishments and employing around one-third of total workers. Less than one half of small businesses had a computer and Internet access, and even when equipped the smallest often did not use them in business operations and processes. Small businesses are not fully exploiting the advanced broadband environment, for reasons including awareness, lack of skilled personnel and lack of specialist services[72].

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72   OECD (2004): ICT diffusion to business; peer review Country report; Korea

South Korea's ICT policy

16   Policy is the domain of the Ministry of Information and Communications (MIC). Providing all of its citizens access to broadband was one of the key policy measures. A major policy choice in the field of telecom policies is that the license fees of the telecom industry are kept in the industry itself and not used for other government spending. It is used i.a. for seed funding by the Ministry of Information and Communication for low interest loans for network roll out, ICT training and providing access to disadvantaged groups.

17   Small and micro establishments are an increasing focus of policy, as it is clearly recognised that they trail larger enterprises. The emphasis on the supply side, particularly on broadband infrastructure and the ICT supply industry has been very successful, and the emphasis is now on demand pull strategies. This means placing more emphasis on business use and exploitation of ICT, software and content and more fully exploiting the potential of the advanced broadband infrastructure.

18   The next steps in policy could be to further strengthen initiatives to pursue market-based solutions to diffuse ICT to business, allowing business-strategy driven integration of ICT in business processes. Particular attention should be paid to measures that reach large numbers of small businesses, using simple programme structures and delivery, further improve evaluation, and involve the business sector more broadly in programme design and delivery.

19   Anticipating the shortage of ICT specialists, Korean Government has an active ICT education and retraining policy. Korean educational policy goes beyond simply providing access to ICT. It also provides applications and content and produces on line educational material.

20   In 1999 Korea set up a fund with very low interest rates for investment in broadband access networks, specifically for less densely populated areas. It currently supports the development of IPv6. A new scheme (e-silk road) supports Korean software companies in establishing themselves as export industries.

21   At present, with 10 million subscribers, Korea has the highest penetration of broadband. This was partly enabled by the fact that most Koreans live in Seoul in high rise buildings. But also the penetration was pushed up by competition (internet over cable), government support (early commitment to a high speed infrastructure), a manufacturing industry eager to get into the ADSL market, and the Korean mentality. At present, Korean broadband has among the lowest internet broadband prices worldwide, with a performance above average[73].

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73   OECD, (2004): Benchmarking broadband prices in the OECD (http://www.oecd.org/dataoecd/58/17/32143101.pdf)

China: Orchestration for prosperity

22   China's Government has shown dedication through an orchestrated industry policy: foreign knowledge is attracted and retained by allowing foreign investment only through joint-venture business models. Furthermore, a very strong standardisation policy aims to stimulate domestic standards, for instance China's 3G telephony standard.

State of the Art of China's ICT industry

23   The ICT industry in China has experienced an explosive growth and is at present one of the pillars of the economy.

24   In 2002, the Chinese telecom sector contributed 2.69% of GDP. It is the third largest world wide. In the same year, the revenues of the telecom sector amounted to $ 168,7 billion, which was a rise of 20% compared to 2001.

25   Hardware production is booming. In 2002 production of mobile telephones was increased to 120 million, with foreign companies Nokia, Siemens and Motorola still in the lead, but Chinese companies are rapidly increasing their market share, from 2% in 1999 to 30% in 2002.

26   Computer production and sales have also boomed, despite the economic recession. Annual production of computers in 2003 was estimated at 13 million in volume.

27   Investments of foreign companies in Chinese IT-sector in 2002 amounted to $ 70 billion. In previous years, foreign capital went principally to mobile communications sectors, with Motorola, Ericsson, Nokia, Samsung, LG and Sanyo as the major investors.

28   In the course of China's admittance to WTO, China issued in 2000 a telecom directive. At present, still a regulatory framework is missing. For many foreign companies this is a barrier to entering the Chinese market. The Chinese Government only allows foreign investment under certain and tightly controlled conditions.

29   The Chinese software industry is small and underdeveloped, compared with its ICT hardware industry and compared with India's software industry. Yet, current status is not necessarily a good guide to future prospects, as China's recent history amply demonstrates. An important difference between the Chinese and Indian software sectors is the formers close links to domestic users, notably industrial and commercial users. This has fostered intensive learning in the area of product development for a large and rapidly growing domestic market. India's software sector, lacking such a dynamic domestic user sector until very recently, has thrived on exporting software services.

30   Certain Chinese Government policies and institutions - notably, publicly financed research into Chinese language software, translation engines, security systems, etc. - appear to have generated a significant number of software spin-offs, in some cases as derivatives of hardware by products from government research laboratories.

China's ICT policy

31   China's Government places strong emphasis on promoting domestic production capabilities and using local products in preference to imported foreign technology. However, China recognizes it's commitments under the WTO and ITA open markets.

32   The industry policy emphasizes China's future role in establishing world standards in future technologies (mobile data and digital media). At a general level, the policy emphasizes raising productivity levels and more efficient allocation of resources. China aims to spread the use of ICT and modern management methods with the help of ICT in state owned enterprises.
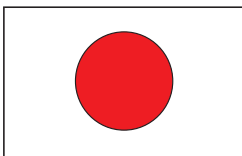
Japan, a techno-cultural fit

33   Japan is relevant because of its strong linkage between ICT and consumer electronics and successes in mobile applications, that are a close fit to socio-cultural circumstances: the Japanese are information-maximizers, 'gadget happy' people that value the intensified communication, without the psychological and ritual complexities of a direct physical meeting.

State of the Art of Japan's ICT industry

34   Japan is the world's second largest economy (larger than Germany, France, and the United Kingdom combined). Still suffering from a prolonged economic slump which began in 1989, the Japanese population is now rapidly aging: Japan is expected to have the most aged population in the world by 2005. However, Japan maintains high potential in educational standards and technological capability maintains its high potential.

35   The electronics (e.g. Hitachi, Sony, Fujitsu) and automotive industries (e.g. Toyota, Nissan, Suzuki) continue to dominate Japan's manufacturing sector and have had success in penetrating international markets. Both have suffered from the economic downturn, which has prompted a wave of outward direct investment into lower-cost countries, to Asia in particular. The contribution of ICT to the economic growth has been significant. In 2001 ICT industry contributed 0,83% for an overall economic growth rate of 0,30%, while other sectors such as electric machinery were holding back economic growth. The IT-sector has become the largest of eight industrial sectors the Japanese Government distinguishes. IT accounted for 11,6% of GDP in 2000.

36   The software market in Japan has been different from that of the United States. Reliance on mainframes has meant that Japanese businesses favoured custom software made by domestic software firms, which have tended to concentrate on this domestic sector, preferring not to compete against Microsoft and others for global market share in pre-packaged PC software. However as mainframes have become outdated and the number of PCs is growing in Japan, a huge market is opening for Microsoft and other foreign companies because Japan does not have software companies that have established a worldwide reputation like SAP, Siebel, Peoplesoft, Adobe and Dassault[74].

37   Although PC and Internet use in Japan lags behind U.S. usage, the markets for these sectors have been growing fast the past three years. Household PC possession and use of internet over fixed line has started relatively late; the catch-up rate has been impressive.

38   Japan has an excellent telecommunications infrastructure. Until recently its domestic system has been under the unchallenged control of Nippon Telegraph and Telecommunication (NTT), the world's largest telecom with $71 billion in annual sales. In addition, Kokusai Denshin Denwa Co., Ltd. (KDD) was the only carrier to offer international communication services. Japan is spending more than $30 billion a year on telecommunication infrastructure improvement.

39   In semiconductors Japan has recently lost ground to especially to the United States while other Asian countries such as Korea, Taiwan and China are becoming stronger competitors. The three major Japanese semiconductor companies are Toshiba, Hitachi and Fujitsu[75]. Major competitors are Intel, Micron and IBM (United States), ST Microelectronics, Infineon and Philips (Europe) and Huyndai and Samsung (Korea). A recent analysis of the Japanese semiconductor problems points to five explanations:[76]
1) Large amount of producers;
2) All enterprises offering similar products;
3) No economics of scale;
4) Lack of horizontal cooperation; and
5) Japan's ICT policy.

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74   Risaburo Nezu (Fujitsu Research Institute), Evolving applications of ICT across manufacturing and service sectors, ASEM Conference on Globalization and ICT (Malmö, Sweden), March 11, 2003

75   A company such as Fujitsu is not only active in semiconductors. Of total annual turnover about 40 percent is realised in software and services, 30 percent in IT, 10 percent in both communications and electronic devices and less than 10 percent in other industry segments (Source: Annual Report Fujitsu, 2001)

76   Risaburo Nezu (Fujitsu Research Institute), Global industrial restructuring (ICT equipment), Presentation for OECD Business and Industry Forum, 19 February 2002

40   Japanese policy makers passed new IT legislation in 2001 ('IT Basic Law').
At the same time, the 'e-Japan strategy' programme was initiated. This
programme aims to make Japan the most advanced IT country in the world. The
programme targets five main areas:
1) Infrastructure
2) Knowledge workers
3) e-Commerce
4) e-Government
5) Security

41   Broadband access is a major topic on the policy agenda. Fast
development of broadband is considered a key enabler of economic growth. The
main distinguishing element of this programme compared to other countries is
the fact that the private sector is expected to take the lead in the further
development of broadband infrastructure.

42   The main instruments that Japanese Government offers to stimulate
broadband access are a financing package with low interest rates for broadband
network operators. At the same time, significant tax benefits exist for companies
that invest in broadband networks.
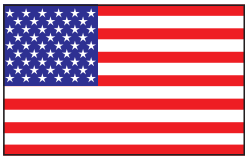
## USA: Freedom and support for the ICT industry

43   The key differentiator of the US Government's ICT policy is the stimulation
of high-tech entrepreneurial culture, creating a homogeneous and flexible labour
market while acting as a launch customer for new technologies. The industry is
characterized by a high-tech attitude and a close cooperation with universities.

44   The USA is globally the biggest purchaser of ICT goods and services.
Estimates from IDC and the World Bank indicate that the annual spending on ICT[77]
is nearly three times as high as the national spending on ICT of the runner-up,
Japan. Additionally, some of the largest firms in the field of ICT originated in the
USA (Microsoft, Hewlett-Packard, Intel, IBM, to name only a few).

State of the Art of United States' ICT industry

45   The relative position of the US ICT industry is obviously linked to the sheer
size of the home market. The graph below shows the leading position of the US
in the global spending for IT services and software.
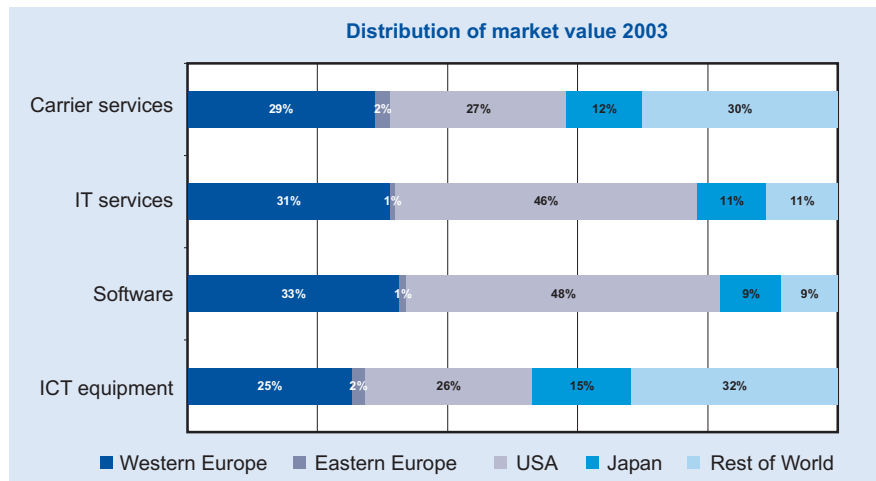
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77   Numbers relate to the year 2001
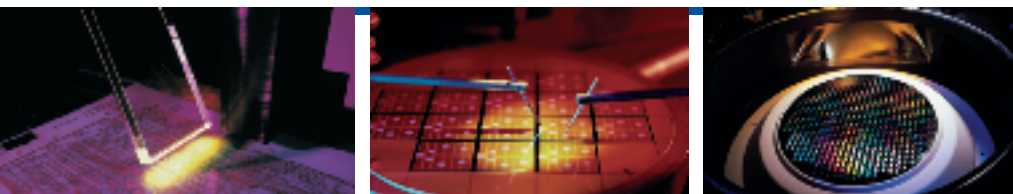
Figure 17, Distribution of market value in ICT services and software in 2003[78]

46   The ICT industry is characterized by a high tech entrepreneurial culture and a close cooperation with universities. This has led to several strong regional ICT-clusters in Silicon Valley, New York, the Research Triangle Park (North Carolina), Pennsylvania and the Greater Boston Area. Each of these clusters has a critical mass of research universities, industry labs, labour pool, start-up companies and big ICT players.

47   In the field of hardware, the major 'semiconductors' companies in the world are based in the US: Intel, Micron, AMD and IBM. US based companies gained market share in the nineties (40% in 1995, 55% in 2000).

48   In the field of software, most global leaders are based in the USA. Microsoft is the centre (or source) of the ICT cluster in Redwood Washington. Oracle is only slightly smaller than Microsoft in terms of number of employees. Other big software companies with a main presence in the US are (German) SAP, Computer Associates International, Veritas Software, Symantec, Adobe, Intuit and Infosys technologies.

49   In the services area, major players include IBM, Electronic Data Systems Corporation (EDS), Computer Sciences Corporation (CSC).

## Unites States' ICT policy

50   Government support for basic research programmes has in the nineties been provided through the HPC-act. Its main goals were to develop gigabit networks, tera-flops computing systems, advanced algorithms and software and demonstrate innovative solutions (grand challenges) in a number of areas. In 2003, US Government has updated these grand challenges. Its R&D scheme addresses a number of challenges, showing that American R&D is to a large extent application driven, with themes such as: knowledge environments for science and engineering; high confidence infrastructure control systems, safer, more secure, more efficient, higher capacity multimodal transportation systems.

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78   EITO 2004, IDC

51   Particular support for the American ICT sector comes from the government sector. Government Departments of the Defence and NASA have been important customers for American ICT industry. This trend is continued through the new "Homeland Security Initiative". Another recent example is the choice of the American Department of Defence (DoD) for IPv6.

52   A shift is observed in the allocation of Government research funds as the various agencies increasingly look for short-term results (typically within 18 months from research grants). This could affect the position of a university faculty negatively as they tend to focus on more fundamental research with longer lead times.

53   There are some marked differences between regulatory frameworks in the USA and Europe. Privacy and spam are in the US mostly regulated by the market, where as Europe tries to offer legal protection via government regulation. For electronic signatures the US only has a generic regulation framework in place, whereas the EU has chosen a more detailed approach. On the other hand, the US offers more detailed legislation for electronic contracts and electronic payments. Telecommunication regulation remains a source of dispute and has experienced major problems.
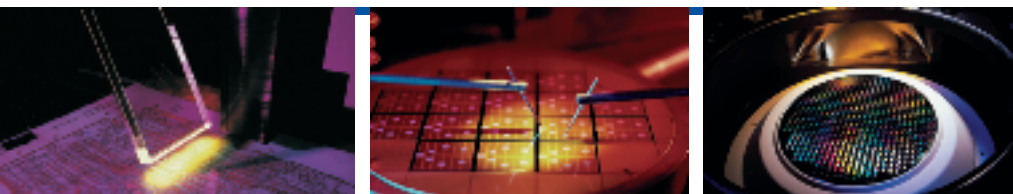
B Methodology and approach

Aim and purpose of the project

1   The purpose of this report is to identify new ICT related policy questions, a request triggered by the desire to provide new impetus to the policy debate. The report is an input to the international high-level conference on Director-General level on the 29th and 30th of September 2004 in Amsterdam. It will also be used as an input for an informal ministerial meeting prior to the Telecoms Council scheduled for December 9, 2004.

Methodology and approach

2   The approach used for the development of the report is shown in the figure below.

1. Preparation
- Kick off
- Outline paper
- E-board session
- Choice and appointments

2. Inventory/taking stock
- Desk research and interviews
- Reviews

3. Analysis and interpretation
- Integration report
- Rational analysis
- Creative analysis
- Integral analysis

4. Selection
- Interactive sessions
- Selecting main policy issues

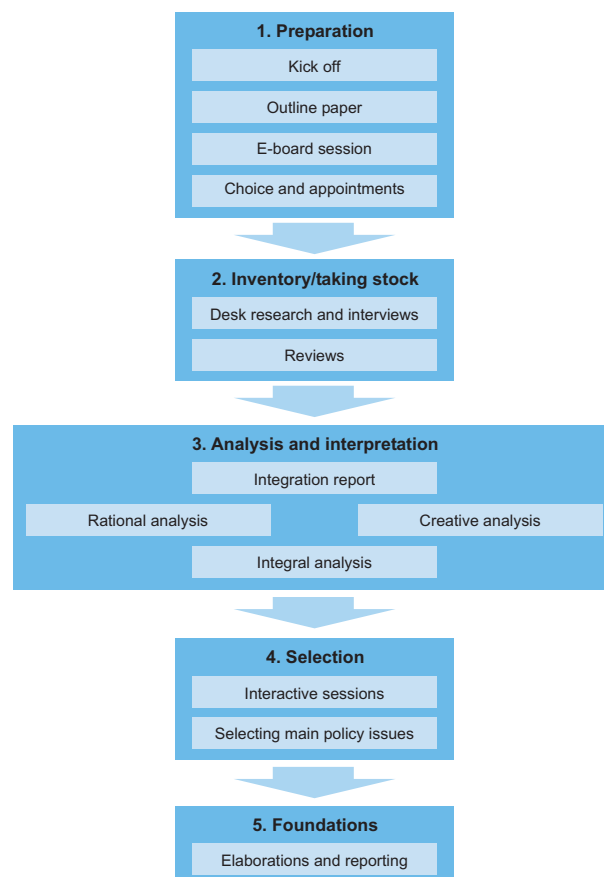**5. Foundations**
- Elaborations and reporting

Figure 18, approach in five phases

3   The approach of the study consisted out of five phases:

   a.   The preparation phase was used to determine the outlines of the study in order to establish the main issues under investigation. An e-Boardroom session with industry leaders and policy makers was held to verify the first results of the desk study concluded in an outline paper.
   b.   The second phase consisted of an extensive interview round, with opinion leaders, key decision makers throughout Europe and the five reference countries to identify new insights, new perspectives, discontinuities, a new sense of urgency that would give rise to the formulation of new policy questions. As annex D shows over 90 thought-leaders were interviewed. These interviews resulted in an extensive list of policy questions and breakthroughs.
   c.   During the third phase the ranking and selection of this gross list of policy questions and breakthroughs took place in several workshops with representatives from the ICT industry, users and policy makers.
   d.   During the selection phase we made the final selection of the main breakthroughs and policy questions using the input of policy makers across Europe during the second e-Boardroom meeting and some additional interviews.
   e.   Finally the fifth phase consisted of the elaboration of the results, some additional interviews to further verify the outcomes and the writing of the report.

4   The challenge the Project Team faced in the process of selection was the broad range of actions already under way as part of or related to the e-Europe Action Plan. Recognizing the aim to identify new topics and to avoid redundancy, the team has focused on the one hand on identifying breakthrough initiatives that would accelerate the use of ICT in Europe and thus stimulate growth and productivity, and on the other hand on identifying barriers that would prevent Europe to fully utilize the potential of ICTs.

Client, Steering Committee and project team

5   We specially like to thank the client, the Ministry of Economic Affairs in particular Director General Mark Frequin for this challenging assigment.

6   The progress and quality of the work during the project was monitored by a Steering Committee consisting of members of the Dutch Ministry of Economic Affairs and the EU. These members were:
•   Dries Bartelink (project leader);
•   Lucilla Sioli (European Commission);
•   Hans Bekius;
•   Claudia Cremers;
•   Rogier van Dokkum;
•   Theo Fielmich;
•   Victor Holleboom;
•   Norbert van den Hove;
•   Stephan Raes;
•   Wolfgang Tostmann; and
•   Carol Verhey.

7   Next to the Steering Committee an extensive list of people of the Dutch Ministry of Economic Affairs gave their view on the interim results of the project. We specially like to thank Rodrigo Pinto Scholtbach, Bart Schaap, Joost van der Vleuten, Mark Esseboom and Niels van Campen for their valuable contribution to this report. We would also like to thank Jos Leyten of TNO for his proficient remarks.

8   The project team consisted of consultants of PricewaterhouseCoopers enforced with telecom specialist out of the PwC network consultants with a 'consultants to the firm' status. The project team consisted of:
- Erik Klein Nagelvoort (partner responsible for this assignment);
- Jan Willem Velthuijsen;
- Robert van der Lande (Consultant to the firm / Triarii B.V. / project leader);
- Wolter Lemstra (Consultant to the firm / Industry-Insights);
- Wilco de Goeij;
- Maurice de Valois Turk; and
- Ton Jonker.

9   The project team was supported by an expert team of PricewaterhouseCoopers Global Technology Centre 'Menlo Park' Europe[79] (Greg Garrison, Werner Trattnig and Jason Slocock) and Professor William Melody of LIRNE (Learning Initiatives on Reforms in Network Economies). The experts participated in various sessions and reviewed the (draft) results.

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79   The PricewaterhouseCoopers Global Technology Centre located in Menlo Park, California and its European Centre has been consulted and participated throughout the process and acknowledges the issues raised in this publication. The Centre has a staff of researchers and technology analysts with extensive experience in existing and emerging technologies.

C Long list policy questions

In the interviews many policy areas were mentioned that might need extra attention and might provide a chance for a breakthrough. The policy questions can be grouped according to the graph below.
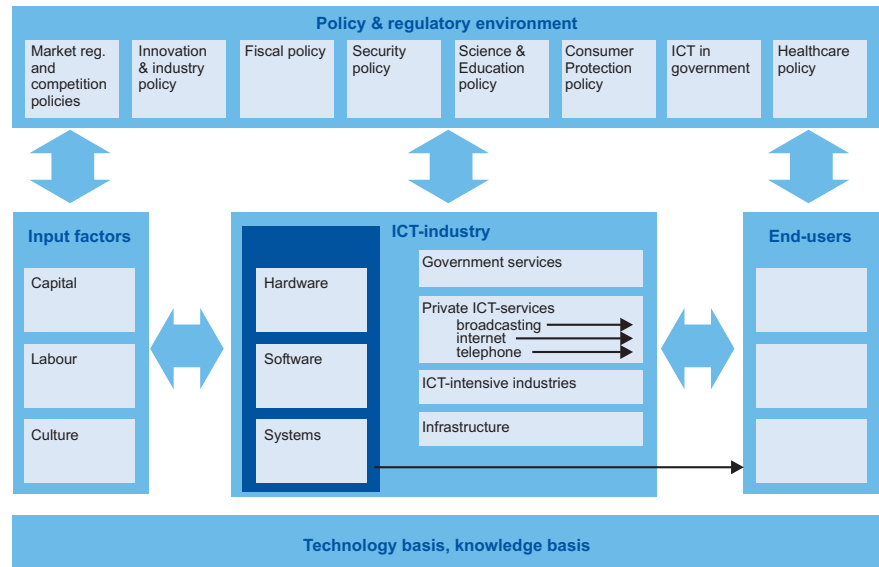

Figure 18 (as figure 11), basis for clustering results of interviews

1   The input-factors
- Capital:
  - The questions related to the changing orientation of providers of financial capital (from venture capital to production capital).
  - The problems regarding capital are: reduced availability of venture capital, the increased risk factor associated with disruptive technologies and regulatory uncertainty, the increased risk perception, extended value chain that causes the problem that investment and user revenues are not always in one hand, impeding investments, stagnating investment in infrastructures.
  - The policy questions were:
    - Which instruments will the EU use to boost new private investments in ICT?
    - How can the existing European financial means be rearranged and utilized to generate new private investments in long term ICT-innovations (including next generation networks)?

- Labour:
  - The problems mentioned were that Europe lags behind with ICT education and training compared to the other economic regions. The European education system is not yet up to its task.
  - The policy questions:
    - Should there be a stronger European effort on e-Learning?
    - Should EU have retention policy to stop ICT-brain drain?
    - Should the European education system be harmonized?
    - Should EU attract more students to technology studies?
    - Should EU promote ICT-oriented education?
- Culture:
  - The problems mentioned regarding culture are that Europe counts fewer company start ups, university spin offs, and that there consequently is a lower rate of innovation. Also in Europe there is a lower esteem for entrepreneurship. The European market is much slower in the uptake of new technologies. In USA, Korea and Japan, consumerism is much more pronounced.
  - The policy questions:
    - Does EU do enough to improve entrepreneurial climate?
    - Is the new generation the key for creating the new entrepreneurial spirit?

2　　The ICT industry
- Hard- and software sector:
  - The European software industry is relatively weak, with some exceptions (such as embedded software). There is a trend towards open source and open standards, creating opportunities for EU software industry. However some ICT-firms achieve monopolistic market power, resulting in lack of incentives for innovation, user choice and price competition. Also there is a slow process of establishing EU patent directive. Enforcement of IPR is costly and puts SME's at a disadvantage.
  - Policy questions that were raised:
    - How can the EU improve the relative position of the EU software industry?
    - How can the EU lower the dependency on (foreign) ICT companies?
    - What should the EU do to mitigate the effects of the software directive on SME's?
    - Should EU take additional steps to stimulate open source / standards?
    - Further structural reforms of labour- and product markets for making ICT-industry competitive?
- Systems sector:
  - Major discussion topics: With the exception of mobile communications, the European ICT systems sector is relatively weak. Opportunities for the European systems industry can be found in the field of regulation/supervision, spectrum management and use of ICT in public domain (e-Government, e-Health, e-Learning).

- Policy questions that were raised:
  - Should the EU pursue a more active policy on standardisation in order to create the right investment climate for European systems producers?
  - What can the EU do to regain the initiative in the mobile communications market?
  - Should the choice for UMTS be reconsidered?
  - What are the costs of not having a European policy in the areas of regulation (including supervision), spectrum management and the use of ICT in public sectors (e-Government, e-Health, e-Learning)?
  - What are the biggest opportunities for EU-harmonization?
- The electronic communications sector:
  - The major issues regarding the electronic communications sector centred around the regulatory framework that should be adjusted to the IP-convergence, the introduction of VoIP and the lagging investment in next generation infrastructures.
  - The policy questions that were raised were:
    - Should EU integrate its ICT-policies? (e-Europe+regulation+ stimulation)?
    - Should new benchmarks be developed for further telecom reform?
    - Should the EU, in order to achieve Lisbon targets, consider stimulation measures, other than benchmarking, with stronger incentives?
    - How can the EU exploit the opportunities for users and companies related to the switch to VoIP?
    - What does the EU to take the leadership role in internet governance and achieve a global solution?
- The content industry:
  - The major discussions centred around the rich EU-content sources that can drive broadband implementation, the EU-IPR-directive that is not enforceable, the perceived incompatibility between the data protection directive and the IPR directive, the inability to exploit content profitably: any platform, any time, any place, the absence of an industry incentive for DRM and the national boundaries of the copyright system that obstruct content providers.
  - The policy questions mentioned were:
    - What can the EU do to benefit more from the rich European content sources to accelerate broadband use?
    - What should EU do to achieve an open content market (any time, place, platform)?
    - Set up high level EU initiative on Content?
    - Review remaining degrees of freedom of IPR directive?
    - Stimulate DRM?
    - Create better motivators?
- The ICT using industry:
  - The major discussions centred around the slow take up of high tech ICT entrepreneurship in Europe, the specific problems within SME's and the role of the EU to stimulate the deployment of ICT within private companies.
  - The major policy questions:
    - Should EU play a role in pushing the low "high tech equilibrium" of SME's to a higher level?
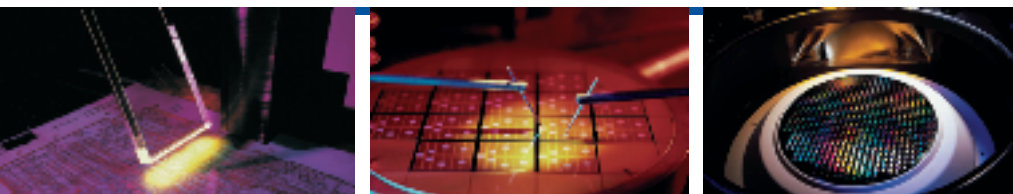
- – How can the EU stimulate productivity growth through ICT by private companies?
- – Should support be given through a "grass roots" based policy? (local support for SME's)?

3   Policy & regulatory environment

- Major topics of discussion were the telecom directive and the use of radio spectrum:
    - – Regarding spectrum: New applications requiring more spectrum; unbalance licensed/unlicensed use, current licenses coming up for renewal, unequal treatment of actors across EU countries in previous license awards, redundant efforts in tuning national frequency policies.
    - – Regarding the telecom directive: The regulatory framework forces NRA's into review process with long intervals, risking inadequate response to industry developments, there is no uniform application of remedies, no structural "learning loop" through jurisprudence, there is a move to the "legal battlefield", regulatory framework inhibits long-term investments in innovation.
    - – Regarding general policy: There is an aggressive job redistribution, ICT-jobs move to India & China. New technologies (such as LB-ID and RFID) enable person tracking & tracing will have a huge economic and societal impact but their introduction needs to be helped.
- Policy questions raised:
    - – Regarding spectrum:
        - – How can EU increase the use of licensed and unlicensed spectrum, thus creating value for industry and consumers?
        - – Should the balance between national and EU involvement in spectrum allocation and -policies be reviewed?
        - – Should EU increase the value and use of the spectrum by creating a EU spectrum market?
    - – Regarding the telecom directive:
        - – What can the EU do to alleviate the implementation problems of the EU directive?
        - – What should the EU do to prevent the telecom market to evolve to a legal battlefield and to enable NRA's to intervene quickly and adequately?
    - – Regarding general policy:
        - – Does EU do enough to benefit optimally from new technologies such as RFID, at same time dealing with public interests?
        - – Should EU explicitly lead the debate on technology-developments such as RFID/LBID?
        - – How can EU benefit from job redistribution in the light of Lisbon targets?
        - – Should EU work towards a seamless EU job market?
        - – What can the EU do (additionally) in the field of ICT-R&D, innovation & entrepreneurship to create new ICT-jobs?
        - – Should EU establish a European Communications Committee?

4   End users

- Major topics: the information society is slow in taking off, there are major problems affecting consumer trust and confidence:
  - Viruses are the most serious threat to user confidence in ICT/internet.
  - Spam regulation has implementation difficulties.
  - Low protection levels SME's.
  - Security industry lacks incentives for structural / optimal security solutions.
  - Increasing (economic) dependency of business users and consumers on the internet.
  - Connectivity and use of new ICT-technologies may be unevenly spread.
- Major policy questions:
  - How can the EU create and stimulate the necessary 'horizontal' circumstances?
    - through digital identification infrastructures?
    - through electronic payments?
    - through authentication?
    - through digital rights management?
  - How can EU improve trust & consumer confidence relating to new technologies (culture of security)?
  - Should the EU move towards a more prevention-orientated policy?
  - Is there balance between security of supply and market dynamics?
  - Should the EU coordinate the European effort by:
    - Awareness campaigns?
    - Identify issues for Spam regulation?
    - Set up a European cybercrime network?
  - Must the EU take initiatives to improve Internet Security-of-Supply?
  - Should EU take initiatives to decrease dependency on internet?
  - Which vulnerable groups deserve attention?
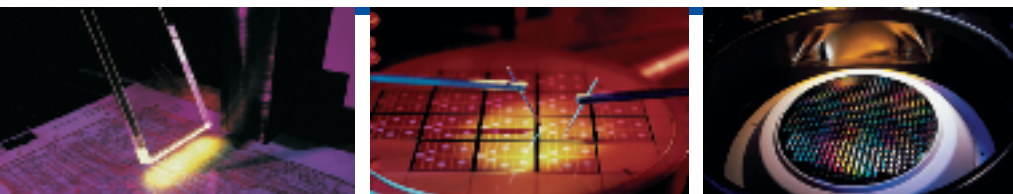
D Interviewees

Organization	Interviewee
104.com	W. van Blokland
Alcatel	J. Cornu
Antonio/Nederlof & Partners	P. Antonio
Bits of Freedom	M. Wesseling
	S. Nas
Business Software Alliance	F. Mingorance
BPL	B.K. Syngal
CERF Judge Institute, Cambridge University	C. Perez
Cellular Operators Association of India	T.V. Rachmanadran
CEMR/Elanet	J. Ossandon
CeTIM	B. Katzy
Chuo University, Japan	S. Naoe
Cisco Systems	M. Sheers
Colt	M. Matson
De Waag	M. Stikker
EADL	D. van de Mark
eBiscom / Fastweb	M. Gillespie
ECP.nl	A. van Bellen
EFMI; European Federation for Medical Informatics	A. Reichert
Elsevier	G. Staal
EMOTA	A. Weening
EuroLinux	L. van Dijk
European Commission, Directorate-General Information Society	F. Colasanti
	F. de Bruïne
	L. Sioli
	B. Langeheine
European Data Protection Supervisor	P. Hustinx
European Media Institute	J. Groebel
European Parliament	W. van Velzen
ICT Forum	P. 't Hoen
India Information Research Institute & Carnegie Mellon	V.S. Arunachalam
INSEAD	J. Story
Institute for Information Law University of Amsterdam	E.J. Dommering
International Telecommunications Users Group (INTUG)	E. Sutherland
ISTAG	J. Encarnacao
KPN	A. Scheepbouwer
Learning Initiatives on Reforms for Network Economies (LIRNE)	W. Melody
Magic Lantern	A. Lilly
Massachusetts Institute of Technology (MIT)	R. Brooks
Microsoft	W. Grommen
Ministry of Economic Affairs (Netherlands)	Several policy advisors of DG Telecommunications and Post and DG Innovation

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Organization	Interviewee
Ministry of Innovation and Technology (Italy)	M. Pelosi
Montana PSC	B. Rowe
National Association of Software & Services Companies	K. Karnik
National TeleCable	M. Matson
Nederland Kennisland	J. van der Steenhoven
Nokia	M. Alahuhta
	Y. Neuvo
Organisation for Economic Co-operation and Development (OECD)	A. Carblanc
	M. Donohue
	S. Moers
	D. Pilat
	G. Vickery
On Demand Distribution (OD2)	C. Grimsdale
Onafhankelijke Post en Telecommunicatie Autoriteit (OPTA)	J. Arnbak
Philips Design	J. Green
Philips International	A. Weyns
Philips Natlab	F. Snijders
Pvdl	A. van Buitenen
Rathenau Institute	M. Schoenmaker
Rotterdam School of Management	J. van den Hoven
Service des Technologies et de la Société de l'information STSI DIGITIP 2 (France)	E. Caquot
Sharman Networks	R. Chernela
Siemens Mobile	K. Smaling
Skype Technologies SA	N. Zennstrom
Stratix Consulting Group	F. van Iersel
Swidler Berlin Shereff Friedmann	A. Lipman
Symantec	I. Chantzos
Technical University of Denmark	W. Melody
Telecom Italia	A. Camanzi
	S. Gambardella
Telefonica	M. Avendano Gascon
	J. Ruiz
TeliaSonera	T. Johansson
Tiscali	M. Minsci
TNO Industrie	E. Sol
University of Groningen	B. van Ark
University of Twente	H. Roosendaal
University of Warwick, CMUR	M. Cave
Universitat Oberta Catalunya	M. Boisot
UPC	K. O'Sullivan
	M. Kohnstamm
VISA	R. Summerville
VSNL Telecom	S. Gupta
Yahoo	S. Collins

E Participants workshops

e-Boardroom session I on 15 April 2004

Organization	Participant[80]	Position
Alcatel	J. Cornu	Board of Directors
European Commission, DG Information Society	F. Colasanti	Director General
Learning Initiatives on Reforms for Network Economies (LIRNE)	W. Melody	Managing Director
SAP AG	C. King	Director European Affairs
Telecom Italia	A. Camanzi	Senior Vice President Regulatory Affairs

e-Boardroom session II on 14 June 2004

	Organization	Participant	Position
UK	Department of Trade and Industry (UK), Communications & Information Industries Directorate	D. Hendon	Director Communication and Information Studies
EU	EU, second section of the e-Europe Advisory Group	R. Carneiro	Chairman Workgroup on strategy
	European Commission, Directorate General Information Society	F. Colasanti	Director General
GER	Federal Ministry of Economics and Labour	W. Hochreiter	Head Div. Inform. Economy, European Media
FR	Service des Technologies et de la Société de l'information STSI DIGITIP 2	E. Caquot	Chef du Service
LU	Ministère d'Etat, Service des Médias et des Communications	J.P. Zens	Director General ICT
SP	Ministry for Science and Technology	A. Alonso Pardo	Director General ICT
PL	Ministry of Scientific Research and IT	A. Kolesiñski	dep. Dir. Dept Information Society
NL	Ministry of Economic Affairs	M. Frequin	Director General
		D. Bartelink	Senior Policy Advisor

80   Excluding participants of Dutch Ministry of Economic Affairs and PwC team

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Analytical workshop on 26 May 2004

Organization	Participant[81]	Position
BIPT and University of Ghent	E. van Heesvelde	European Regulators Group
CERF Judge Institute, Cambridge University	C. Perez	Research Fellow - The Financing of New Infrastructural Networks
Elsevier	G. Staal	Dir. of sales and market development Marketing and customers relations
LIRNE, TU Denmark and London School of Economics	W. Melody	Director LIRNE
LIRNE, Min. of Economic Reform Sri Lanka	R. Samarajiva	Visiting professor -former Senior International Specialist at the National Regulatory Research Institute (USA)
Mobility Platform	P. Spohr	Director
Philips	A. Weyns	Vice president, Consumer Electronics
Siemens	J. van der Velden	Manager Special Projects
TNO	J. Burgmeijer	Ma. Telecom Infrastructure and Services

Creative workshop on 28 May 2004

Organization	Participant[81]	Position
AB-Five Business Systems	A. van Arkel	Founder
De Waag	M. Stikker	Co-founder
Logica CMG	P. Burghart	Senior Business Consultant / Creative Director
Mediarepublic	D. Dirks	Business Development Manager
Nieuwe Helden	A. van Brakel	Entrepreneur
Stichting Nederland Kennisland	J. van der Steenhoven	Founder
Tresparc	V. Wentink	Founder
University of Wageningen	T. van Rooijen	Business Consultant Harbinger, University Wageningen

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81   Excluding participants of Dutch Ministry of Economic Affairs and PwC team
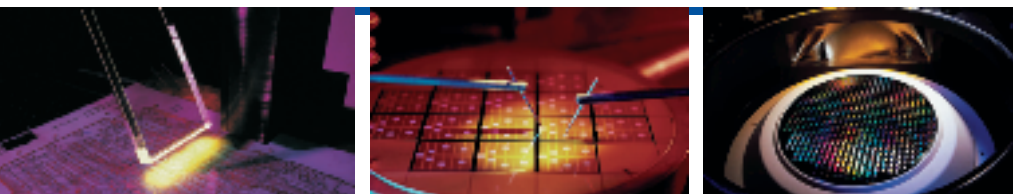
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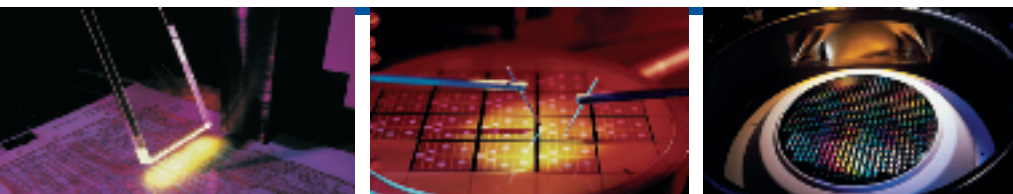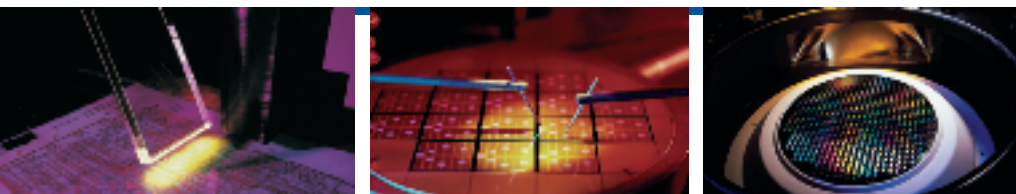
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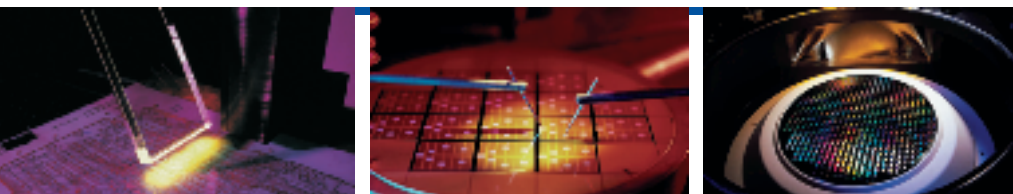
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