Identifying factors of success and failure in European IST-related National/Regional developments: The case of Austria

Final Report

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Executive Summary

The Austrian Tiger

If Ireland is nowadays called the 'Celtic Tiger' because of its rapid economic development, Austria of the 1950s and early 1960s may be regarded as the 'Austrian Tiger'. Austria was the fastest-growing European economy of this time, only surpassed by the German „Wirtschaftswunder". The catching-up of the 1950s and 1960s and above-average growth rates in the 1970s and 1980s made Austria one of the richest countries in Europe today. If we combine GDP and unemployment to a superindicator of economic welfare, Austria lies in front of most other EU countries.

A few key indicators describing Austria

Austria	dimension	2000
Population	In millions	8,110.244
Population density	Inhabitants/ square km	97
GDP/capita at current prices	In euros *1000	25,530
Unemployment rate	In % of labour force (employees+self-employed)	3,7
National Debt/GDP	Ratio	63,6
Date of birth of the nation	Year	(1919) 1945
EU accession	Year	1995
Share of employment in agriculture	As a % of total employment (employees+self-employed+family members)	5,68
Share of employment in industry	As a % of total employment (employees+self-employed+family members)	20,7
Share of employment in (market + non market) services	As a % of total employment (employees+self-employed+family members)	73,7
Ranking in UNHD index		15
Information Society Index (ISI) ranking		14
Share of employment in the ICT sector (services+manufacturing)	As a % of total employment	2,6 (1999)
Share of population (15-65 yrs) with access to Internet technologies	As a % of total population	31,9 (2001)
ICT value added as % in GVA	As a % of	8 (1999)

However, Austria's current favourable economic position cannot hide structural problems that affect today's and tomorrow's economic performance. If we assess Austria's way into the Information Society, we are faced with structural change in a matured, developed economy. Hence, this is more the story of an "old" Tiger which has to keep up or even shape the developments than simply catch up. Austria's story is also a story of old virtues which partly turn into burdens. Austria's institutional set-up with its strong corporatist elements and its orientation towards a consensus-orientated policy did well in the times of catching up, but didn't result in as much structural change as Finland or the other countries examined in

this project. Therefore, Austria may be less suitable as a direct example for the CECs, but rather as an illustration of a country in the post-"Tiger" period.

Some "Stylized Facts" on Austrian IS Development

Austria is still clearly ahead of many other European countries with respect to many Information Society indicators, especially ahead of the CECs and the South-European members of the EU. However, this favourable picture changes if we compare IS indicators for Austria to those of countries of similar or higher income. Therefore Austria is relatively lagging behind in ICT: many indicators position Austria *above* EU-average, but constantly *behind* behind in its 'peer group', particularly the Nordic countries. If IT expenditure indeed have a measurable impact on growth, competitiveness and therefore future wealth, Austria invests too little in ICT compared with countries of similar wealth.

Internet use

Austria again ranks slightly above EU level. As the use of Internet is clearly related to a country's level of income, it is not surprising that high-income countries like Norway and the US are in the lead in the rankings of Internet use. However, Austria's position at the back of its 'peer group' of countries with equal income and behind the Nordic countries also becomes apparent.

Diffusion of ICT in the enterprise sector: e-commerce

Almost every enterprises in the European Union makes use of PCs and the majority of enterprises already have access to the Internet. According to Eurostat (2001), Austrian businesses have fully embraced the Information Society: almost every Austrian business (92%) uses computers, 76% have Internet access, every second business (54%) has its own website (EU: 46%). The gap between e-readiness of Austrian enterprises and actual use, however, is striking, yet common to all European states.

The Austrian ICT sector

Although Austria has a long-lasting industrial tradition in electrical engineering and electronics, the Austrian ICT manufacturing could not avoid continuously losing market shares and jobs. Employment in this sector dropped from 42,500 in 1995 to 39,250 in 2000. Rather traditional sectors like the manufacturing of cable or parts of telecommunication equipment and radio and television manufacturers lost the most. The only sub-sector in ICT manufacturing with considerable increases in employment in this period are the producers of electronic components.

One of the reasons for this unfavourable development of the Austrian ICT manufacturers may be that Austria's telecommunication equipment market was restricted to four national suppliers until the mid-1990s with low competitive pressure. Another reason why Kapsch and Schrack, two of the national telecommunication manufacturers, never turned into "Nokia", was the small size of the home market.

ICT services have turned out to be one of the most dynamic sectors of the Austrian economy in recent years. The number of employees doubled between 1995 and 2000. The telecom sector's contribution to employment have been clearly positive, and it was more than just positive in software services. Here the number of jobs more than doubled between 1995 and 2000 meaning that two out of three new jobs in ICT has been set up in the software industry. However, we should regard these figures with caution as we do not know how much of this growth comes from outsourcing of already existing employment and how much has been really created within the last five years.

Factors of success and failure

The political framework of the Austrian Information Society

Austrian ICT policy in the 1990s

Austrian ICT policy lacks a pro-active, strategic approach. The fact that Austria nevertheless has a quite well developed Information Society is mainly due to the initiative and the interest of the private sector, drawing on the ‘’wealth” of its enterprises and households. However, this policy inactivity may not have necessarily hampered IS in Austria because Austria strongly benefitted from policy initiatives at the European level like telecom liberalisation. The Delors White Paper of 1993 and the Bangemann-Report initiated the Report of the Working Group of the Austrian Government on the Information Society (1996). However, in comparison with the vivid discussion in other European countries like the Netherlands, the report remained a singular event. In 1999, the eEurope initiative of the European Commission put the Information Society back onto the Austrian political agenda and led to the initiative "e-Austria in e-Europe" in the spring of 2000. As there is no co-ordinating institution for strategic IS policy, policy initiatives by the various ministries are manifold, yet seem rather uncoordinated. Despite this strong institutional fragmentation, there are recent attempts in the public sector to establish a joint ICT Board to co-ordinate all e-government activities of the federal level. Moreover, is the virtual absence of public promotion schemes specifically dedicated to IST or mission-orientated programmes in the ICT sector. Most financial support has come from general promotion schemes, and from the EU Framework Programmes.

Social Partnership

What distinguishes Austria’s political system from other European countries until today is the degree to which the Social Partners, besides political parties, the elected parliament and the government, are involved in the policy process. Austrian economic policy has always been strongly consensus-oriented, taking into account the interests and demands of many societal groups. By stabilising price and wage expectations, the Social Partners were a central part of the Austrian economic policy until the 1990s. The merits of Social Partnership can undoubtedly be found in their stabilising efforts. But we also see negative, hampering effects of the Social Partnership with respect to the Information Society: there were also fears by the trade unions of job losses and the labour-saving effects of ICTs.

Telecom deregulation

The fast liberalisation of the Austrian telecom market is the most remarkable development in Austrian Information Society of the 1990s and an example for a successful policy initiative. Austria’s telecommunications market was restricted until the 1990s to the monopolist ÖPTV and four equipment suppliers. ÖPTV was an administrative body within the Ministry of Public Enterprises and Transport and acted as telecom and postal services operator as well as regulatory authority. It was not until Austria’s accession to the European Union in 1995 that telecom liberalisation began. The most striking effect of liberalisation was the fast diffusion of mobile phones in Austria, resulting in Europe’s highest mobile phone penetration within a few years.

Industrial structure and the diffusion of ICT

Different sectors exhibit very different opportunities for the use of ICT. Thus, the diffusion of ICTs in the business sector is strongly related to the sectoral composition of the economy. Using software investment as a proxy for "high opportunity concentrates in very few branches it can be shown that much of Austria's lagging behind in R&D expenditure can be explained by the Austrian industrial structure and its low share of technology-driven industries (Peneder et al 2002). The same holds for expenditure for research and development (R&D) in manufacturing.

Social factors

Information culture and e-literacy

E-literacy means having the skills, knowledge and attitudes to use ICT to maximum advantage and to keep up-skilling. Optimal levels of access and e-literacy may contribute to a person's well-being and thus allow him or her to be a more effective worker, entrepreneur, consumer, or citizen. E-literacy is determined by ICT infrastructure, financial means, ICT skills and attitudes. One of the most important challenges of the information society is to extend simple computer literacy to the complex phenomenon of e-literacy with positive attitudes towards ICT-conveyed information.

This development seems to closely related to the predominant information culture. Information culture may be generally interpreted as the value a society attributes to information. Overall, Austrians have readily accepted the availability of ICT-conveyed information products and services. However, as regards daily newspaper circulation and books titles published or the number of books available in public libraries, the difference between Finland and Austria is quite large. Differences in the use of libraries between Finland and Austria are also quite striking.

Hierarchical thinking and trust in institutions

Dominant religious and ethical values, the political and legal structures strongly influence the information culture at the societal level. The more trust is conveyed into public authorities and institutions, the less distrust or fear there is on the part of the individual concerning privacy, data misuse, etc.: highly important issues for the diffusion of e-commerce or tele-work. Scandinavian countries with their longstanding, democratic-liberal political system are generally regarded by experts as information-friendly, transparent, with flat hierarchies. By comparison, Austria with its absolutist legacy is characterised by a strong belief and trust in public authorities and institutions; experts thus find a rather information-restrictive climate with strong information gate-keepers.

The education system

Education plays a key role in the development of IS because it qualifies a society and its members to use new information and communications technologies and its services offered, increasing as well the demand and necessities of information. Austria's education system is generally regarded as democratic and egalitarian, providing equal access for all. International managers attest the Austrian education to meet the needs of a competitive economy. Austria's expenditure for education also rank among the highest in OECD comparisons.

Yet Austria's education system is also associated with a conservative academic tradition which is more "answer"- than "question"-oriented. This implies that it does not broadly and proactively promote creativity and/or research skills. The issue of a "digital divide" is addressed by the large-scale introduction of ICT in the schools. Statistics show that Austria has a very high percentage of population with completed secondary degrees but drastically less with completed tertiary degrees. Although it ranks first with regard to expenditure on tertiary education within the OECD, only 14% of secondary school graduates per year continue to pursue an academic career in the university. Only half of those successfully complete their studies with a formal degree (1995).

Gender differences

The 'Internet gender gap' is one aspect of the ongoing discussion about a 'digital divide'. If the gap were smaller, Austria may have a higher overall Internet penetration rate. Therefore, the reasons for the gender gap may also explain why the overall number of Internet users in Austria is smaller than in the Nordic countries. This gap exists in other countries as well, however, there are a number of countries where these differences appear to be much smaller than in Austria. Although women are one of the fastest growing sub-groups of Internet users, the Internet gender gap closes only slowly in Austria.

What can be learned from the Austrian experience?

Austria is well advanced in Information Society development, yet lags behind other countries of comparable economic status, especially the Nordic countries. A number of factors have very likely shaped the diffusion of ICTs and the development of the information society in Austria:

- Austria's political institutions showed only little concerted effort in pushing Information Society policy. A major impetus came from the EU through policy-making.
- 'Old' institutional structures seemed to work fine and there was little pressure for radical reform.
- A higher share of industries making little use of ICTs and a smaller share making heavy use of ICTs may partly explain lower adoption rates in the Austrian enterprise sector.
- Austria's information culture is comparatively restrictive. Its education system requires students more to learn contents rather than to learn how to search for information. This may be a reason why many people see only little additional value in the Internet compared to other media.
- Gender differences with respect to Internet use are still larger in Austria than in other countries.

Some lessons learned:

- Institutional reform and liberalisation can quickly develop a well-functioning telecom market and force down prices. A necessary precondition is an independent regulatory authority.
- Long-established structures can turn out to hamper the development of an Information Society when they do not allow for social, institutional and structural change ("lock-in").
- The development of an Information Society is not necessarily the result of 'good policy'. Only little concerted effort has been achieved on ICT-specific promotion schemes in Austria. Yet good framework conditions such as high levels of education and income may also favour high diffusion.

- Austria also shows that there may be other sources of wealth than ICT. Countries can also be successful if they manage to gain competitive advantage in other sectors.
- Changes in the education and training systems towards more problem- and research-orientation in order to affect (long-term) changes in information culture which will eventually foster more creative use, i.e. increased utility, of ICT.

Introduction to the Study

Which factors have shaped information and communication technologies in Austria? What determined the way people use mobile phones, personal computers and the Internet? We try to find answers to these and similar questions in our paper. Furthermore, we want to point at factors that turned out to be crucial to the development of the Information Society in Austria – in our opinion and in the opinion of experts.

Technological trends in ICTs like the Internet or mobile communication are truly global, set by the R&D as well as the marketing departments of large companies as well as 'grass roots' movements like Open Source. However, users, culture and content, or governmental institutions still act locally to a large degree. The practical implementation of the Information Society is the frequency of computer adoption, information networks, mobile telephones usage and the differences in 'information culture' and information-related habits among the various groups. Information Society development is all about how and to what extent the business sector, government authorities and citizens adopt modern information and communication technology in their daily routines.

Following a Social Construction approach (Williams 1997), software and ICTs in general are shaped by interactions between global (technologies, markets) as well as local (user, context) factors. ICTs have more or the less the same features everywhere in the world. What people actually do with the technology is a result of habits, social structure and history-related to a certain degree, all factors which are highly localised. This is where TIGERS comes into play. We want to reveal at least some of the country-related historical, social, structural, political or cultural factors which influenced the take-up of ICTs in Austria in order to give insights what has shaped the country's way into the Information Society.

We go on in this chapter with a description of Austria and relevant parts of its economic history. Chapter 2 tries to assess Austria's position in ICT with regard to other EU countries. Chapter 3 presents some characteristics in Austria's institutional framework, its industrial structure and cultural as well as social conditions that may have been influential on IS. Finally, Chapter 4 sums up and tries to sketch out some lessons that the CECs may learn form the Austrian experience.

The Austrian Tiger

Currently, Austria has 8.11 Mio. inhabitants and ranges between Sweden (8.9 Mio. inhabitants) and Denmark and Finland (5.3 Mio. and 5.1 inhabitants) with respect to population size in Europe. With respect to population density (97 inhabitants per km^2), we have to distinguish between eastern, more flat parts of the country, the capital Vienna (1.55 Mio. inhabitants) and the Alpine regions in the West and South, where densely populated valleys alternate with deserted mountain areas. The First Austrian Republic was found in 1918 after the collapse of Habsburg Empire. However, the first Austrian Republic differed fundamentally from post-War Austria. We can also speak of 1945, the year Austria was liberated from Nazi occupation, as the date of birth of the nation.

Table 1: A few key indicators describing Austria

Austria	dimension	2000
Population	In millions	8,110.244
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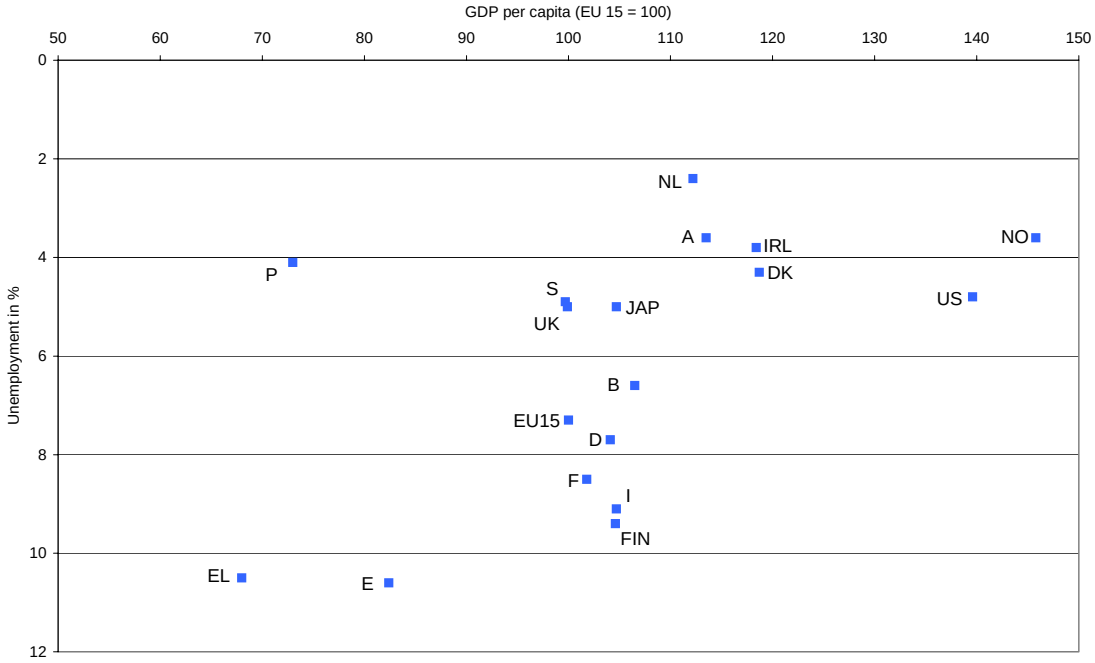
Information Society Index (ISI) ranking		14
Share of employment in the ICT sector (services+manufacturing)	As a % of total employment	2,6 (1999)
Share of population (15-65 yrs) with access to Internet technologies	As a % of total population	31,9 (2001)
ICT value added as % in GVA	As a % of	8 (1999)

If Ireland is nowadays called the 'Celtic Tiger' because of its rapid economic development, we may label Austria of the 1950s and early 1960s as the 'Austrian Tiger'. Austria was the fastest-growing European economy of this time, only surpassed by the German „Wirtschaftswunder". The catching-up of the 1950s and 1960s and above-average growth rates in the 1970s and 1980s made Austria one of the richest countries in Europe today. Measured in GDP per capita (2000: 25,530 €, 1995: 21,411 €), Austria ranks 5th place in 2001, above countries like Finland or Germany. Austria also enjoys a favourable low level of unemployment of 3.7% (1995: 3.9%) and stable prices. If we combine GDP and unemployment to a superindicator of economic welfare, Austria ranks in front of most other EU countries.

Table 2: GDP per capita and unemployment in the European Union, 2000



Source: EUROSTAT, Structural Indicators.

However, Austria's seemingly favourable economic position cannot hide structural problems that affect today's and tomorrow's economic performance. The effective retirement age in Austria, for instance, is one of the lowest in the EU, an indication for a lot of 'hidden' unemployment. Economists are also worried about Austria's poor growth performance in the 1990s which may be due to structural problems. If we assess Austria's way into the Information Society, we are faced with structural change in a matured, developed economy. Hence, this is more the story of an "old" Tiger which has to keep up or even shape the developments than simply catch up. Austria's story is also a story of old virtues which partly turn into burdens. We suppose that Austria's institutional set-up with its strong corporatist elements and its orientation towards a consensus-orientated policy did well in the times of catching up, but - metaphorically speaking – didn't "produce" as much structural change as Finland or the other countries examined in this project. Therefore, Austria may be less suitable as a direct example for the CECs but rather as an illustration of a country in the post-"Tiger" period.

Catching up

The Austrian catching-up miracle of the 1950s and 1960s has diverse explanations. Austria has a long industrial tradition although many parts of the country remained rural until the 1960s. The war time losses of equipment, buildings, infrastructure and, of course, people were severe. But Austria had still a well-educated labour force. Furthermore, the Nazi economic planners invested so heavily in Austria that some economic historians speak of a "second industrial modernisation" (Sandgruber 1995) during these dark times. Despite the losses, a number of industrial facilities survived the War, many of them technologically very competitive. The reconstruction of post-War Europe boosted production and exports of steel, wood, paper and other raw materials but also investment goods, vehicle parts, and chemicals. But also a strong-growing domestic demand ensured continuous production growth until the 1960s.

The Austrian Tiger could also rely on a strong political and social commitment to growth and stability. The common vision of national re-construction ("Wiederaufbau") helped to cover many of the political and

social conflicts that accelerated the decline of the First Austrian Republic of the mid-war years. Economic growth and stability were also the primary goals of the institutional arrangement between employer's associations, the representation of agriculture and the labour unions ('Social Partnership') which helped to avoid strikes and ensure moderate but stable wage increases. The Social Partnership remained highly influential – partly even more influential than government and parliament - for income, economic, social, and labour market policy until the late 1980s. We believe that Social Partnership and similar institutional arrangements of catch up have decisively shaped the emergence of the Information Society over the years.

Slowing down

As growth slowed down during the 1960s, the need for structural reforms became more and more obvious. One of the most important areas was education. Until the end of the 1960s, only 10% of the children between the age of 10 and 14 attended secondary school, the number of students stagnated since the days of the Habsburg empire (see Bachinger, Hemetsberger-Koller et al. 1994). Education and far-reaching social reforms were main policy fields of the social-democratic governments of the 1970s and early 1980s. The economic policy of this time, "Austro-Keynesianism", succeeded to maintain full employment until the early 1980s.

We can also find the origins of the Austrian Information Society in this period. With respect to information and communication technologies, this was a time of great expectations and public as well as private enthusiasm for computers as means of technological progress and modernisation[1]. Austria had a long tradition in physics and engineering sciences as well as a sound industrial base in electrical engineering. However, early technological breakthroughs like the fully-transistorised, binary computer "Mailüfterl" developed at the Vienna University of Technology between 1954 and 1959 found only few industrial successors.

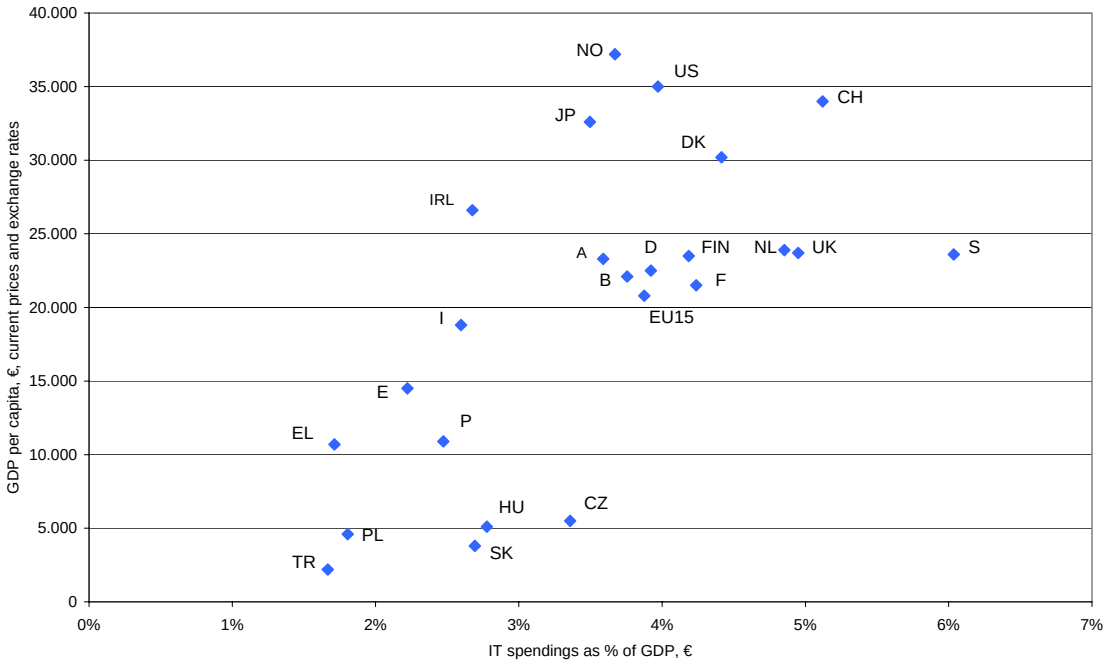
A third period of post-War economic history began in the early 1990s with the preparation of Austria's accession to the European Community. Austria joined the EU in 1995. Although historical developments can only be assessed in perspective, we can already state that this period brought far-reaching changes. There are also many signs that the Social Partnership has irrevocably lost its far-reaching influence. Moreover, a considerable part of Austria's economic and financial policy is now determined at the European level which gives less room for trends divergent to the European developments.

Tiger or Laggard? Some "Stylized Facts" on Austrian IS Development

If assessed by macroeconomic indicators, Austria is clearly an economic success story. The country is also still clearly ahead of many other European countries with respect to Information Society indicators, especially ahead of the CECs and the South-European members of the EU. However, this favourable picture changes if we compare IS indicators for Austria to those of countries of similar or higher income, with per capita income in the range of 20,000 and 25,000 €. Therefore, we may say that Austria is relatively lagging behind in ICT: many indicators position Austria *above* EU-average, but constantly *behind* behind in its 'peer group', especially behind the Nordic countries. A striking example is IT expenditure (see Table 3) where Austria is behind Belgium, Germany, Finland, France, the Netherlands, the UK and Sweden, all countries with a GDP per capita between 20,000 and 25,000 €.

[1] Sandgruber (1995) illustrates this enthusiasm by showing Austrian chancellor Josef Klaus taking computer lessons.

Table 3: GDP and IT expenditure as percentage of GDP, 2001



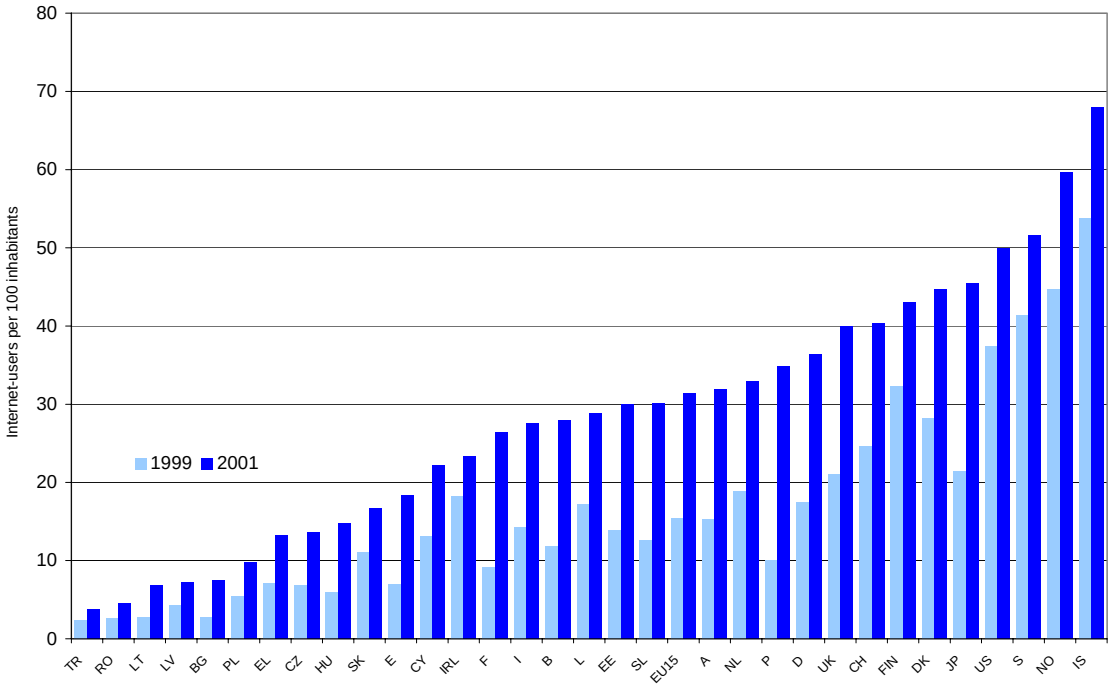
Source: OECD, EITO, own calculations.

If IT expenditure indeed have a measurable impact on growth, competitiveness and therefore future wealth, the figures show clearly that Austria invests too little in ICT compared with countries of similar wealth. Policy makers should also be worried if we look countries like the Czech Republic, the Slovak Republic or Hungary which already surpass Greece or Spain in IT spending as % of GDP to catch up even more rapidly than in the last years.

Internet use

Regarding Internet use, Austria again ranks slightly above EU level. There are seven countries ahead of Austria, seven behind. Again, Austria is in front of most South European countries and the CEEs. As the use of Internet is clearly related to a country's level of income, we can expect the number of people who can afford a PC to be relatively higher in Austria than, for example, in Poland. Therefore, it is not surprising that high-income countries like Norway and the US are in the lead in the rankings of Internet use. However, Austria's position at the back of its 'peer group' of countries with equal income and behind the Nordic countries also becomes apparent in this comparison.

Table 4: Internet users per 100 inhabitants, 1999 and 2001



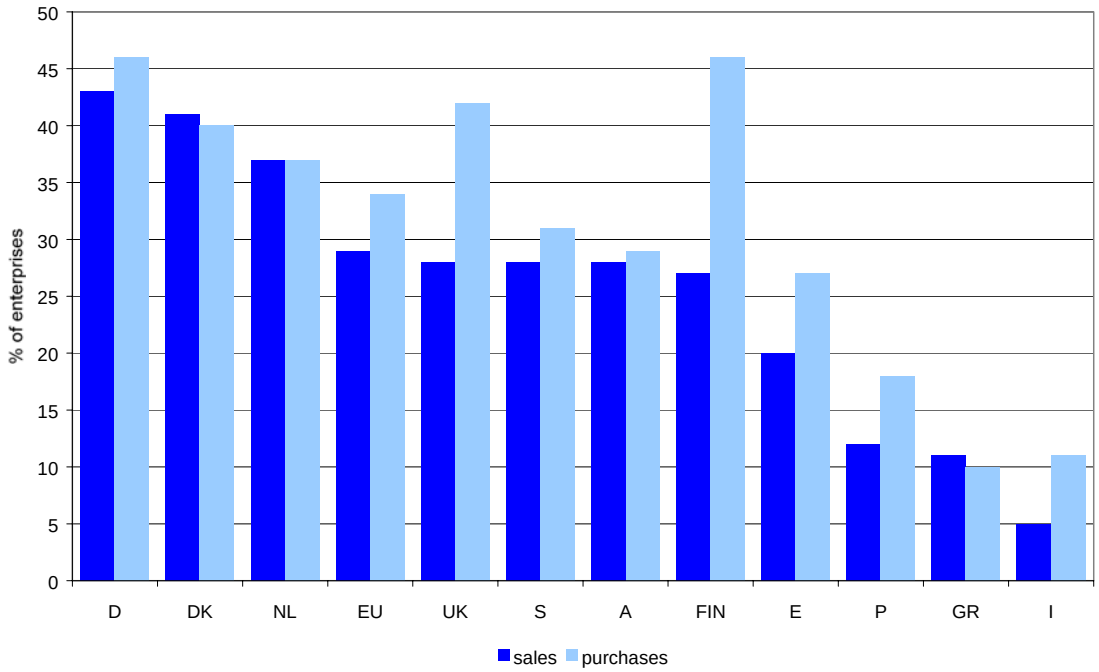
Source: ITU.

The relationship between income and the stage of diffusion of the Internet becomes apparent if we regard the position of the accession countries. But income alone cannot explain all differences between countries, because some of them, again the Nordic countries, are clearly ahead of others with a higher income. This may reflect the influence of other, "soft" factors which will be discussed later.

Diffusion of ICT in the enterprise sector: e-commerce

Unlike households, almost every enterprises in the European Union makes use of PCs and the majority of enterprises already have access to the Internet. According to Eurostat (2001), 92% of Austrian businesses use computers, 76% have Internet access. Every second business (54%) has its own website (EU: 46%). As the Internet has indeed become a "standard" tool for European businesses, it makes more sense to compare *actual use* and not *readiness*, measured by Web and PC penetration: Austrian enterprises are prepared for e-commerce, but up to now (2001) they use it only rarely. However, this sharp contrast between e-readiness and actual use is common to all European states.

Table 5: Diffusion of e-commerce in Europe, 1st half of 2001



Source: Eurostat, E-Commerce in Europe, Results of the pilot surveys carried out in 2001.

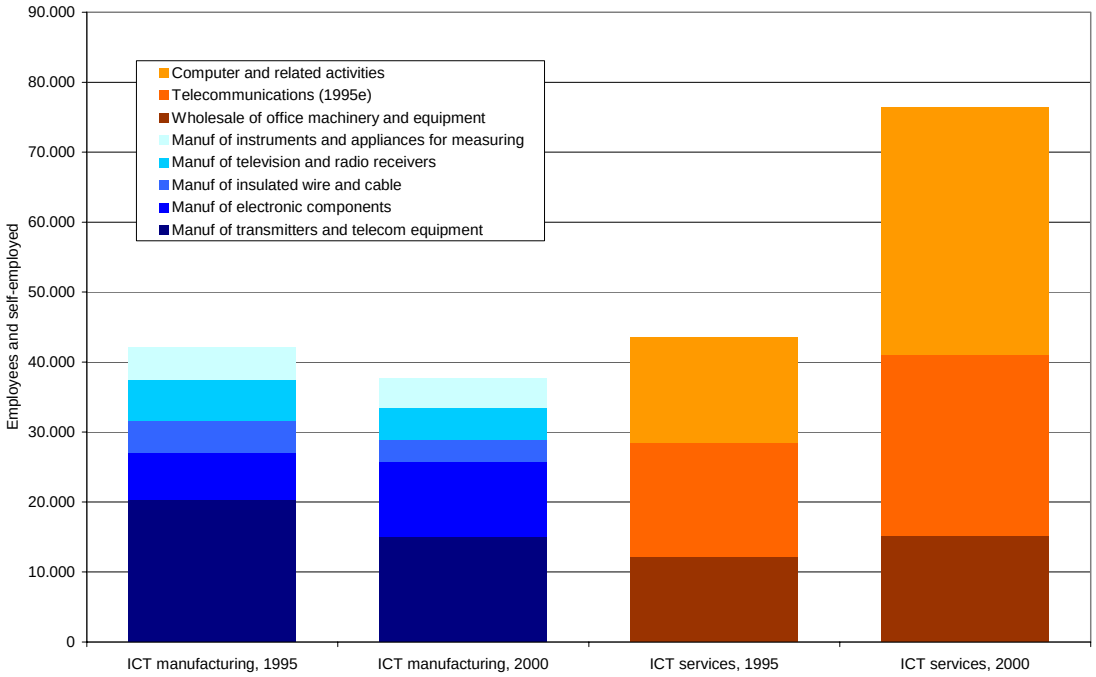
During the first half of 2001, 12% of all enterprises sold, and another 15% purchased goods and services over the Internet. Another 16% planned to introduce e-sales or e-purchases (14%) in the course of 2001. This matches with the picture of Austria drawn above – on average position, but lagging behind countries of equal economic strength. Data security proves to be a major concern and has resulted in slowing down e-commerce development (68%). Comparable with most other countries, Austrian enterprises fear the lack of potential customers (cited by 45%) and costs (48%). One sixth of all businesses also make use of specialised B-2-B marketplaces which again reflects the status of most European countries.

The Austrian ICT sector

Less obvious than growing diffusion rates are the supply-side effects of the Information Society in the production sector. It seems that this aspect of the IS is very unevenly distributed among the European industry. We again see the dualism between global technology development and local diffusion as mentioned by Williams (1997). New jobs have been largely created in all countries by localised, less tradable ICT services like software producers and telecom operators. Yet only three countries, Ireland, Sweden and Finland, managed to gain a surplus in their trade balances for ICT manufacture in 2000. Employment in IT manufacturing also stagnated or decreased in most EU states since the beginning of the 1990s. Again, the big exceptions are Sweden, Ireland, and Finland who were able to turn the benefits of the IS into new industrial jobs.

Although Austria has a long-lasting industrial tradition in electrical engineering and electronics, the Austrian ICT manufacturing could not avoid continuously losing market shares and jobs. Employment in this sector dropped from 42,500 in 1995 to 39,250 in 2000. Rather traditional sectors like the manufacturing of cable or parts of telecommunication equipment and radio and television manufacturers lost the most. The only sub-sector in ICT manufacturing with considerable increases in employment in this period are the producers of electronic components. Examples of successful firms are AMS, AT&S or Infineon Austria that established themselves as suppliers of custom-made components.

Table 6: Employment in the Austrian ICT sector, 1995 and 2000



Source: Statistics Austria, Enterprise Survey.

There are many reasons for the unfavourable development of the Austrian ICT manufacturers. Some of them, like the competitive pressure in consumer electronics and computers from the US and the Far East, are valid for the whole European ICT sector, others seem to be specific to the Austrian situation. In contrast to the Nordic countries, Austria's telecommunication equipment market was restricted to four national suppliers until the mid-1990s. With low competitive pressure and a centrally-planned, monopolistic demand side, incentives to innovate were relatively low.

Another reason why Kapsch and Schrack, two of the national telecommunication manufacturers, never turned into "Nokia", was size. Size is important if we take into account the nature of innovation in the telecommunications sector: it is a costly and risky business carried out by laboratories of large enterprises and does not come, like in the computer industry[2], from garage entrepreneurs. Austria, like Finland, is a small market. But unlike the Austrian companies, who restricted themselves to the domestic market[3], Nokia was at the beginning of the 1990s already a very large enterprise in relation to his home market, with more employees working outside of Finland (Nokia 1995). Nokia saw itself already as an internationalised, 'Nordic' enterprise which naturally focused on the world market. On the contrary, it would have been impossible for the Austrian telecommunication industry to earn enough in Austria to finance radical innovations like mobile communication.

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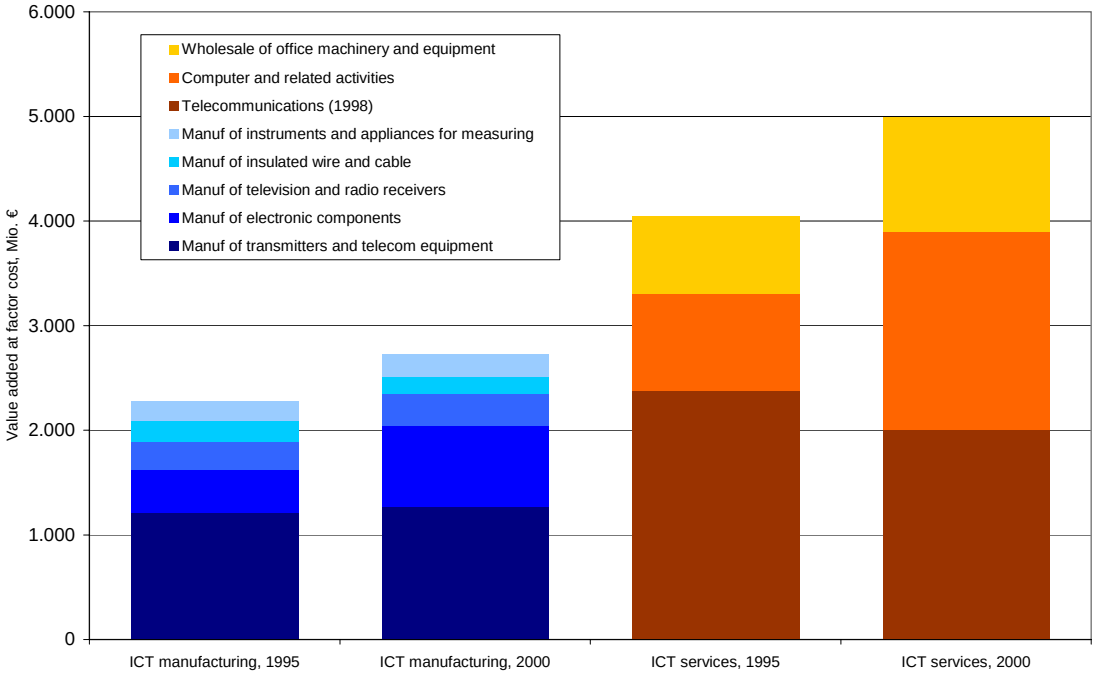
2 Unlike telecommunications equipment, manufacturing of computers, and other office machinery is negligible in Austria, despite some promising beginnings in the 1960s. The only public attempt to establish an Austrian computer industry dates from the beginning of the 1980s when the state-owned telecom operator developed MUPID, the Austrian version of MINITEL, together with other public enterprises and universities. Although technologically advanced, MUPID failed to gain a wider attention (see Latzer 1997)

3 One reason for this may be that two (Siemens, Alcatel) of the four national competitors have been subsidiaries of multinational enterprises.

Unlike ICT manufacturing, ICT services have turned out to be one of the most dynamic sectors of the Austrian economy in recent years. The number of employees doubled between 1995 and 2000. Here, Austria reveals a pattern of structural change very similar to that of Flanders: job losses at the national telecom incumbent PTV have been more than compensated by new jobs created by new entrants. Overall the telecom sector's contribution to employment have been clearly positive[4], and it was more than just positive in software services. Here the number of jobs more than doubled between 1995 and 2000 meaning that two out of three new jobs in ICT has been set up in the software industry. However, we should regard these figures with caution as we do not know how much of this growth comes from outsourcing of already existing employment and how much has been really created within the last five years.

Value added grew in manufacturing and services to a similar degree during the period 1995 to 2000. Again the producers of electronic components showed the best performance in manufacturing, while software services grew fastest in the ICT service sector. The development of value added in telecommunication services is difficult to assess as the 1995 numbers included both postal services and telecommunication. Compared to 1998, value added in 2000 has decreased which may be a sign of the fierce price competition in the Austrian telecom market.

Table 7: Value added of the Austrian ICT sector, 1995 and 2000



Source: Statistics Austria, enterprise survey

[4] The data on employment in the Austrian telecommunications sectors provided by the EUROSTAT Information Society Pocketbook is somewhat misleading as they state massive job losses between 1997 and 2000. Austria's national operator PTA (aka ÖPTV) delivered both postal and telecommunication services. Until 1997, the figures for telecommunication services contained both activities. According to PTA's 1995 annual report there should have been about 19,000 persons in telecommunications in 1995.

Factors of success and failure

The indicators presented in the previous chapter seem to form rather robust findings about the Austrian Information Society, being among the most advanced countries but somewhat lagging behind other countries of similar economic wealth.

We now turn to the question which factors have actually promoted or hampered Information Society development in Austria. Due to the limited resources available in this project and the complexity of the issue, we can neither give exhaustive answers nor offer clear 'cause-effect' explanations. Relations between influential factors and observable outcomes are often too complex and interactions sometimes work in both directions. Moreover, there exists surprisingly little literature on the long-term, historical factors that influenced the genesis of the Information Society in Austria and research is still in its infancy. We can only sketch out some strands of argumentation what factors typical to Austria may have been more or less favourable for the country's way into the Information Society, drawing on publicized IS indicators, the scarce available literature, and expert interviews, and simply leave others out. Two of these strands of arguments are:

- The lack of risk capital in Austria has been pointed out by numerous reports[5] as a hampering factor for the development of a dynamic ICT industry. The low share of venture capital can partly be explained by the traditional dominance of bank loans for investment financing and a highly critical attitude of all Austrian post-war governments towards the capital market which may be explained by the experiences made in the First republic. Moreover, shares constitute only a small part of private wealth compared to other countries. It is not clear if the low importance of risk capital also indicates that the 'entrepreneurial spirit' in Austria is comparatively low because internationally comparable statistics on the creation of new businesses do not exist.

- The role of neighbouring countries for IS development, namely Germany, is certainly higher than in other countries. Austria is closely connected to Germany through many cultural, economic and societal ties. Many things that work in Germany may work in Austria as well. Germany is often the first step for Austrian firms who want to sell their products abroad. Austrian subsidiaries of German firms are well represented in many sectors of the Austrian economy including ICT companies such as T-mobile or Siemens. Another effect of the proximity to Germany is that Austrians, compared with other small countries, have access to a much broader range of media contents in their language. This is certainly a positive influence on the diffusion of new media like the Internet. Yet, this may also turn out to limit the incentives to learn foreign languages.

The political framework of the Austrian Information Society

Austrian ICT policy in the 1990s

A common feature of the cases of Flanders, Ireland and Dresden is a strong public policy to drive Information Society development. ICT has been seen as a means to overcome an unfortunate economic

[5] See the Trend Chart on Innovation as a recent example http://trendchart.cordis.lu/Scoreboard2002/html/indicators/indicators_4.1.html

and demographic development (Ireland) or to achieve goals where the allocation of responsibilities between federal and regional level leave room for initiative (Flanders).

We do not find comparable strategic approaches in the Austrian ICT policy[6]. On the contrary, the finding that Austria has been 'forced' to telecom liberalisation may be generalised for ICT policy as a whole. The interest of the Austrian political players for ICT was remarkable lower than it was the case in Flanders of Ireland. The fact that Austria nevertheless has a quite well developed Information Society as shown in the previous chapters is therefore mainly due to the initiative and the interest of the private sector, enterprises and households. Briefly stated, Austria is well developed in ICT because it is a rich country, not because policy-makers pursued a pro-active ICT policy. However, we do not think that this inactivity necessarily hampered IS in Austria because Austria largely benefitted from policy initiatives at the European level like telecom liberalisation.

ICT policy developments in Austria in the 1990s have always been strongly influenced by policy-making at the European level. The Delors White Paper of 1993 and the Bangemann-Report can be regarded as starting points for a process which led to the Report of the Working Group of the Austrian Government on the Information Society (1996). However, in comparison with the vivid discussion in other European countries like the Netherlands, the report remained a single event. In 1999, the eEurope initiative of the European Commission put the Information Society back onto the Austrian political agenda and led to the initiative "e-Austria in e-Europe" in the spring of 2000.

The Working Group Report of 1996 is also remarkable because up until now it is the only paper developing a cross-cutting 'vision' for the Austrian Information Society. This shortcoming on the strategic level is another factor which distinguishes Austria from other countries involved in the study, and may be a consequence of the complex institutional setting of the Austrian ICT policy and technology policy as a whole. As in most other OECD-countries, information technology is a cross-cutting topic for which different ministries and agencies assume responsibility. The institutional set-up is, therefore, quite diverse and complex. The main policy makers and their competencies at the federal level are:

- the Federal Ministry of Economic Affairs and Labour (IT related research, technology diffusion, e-commerce, promotion of SMEs and start-ups, competition policy, labour related aspects of the information society)
- the Federal Ministry of Education, Science and Culture (promotion of IT-related research, IT-training at the secondary and tertiary level, IT equipment for federal schools and universities, research networks)
- the Federal Ministry of Transport, Innovation and Technology (promotion of IT-related research and technology diffusion, telecommunications policy, IT applications in transport)

In addition, other ministries have minor responsibilities in IS affairs: the Federal Ministry of Finance (electronic payment and revenue, security of the information technology, Corporate Network Austria), the Federal Ministry of Justice (consumer protection, electronic signature, e-commerce), the Federal Ministry of Public Services and Sports (information technology in the federal administration, e-government) and the Federal Chancellery (international co-ordination on activities related to IT and the Information Society, public procurement, privacy).

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[6] This section is partly taken from Dachs and Wagner 2001

The high level of administrative fragmentation is a well-known challenge for innovation and technology policy in Austria. Unlike other countries like the Netherlands, there is no co-ordinating institution for strategic IS policy. Consequently, policy initiatives by the various ministries seem rather uncoordinated, one example may be Kplus and Kind, two programmes to foster co-operation between academia and industry (Dachs, Wagner 2001). Yet things do change: for ICT in the public sector, an ICT Board has been established by the Federal Ministry of Public Services to co-ordinate all e-government activities of the Federal government. This reflects not only the importance that e-government has gained in recent years but also a growing sensitivity for the needs of inter-ministerial co-ordination in ICT policy.

Beside the institutional fragmentation and the lack of a common 'vision' or strategy, a third distinctive feature of Austrian ICT policy is the virtual absence of public promotion schemes specifically dedicated to IST or mission-orientated programmes in the ICT sector. Most financial support has come from general promotion schemes, and, of course, from the EU Framework Programmes. The Austrian Industrial Research Promotion Fund (FFF)[7], for example, devoted nearly a third of his funds to the ICT sector (NACE 31 and 72), and their share has increased very fast in recent years. Another example are the competence center initiatives k_{ind} and k_{plus}, where nearly half of all centers deal with information and communication technologies from image recognition to visualisation and telecommunications.

The Long Term: Social Partnership

What distinguishes Austria's political system from other European countries until today is the degree to which the Social Partners[8], beside political parties, the elected parliament and the government, are involved in the policy process. Austrian economic policy has always been strongly consensus-oriented, taking into account the interests and demands of many societal groups. If we talk about the long-term deteminants on the Information Society in Austria, we cannot leave this aspect beside.

Social partnership is not a uniquely Austrian phenomenon and similar arrangements may be found in many European countries: for example, the Irish TIGERS case study mentions a series of National Partnership Agreements closed in the course of the economic crisis of the late 1980s that exist until the present time. What distinguishes, however, the Austrian kind of Social Partnership from other countries is its duration, stability, and the influence it had on Austrian politics and policy. It was deeply anchored in the Austrian political system, and the two large parties. The relative loss of influence the institution has suffered in recent years is therefore closely related to changes in the political constellations, namely the rise of the Freedom Party, which disapproves of the institution. It also turned out that the Social partners had only limited problem-solving capabilities with respect to recent challenges, for example environmental issues. It can be seen as 'normalisation' and resembles an adjustment to the course of the political process in other EU member countries (Tálos 2001).

The existing literature tells only little about how Social Partnership shaped the Information Society in Austria. However, it is possible to draw some conclusions from the more general assessments of the institution. The Social Partnership's original intention and most important goal was to maintain stable and predictable development of wages that matches with other macroeconomic goals, like external stability

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7 http://www.fff.co.at

8 Tálos (1997) describes social partnership an informal system of interest groups and professional bodies that represent different socio-economic classes: the Federation of Austrian Trade Unions, the Federal Chamber of Labour, The Austrian Federal Economic Chamber, the Presidential Conference of the Chamber of Agriculture, and the Federation of Austrian Industry.

and competitiveness, without getting into industrial disputes. In contrast to other countries, this also included price determination to a certain degree (Novotny 1994). By stabilising price and wage expectations, the Social Partners were a central part of the Austrian economic policy until the 1990s.

The merits of Social Partnership can undoubtedly be found in their stabilising efforts. A stable macroeconomic growth and an orientation towards more equal income distribution creates mass purchasing power which is a necessary pre-requisite that as many people as possible can afford new technologies like mobile phones or Internet access. Most Austrian economists also agree that the stable wage and exchange rate expectations had a positive influence on investment behaviour of Austrian firms. This 'Hartwährungspolitik' let no room to compensate wage increases with devaluations of the Austrian Schilling and therefore forced Austrian enterprises to investment rates above the European average which also spurred ICT investment.

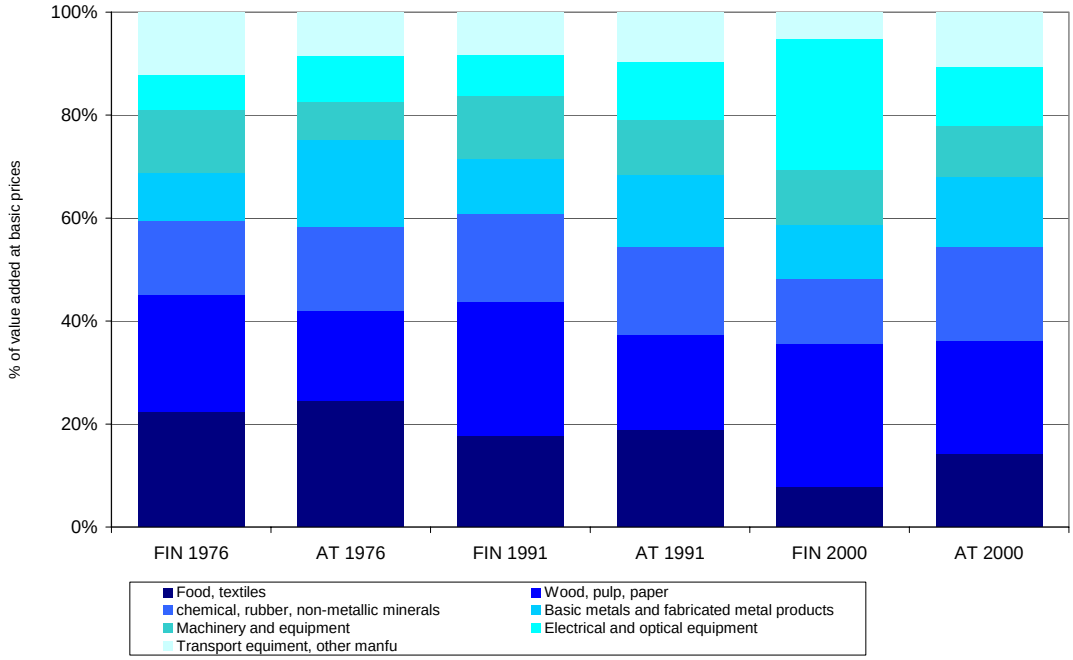
But we also see negative, hampering effects of the Social Partnership with respect to the Information Society: the Social Partner's understanding of growth policy was mainly tied to demand management and capital investment and less to the links between innovation, competition and growth. Kramer (1989) characterises Austria's growth policy as (over)emphasizing tangible capital. The pre-eminence of full-employment goal remained largely unquestioned. Austria's policy-makers were also much less aware about technology policy and the ICT sector as a whole, at least until the mid 1990s[9]. There were also fears by the trade unions of job losses and the labour-saving effects of ICTs.

The Social Partners together with the government also exerted price controls on local and long distance calls. The surplus from telecom operations had to finance deficits in postal and coach services, with the result that infrastructure investment like the digitalisation was seriously delayed. Moreover, the influence of trade unions in the nationalised enterprises was strong, and procurement and staff policy of the telecom provider ÖPTV was not mainly targeted to economic and technological efficiency, but had to serve a number of goals, including labour market policy (see Husz 1997).

If only judged by its original goals – stabilising wage and price expectations, maintaining constant income increases, guaranteeing social peace and therefore supporting Austria's catching up - the Austrian, consensus-orientated style of economic policy worked well and most economists agree to its account for Austria's post-War growth performance (Guger 1992). The development of an Information Society, hence, is more about fast change and overcoming old structures than about stability. Social partnership did well in the catching up-times, but - metaphorically speaking - 'produced' much less change than Finland or the other countries examined in this project. Moreover, Austria – luckily – did not experience the 'inspiration of crisis' found in other countries.

[9] Although the Social Partners were among the first to point at the importance of technology. The first Austrian R&D surveys, for example, were carried out by the Chamber of Commerce.

Table 8: Industrial structure in Finland and Austria, 1976, 1991, 2000



Source: OECD, STAN database

Success example: telecom deregulation

The fast liberalisation of the Austrian telecom market is the most remarkable development in Austrian Information Society of the 1990s and an example for a successful policy initiative. Austria's telecommunications market was restricted until the 1990s to the monopolist telecom operator ÖPTV and four equipment suppliers of switches and telephone sets, two of them affiliates of multinational companies. ÖPTV was an administrative body within the Ministry of Public Enterprises and Transport and acted as operative telecom and postal services operator as well as regulatory authority. This institutional set-up remained unchanged until the first steps of the liberalisation of the Austrian telecommunications market in 1994 (Latzer 1997). Early efforts for telecom liberalisation by the European Commission and Member States such as the Green Book of 1987, KOM (87)290) found no immediate response in Austria. It was not until Austria's accession to the European Economic Union and the European Community in 1995 that telecom liberalisation began.

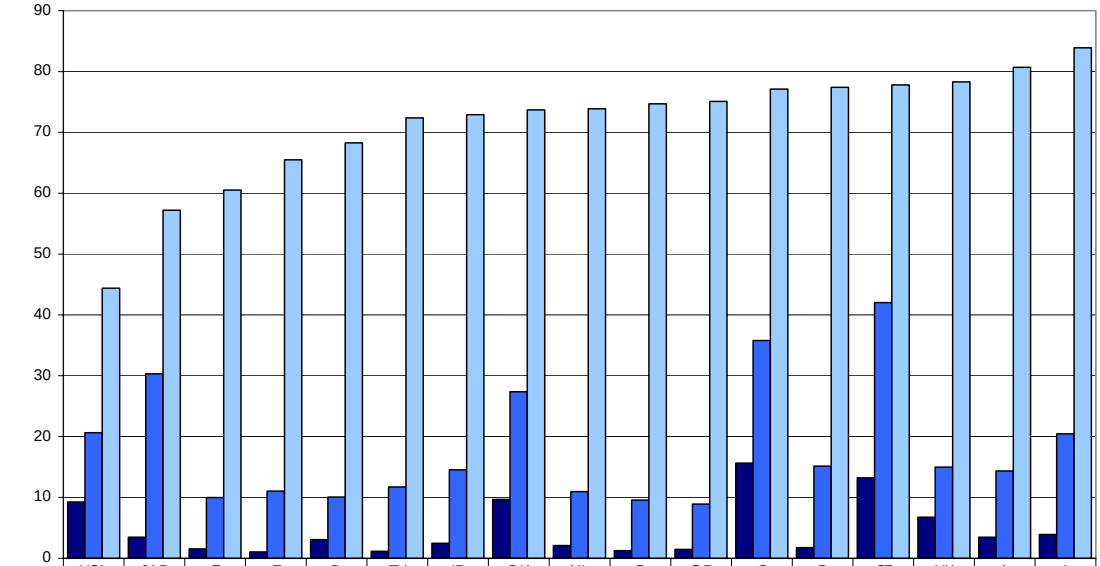
Important steps towards a fully liberalised telecom market were the separation of the ÖPTV's regulatory and operational branches and establishment of the National Telecommunications Authority in 1993. In the same year, the Telecommunications Act brought the liberalisation of all services except fixed-line voice communication. In 1996, the Post Structure Act 1996 resulted in the post and telecom operator founded as one independent public limited company (PTA). In the same year, the first GSM licence has been awarded to a private mobile phone operator. Austria remained a country of relatively high connection prices and low diffusion rates until the 1990s.

The Telecommunications Act of 1997 brought the liberalisation of fixed-line voice communication and the establishment of independent regulatory authority Telecom Control GmbH which started the following year. Market development continued with the start of unbundling of local loops, the decree of

interconnection fees, and the definition of dominant firms in 1999. A key step for the future of mobile communication was the award of UMTS frequencies in 2000.

In retrospect the idea of telecom liberalisation was certainly not a genuine Austrian one. Austria's telecom regulation authority TKG states: "*The restructuring of the Austrian telecommunications sector and the establishment of corresponding institutions and mechanisms, as shown below, was carried out not so much due to independent national initiative but rather the pressure for reform and reform patterns worked out by the European Union. In many cases re-organisational steps were performed late and only to the extent absolutely necessary"* (Telekom-Control 2000).

Table 9: Mobile phone users per 100 inhabitants in 1994, 1997, 2001



	USA	JAP	F	E	D	EU	IR	DK	NL	B	GR	S	P	SF	UK	A	I
1994	9,3	3,5	1,5	1,0	3,0	1,1	2,5	9,7	2,1	1,3	1,5	15,7	1,8	13,2	6,7	3,5	3,9
1997	20,6	30,3	10,0	11,0	10,1	11,7	14,6	27,4	11,0	9,6	8,9	35,8	15,1	42,0	15,0	14,4	20,5
2001	44,4	57,2	60,5	65,5	68,3	72,4	72,9	73,7	73,9	74,7	75,1	77,1	77,4	77,8	78,3	80,7	83,9

Source: ITU.

Although telecom liberalisation was in many ways not typical for Austrian IS policy, it was the most successful policy initiative in the 1990s. Austria's position in telephone charges comparisons improved considerably between 1994 and 1999 (OECD 1995, 1999). The most obvious effect of liberalisation was the fast diffusion of mobile phones in Austria. Starting from a low level in 1994, Austria managed to get to the top of mobile phone penetration in Europe within a few years. One important reason for this development was the fierce price competition between the telecom operators; another that mobile communication was affordable to large parts of the population because of an even distribution of income and relatively high GDP per capita.

But experts agree that this development would not have been possible without the independent regulatory body Telecom Control. This type of organisation, without the involvement of various interest groups, would have hardly been conceivable in the Austrian political environment of the late 1980s and early 1990s.

Industrial structure and the diffusion of ICT

It is a common observation that different sectors exhibit very different opportunities for the use of ICT. While labour-saving innovations based on ICT have been very successful in retail banking, there are only rare examples for similar applications in the restaurant business or other personal services. Following Malerba/Orsenigo (1996) and Marsili (2001), this may reflect different technological regimes in terms of different technological opportunities for the use of ICT and different characteristics of the underlying knowledge base which may be more or less suitable for automatisation and computerisation. This is also confirmed by industrial statistics which show considerable variations in the rate of investment of Information and Communication Technologies between sectors.

From this point of view, the diffusion of ICTs in the business sector would be strongly related to the sectoral composition of the economy. If sectors where ICTs offer 'high' technological opportunities are strongly represented, we may expect a high diffusion rate. If, however, the share of 'low opportunity' industries is high, we may also find a low penetration rate compared with countries with a different sectoral composition. This 'structural' dimension of technology explains to a large degree Austria's lagging behind in gross R&D expenditure (Dachs, Gassler et al. 2002). It turns out that Austrian enterprises do not invest considerably less in R&D than their foreign competitors in the same industry. However, some industries (mainly R&D-intensive high tech industries) are simply weaker represented in Austria than in other European countries.

Which are the 'high opportunity' sectors? We will use software investment as a proxy for total ICT intensity, as this is the only information available from official Austrian statistics on ICT-related investment at a low sectoral aggregation level. We have to assume that the use of software directly calls for adequate hardware investments, and therefore reflects the total ICT intensity of an industry.

Software investment concentrates in very few branches (see Table 2). In 1998, over 60% of all software investment in the Austrian business sector came from five service industries – 'high opportunity sectors' - which jointly encompass 20% of business sector employment. A common feature of all these sectors is that they handle large quantities of data – financial information, inventories, orders, etc. - or develop tools for data handling. 'Low opportunity' sectors[10], on the contrary, are hotels and restaurants (but not the travel and tourism sector in general!), construction, land transport or industrial services with a low skill profile (see Table 3). Furthermore, manufacturing as a whole is less ICT-intense than the service sector.

[10] The term 'low-opportunity' does not mean that there is no opportunity for productive applications in these industries. It just highlights the fact that – compared to other sectors – the input of ICT is quite low compared labour inputs, measured in persons employed.

Table 10: Top five industrial sectors in software investment, Austria, 1998

NACE	Industry	Software Investment (1,000 Euros)	Employment (persons)	SW investment per employee (Euros)
65, 66, 67	Financial intermediation	186,182	115,169	1.617
64	Post and telecommunications	75,896	63,587	1.194
51	Wholesale	55,216	199,258	277
72	Computer and related activities	51,941	24,781	2.096
741-744	business services	36,271	101,046	359
	‚High opportunity' sectors	405,505	503,841	805
	Share of Business Sector	64%	22%	

Source: Statistic Austria, Business Survey 1998

Table 11: Top five industrial sectors with lowest software investment, Austria, 1998

		Software Investment (1,000 Euros)	Employment (Persons)	SW investment per employee (Euros)
745-748	Personnel provision, industrial cleaning and security services	6,636	72,072	92
50	Sale, maintenance and repair of motor vehicles	6,500	78,435	83
45	Construction	16,577	248,135	67
60	Land transport	4,194	138,656	30
55	Hotels and restaurants	4,907	197,739	25
	‚Low opportunity' sectors	38,815	735,037	
	Share of Business Sector	6%	32%	

Source: Statistic Austria, Business Survey 1998

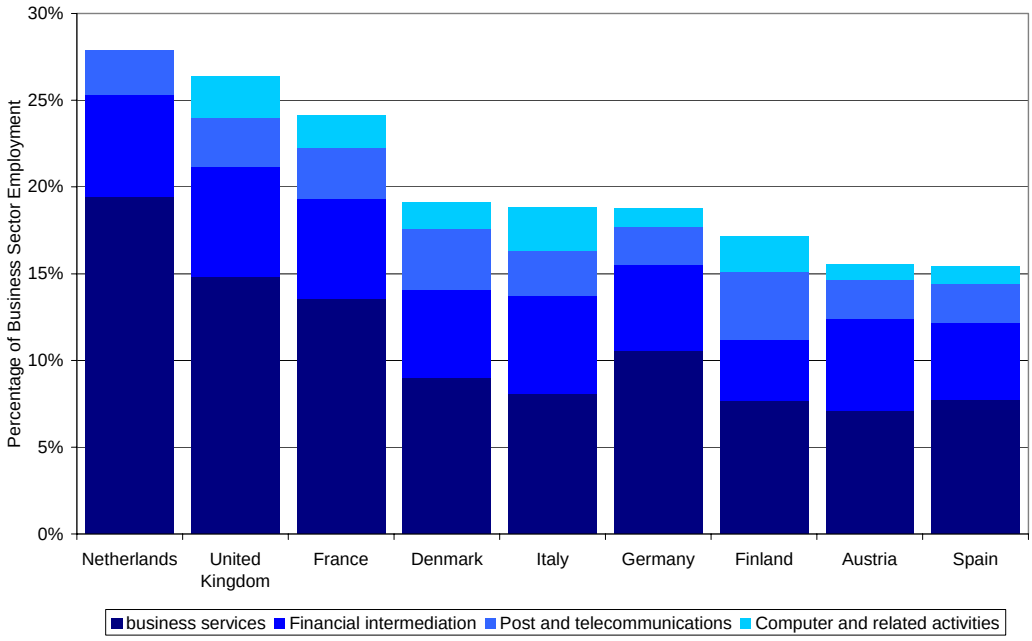
This structural dimension may help to understand the low diffusion rates for ICTs in the Austrian business sector. Although answering this question in full detail would require a proper econometric approach, descriptive statistics may already tell us a large part of the story. For this analysis, we use the STAN database by the OECD.

First, we look at 'high opportunity' sectors. While financial services and communication services are of roughly equal size compared to other EU countries, computer services and business services are considerably underrepresented. The largest differences show up in business services where Austria is behind all others, whereas Austria's financial sector is relatively larger than that of Finland, Germany, or Spain. Altogether, the share of these industries in the Austrian economy is considerably lower than in most other EU countries where data are available. On the other hand, the share of industries which make only little use of ICT is in Austria higher than in any other country. This is due to Austria's tourism industry, which in relative terms is the largest of all countries compared. But Austria has also a very large transport sector.

To sum up, the reason for a lower ICT penetration rate in the Austrian business sector may not be a lower propensity of firms to invest in computers and networks. The share of enterprises operating in sectors

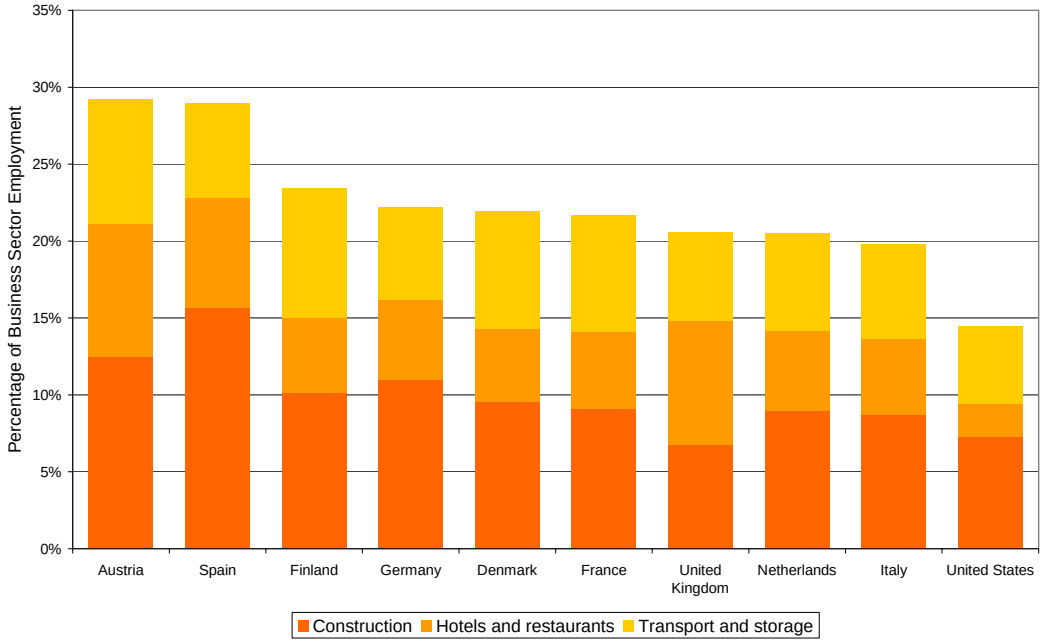
where ICT investment offers high technological opportunities is simply smaller. The same is true with expenditure for research and development (R&D) in manufacturing. Much of Austria's lagging behind in R&D expenditure can be explained by the Austrian industrial structure and its low share of technology-driven industries (Peneder et al 2002). But this may not necessarily be a sign of structural deficits. In tourism, we rather see a pattern of specialisation based on superior resources, like in the paper industry. In other sectors, Austrian enterprises have specialised in niche products and managed to serve the high quality segments within more traditional patterns of specialisation.

Table 12: Share of 'high opportunity' sectors in the European Union , 1998



Source: OECD STAN, own calculations

Table 13: Share of 'low opportunity' sectors in the European Union and the US, 1998



Source: OECD STAN, own calculations.

Social factors

What makes Austria's development and current position in IST very high but not "excellent"? We have already examined some factors related to politics and industrial structure. Another area of interest are private households and consumer habits with relation to the Internet and ICT. Conventional factors such as connection prices or the diffusion of the broadband access are often quoted as determining factors but do not always tell the whole story. Trying to understand why Austria with its favourable economic position in Europe has not so intensively developed for instance with respect to the penetration of several ICT leads us to look more closely at social and cultural factors.

We take as a starting point the following assumptions of how cultural and social factors may affect the diffusion of Internet and related utility derived from its use:

- If information is regarded as a highly valued good (i.e. the presence of an information culture), we expect a higher use of information and communication technologies.
- If a society has a high level of education and qualification, we also expect higher levels of higher ICT penetration rates because ICT use rises with technical and scientific skills.
- If differences between men and women in education, income and job qualification are small, we also expect higher penetration rates because Internet users tend to be better educated and earn higher incomes.

These assumptions may be difficult to prove through measurement, yet experts have strongly supported our interest in exploring these avenues further. We will follow the same rationale as before when we compared Austria's position to that of the Nordic countries, especially Finland.

E-literacy and Information culture

E-literacy means having the skills, knowledge and attitudes to use ICT to maximum advantage and to keep up-skilling. Optimal levels of access and e-literacy may contribute to a person's well-being and thus allow him or her to be a more effective worker, entrepreneur, consumer, or citizen. E-literacy is determined by the following factors:

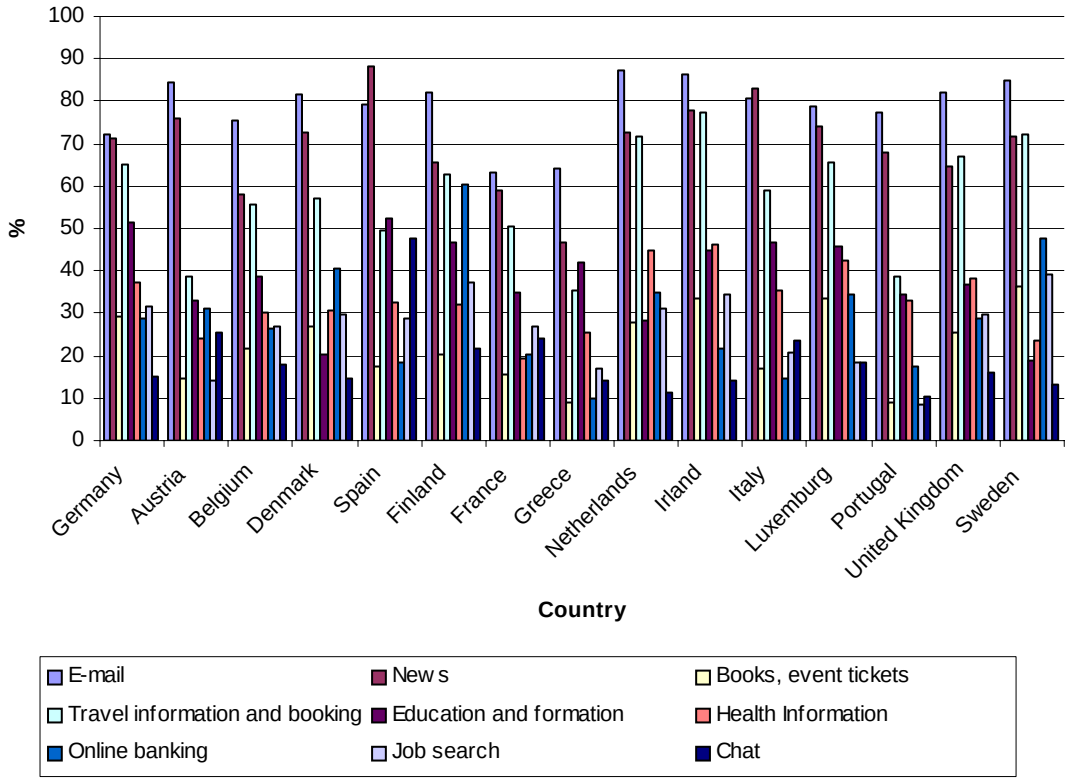
- Infrastructure, i.e. having access to ICT and sufficient levels of bandwidth available to carry out e-commerce, e-government or e-learning.
- Finances, i.e. connecting to the Internet in a way which enables a person to carry out required activities through affordable access.
- Skills, i.e. having sufficient skills, or access to tuition, to develop and increase skills, to use ICT to an optimal level for personal and economic gain.
- Attitudes, i.e. perceiving ICT skills and access to the Internet as value-adding and important for future well-being, perceiving the internet as having meaningful and relevant content.

One of the most important challenges of the information society is to extend simple computer literacy to the complex phenomenon of e-literacy with positive attitudes towards ICT-conveyed information.

This development seems to closely related to the predominant information culture. Information culture may be generally interpreted as the value a society attributes to information. The educational system may be another determining factor to explain the different attitudes to information. Several of the experts interviewed confirmed that the Anglo-Saxon system for instance is known to foster a learning, or information culture that it is more oriented towards learning-to-learn and to develop students' abilities to gather and use information independently. Libraries are additionally important institutions for providing information resources and services. Thus, reading newspapers and specialised magazines or using a library may be used as indicators for a population's interest in information as integral part of their daily life. Information culture thus describes the culture of using of information, the criteria for evaluating the quality of the information, as well as the capacity to identify which information is necessary for a specific purpose.

Overall, Austrians have readily accepted the availability of ICT-conveyed information products and services (see Figure 14).

Table 14: Types of Internet use by country, 2001



Source: Eurobarometer (2001)

However, when it comes to the number of daily newspaper circulation and books titles published, the difference between Finland and Austria is quite large (298 compared to 468 per 1,000 inhabitants). Even more striking are the large differences in the number of books available in public libraries and the extent to which people make use of them (see Table 15).

Differences in the use of libraries between Finland and Austria are also most obvious: Austrians do not frequent libraries as much as e.g. the Finns. Yet, we can also find other indicators that reveal a different attitude towards information related to leisure time activities such as the visit of museums, art galleries etc. (see Table 16).

Table 15: Cultural activities: newspapers, books and libraries

	Daily Newspapers (daily circulation per 1,000 inhabitants)	Book titles published (per 100,000 inhabitants)	Registered public library users (per 100 persons)	Number of books in public libraries (per 100 inhabitants)
	1994	1991-94	1989-94	1989-94
Austria	298	99	12	102
Belgium	316	138	17	294
Finland	468	246	47	712
Germany	313	86	11	158
Greece	153	39	…	71
Ireland	154	…	22	309

Source: UNESCO World Culture Report (1998)

Table 16: Types of establishments visited during the last 12 months (in % of EU 15)

	Public library	Zoo/Aquarium	Art gallery	Science / Technology Museum	None of those
Austria	15,8	30,2	15,6	11,7	51,1
Belgium	39,9	22,1	19,6	9,7	47,6
Finland	73,2	20,7	27,2	10,3	16,5
Germany	22,6	33,5	16,1	12,3	4,4
Greece	8,1	11,7	11,1	5,1	72,9
Ireland	31,3	19,6	11,1	4,1	51

Category "don't know" not included.

Source: Eurobarometer (2000)

However, Austrians may just as well have a different information culture, i.e. they use different sources or media to satisfy their information needs. Moreover, there may even be strong complementary or substituting effects among ICTs. The most frequently visited Web sites in Austria to date (see Table 17) confirm the attractiveness of the Internet to provide information (news) and communication (short message services).

Table 17: Most frequently visited Internet sites in Austria, 2002

No.	www site	Description	% of visits
1	ORF[1]	Austrian Broadcasting Corporation: news	44
2	Herold[2]	Telephone directory: white and yellow pages	38
3	sms.at	Short Message Service: communication	37
4	News networld[3]	Weekly magazine (yellow press): infotainment	26
5	Kronen Zeitung[5]	Daily newspaper (yellow press): infotainment	24

Source: Austrian Internet Monitor. Data April -June 2002. Rep. Austrians > 14 yrs. n=3.500 per quarter.

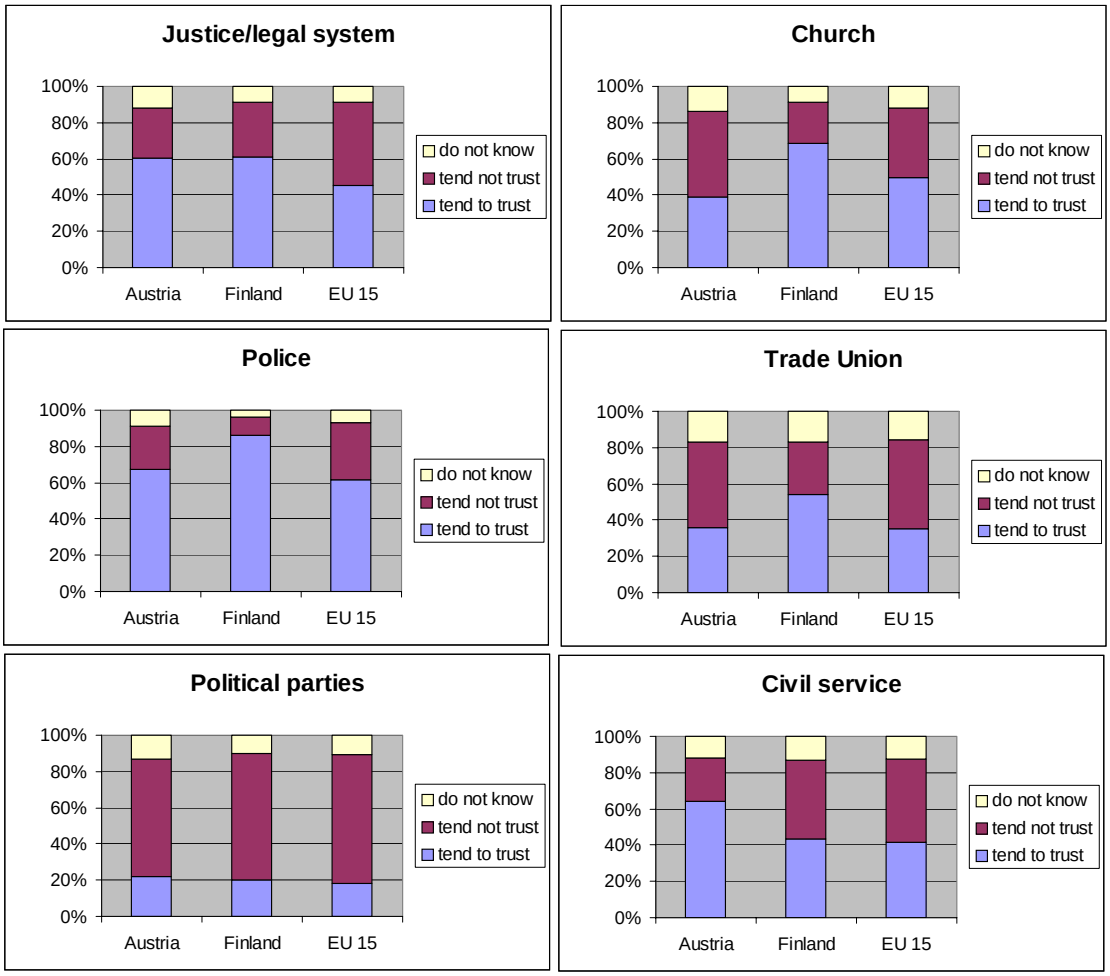
Hierarchical thinking and trust in institutions

Beyond the above described indicators of individual information attitudes and behavior, experts have indicated a specific "Austrian" information culture at the collective societal level (e.g. Maier-Rabler 1995). Major factors influencing a specific information culture are dominant religious and ethical values of a society as well as the political and legal structures. The underlying assumption is that the more trust is conveyed into public authorities and institutions, the less distrust or fear there is on the part of the individual concerning privacy, data misuse, etc. These are highly important barriers or carriers for the diffusion of e-commerce or tele-work.

Scandinavian countries with their longstanding, highly democratic-liberal political system are generally regarded by experts as information-friendly, transparent, and organised along flat hierarchies. By comparison, Austria with its hierarchical-absolutist legacy is characterised by a high degree of hierarchical thinking and stronger belief and trust in public authorities and institutions. The latter is not which is not explicitly conducive for actively sharing and disseminating information. Experts thus describe Austria as

having a rather information-restrictive climate with strong gate-keepers to public information, e.g. through a highly concentrated media market. A UNESCO survey (see) partially confirms this notion.

Table 18: Trust in institutions, 1998



Source: UNESCO (1998).

Information and communication technologies are organised as digital networks providing various kinds of information, communication and transaction services (Latzer 2000; Warta, Wagner 1998). Some experts argue that the closer a society's information culture resembles the decentral, network characteristics of ICT, the better a society will be able to make use of this potential (see Meier-Rabler 2002). If this is the case, Austria may have to adapt its information culture to take full advantage of the Network Society.

The education system

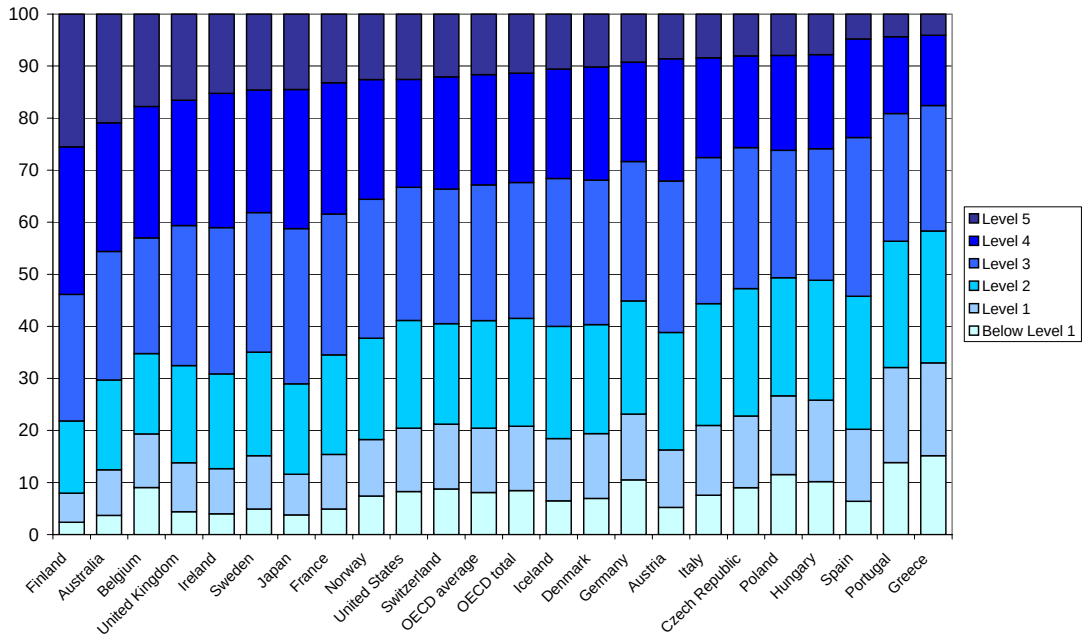
Education plays a key role in the development of IS because it qualifies a society to use new information and communications technologies and its services offered, increasing as well the demand and necessities of information. Thus, we are not only interested in the levels of education but also in the education system itself, i.e. to which extent it stimulates creativity, research skills, and information culture.

Austria's education system is generally regarded as democratic and egalitarian, providing equal access for all. International managers attest the Austrian education system meets the needs of a competitive economy (The World Competitiveness Yearbook 2000). Austria's expenditure for education also rank

among the highest in OECD comparisons. This is particularly the case for secondary education, resulting in one of the highest proportions of secondary school graduates in the population: Austria ranks third with over 80% of 22-year-olds with an upper secondary school degree only behind Finland and Sweden with around 90% (Eurydice, Eurostat). In Austria the proportion of students with vocational secondary education is comparatively high. In addition, the system of dual education combining vocational training and general education for youths results in a highly qualified and technically qualified work force for industry.

Yet Austria's education system is also associated with a conservative academic tradition which is more "answer"- than "question"-oriented (interview with Maier-Stadler). This implies that it does not broadly and proactively promote creativity and/or research skills. We also find some indications on this topic in the OECD-PISA assessment[11] on skills of students. Although no indicator has measured this 'creative search' capabilities directly, we see that the overall reading literacy of Austrian pupils is above OECD average, whereas the number of students who reached Level 5-reading literacy is below OECD average. Level 5 includes the most difficult tasks which may come closest to the creative search capabilities: managing information that is difficult to find in unfamiliar texts; evaluating critically and building hypotheses, drawing on specialised knowledge, and accommodating concepts that may be contrary to expectations.

Table 19: Percentage of students at each level of proficiency on the reading/retrieving information scale, 2000



Source: OECD, PISA Study

This implies that it does not broadly and proactively promote creativity and research skills. This may be illustrated by the fact that Austria is one of the few EU15 countries which does not explicitly include the development of creativity in elementary and pre-school curricula (see Eurydice).

[11] OECD 2002a) A lot of material can also be found on the OECD's Pisa homepage http://www.pisa.oecd.org/

The issue of a "digital divide" still is a major social challenge of the information society. The hypothesis is that segments of the population with higher social status tend to benefit more from the use of mass media that segments with lower social status. Therefore, the issue of closing and/or preventing of the digital divide is also an issue of influencing a country's information culture. One way to combat this effect is by the introducing ICT in the schools: By mid 2000, access to the Internet is provided in 52%, that is 3,307 of all 6,382 Austrian schools. The diffusion of Internet access to different types of schools is yet rather uneven. It is lowest in primary schools (34%) and special needs schools (44%), and highest among secondary schools (97%). According to a recent report on Austrian's progress within the eEurope initiative, nearly 100% of secondary schools will be connected to the Internet in the immediate future (eAustria 2000; Aichholzer, Schmutzer 2000).

Statistics show that Austria has a very high percentage of population with completed secondary degrees but drastically less with completed tertiary degrees (see Table 6). Although it ranks first with regard to expenditure on tertiary education within the OECD (and tuition fees only recently introduced), only 14% of secondary school graduates per year continue to pursue an academic career in the university. Only half of those (53% in 1995) successfully complete their studies with a formal degree within an average of 7,4 years. Official statistics however do not take full account of the fact that the Austrian tertiary education system has only recently introduced a bachelor's diploma as the first academic degree.

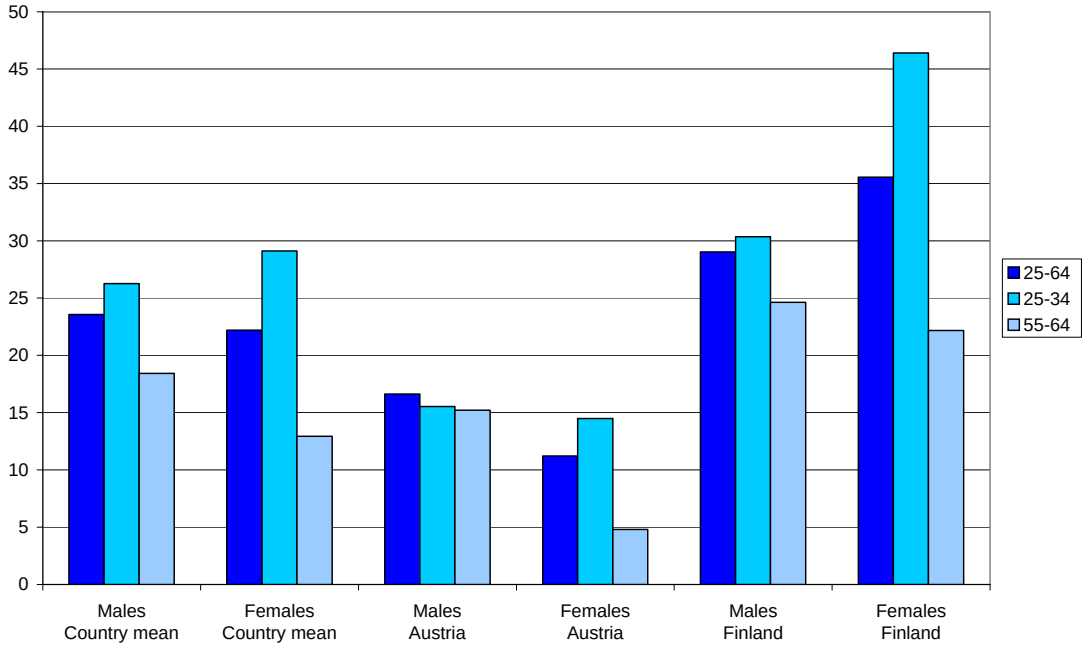
Table 20: Students enrolled in secondary and university level education (in % of population),1998

	Secondary school enrolment	University and post secondary enrolment
Austria	9,79	2,95
Finland	8,94	4,15

Source: Austrian Statistical Yearbook (1999/2000), UNESCO (1998).

The number of persons obtaining formal tertiary, science-related qualifications is an important indicator of the supply of high-level skills and knowledge. Moreover, people with a higher level of education tend to be more interested in reading books, newspapers and magazines. Compared again with Finland, OECD sources cite Austria with 13,3% engineering graduates from university and 14,2% in non-university institutions. Eurostat, using a different classification, finds the proportion of science and technology graduates in Austria at 7,1% (2000) comparable to Germany (8,2%), yet Finland with 17,8% (1999). Austria also shows a gender gap within the tertiary system: there are comparatively few women with science and engineering degrees and also in leading academic positions in Austria.

Table 21: Share of males and females with completed tertiary education (age breaks), 2001



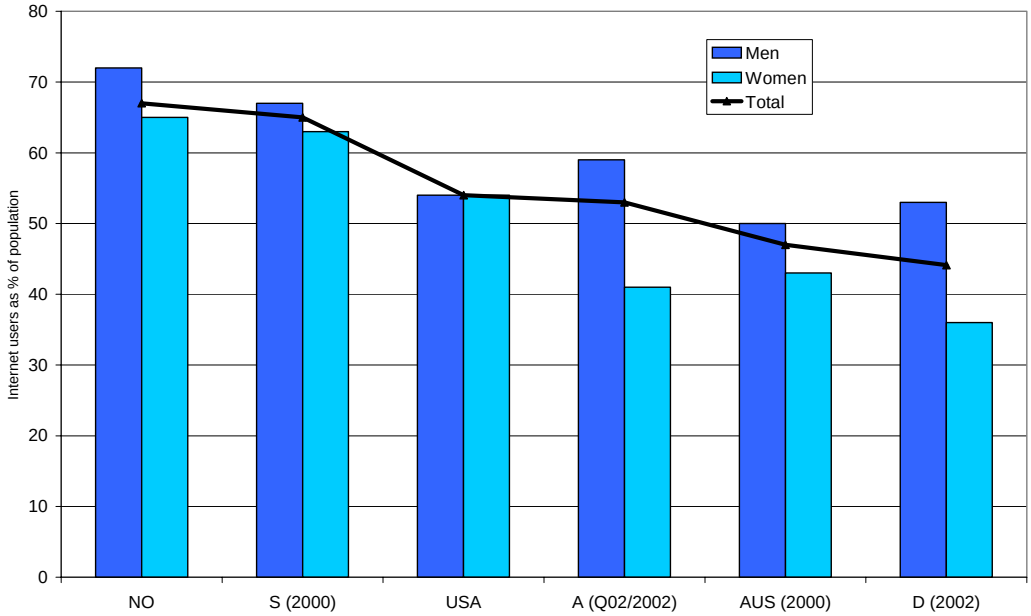
Source: OECD, Education at a Glance 2002

Gender differences

Finally, we briefly discuss gender differences with respect to the use of the Internet and how these differences may influence the overall diffusion of ICTs. This 'Internet gender gap' is one aspect of the ongoing discussion about a 'digital divide', describing differences based on economic status, gender, race, etc. with regard to their opportunities to access and use ICTs such as computers and the Internet (OECD 2002).

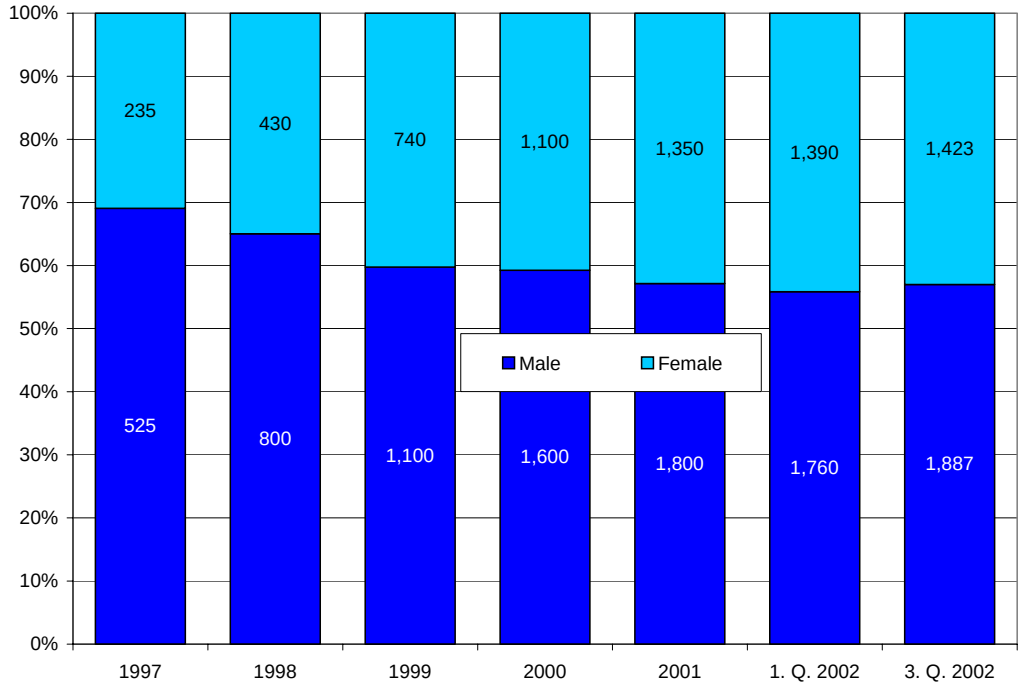
If the gap were smaller, Austria may have a higher overall Internet penetration rate. Therefore, the reasons for the gender gap may also explain why the overall number of Internet users in Austria is smaller than in the Nordic countries. This gap exists in other countries as well, however, there are a number of countries where these differences appear to be much smaller than in Austria.

Table 22: Internet gender gap in international comparison, 2001



Source: Austria Internet Monitor, OECD 2002, ARD/ZDF 2002

Table 23: Male and female Internet users in Austria, 1997 - 2002



Source: Austria Internet Monitor.

Although women are one of the fastest growing sub-groups of Internet users, the Internet gender gap closes only slowly in Austria. The number of female Internet users doubled between 1999 and 2001 in absolute terms, compared to an increase of 65% for male users. However, in 1997 almost 70% of all Internet users were male. Until 2001, the share decreased 57%. Differences are even more striking with

respect to intensive users where only 41% of users are female users. We also notice that a digital divide shows up in applications: women make less use of Internet banking or e-commerce (see AIM 2002)

According to expert interviews, the reasons for the gender gap mainly reflects the general differences between men and women in society:

- Labour participation rates of women are considerably lower in Austria than in the Nordic countries which reduces the opportunities for women to get computer and Internet access at work. Moreover, women frequently occupy jobs where they do not get in touch with the Internet.

- The gender gap is rather small between younger people and widens with age. Although increasing quickly, the number of elderly female Internet users is still considerably lower than the number of elderly male users. Reasons for hampering the diffusion of Internet access in this group are income disparities, a lack of computer skills, no opportunity to get access at work, but also simply a lack of utility. As experts point out, elderly women quickly become familiar with the Internet if they recognise that it is sometimes easier to keep in touch with friends and family members by email than by phone or paper mail (expert interviews).

- A larger gender gap than in the US or Scandinavia may also be a result of the relatively late take-off of the Internet in Austria. In 1997, only 4.5% of the Austrians had Internet access, a very low share compared to the US (14.9%), Sweden (23.7%), or Norway (29.4). The typical Internet pioneer user of these days was male, between 20 and 39, working and well-educated and this picture of the typical Internet users has been transported by mainstream media, putting off women and other people outside of this group to a large degree. As the Internet becomes a well-known, mature type of media, this 'nerd' image of the Internet that may have scared off women disappears.

- Finally, experts suggest that gender-specific differences in education with respect to technology are still widespread in the Austrian society, holding back girl's interest in computers and other technology. The low number of females students in engineering and natural sciences enrolled at universities as well as girls taking up technical crafts may be indicators for this.

What can be learned from the Austrian experience?

Austria is well advanced in Information Society development, yet lags behind other countries of comparable economic status, especially the Nordic countries. We have identified a number of factors that have very likely shaped the diffusion of ICTs and the development of the information society in Austria:

- Unlike other countries analysed in the TIGERS project, Austria's political institutions has shown only little concerted effort in actively pushing Information Society policy. Major stimuli have come from the EU through White Papers and regulation.

- The reason for these restraints may have been that the 'old' institutional structures seemed to work fine and – unlike in Finland or Ireland - there was no pressure for radical reform. Although we see no major hampering effects from the political environment, we may nevertheless assume that Austria would doing even better in some indicators if there had been a stronger public policy push towards the IS.

- Overall we find a higher share of industries making little use of ICTs and a smaller share making heavy use of ICTs in Austria compared with other European countries. This partly explains lower ICT adoption rates in the enterprise sector.

- Experts assess Austria's information culture to be different from Nordic countries. The Austrian education system for instance requires students more to learn contents than to learn how to search for information. This may be a reason why many people see only little additional value in the Internet compared to other media.

- Gender differences with respect to Internet use are still larger in Austria than in other countries. Without a gender gap, overall Internet penetration in Austria would also be higher than today.

Austria is not a country that has become affluent by specialising in ICT manufacturing and services and may thus provide only few lessons about catching up compared with Ireland or Finland. Some lessons though may still be derived from the Austrian case:

- Institutional reform and liberalisation can quickly develop a well-functioning telecom market and force down prices. A necessary precondition, however, is an independent regulatory authority.

- Long-established structures can turn out to hamper the development of an Information Society when they are unable to 'produce' social, institutional and structural change ("lock-in").

- The development of an Information Society is not necessarily a result of 'good policy'. Only little concerted effort has been achieved on ICT-specific promotion schemes in Austria. Yet good framework conditions such as high levels of education and income may also favour high ICT diffusion rates.

- Austria also shows that there may be other sources of wealth than ICT. Countries can also be economically successful if they manage to gain competitive advantage in other sectors.

- We also see the importance of the education and training system for providing the necessary skills (e-literacy) to make use of the full potential of ICT. Changes in education systems towards more problem- and research-orientation in order to affect (long-term) changes in information culture which will eventually foster more creative use, i.e. increased utility, of ICT.

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Annex: Expert Interviews

Field	Organisation	Expert	Function
Sciences and Academia			
	▪ WIFO Austrian Institute for Economic Research, Innovation and Telecom Group	Norbert Knoll	Researcher
	▪ Austrian Academy of Sciences, Institute of Technology Assessment	Georg Aichholzer	Researcher
	▪ University of Salzburg, Department of Multimedia Design and New Communication Technologies	Ursula Maier-Rabler	Professor
	▪ University of Vienna, Department of Communication Science	Johanna Dorer	Researcher
Administration, Social Partners, Interest Groups			
	▪ BMVIT - Austrian Federal Ministry for Transport, Innovation and Technology	Michael Wiesmüller	Civil Servant, National Expert IST-FWP
	▪ Verband für Informationswirtschaft / Information Industry in Austria	Gerhard Wagner	General Secretary, Industry lobby
Enterprises			
	▪ One	Florian Stieger	Head of Future One