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position in an international comparison?
Results of an empirical study**

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Introduction and Diffusion of
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What is Switzerland's position in an
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Najib Harabi

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Abstract

What is Switzerland's position today with regard to the acceptance, diffusion and usage of new work forms and business methods in the economy and society? One of the most extensive international surveys of population and businesses done thus far gives well founded answers to these questions: Last year, distinguished research institutes from 10 different countries of the European Union (Denmark, Germany, France, Finland, Ireland, Italy, Netherlands, Spain, Sweden, United Kingdom) and Switzerland carried out the *research project ECATT99 Electronic Commerce and Telework Trends*. With it they produced a study of the adoption and diffusion of new electronic business methods and work forms in the information society. Its approach makes the study unique within the framework of the European *ESPRIT* programme. In the whole of Europe (including Switzerland) around 8,000 private individuals and around 4,300 decision makers in private and public businesses were interviewed about knowledge, acceptance, current and planned usage of Electronic Commerce and telework. In addition, around 100 detailed case studies were carried out. For the future, regular biennial repeat studies are planned.

Switzerland is taking part in this international comparison for the first time. The results of this report are primarily based on 400 interviews in the Swiss population and 200 interviews with owners or responsible senior staff in businesses of all sectors of German, French and Italian Switzerland.

This report is limited to the project section on Electronic Commerce; a separate report is being prepared for the section on telework.

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1 Introduction: Issues and Goals of the ECATT-Project¹

Technological progress is one of the most important driving forces for the economic, social and political development of nations. Many theoretical and empirical studies in economic and social science have confirmed this finding.

J. A. Schumpeter, for example, concerned himself extensively with this phenomenon in the 30s and 40s and discovered that the “fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumer’ goods, the new methods of production or transformation, the new markets, the new forms of industrial organisation, that the capitalist enterprise creates”. (SCHUMPETER 1950: 83). Later studies² show that the contribution of technological progress to economic growth is very important and quantitatively lies between a third and 50%.

For Switzerland empirical research reaches a similar conclusion: Quantitatively – depending on the method of calculation– technological progress contributes between 40% and 60% toward economic growth. This means that from every Franc earned we owe an average of 40 to 60 Rappen to technological progress³. Technological progress has therefore been of central importance for the development of the Swiss economy thus far and will remain so in the future.

From an economic viewpoint technological progress manifests itself in the production of new or improved products or in the introduction of new or improved production methods which enable the production of greater amounts of a product at the same costs or of the same amount of output at reduced costs (GEIGANT ET AL. 1987). Hence it manifests itself in the form of product or process innovations or even both together and is therefore limited to technological innovations. The development and application of (ICT), for example, in the form of the Internet, is an outstanding example of such technological innovation.

In contrast to numerous other technological innovations, the application and commercial usage of the Internet affect not only single sectors but also almost all economic sectors. The Internet not only offers a new distribution channel but also a new information and communication system as well as a new marketplace for goods and services, and this in a potentially worldwide setting. The Internet is thus a “General-Purpose Technology” which shows central overall economic (direct and indirect) effects. At a macro-economic level this technology generates important growth and employment effects. At a micro-economic level there are fundamental changes at the level of individual businesses, individual markets and the interaction of businesses and markets between each other (co-operation and competition) which amongst other things very often lead to cost savings.

¹ I would like to thank Frank Hespeler, former research assistant at Solothurn University of Applied Sciences, for his very able research assistance.

² e.g. SOLOW and ABRAMOVITZ in the 50s, JORGENSON, KENDRICK, ROSENBERG, ARROW, MANSFIELD, NELSON and DENISON in the 60s and 70s.

³ For an overview of empirical literature in Switzerland see HARABI (1992).

Macro- and micro-economic consequences of the Internet change the design parameters for national and international economic policy.

According to an estimate of Bern University, by the end of 1999 commercial usage of the Internet had created at least 10,000 jobs (full-time equivalent) in Switzerland and so has made an important contribution to economic growth (GRIESE 2000: 5). In 2002, according to PAULI (2000), savings of around 5% of the Gross National Product (GNP) are expected in Switzerland because of Internet usage. As the total economic effect generated by an innovation can only be realised on the completion of its diffusion, it can be expected with certainty that the Internet's contribution to Switzerland's economic growth will be considerably higher than the above estimates. Today we are at the beginning of a worldwide technological revolution.

In spite of its increasing economic importance, there is currently no agreement between the leading national and international institutions on the exact definition of and the gathering of statistics on the phenomenon "E-Commerce". This is supported by the following selection of definitions and descriptions of the term:

- "Electronic Commerce is the carrying out of business activities that lead to an exchange of values across telecommunications networks." (EITO 1997).
- "Electronic commerce refers generally to all forms of transactions relating to commercial activities, including both organisations and individuals, that are based upon the processing and transmission of digitised data, including text, sound and visual images." (OECD 1997)
- "Electronic commerce is about doing business electronically. It is based on the electronic processing and transmission of data, including text, sound and video. It encompasses many diverse activities including electronic trading of goods and services, online delivery of digital content, electronic fund transfers, electronic share trading, electronic bills of lading, commercial auctions, collaborative design and engineering, online sourcing, public procurement, direct consumer marketing, and after-sales services (e.g. information services, financial and legal services), traditional activities (e.g. healthcare, education) and new activities (e.g. virtual malls)." (EUROPEAN COMMISSION 1997).
- "The Internet will also revolutionise retail and direct marketing. Consumers will be able to shop in their homes for a wide variety of products from manufacturers and retailers all over the world. They will be able to view these products on their computers or televisions, access information about the products, visualise the way the products may fit together (constructing a room of furniture on their screen, for example), and order and pay for their choice, all from their living rooms." (US EXECUTIVE OFFICE OF THE PRESIDENT 1997).

According to an OECD study, Electronic Commerce encompasses "all commercial transactions occurring over open networks, such as the internet" (OECD 1997: 3). This definition covers all types of electronic transactions and can be further sub-divided into the following E-Commerce matrix according to the functions of its transaction partners:

	Business	Consumer
Business	B2B GM/Ford EDInetworks	B2C Amazon, Dell
Con- sumer	C2B Priceline, jobpilot	C2C Ebay, OXL

Source: Economist, 26th February 2000, p. 9.

This study deals fundamentally with the introduction and diffusion of the most important forms of Electronic Commerce in Switzerland, in particular with B2B and B2C in the above matrix. Taking as a starting point the theoretical insight and the empirical finding that an understanding of market supply and demand is necessary for a successful introduction of new ideas onto the market, e.g. the commercial application of the Internet, our study examines the diffusion of E-Commerce from the point of view of businesses and households.

The following research questions are central to the analysis of E-Commerce diffusion in households:

- What is the basic data on ICT infrastructure in Swiss households?
- What are the level of awareness and effective use of the Internet and of other online services amongst the Swiss population?
- What is the situation regarding electronic shopping from the viewpoint of Swiss households and what are its growth prospects for 2001?
- How high is actual spending on online shopping?
- Which are the factors supporting and hindering online shopping from the viewpoint of Swiss households?

Analogous research questions are central to our study on E-Commerce diffusion in Swiss businesses. They are as follows:

- How widespread are the provision of Swiss businesses with ICT and the usage of these technologies? In the forefront there are questions related to the diffusion of Email, Internet, Intranet, Group Ware Tools, EDI and Call Centres amongst Swiss businesses.
- How widespread is the presence of Swiss businesses on the Internet and on other online services?
- What are the purposes of businesses' online presence?
- What factors support or hinder online shopping from the viewpoint of Swiss businesses?

In view of the growing importance of the Internet economy for businesses and the national economy as a whole, it is not surprising that the number of authors and institutions that concern

themselves with this phenomenon is also increasing. Thus, in Switzerland for example, numerous studies have been published.⁴ However, a distinctive feature of this study on the current diffusion of Electronic Commerce in Switzerland is the fact that with the help of a uniform methodology a direct international comparison is possible. Thus, the relative position of a country can be determined against the background of a global economy.

Apart from its international comparability, one further distinctive feature of this study must be mentioned. In contrast to most published studies, the current study investigates the diffusion of E-Commerce from the supply as well as the demand point of view. This procedure is linked to the expectation of making a new contribution to the understanding of this increasingly important innovation.

The rest of the paper is organized as follows: First we will outline the research design and survey methodology. We then present the related results both from the consumer's and firm's points of view. In the final section we discuss the findings and their significance, concluding with a few brief observations on their implications they carry for public policy towards e-commerce in Switzerland.

2 Research Design and Survey Methodology

2.1 ECATT 99 in the 10 EU-countries

In Europe, within the framework of ECATT 99, representative surveys of private individuals in the population as well as decision makers in businesses were carried out according to an internationally uniform and comparable methodology. In addition, in a total of around 100 detailed case studies in businesses researchers documented examples of "best practice" with regard to telework and E-Commerce. For the future, regular follow up studies on new work forms and new (electronic) business methods are planned. Under the coordination of *Empirica Gesellschaft für Kommunikations- und Technologieforschung mbH* in Bonn partners in 10 EU countries and Switzerland are involved – all the larger member states are represented, with only Belgium, Greece, Luxembourg, Portugal and Austria missing from the 15 member states.

In the USA and in Japan separate but comparable data is collected which serves as a benchmark for progress in Europe.

The General Population Survey is based on representative random samples of the population of the previously mentioned countries. In the EU the survey was performed in February/March 1999 by the institutes Infratest Burke and Emnid (Taylor Nelson Sofres Group) and their local partners with the help of computer aided telephone interviews. The goal, to interview around 1,000 people each in the larger countries (Germany, France, Italy, Spain, UK) and 500 in the smaller ones (Denmark, Netherlands, Finland, Ireland, Sweden), was achieved; a total of 7,700 interviews were held in these countries alone.

⁴ HOCHSTRASSER & SIEBER (1998), GRIESE (2000), SIEBER & HUNZIKER (1999), PRICEWATERHOUSECOOPERS (1999a), THE BOSTON CONSULTING GROUP (2000), and others.

The Decision Maker Survey is based on a random sample of businesses classified by size (number of employees) and sector. Quotas are weighted according to firm size in order to ensure that results are not biased by the large number of small survey units but that they also adequately represent the situation in larger firms. Fieldwork was carried out in April and May 1999 by Infratest Burke with computer aided telephone interviews. Samples were taken from the existing master samples of the institute or from other nationally varying sources. Target persons in the businesses were managers or other senior staff members of the IT department, the managing director or the owner of the business. In the larger countries around 500 businesses were interviewed, in the smaller countries around 300, a total of 4,000 businesses were interviewed in the 10 EU countries.

In the report below, the survey results of these 2 studies are presented in comparisons with the Swiss data, either separately for each country or as a weighted average of all 10 countries.

2.2 ECATT 99 in Switzerland

In the interest of comparability of results, the research design and survey methodology – i.e. definition of the universal set, sampling process and questionnaires – of the European study were adopted for Switzerland more or less unchanged. The general remarks in the previous chapter 2.1 therefore also essentially apply to Switzerland in particular.

The *questionnaires* for both study parts, general population and decision maker survey, were developed and tested in the European consortium under the coordination of *Empirica GmbH* in Bonn and with the co-operation of both Swiss contractual partners, translated into the languages of the participating countries and then applied in around 7,700 interviews. For Switzerland we adopted the questionnaire from the European survey in its German and French versions, however with practical testing in a further 20 pre-test interviews. With some editorial changes and improvements of content it was adapted to the conditions and language usage common in the German and French speaking parts of the country.

In both studies questions were put forth regarding plans and intentions “for the next one to 2 years”. Our prognosis for the various areas by the year 2001, e.g. about additional users of the Internet, Email or E-Commerce, was based on the corresponding answers of the interviewees. Answers on future, in part hypothetical, behaviour can supply valuable indications, but in general must be regarded with caution in respect of their validity and reliability.

In Switzerland for administrative and financial reasons fieldwork could only be realised several months later than in the EU countries. Assuming that in the meantime the diffusion process of E-Commerce has continued in Switzerland, this time difference could have positively influenced the Swiss figures. This has to be taken into consideration when interpreting the results in comparison with the European data.

2.2.1 Research Design and Survey Methodology of the General Population Survey

The methodological characteristics of our study in detail are as follows: For our study we defined the *universal set* as the population of German and French Switzerland excepting Tessin, men and

women, Swiss nationals and foreigners as long as they speak the respective language of the country, aged between 15 and 74, who live in private households with telephones. The total population defined like this comprises around 5.14 million people (FEDERAL OFFICE FOR STATISTICS 2000: 26). As telephone diffusion (number of households with telephone connection) in Switzerland lies at almost 100%, it can be assumed that in principle almost all of these households are contactable by phone.

The *sampling method* for taking a representative cross section of the population from the defined universal set can be characterised as a two-tier random process: On the first tier households with telephone connection (subscribers) were selected through random sampling from the electronic subscriber directory ETV of Swisscom⁵; on the second tier followed the selection of target persons in the chosen households on the basis of age and gender quotas.

The sample taken: Its scope is $n = 400$ interviews. These, unless mentioned otherwise, form the empirical database for the percentage calculations and the illustrations. The statistical error margin (standard error, confidence interval) for this total sample lies at a maximum of $\pm 5\%$ with a 95% level of significance. Minor deviations of the age structure from the total population (according to official population statistics) were adjusted through a weighting of the "age" - variable. All figures in this report rely on the so *weighted data*. According to the weighting protocol in around 80% of cases the weightings are in the narrow range between 0.85 and 1.13, in all lie between 0.80 and 1.17.

The sample taken like this can be described as representative of the universal set. The comparison of several important socio-demographic features results in an extensive agreement with the structure of the Swiss population according to the official figures of the Federal Office for Statistics (BfS) as illustrated in the following table.

⁵ The electronic subscriber directory ETV of Swisscom (previously a PTT) is the largest and most complete public database in Switzerland. Thanks to daily mutations and direct access it enables access to the most up-to-date address base of telephone subscribers at any time.

Table 1: The socio-demographic structure of the sample and universal set

	Sample n=400 in %	Population of Switzerland in %
Gender		
Men	49	49
Women	51	51
Age		
15-29 years	21	25
30-49 years	44	41
50-64 years	24	23
above 65 years	11	11
Language area		
German Switzerland	76	76
French Switzerland	24	24
Italian Switzerland	0	0
Place of residence		
City (>100,000 inhabitants)	19	..
Small-to medium- sized town, Agglomeration	31	..
Small-to medium- sized town, not near a city, rural area	50	..

Survey methodology: Computer aided telephone interviews (CATI) were carried out in a central telephone laboratory by 20 experienced interviewers, specially trained for this study. *Fieldwork* took place from the end of November to the beginning of December 1999.

The *questionnaire* is an extensive, standardised and fully structured instrument with a total of 120 single questions solely on the single area of Electronic Commerce relevant to this study: actual and future ownership or access to and usage of PCs, Internet, E-mail, online shopping and relevant "statistics", i.e. socio-demographic characteristics of interviewees or households. The questionnaire consisted almost exclusively of closed questions with only very few open ones. Questions and the question order were presented and determined by a computer-controlled flow chart with filter conditions which would have made an interview using conventional "paper and pencil" methods practically impossible. Interviews lasted in total an average of around 20 – 25 minutes.

2.2.2 Research Design and Survey Methodology of the Decision Maker Survey

The *universal set* for this study was made up of businesses in German, French and Italian Switzerland according to an official definition by the Federal Office for Statistics (BfS), as given in its official business and enterprise directory (BUR). In 1998 this universal set comprised around 81,000 businesses in the manufacturing, trade and construction sectors and 298,000 in the services sector, totalling 379,400 units excluding agriculture and forestry. In all they account for 3.471 million full and part-time employees in all sectors of manufacturing industry, trade, commerce, service provision and administration, according to the Swiss industry classification.⁶ This is based on the European industry classification and so makes international comparisons possible (FEDERAL OFFICE FOR STATISTICS 2000: 9, 164-165).

Sample/Addresses. At our request the BfS selected, in line with our quotas for sectors and establishment size classes (number of employees), a disproportionately layered random sample of businesses from the universal set and made the respective addresses available from their directory. They included the names and addresses of the businesses, but not the names of target persons or telephone numbers. This information had to be determined initially through a telephone screening interview. Table 2 illustrates the structure of the actual sample.

Target persons in the businesses were the business' owner or the managing director (in small- and-medium sized units), the head of business unit, the operations manager, the head of IT or another leading employee in IT (in the larger units). The interviewers had been instructed to ask for one of these decision makers on the telephone.

⁶ FEDERAL OFFICE FOR STATISTICS (1995), Allgemeine Systematik der Wirtschaftszweige/Nomenclature Générale des Activités Economiques (NOGA). Bern.

Table 2: The size, sector and regional structure of the sample

	Sample n=200 in %
<hr/>	
Business size (employees)	
1-9	15
10-49	25
50-199	27
200-499	19
500 and more	12
Don't know/no information	2
Sector	
Manufacturing sector and industry	37
Trade /logistics	16
Financial and business services	33
Public transport	14
Language area	
German Switzerland	76
French Switzerland	24
Italian Switzerland	0
Regional affiliation	
Urban area	37
Suburban area	40
Rural area	23

Methodology and execution of the survey: Computer aided telephone interviews (CATI) were also used for this study. The questionnaire was again adopted with little modification from the European study. Questions related to the situation in the respective establishment, not to the whole enterprise. Especially in large organisations it would have been almost impossible to find a single interviewee who could have given reliable information about the situation in the organisation as a whole. The survey was carried out in the central CATI laboratory between the beginning and the middle of October 1999. The interviewers used for this task were specially instructed and continually monitored at their work by their supervisor; this assured a good interview quality. Average interview time in this study was 23 minutes. However, the variance in this area is very high. The shortest interview lasted 12 minutes, the longest 53 minutes.

From a technical point of view as well as with regard to its content, we succeeded in doing the main survey without any problem, as had already been the case with the 21 pre-test interviews. The readiness of those decision makers approached to take part in the survey was high and the

ECATT topics were met with interest in the businesses. Where necessary, the selected target persons were sent information in order to motivate them to co-operate. Thanks to the explanation of the IT technical terminology there were no language problems during the interview.

Exhaustion of the address total: For this study 710 telephone numbers and target persons were identified from the addresses received from the BFS. This resulted in 200 interviews. Thanks to up to 6 telephone calls to the target persons a positive response was achieved from 33% of the original samples (600 valid addresses). The non-responses, in contrast, were 67%, with the following breakdown of the reasons for dropout:

Table 3: Non-Response Overview

	n	%
True refusals	280	47
Absence of the target person due to holidays, military etc	39	7
Target person could never be reached	73	12
Other reasons (language problems, contact breakdown)	8	1
Total	400	67

3 Electronic Commerce from the Consumer's Point of View: The General Population Survey

1. In Switzerland, the provision of households with computer and telecommunications hardware and software as a technological prerequisite for access to the Internet is relatively far advanced. By the end of 1999, 66% of all Swiss households interviewed had a PC or other computer available in the home. A further 16% of all those interviewed had the intention of acquiring one over the next one or 2 years. It is therefore likely that by 2001 around four fifths of the population will own computers. Switzerland, together with Sweden, is at the top of the position table of the 10 partaking EU countries (EU average lies at 44%). The ICT infrastructure of Swiss households therefore offers favourable conditions for the diffusion of E-Commerce in the area of Business-to-Consumer.
2. In the Swiss population, as for the whole of Europe, the Internet enjoys a very high, almost 100% general awareness level in all socio-demographic population groups. The information and knowledge level therefore also generates a favourable starting point for the diffusion of E-Commerce.
3. With regard to effective usage of the Internet as well as of other online services (share of users in the total population) Switzerland lies in second position in Western Europe after

Sweden. 53% of the Swiss population have already used the Internet; around 46% have used it during the last month or during the last 3 months. However, Internet usage differs very much in the individual socio-demographic sub-groups of the population. Users are mainly young males of higher education and professional status in urban surroundings.

4. Access to and actual use of electronic mail are widespread in Switzerland. 40% of all those interviewed have sent at least one electronic message in the past month. In the international comparison Switzerland shares the top position with Sweden (EU average in 1999: 18%). In Switzerland, over the next one to 2 years, a considerable growth in Email use is anticipated. By 2001 it can be expected that around three quarters of the population will be using an Email service.
5. In spite of the high awareness level, so far use of the Internet for online shopping is not very widespread in Switzerland. The most frequent commercial uses are sourcing and evaluation of information but less frequently for the purchase of goods or services. In Switzerland today, as in the whole of Europe, the Internet and other online services are principally used to gather information on suppliers, offers, shopping opportunities and conditions swiftly and effortlessly, and less often to place orders. Furthermore, supply of information is perceived as most attractive when it is free.
6. Most purchases are of the typical "E-Commerce-products", i.e.: 1. books, brochures or magazines (1999, 16% of all interviewees), 2. computer software, CD-ROM or other computer accessories (12%), 3. travel, hotel accommodations (12%), as well as tickets for sporting events, cinema etc (10%). In Switzerland, these articles are ordered by around 3 to 4 times as many households as in the weighted EU10-average. In the next positions, after some considerable gap, follow music, CDs, videos (8%), and electric/electronic equipment (7%), grocery and consumer goods, wine (4%), clothing, textiles, shoes (4%), online magazines, online news services or other chargeable online services (4%).
7. In the area of Internet banking today around 11% of all interviewees have attempted to receive information from their bank or carry out payments by giving credit card or account numbers. Almost the same percentage (10%) has instructed their bank to make a transfer. This is around twice as many as the EU10 average. In the coming 2 years a significant growth of around one fifth can be expected in these 2 areas.
8. For the near future there is a considerable but by no means 'explosive' growth potential in commerce-related use of the Internet or other online services. One fifth to two thirds of the current 'not yet user' segment, that is an additional 10-44% of all interviewees, depending on application area and product class, consider becoming active users over the next one to 2 years. The applications mentioned most often are again, sourcing of information (for tickets, prices, suppliers, travel, hotels, banks) rather than ordering. In the future actual purchases will become more important than they have thus far, but they will still not be in the forefront. With regard to the year 2001 the uses most mentioned are the ordering of tickets for cinema or sporting events, and travel or hotel accommodation bookings.
9. From the public's viewpoint the advantages of electronic shopping are mainly easier and faster shopping, less time and less effort needed as well as the larger and more varied ranges on offer. These are the potential features supporting diffusion of electronic commerce. However, financial savings are seldom expected.
10. According to consumer opinion the barriers which still hinder or delay the further diffusion of E-Commerce today are mainly a lack of security or the increased risk, disadvantages of

virtual shopping without having physical contact to the product, and little benefit over conventional shopping. Compared to the population of the 10 EU countries, the public in Switzerland is considerably more critical where security problems are concerned. Having too little or insufficient technical equipment also creates a barrier for users. In contrast, little or insufficient user knowledge and costs are of comparatively lower importance. However, almost three fifths do not acknowledge the necessity and the benefit of online shopping in principle and therefore do not have any reason to change their behaviour.

11. New and unconventional payment methods for online shopping meet with scepticism in the Swiss population. Only a quarter of the population would accept the transfer of credit card or account number, of "cyber cash" or of another special Internet currency in order to pay for online-orders. In contrast two fifths of all interviewees would be prepared to make payments with the conventional, and generally low-risk, cash-on-delivery method.
12. Further diffusion of E-Commerce in the Business-to-Consumer area -- and perhaps its actual breakthrough -- will require amongst other things that the Internet in general and online shopping in particular become more "secure" and "beneficial" from the potential users' point of view and that users' respective reservations are overcome.

In Sum: The technological conditions for diffusion of "Electronic Commerce" in Swiss population are favourable. Ownership and usage of the necessary IT-infrastructure and access to the Internet as a prerequisite for participation of Swiss households in electronic commerce are widespread. In this regard, Switzerland today is at the top of the 10 most important EU countries. However, this latent market potential has not yet been exhausted. In fact, further diffusion is being hindered and delayed by unresolved security problems and consumers' considerations of risks and benefits. For all businesses which offer their products or services via the electronic commerce channel on the Internet or wish to do so in the future, it is important to actively utilise the favourable starting position and market potential. As a result of the findings of the population survey, on the one hand, businesses have to reduce the existing risks and consumers' insecurities (e.g. regarding data protection, loss of money and the risk of fraud). On the other hand, businesses should demonstrate the relative economic, social and psychological advantages of virtual shopping and banking on the Internet through persuasive reasoning. The same obviously applies to suppliers of technological infrastructure and of know-how in the Internet era -- i.e. computer manufacturers, telecommunications and software businesses, providers, consultants, and other suppliers of related products and services.

4 Introduction and Diffusion of Electronic Commerce: Results from the Decision Makers' Point of View

The results with regard to provision and use of ICT can be summarised as follows:

1. Email: The diffusion of Email has progressed very far in 1999 (83% of all businesses interviewed) and will reach the near-saturation point (90%) over the next 2 years. Switzerland is therefore in third place after Finland and Denmark.
2. The Internet: In Switzerland the diffusion of the Internet is even further advanced than Email. In 1999, only one in ten businesses does not yet use the Internet. In the near future

this will be reduced by more than half. In comparison with the rest of Europe Swiss businesses are very well equipped (2nd position after Finland).

3. Intranets: With a diffusion of intranets reaching 56% (1999) and 75% (2001) respectively of all businesses interviewed, Switzerland once again proves itself as the country with outstanding technological infrastructure (1st position).
4. Groupware Tools are used in Switzerland by the majority of businesses interviewed (60% in 1999 and 70% by 2001), so that it again belongs to those European countries with a high diffusion of this service (3rd position after Ireland and Great Britain).
5. Electronic Data Interchange (EDI) on the other hand is used by only 35% (1999) or 50% (2001) respectively of all businesses interviewed. While use of this facility is more widespread than the European average, Switzerland here only takes 4th place.
6. Call Centres: As with the other online services, the call centre is also used relatively frequently in comparison to the rest of Europe. One fifth of Swiss businesses interviewed use this service (3rd place), whereas in the rest of Europe an average of only 15% do so.

On the actual use of online services for business activities the following can be noted:

7. General presence on the net or on another online service: Almost two thirds of businesses interviewed (1999) are present on the Internet or on another online service, and a further fifth is currently planning a presence (2001). These Swiss figures correspond to the situation in the best-equipped country of the EU, namely Finland. In Switzerland as well as in the rest of Europe large businesses with their own products are more often represented online than small businesses. In Switzerland the trade and logistics sectors are most prevalent here. Within Switzerland German speaking businesses are present on an online service or plan a presence more often than French speaking businesses.
8. The purpose of businesses' online presence: On the whole, most Swiss businesses with an online presence interviewed see the purposes of the presence to be in marketing and customer relations. Only around half use it to change their own production processes. Finally, only a very small percentage see the purpose of an online presence to be to act as a supplier. In the next 2 years the main purpose of being online for the interviewed businesses will still remain the management of internal and external information flows. A similar picture emerges for the rest of Europe.

After this general characterisation of the purposes Swiss businesses have for being online, more detailed results now follow. The present study differentiates among 8 different purposes for having an online presence.

9. Advertising and marketing: Most often within Europe Swiss businesses are online for advertising and marketing. In Switzerland and in all other countries the public sector lags a little behind the other sectors. In particular the Swiss businesses in the German speaking areas see advertising and marketing as the main purpose of their online presence.
10. Provision of free information: From an initially high level there will be a further increase in the offering of free information as the main purpose for having an online presence in Switzerland over the next 2 years. While in 1999 online businesses from the trade and logistics sector lagged behind in this respect, by 2001 the public sector will stand out from all other sectors with a significant lead. This is already the case today in some other

countries and can be attributed to the multitude of state websites for public information. In 1999 a higher percentage of German speaking businesses than French speaking businesses offered free information on the net. However, according to businesses' future plans so far, this situation will be reversed by 2001.

11. Provision of chargeable information: In comparison to their European competitors Swiss businesses only rarely use their online presence for the provision of chargeable information. As in the other countries businesses of the finance and business service sectors are particularly active here.
12. Online selling: In a European comparison, in 1999 Switzerland manifested itself with a high utilisation of its online presence for online selling (32.5% of businesses interviewed). However, by 2001 it will fall far back into the European middle field. In contrast to the other countries in our study where businesses from the commerce and logistics sectors use their online presence for the purpose of online selling, in Switzerland businesses from the finance and business services sector engage themselves more strongly.
13. Electronic data exchange with suppliers and customers: Around half of all Swiss online businesses see data exchange with suppliers and customers as the main purpose of their online presence. This corresponds to the situation in the rest of Europe. In contrast to the other European countries, in Switzerland all industries seem to be interested in EDI with external partners to the same extent. German speaking businesses within Switzerland are more likely to take part in EDI than French speaking ones.
14. Creation of Joint value chains with suppliers and co-operation partners: In respect of the use of their own online presence for the joint creation of value with partners, the Swiss businesses interviewed proved to be very reluctant in spite of their high technological standards. In contrast to some of the other European countries there are hardly any differences among the individual industries in this respect.
15. Sourcing of supplies and raw materials: The use of online services for the sourcing of supplies is more widespread in Switzerland than in all the other countries of our study: almost every 2nd Swiss business interviewed uses them in this way. In 1999 larger businesses in particular used online services for this purpose, however this will happen less and less frequently in the future. In Switzerland the finance and business service sectors in particular do not use online services for sourcing material supplies.
16. Recruitment of personnel: In Switzerland online services are used less frequently for the recruitment of personnel than for sourcing material supplies. Only one third of those businesses interviewed recruit new personnel online. Here larger businesses are more likely to use this type of personnel recruitment. However as they generally make use of online services more frequently, the influence of firm size on this specific use should not be misinterpreted. Businesses in the finance and business service sectors have an above average online recruitment of personnel.

The results regarding the barriers to use of online services from the point of view of the businesses interviewed are as follows:

17. Online selling: Swiss businesses see the barriers to a rapid diffusion of online selling to be particularly on the side of the suppliers. From their point of view products' characteristics in particular hinder a rapid diffusion of this selling channel. The different barriers can be

categorised by effects of learning on them. Whereas the barriers “costs” and “lack of demand” are not subject to effects of learning, and the importance of product characteristics as a barrier reduces with increased familiarity, the importance of the barriers “lack of know-how”, “security concerns” and “general conditions” increases. Small businesses are more averse to risk and regard the impact of the barriers as a whole as more important than larger ones do. The manufacturing industry and trade /logistics industries prove to be considerably more risk averse than the other industries.

18. Online sourcing: Those businesses in Switzerland which thus far have not used online services for the sourcing of supplies give as a main reason that their products would not allow this. It is also relevant that there is often no appropriate source of supply available. This opinion coincides with that of businesses in the other European countries. In contrast, security concerns play a more important role in Switzerland, whereas lack of know-how is seen as less important.

The following results on best practices in E-Commerce could be compiled from the case studies⁷ conducted :

19. Strategic partnerships between traditional businesses and businesses in the ICT sector facilitate market entry and can help reduce investment risk for the individual partners through cost sharing. In this way even small businesses may successfully enter the market.
20. Organisational separation of E-Commerce from other distribution channels or business areas proves to be a necessary condition for lasting success in the establishment of new business fields within traditional businesses.
21. Basic products or basic services which can be adapted to customers' individual preferences are particularly suited for E-Commerce. These can assist in generating long-lasting customer relationships which enable the future supply of customized products and services.
22. In smaller businesses the personal motivation of individual leading members of staff forms the basis for the introduction of E-Commerce.
23. Financial success is not the only benefit of E-Commerce. Improved image and publicity, potential savings and strategic options are also important.

5 Comparison General Population and Decision Maker Survey

In many topical areas both private households and businesses were asked analogous questions, in each case relating to an individual person or organisation. Both classes of interviewees answered these questions from their own completely different circumstances and perspectives. This gave us the opportunity to make comparisons between the supply and demand perceptions and to determine both the common ground and the differences between representatives of

⁷ The case studies deal with the businesses UBS AG, Kuoni Reisen Holding AG, Lecureux SA, Net-tissimo AG und Räber Information GmbH.

businesses and households. This set of common questions relates to the following areas: provision of ICT, access to and use of the Internet, use of Email, barriers to the use of online services, in particular of online shopping/selling. We expect differences between businesses and private individuals *a priori* because of the different institutional backgrounds of those interviewed as well as the varying objectives, interests, material means and opportunities.

1. The provision of the necessary infrastructure – i.e. having a PC with an online connection, Internet access, ISDN and Email from the consumers' perspective and Internet access, Email, online presence with a Website for the supplier – regarding the technological prerequisites for participation in electronic business transactions in Switzerland had reached a high level by the end of 1999, both in absolute terms as well as in a relative comparison with the other European countries. There are therefore favourable conditions on both sides of the market for a successful and widespread diffusion of E-Commerce.
2. The effective use of the Internet and other online services (proportion of users in the respective universal set) however, is considerably further advanced amongst businesses (with almost 90%) than in the population (around 53%), where commercial motivations and the anticipated advantages are less pronounced than in business.
3. The diffusion of Email in businesses had in 1999 also reached a considerably higher level (83%), i.e. twice as high, than in private households (40%).
4. When looking at the expressed purpose of businesses' online presence and the effective use of the Internet by private households, contrary to what might be expected, a high degree of agreement is evident: Businesses still want to use the Internet primarily for marketing and advertising purposes and to pursue other purely business specific purposes. They do, however, at least mention in second place, free provision of information, which, for most private households is clearly of great interest. Furthermore, around half of them see data exchange between suppliers and customers as the main purpose of their online presence.
5. With regard to barriers to a rapid diffusion of online shopping or selling, both private households and businesses fundamentally agree that considerable barriers have to be found on the supply side of the market. Both parties see product characteristics in particular as a hindrance to the spread of this marketing media. Security concerns also present a further barrier for both parties; this however can no longer be exclusively attributed to the supply side of E-Commerce.

6 Summary and public policy implications

The purpose of this paper was to summarize the major findings of a research project on the introduction and diffusion of E-Commerce in Switzerland. This project distinguishes itself from other studies in this field in two ways. First, based on a common methodology the project has been conducted in ten other European countries and therefore the international comparison of the results is possible. Second, the project investigates the diffusion of E-Commerce from both the consumer's and firm's point of view.

From the perspective of public policy the following finding is crucial: Both private households and firms point to the issue of security as a major hindrance for the wider diffusion of E-commerce in Switzerland. Security in the Internet in general and in E-commerce in particular is a very complex problem. Security has too many different facets (technological, legal, economic,

political etc.) that can be dealt with comprehensively in the framework of this paper. One interesting facet of security is, however, that it is both a private good and a public good. There are many things that private households and firms can do to protect themselves on the net. A legitimate question is also to ask what the Swiss state does to enhance overall security on the net. We will try to answer this question more broadly and look at all major activities of the Swiss Federal government in the last few years⁸.

Swiss Federal government has issued 1998 policy statements and broad actions plans to focus and streamline government's agencies activities in the face of the digital economy in general and e-commerce in particular.

The Swiss action plan "e-commerce" is based on the general principles of (1) subsidiarity, (2) non-discrimination (regulatory solutions apply equally to on-line and off-line activities), (3) technological neutrality (governmental interventions do not rely on specific technologies), (4) international compatibility, and (5) high degree of private-public participation.

The Swiss action plan "e-commerce" is not only principle-based, but also focused: the Federal Department of Economic Affairs picks out eight conditions for a wide-ranging development of electronic trading in Switzerland. These are: (1) The availability of high-quality communications infrastructures. (2) Access for all to modern information and communications technologies with equal opportunities. (3) Wide acceptance of the application of modern information and communications technologies by the population and the private sector. (4) Guaranteeing the necessary professional skills. (5) Guaranteeing the necessary financing, incl. for SMEs. (6) Availability of trustworthy security solutions for electronic transactions. (7) Adequate and reliable regulatory environment. (8) Intensive use of IT solutions by public administrations.

The most important aspects of this action plan can be described as follows:

With respect to telecommunications infrastructure, use of the Internet and PC density, Switzerland is ranking at the top in a world-wide comparison. The liberalisation of the Swiss telecommunications market on 1.1.1998 has resulted, at least partially, in essential cost reductions.

While the infrastructure in Switzerland is largely in existence, its use still too often founders on lack of confidence and insufficient experience on the part of users of modern information and communications technology. Education and knowledge about how to deal with modern information technology must therefore be promoted more efficiently, particularly through basic and advanced education as well as on-the-job training. Here government and private sector have been trying to co-operate more effectively.

In order to increase confidence of users in business transactions on the Internet, the confidentiality, authenticity and integrity of digitally transmitted data must be guaranteed. In Switzerland, with the possibility of free use of strong encryption systems, a substantial requirement for safe electronic trading is fulfilled. Corresponding technological solutions such as Secure Electronic Transaction Protocol (SET) are also available. The reliable application of technological solutions requires also a minimal legal framework. In Switzerland, the legal basis for the infrastructures necessary for the use of digital signatures, the Public Key Infrastructures (PKI) has been put in place since May 1, 2000.

⁸ Für Informationen in diesem Bereich siehe: <http://www.isps.ch>

In addition, The Swiss government has been checking the existing legal framework as to whether it corresponds to the requirements of e-commerce. What is required is clarity about the applicability and enforceability of the existing regulatory framework for electronic transactions. This is particularly the case in fields such as data protection, contract law, taxation, labour regulations, company law, competition and intellectual property. Banking and stock trading law too are also challenged by the surge of e-commerce.

Alongside regulatory activities, Swiss government plays a role in promoting the use of Internet:

- 1) In the field of professional education, federal Government has recently approved a credit of about 7 Bio. SFr over 4 years for professional education, a large share of which will be devoted to filling the gap of IT-specialists on the labour market.
- 2) R&D Programmes. The main objectives of this programme are design, development, implementation and trials of distributed applications and associated networks. The programme has four modules (engineering of distributed applications and networks, quality and security aspects, management of distributed systems, demonstrators). The group of experts selected 33 projects, and a sum of approximately CHF 10 million was dedicated to a first series of projects of 24 months' duration. All projects include private business partners in order to achieve technology transfer. A second call for submissions took place in 1997, and additional projects were defined. In 1998, a last initiative of the programme was to set up a networked competence centre for applied R&D on electronic commerce.
- 3) The spread of the use of IT-technologies, particularly through SMEs, is supported by government measures. For instance, the Swiss Federal Office for Education and Technology is running a software databank called "Softnet" where demand and supply of software applications are brought together. This considerably facilitates access to applied software technologies by SMEs. In addition, an ambitious electronic portal and a practical internet guide for the specific needs of this particular size of firms have been initiated and partially supported by government money.
- 4) Finally, the Government itself will increasingly use e-commerce- applications, (as for instance in the field of public procurement, in the fiscal and administrative domains), in order to create confidence and acceptance.

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