

## INTERNET ECONOMY AND ELECTRONIC COMMERCE

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*This paper presents an overview of and development trends in the Internet Economy and Electronic Commerce. The first part of the paper describes the influence of information technology on the economy. The paper then gives an overview of the basic components of the Internet Economy, i.e. the economy based on the Internet, and it presents key figures from recent research about revenues and jobs related to the Internet Economy. Electronic Commerce (E-commerce) refers to business activities using computer networks. The main components of E-commerce, as well as its technical, business, security, regulatory and legal aspects are all presented. The paper concludes with an analysis of current trends in business and technology, and looks at the social issues of E-commerce.*

**Keywords:** electronic commerce, Internet economy.

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### 1. INTRODUCTION

The rapid development of information technology (IT) and the dramatic fall in IT equipment prices in the last decade (the annual fall in price being about 8 percent for the years 1996 to 1998) is having a fundamental influence on the economy as a whole. A recent report from the U.S. Department of Commerce [24] gives us the basic figures about the influence of IT on the U.S. economy. Real business investment in IT equipment and software in the U.S. increased from \$243 billion in 1995 to \$501 billion in 1999. IT industries account for 8.3 percent of the U.S. economy's output in 1999 and contributed to nearly a third of U.S. economic growth between 1995 and 1999. In 1998 IT industries invested \$44.8 billion in research and development (R&D), which is almost one third of all company funded R&D investment. In the second half of the 1990s the production and use of IT contributed to more than a half of the acceleration of the U.S. productivity growth. In 1998 the number of workers in IT-producing industries, including workers with IT occupations in other industries, equalled 6.1 percent of all the workers in the U.S.

A really strong influence of IT on the economy came from the extremely fast growth in computer networks, and the Internet in particular. This influence completely reshaped business practices. The Internet and the World Wide Web enable companies of all sizes to develop new online business models, radically improves interaction with customers and other businesses, build new products and services, and carry out business efficiently and globally. Private computer networks (intranets) enable an exchange of important information within the enterprises, as well as cooperation between employees living in diverse parts of the world. Outsourcing became much

sales via the Web and distribution of digital products via the Internet led to a dramatic fall in operation and distribution costs. Customers got the opportunity to compare product and service prices with ease, and they also started to request personalization for the products and services.

The potential for and significance of online business can be illustrated with a few figures. While costs related to the selling of an airline ticket are \$23 per ticket in a traditional travel agency, they fall to \$6 when sold via Web site (source: American West Airlines). The total number of unique users who visited a Yahoo! Web site in October 1999 was 33.6 million, and in mid 1999 Yahoo! had about 65 million registered users. Finally, about one the third of the budget for buying Christmas presents in the U.S. in 1999 was spent via the Web, and 64 percent of buyers were satisfied with their online buying experience (source: InsightExpress).

In Section 2 of this paper we shall present the Internet Economy, along with the figures for revenues and jobs related to it. In Sections 3 and 4 the basic characteristics and components of Electronic Commerce are presented, while Sections 5 and 6 discuss the technical and business aspects of E-commerce. Sections 7 and 8 present the security and the legal aspects of E-commerce, and section 9 is devoted to the analysis of current trends in E-commerce, while Section 10 contains our conclusions.

## 2. THE INTERNET ECONOMY

The Internet Economy is an economy based on the Internet, fully exploiting its global character, speed and efficiency in dealing with information and knowledge. The Internet Economy includes companies that directly generate all or some part of their revenues from the Internet or Internet-related products and services. According to the Centre for Research in Electronic Commerce, University of Texas in Austin [6], the Internet Economy can be classified into four layers: the Internet infrastructure, its applications, the intermediaries between buyers and sellers, and electronic commerce.

*The Internet infrastructure layer* includes companies that provide products and services that make up the network infrastructure for Electronic Commerce, and consists of Internet backbone carriers, Internet Service Providers, "last mile" access companies, and manufacturers of end-user networking equipment (examples include America Online, Cisco and MCI Worldcom). *The Internet applications infrastructure* includes products and services built on the network infrastructure, that make it technologically feasible to perform business online. This layer includes Web development software, multimedia applications, search engine software, online training, Internet consultants, Web hosting and support services, etc. (examples include Sun, Microsoft, Adobe and Oracle).

*Internet intermediaries* increase the efficiency of the electronic markets by facilitating the meeting and interaction of buyers and sellers over the Internet, and they generate revenues through advertising, membership subscription fees and commissions, rather than directly generating revenues via business transactions. This layer includes market makers in vertical industries, online travel agents, brokerages, advertisers and content aggregators, as well as portal and content providers (examples



include Yahoo!, Zdnet, E\*Trade and VerticalNet). *The Internet commerce layer* includes companies that generate product and service sales to consumers or businesses over the Internet. It includes electronic retailers, online entertainment services, manufacturers selling online, airlines selling tickets online, and shipping services (examples include Amazon.com, Dell, UPS and American Airlines).

A recent study at the Centre for Research in Electronic Commerce at the University of Texas in Austin [6], that included information on worldwide Internet-based revenues of U.S.-based companies, shows that the Internet Economy is growing rapidly. The overall annual growth in revenue from 1998 to 1999 was 62%, with the fastest growth in the Internet infrastructure (68%) and commerce (72%). The total annual revenue in 1999 was about \$524 billion. The overall growth of the number of employees annually was 36%, with the fastest growth in the Internet infrastructure (48%) and applications (33%). The Internet Economy now directly supports about 2.5 million workers. The biggest layers of the Internet Economy in 1999 are the Internet infrastructure with 779,000 employees and an annual revenue of \$198 billion in 1999, and Internet commerce with 727,000 employees and annual revenue of \$171 billion in 1999. The overall growth in revenue per employee in the Internet Economy from 1998 to 1999 was 19%.

Several facts in this report require special attention. Internet-related growth was 15 times larger than the growth rate of the U.S. economy, while total revenues (Internet and non-Internet) at the Internet Economy companies grew almost three times faster than U.S. economy as a whole. 650,000 new Internet-related jobs were created in Internet Economy in 1999. Although the Internet Economy is still in its infancy it has already exceeded some old traditional industries; for example, there are more workers in Internet-related industries than in insurance or communication and public utilities industries. E-commerce revenue alone is bigger than the revenues in banking, aerospace and the drug industries. However, it was found that a labour shortage exists in the labour-intensive Internet intermediary layer, causing this layer to have the slowest growth in the number of their employees.

A study made by the Internet World magazine [15] was devoted to the 50 biggest pure Internet companies, i.e. companies that receive a dominant portion of their revenues from the Internet. This study presents analyses of the financial data of the companies who work solely with the Internet from the period of July 1, 1998 until June 30, 1999. The study revealed two interesting facts. Firstly, the breakdown of revenues of these companies by sector shows that the major portion of the revenue, even 39%, comes from Internet Service Providers (ISP). Online retail generated 19% of revenues, portals - 13%, financial services - 9%, etc. Secondly, in each category there is a leader that has revenue that by far exceeds its followers. E.g., in the ISPs category America Online leads with revenue of \$3.3 billion, followed by PSINet with revenue of \$390 million. America Online also leads in the category of portals, with revenue of \$1 billion, followed by Yahoo! with a revenue of \$390 million. Amazon.com leads in the category of E-commerce sites with revenue of \$1 billion, followed by On sale with a revenue of \$266 million.

### **3. ELECTRONIC COMMERCE**

Electronic Commerce refers to all aspects of business that take place over computer networks ([1], [8], [16], [19]). These business activities may involve consumers, manufacturers, service providers and intermediaries. E-commerce includes goods and services that are delivered over the networks, as well as goods ordered over the networks and delivered via traditional delivery channels. E-commerce includes various business functions required to support these activities, such as marketing, production and delivery.

E-commerce radically changed the way organizations carry out business and brought about a substantial increase in the speed and efficiency of business transactions. Communication and cooperation inside the company and between companies and customers, or between other companies became much simpler and faster. Production and delivery costs were lowered and delivery costs for digital products became negligible, while products are delivered almost instantaneously. A range of new information-based services was developed, and cheap global publishing enabled the publication of a large quantity of detailed and updated information. E-commerce doesn't require massive investment; therefore even small enterprises can become players in the global market.

E-commerce is used in all industrial branches. In the publishing industry it ensures a rapid and cheap delivery of information as well as its personalization. In the banking industry it allows clients to do home banking, along with stock trading via online brokers. The information and computer industry uses direct sales from manufacturing Web sites, online software delivery and supply-chain management, and these cut down the product development cycle. The tourism and travel industries have an intensive information character, and E-commerce applications can offer solutions for most of the needs of these industries, including the use of intelligent agents that can take the role of travel agents.

Customers are empowered with E-commerce since they can easily compare product and service characteristics and find the cheapest or most adequate products and services. Moreover, customers can communicate, access information, order a product or a service, and make a payment at any time without leaving their home or hotel room, and without waiting.

The first E-commerce technology, developed in the 1970s, was electronic fund transfer (EFT) that occurs between banks that used secure private networks. In the late 1970s electronic data interchange (EDI) allowed companies to exchange standard business documents using secure private networks. Since EDI was an expensive, it was used primarily among the big companies. The late 1970s and early 1980s brought the popular electronic mail service that enabled fast and cheap asynchronous communication. In the late 1980s and early 1990s various electronic systems for group collaboration were developed. In the same period online services, i.e. closed computer networks (like America Online), emerged and were used for interpersonal and group communication for a large group of people. Finally, in the 1990s World Wide Web enabled simple and cheap publishing, and made possible a variety of business activities for companies of all sizes.



E-commerce has three main aspects: technical (e.g. networks, telecommunication, and security), business (e.g. marketing, supply chain management, and payment), and legal aspects (information privacy, intellectual property, and taxation). We will present an overview of these points in the following sections of this paper.

#### 4. COMPONENTS OF ELECTRONIC COMMERCE

Electronic commerce consists of the following main components: electronic data interchange, electronic catalogues, electronic payment mechanisms, and intranets and extranets [1].

##### 4.1. Electronic data interchange and electronic Catalogues

*Electronic data interchange* (EDI) is the exchange of standardized and structured business documents (e.g. purchase orders, invoices, or receipt notices) between computers. The purpose of EDI is to enable efficient commerce between trading partners. Traditional EDI uses secure private networks. EDI helps in increasing the speed of trading, reducing errors, eliminating duplication of data input, and reducing the use of paper. Traditional EDI requires substantial investments, laborious software implementation and intensive training of personnel, and has therefore been restricted to mainly big companies. Moreover, X12 and EDIFACT standards used in EDI are inflexible and cannot easily accommodate specific business practices. One of the solutions developed for this problem was Internet EDI that uses the Internet instead of proprietary networks, and thus reduces the high investment costs of traditional EDI. Another advantage of Internet EDI is in the cheap transmission of unstructured documents like product descriptions, photos or graphics in the form of files attached to EDI transactions. One major problem with Internet EDI is security that is dependent on the strength of the encryption used.

*Electronic catalogues* (e-catalogues) are Web pages that present information about products and services that a given company has to offer. E-catalogues may support online shopping, ordering and payment, simple communication with customers, as well as simple and quick techniques for price change. They contain information about products, services and prices, as well as detailed descriptions of products and services. Technologically advanced catalogues are integrated with a company's databases in order to increase the efficiency and flexibility of catalogue use. E-catalogues offer global presence and they attract consumers with lower prices, more information and simpler search abilities for finding products and services of interest.

##### 4.2. Electronic payment mechanisms

*Electronic payment mechanisms* include digital currency, electronic checks and electronic credit/debit card systems [17]. *Digital currency* involves digital cash and smart cards, and represents a completely new technology that facilitates new types of payments such as micropayments, i.e. payments of small amounts of money for a tiny fraction of information or software. Digital currencies involve "tokens" of value expressed in a digital form, and are based on cryptography techniques. They have an

important property to allow users to move funds electronically. Besides, they preserve anonymity, represent monetary value, are exchangeable for goods and services, currencies and other tokens, they can be stored and retrieved, and are hard to copy or falsify. *Digital cash* is a PC-based payment system that is based on the cash represented and stored in a computer in a digital form. It is created using digital signatures cryptographic system in such a way that the user generates the serial number of a digital banknote using a random number generator obtained by the bank, and the bank then puts its digital signature to this banknote. Digital cash preserves the anonymity of buyers – however, if the buyer uses the same digital banknote twice, the bank is able to discover his identity.

*Smart cards* (stored-value cards) store a monetary value on a microchip embedded on a card, and are used at the point-of-sale or with personal computers (via smart card readers). They can include digital certificates, they may be used for authentication of secure transactions, and they may contain various non-payment types of information. *Electronic checks* are the same as traditional checks, and they use digital signatures and digital certificates for proof of the authenticity of a given buyer, her bank and her bank account. *Electronic credit systems* are mostly used for payments by sending an encrypted card with information via the Web. The security for this type of electronic payment is a critical issue; one of the most powerful technologies developed for secure payment is the Secure Electronic Transaction (SET) system.

### 4.3. Intranets and extranets

*Intranet* [3] is a private computer network using Internet standards and protocols. It is often called the “corporate Web” since it is based on Web technology. Intranet enables simple and efficient communication and cooperation, a streamlining of business processes, easy publishing and updating of corporate information, fast access to and the ability to search corporate information, as well as distance learning. It greatly reduces the costs of communication, information management, the education of employees, and internal cooperation. One of the important uses of intranets is in the supporting of supply-chain management, i.e. the integration of the internal and external partners on the supply and process chains to ensure an efficient receipt of orders from customers, and to ensure that the raw materials are obtained from the suppliers and that the finished goods reach the end user. The creation of a ‘virtual supply-chain’ is oriented towards the whole enterprise, and has to support the business processes that create, manage and use information. Access to intranet is restricted to corporate employees, and intranet is protected from the Internet with a firewall. A protected zone contains Web and e-mail servers, as well as computers containing databases and personal computers.

*Extranet* [21] is an extension of the intranet accessible to cooperating institutions. It can be accommodated either in a portion of intranet or in a secured zone that is protected with firewalls and located either between two private networks or between intranet and the Internet. By using extranet companies can share their private information with their business partners and thus enable closer and more efficient cooperation between partner companies. Two types of extranets are in use: in one of them each corporation permits its business partners access to specific information from



its intranet, while in the other (the so called hub extranet) one institution enables its business partners access to its information.

## 5. THE TECHNICAL ASPECTS OF ELECTRONIC COMMERCE

E-commerce includes a number of technical aspects such as telecommunication infrastructure, interoperability, storage and retrieval of multimedia information, text search techniques, markup languages, software agents, and Web-based decision support [1].

*The telecommunication infrastructure* is the central technology for E-commerce. It is based on standard network architectures such as Open Systems Interconnection (OSI), communication standards such as Transmission Control Protocol / Internet Protocol (TCP/IP), and technology for data communication such as Asynchronous Transfer Mode (ATM). Another important aspect of E-commerce is the *interoperability* between different applications, as well as its ability to connect multiple object systems that exist in various types of computers in heterogeneous distributed environments that can be realized on the Common Object Request Broker Architecture (CORBA).

*Storage and retrieval of multimedia information* is important because of the significance of multimedia data in the commercial environment, e.g. in multimedia publishing or digital libraries. Different storage techniques are used. Some of them use a single disk while others use a multiple disk storage system. Various retrieval techniques are developed for different types of data, e.g. for image or video data.

*Text search techniques* are the most frequently used techniques for Web search ([7], [11]), and they are the ones that are routinely used in search in the business environment. They include subject trees, search engines, software agents, and a database search. Subject trees are hierarchical catalogues of Web pages that have been developed by human indexing teams and they contain a small but selected portion of the Web pages categorized in the predefined hierarchical cataloguing tree. Search engines embody an automated approach for collecting information stored in the Web sites, using software that continuously retrieves and collects information from Web sites all over the globe. Software agents autonomously perform periodic searches on behalf of the user and they use several search engines. Databases typically include structured data about specific topics, and information contained in databases is hidden and cannot be retrieved via search engines. Due to this fact, specific subject trees that contain the addresses of the Web sites to be used as an entrance to different databases were developed.

*Markup languages* are used for defining the Web document layout. The basic markup language is Hypertext Markup Language (HTML). It is easy to use but it doesn't describe the structure and semantics of the document. Recently eXtensible Markup Language (XML) has been developed and it overcomes this problem and thus enables documents to be retrieved much more efficiently. Specific variants of XML can be developed for different businesses and other purposes.

*Software agents* are programs to that you can delegate a task to. Agents are personalized, continuously running and semi-autonomous. Agents possess some knowledge and are trained by the user to learn how a user is solving a given type of task. Software agents are also able to communicate and exchange information with other agents of a similar type. They are useful for the information-rich and process-rich environment of electronic commerce, and can be used for monitoring a situation on the market, retrieving information (e.g. finding the cheapest CD), or negotiating with other agents on the electronic markets ([12], [18]).

*Web-based decision support* is related to the on-line analytical processing (OLAP) and it helps managers to make decisions that are based on a huge quantity of business information. OLAP technology enables access to data from data warehouses or relational databases, and corporation users have Web-based access to this data via intranets. This data are analysed, summarized and modelled via OLAP or via knowledge discovery in databases or via data mining techniques [20]. Data mining can, for example, carry out clustering or the classification of data, it can find associations between data, or it can perform regression and trend analysis.

## 6. BUSINESS ASPECTS OF ELECTRONIC COMMERCE

### 6.1. Categories of electronic commerce

E-commerce can be classified into the following five categories: intra-organizational, business to consumer, business to business, government to consumers, and government to business.

*Intra-organizational* E-commerce is oriented toward improving efficiency and integrating business processes in the company. The main fields of E-commerce application are in communication and collaborative work, information sharing, Web-based decision support applications, and coordination of internal processes. All these opportunities lead to the appearance of a 'virtual organization' which enables close connections with remote employees, as well as consistent business operations for large organizations with multiple locations and distribution channels.

*Business to consumer* (B2C) E-commerce is largely oriented towards electronic retailing and it offers various online services. Electronic retailing and various related activities incorporate advertising and marketing, selling products via Web sites, the delivery of digital products via a network, electronic payment, and providing service and support. Electronic auctions are major business categories that offer the capability of real-time pricing. A range of new online services have been developed, like the retrieval of phone numbers, the choice of a train, flight, hotel or job, providing health information and health care delivery, or even the online tracking of a package sent via an overnight delivery company. Long-distance learning is a service that is particularly attractive to some types of people and to some geographical locations.

*Business to business* (B2B) E-commerce is used by companies for a direct sale via Web sites, for electronic ordering from its suppliers, for receiving invoices and making payments, as well as for developing inter-business electronic marketplaces. Electronic



procurement is one of the ways that has been proven to help companies to reduce costs and the number of employees it has, as well as to significantly reduce the duration of the procurement process. Some of the current electronic marketplaces for businesses are marketplaces for medical supplies and equipment, for chemical and laboratory supplies, and for the exchange of parts and supplies for the automotive industry. A considerable part of B2B E-commerce today includes the Electronic Data Interchange (EDI), but it is likely that future growth of B2B E-commerce will be based on Internet.

*Government to consumers (G2C)* E-commerce involves communications with individuals and providing public services to those individuals. Some of the U.S. G2C E-commerce services include retrieving trademark records, downloading tax forms and instructions and providing information about the latest clinical research into life-threatening illnesses. *Government to business (G2B)* E-commerce is similar to B2B when it use electronic procurement for a huge quantity of products and services. Other important transaction services for businesses are the electronic interchange of VAT returns and the payment of corporate taxes. G2B also provides essential business and technological information to enterprises, enabling access to training, advice and assistance (the service is especially important for small and medium-sized enterprises), and it establishes an effective communication channel between companies.

All of these activities, plus those that are being prepared for G2C and G2B E-commerce [23], are heading toward fulfilment of the vision of *e-Government* to provide efficiently the most essential information to citizens and business, and enable them to carry out the most important transactions,

## 6.2. Business models

E-commerce business models are based on information character, global nature and the enormous operation speed of computer networks. These models use the fact that computer networks make access to information simpler, faster and cheaper, and that huge quantities of information can be retrieved. Manufacturers and service providers can easily get information about their consumer's tastes, and use this information to personalize products and services (e.g. news or CD content).

It is not easy to classify innovative E-commerce business models, as we will demonstrate with the following examples. Peapod<sup>1</sup> uses the Web for food-retailing services that enable comparison-shopping based on price, nutritional content, etc. It has a staff of professional buyers that shop in several stores for their customers. InScribe Secure File Services (formerly DocSpace)<sup>2</sup> is a platform that enables companies to securely deliver, store and distribute its documents via the Web. It is a kind of electronic courier that functions all over the world and offers a fast, simple, secure and cheap service. Its basic service costs \$10 per month, while sending a single parcel via Federal Express costs about \$20.

Some examples of the several classes of novel E-commerce business models are portals, vertical portals and application service providers. *Portal* is a Web site that can

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<sup>1</sup> Peapod, <http://www.peapod.com>

<sup>2</sup> InScribe Secure File Services, <http://www.docspace.com>

serve as a starting Web page for users. Portals offer a wide variety of useful and interesting links. Typical portal contents include access to search engines, online shops and auctions, financial services, the weather forecast, travelling services, online games, chat services, etc. Integrated services are also developed, like a calendar that can automatically incorporate a TV program of interest or it can send an e-mail message when some important event in the calendar is approaching. Some portals offer personalization, and such personalized portal Web pages are particularly good candidates for a customer's home page. *Vertical portals* are portals specialized for specific areas like finance, sport, news, or shipbuilding. They offer fresh information from the field they specialize in, plus news, product and service information, job listings, etc. A leading portal for vertical trade communities is VerticalNet<sup>3</sup>.

*Application service providers* (ASP) serve multiple users by delivering and managing applications and computer services from remote data centres via the Internet or a private network. ASPs are an outsourcing alternative to purchasing, implementing and maintaining of complex systems in an enterprise. ASPs's customers can control the cost of technology usage and they can focus on their core business. Applications are most often leased. Application software is stored on ASPs servers and is usually used via a Web browser. Some of the most popular applications currently in use are the hosting of Web sites and e-mail mailboxes, business to customer E-commerce and intranet management, and IT security.

### 6.3. Electronic marketing

One of the key features of electronic marketing [13] deals with *Web traffic building*. For this purpose the Internet domain name must be directly related to either the company or the product/service name. Since big search or directory portals are an important source of traffic, the Web site of the company should be classified in these portals with the proper keywords, descriptors, and categories. Publicity and promotion campaigns, or paid advertising via online banners or with the traditional media can also support traffic. This also helps in *brand name building*, since brand names are a strong attractors for visitors. In order to make a visitor go back to a site, each page belonging to the Web site should contain material of interest to the user.

The organization can *benefit from Web technologies* either through improvements made in its products or services, or directly by making more profit. Improvement-based benefits include online brand building, the education of visitors concerning the category of products or services, or by enhancing the quality of their products or services with online material. In revenue-based business models, companies that want to reach visitors of that Web site pay fees to the Web site. Sponsoring arrangements or banner advertising can do this. User-based revenue models use subscription fees or pay-per-use transaction fee models.

*Collecting information about individual visitors to a Web site* allows one to be able to analyse the purchasing structure and the preferences of different groups of visitors in terms of the products and services, and they are therefore of considerable

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<sup>3</sup> VerticalNet, <http://www.verticalnet.com>



importance to the marketing departments. If a visitor registers on the company Web site, the company can get various demographic data about him, and this data can be correlated with the information about the products or services he has purchased. Using so called "cookies", a company can even get information about competitors Web sites that have been visited by the customer, since this information is stored on the customer's computer by his browser.

#### 6.4. Electronic marketplaces

Markets play a central role in the economy since they enable the exchange of information, goods, services and payment. They create an economic value for buyers, sellers, intermediaries, and society as a whole. Markets' function is to match buyers and sellers, facilitate transactions, and provide an institutional infrastructure (laws, rules and regulations for market transactions) [2].

The Internet influences markets in a number of ways. It means that you can have an enhanced personalization of products and services and that digital goods can be created and distributed cheaply. Buyer's searching is assisted and made extremely fast and cheap by general search tools [7], and by a specialized search mechanism for price and product features. New ways of price discovery include electronic auctions, and these are intermediaries that allow the buyers to specify product requirements and to state the maximum sum they are willing to pay for this product, as well as software agents that negotiate prices on behalf of the buyers and sellers.

Information exchange between buyers and sellers is extremely fast, and this means cheaper logistics and reduced inventories. Electronic payment systems reduce the costs of financial transactions, and the micropayment system reduces the cost of small transactions. These lower costs for obtaining information on prices and the characteristics of products lead to increased competition between the sellers that are lowering the price of their products and their services. New electronic intermediaries appear, with the function of matching buyers with sellers, providing product and marketing information, managing physical deliveries and payments, etc.

### 7. SECURITY ASPECTS OF ELECTRONIC COMMERCE

There are numerous security threats associated with e-commerce such as unauthorized access to sensitive data, the destruction or altering of information, or denying service. Establishing security is therefore critical for E-commerce to be widely accepted [1], [4].

The main security functions include authentication, authorization, confidentiality, integrity, and non-repudiation of origin. *Authentication* means that the user proves his identity. This is accomplished by verifying information given by the user with information that the system already has about the user (e.g. his password or fingerprint). *Authorization* includes the control of access to particular information. *Confidentiality* is concerned with the secrecy of information and its protection from access without permission. *Integrity* includes the protection of data from modification,

while *non-repudiation of origin* involves protection against a party involved in a transaction in case that this party may later deny that the transaction actually occurred.

Since TCP/IP protocol is not secure (e.g. it doesn't involve an authentication service), specific security technologies have to ensure transaction and network security. *Transaction security* involves encryption techniques, digital signatures, digital certificates, and certification authorities. *Encryption* is used to satisfy confidentiality – a symmetric key encryption uses the same key for encryption and decryption, while a public key encryption uses a public and a private (secret) key. Encryption key management involves the generation, distribution and deletion of keys, and this is a complicated task.

*Digital signatures* are used for authentication and integrity, as well as for non-repudiation of the origin. The *digital certificate's* purpose is to check whether an encryption key belongs to the person that should possess it. *Certification authorities* generate digital certificates that include the name and the public key of the user. After this, the certification authority digitally signs the certificate using its own private key. In order to get its digital certificate, the user must appear personally in front of a certificate authority and provide satisfactory information to establish their identity. The *public-key infrastructure* (PKI) includes a technology, a set of standards, and a policy for managing certificates.

*Network security* includes firewalls and Web security. The firewall separates a private network from the Internet and checks the traffic that can pass to the private network, by using screening routers. Security protocols for the Web consist of encryption algorithms used for plain text or e-mail messages (like PGP and S/MIME), and network protocols that provide confidentiality, authentication, integrity, and non-repudiation (like SSL and PPTP).

## 8. THE REGULATORY AND LEGAL ASPECTS OF ELECTRONIC COMMERCE

Economic history proves that regulatory and legal frameworks are modified long after a new business practice is established. The rapid technological progress in E-commerce was also not accompanied with appropriate modification of regulatory and legal frameworks. In order to prevent the slowing down of the progress of E-commerce, modifications in a number of regulatory and legal framework subjects need to be done ([22], [25]). Since the electronic marketplace is global, these modifications should be agreed and implemented by the international community.

*Customs and taxation. Tariffs* for products ordered over the Internet will probably be administered, while the Internet could be declared as a tariff-free environment whenever the Internet is used to deliver goods or services. A major problem with *taxation* is in the application of existing tax schemes to E-commerce activities, since taxes in a physical economy are based on where the income is being earned. However, even for electronic transactions that involve tangible goods, it is not quite clear what represents a physical presence – an office but not a residency, a leased line, or an account with an Internet service provider. When transactions involve intangible goods



the situation is even more complicated. One possible solution to these problems is the introduction of the Internet as a duty-free zone.

*The legal issues for electronic payment systems* involve the legal validity of digital signatures and computer crime. *The legal validity of digital signatures* is extremely important since digital signatures can confirm the identity of parties that are using the Internet, and they can ensure data integrity. The digital signature is a precondition for the business itself and it is considered binding when its authenticity can be proved. Important event in this area happened on June 30<sup>th</sup>, 2000, when President Clinton signed the U.S. "Electronic Signatures in Global and National Commerce Act". It is interesting that this act states that the two entities utilizing an electronic signature define the signature themselves, so that electronic signature could be "an electronic sound, symbol, or process, attached to or logically associated with a contract".

The proliferation of digital money can enable easier *money laundering*, i.e. the moving of illegally obtained funds in order to confuse the audit trail. One of the problems in this area is in the inadequately defined legality of digital evidence in a court of law. A big problem for law enforcement in open networking environment is in detecting when a financial *computer crime* occurs, because it would require monitoring of every transaction that takes place over the Internet.

*Protection of intellectual property rights.* E-commerce involves the sale of intellectual property, and the Internet environment means one can violate its protection since those digital products that are being transmitted and can be copied without authorization. In order to encourage E-commerce, the creators and distributors of a piece of work should be efficiently protected. The solutions offered here should also assure that the functions of the electronic market would not be inhibited. Apart from the copyright issues, the other issues in this field are the protection of the databases, patents, trademarks and domain names.

Personal *privacy* protection is an important issue in the networking environment, and the accepted basic principles concerning privacy are that the data-gatherers should inform the consumers about the type of information they will collect and about the way they intend to use this information. They should also provide consumers with a meaningful way to limit the use or the re-using of personal information. These principles allow the consumers to make informed decision about their willingness to participate in a particular E-commerce activity. One delicate issue is that of the conflict between the growth of personalization services and the protection of privacy. Apart from privacy, private information integrity and quality should also be guaranteed. An important issue is that the privacy rights of individuals should be balanced with the benefits from the free flow of information.

Technical *standards* are essential in assuring that products and services from different vendors can work together on the Internet, since this encourages competition and reduces uncertainty in the electronic marketplace. Standards have to assure customers of reliability, security, the inter-operability and the scalability of electronic payments, video and data-conferencing, etc.

## 9. TRENDS IN ELECTRONIC COMMERCE

All of the available forecasts predict that both the number of Internet users and the number of users of E-commerce will continue to grow in the next few years, without a sign of soon saturation. In this section we will present some of the main trends that can be recognized in the business, technological and social issues that are concerned with of electronic commerce. Although some of these examples belong to more than one category, we decided to include them into the one category that fits them best. An exception was made for mobile electronic commerce, which is, without doubt, one of the most complex and fastest growing types of E-commerce. It is therefore treated as a separate category.

### 9.1. Mobile electronic commerce

*Mobile E-commerce* (also known as mobile commerce, M-commerce, or wireless commerce) has begun to play an increasingly important role in E-commerce because of the extremely rapid growth of a number of mobile communication devices and because of the rapid convergence of these devices with Internet technology. By mid 2000 more than 300 million people worldwide will be mobile phone users, and almost one third of Europeans currently own a cellular phone.

The third generation of mobile telecommunication networks proposes new standards like the Universal Mobile Telecommunication System (UMTS) that promises improved bandwidth, compatibility and new service opportunities. The Wireless Application Protocol (WAP) is an open protocol standard for wireless applications, which allows access to intranet and Internet applications on mobile devices. WAP-based applications are independent of the mobile equipment type, the user interface, and the network technology. WAP is a platform for the development of M-commerce applications like the Wireless Markup Language (WML) that integrates well-known Internet standards like HTML, URL and MIME. It also allows for the development of a micro browser that takes into account the specific constraints of the small screen size and the narrow-band nature of these mobile devices.

WAP allows for the development of a wide range of complex applications like content delivery (e.g. weather services and news), database retrieval and messaging services. It also makes possible transaction-based applications like ordering (e.g. books or CDs), payment, ticketing (e.g. seat reservations or train enquiries), or banking. Probably the best-known current M-commerce application is the I-Mode project, launched in Japan in February 1999. I-Mode offers a service of a continuous connection with the Internet via mobile phones. More than 350 companies provide services like news, banking, and games for I-Mode, and about 7,000 Web sites have been adapted for the operation with I-Mode. In mid-2000 this service will have reached about 5 million subscribers, and for each month some 600,000 new subscribers appear.



## 9.2. Business issues

It is expected that in the next five years *governments* all over the world will *move their departments and agencies online* [9]. A delay in switching these governments to online operations was caused by the fact that most citizens still do not have Internet access at home, and by security and trust concerns. The main effects of the government having online operations will be a reduction in purchasing and fulfilment cycles and the lowering of administrative costs, along with delivering a better service.

Apparently *B2B commerce* will grow dramatically in the next few years. Twenty eight percent of global companies are already using at least one B2B site, while an additional 25 percent are planning to use it within a year. In the U.S., the small business B2B spending increased by 138 percent in the first quarter of 2000. B2B growth is expected to result in productivity gains that would help companies to reduce their procurement costs by 10% [14]. Consumers would benefit from B2B with lower prices, a wider range of choices, and a faster delivery. Experts suggest that traditional companies should make an effort to transform their business practices if they want to survive in the B2B era.

The E-commerce industry is increasingly witnessing the growth of a *limited number of powerful companies holding most of the market*, while smaller players have problems surviving in business. A recent Internet Economy study [6] showed that in the E-commerce category the top ten companies generate 35 percent of all revenues. A study of pure Internet companies, done by the Internet World magazine [15], shows that the leaders in practically all the categories of online business have revenues 2-8 times bigger than the second company in their category.

*Online retailers* have a hard time, as they have exceptionally high advertising expenses and they are forced to offer extremely low prices to keep customers from visiting rival Websites [5]. Experts estimate that, on average, Web companies spend between \$45 and \$200 to acquire a customer, who will then typically spend \$35 on the site. Some start-up companies continue to loose money, while some of the big online retailers have serious difficulties staying in business. However, well-funded online companies and reputable brand names are likely to succeed in electronic retail, and Jupiter Communications predicts that online sales to will rise by 53% in 2000.

One of the most promising E-commerce business models seems to be the Application Service Provider (ASP) model. It offers software service on demand over the Web to corporate and private clients. The Gartner Group found that cost savings made by employing ASPs could reach 80 percent, while in a recent Jupiter Communications poll, 57 percent of respondents expect to use these ASP services in the future. The next step in Internet-based outsourcing is expected to be the growth of the Full Service Providers (FPS), and they will offer professional services in human resources, legal areas, sales and in other areas.

## 9.3. Technology issues

In the next few years E-commerce will be available on other devices as well as the PC, and it will have other tools along with the Web browser. E-Commerce will be

embedded in appliances and systems at home and in the environment. *Embedded E-commerce* will probably be used for routine tasks such as re-stocking supplies in warehouses or for scheduling car maintenance.

Digital television is an important broadband service that will mean huge increases in the number of TV channels that are available. It will be interactive and may become a gateway to the Internet in everyone's home. Digital TV is expected to bring about a number of new business opportunities and telecommunication services for both businesses and consumers. Banking transactions can then be carried out, information can be sold, and shopping the mall will be improved with the help of photos or video equipment.

XML is a markup language that has been recently developed and it can represent information by using its structure and semantics. This enables computers to understand the meaning of the information and process it in an intelligent manner. People can read this information from Websites while the software agents can process the same information automatically, without human intervention. Software agents will thus be able to make reservations for a flight, or make a payment using a digital currency. XML will also make information retrieval much faster and much more efficient, since search engines will only take into account the information with a specific meaning. However, in order to enable use of XML, each industry will have to set up its own standards for document structures.

*Security* is of great concern to E-commerce users that are very much aware of the growing number of computer security incidents. These kinds of incidents in the U.S. tripled in 1999, and a number of high profile incidents that occurred during 2000 include a denial of service attacks that shut down Websites of large corporations such as Yahoo! and CNN. The "Love Bug" virus affected networks throughout the world, and hackers broke into AOL's consumer database that contains information about some 23 million users. One of the innovative technological approaches to improving security has been the introduction of *biometrics technology* and this may enhance or even replace passwords. Microsoft, for example, intends to incorporate biometrics technology into new versions of Windows, by using an application-programming interface that allows the biometrics tools, such as eye and fingerprint scanners, to communicate with the operating systems. Another approach is that of using *neural networks* to identify hacker attacks.

Security is also dealt with by governments and in industry. The Council of Europe, in co-operation with the U.S., Japan and Canada, is preparing a treaty to standardize cyber crime laws, while President Clinton included \$2 billion from his 2001 budget proposal to protect the nation's critical infrastructure. In May 2000 a number of companies got together in California for the First Internet Defense Summit, with the aim of initiating the development of methods and standards to counter deal with potential cyber threats.

#### 9.4. Social issues

The growth of E-commerce mainly depends on the *E-commerce professionals* (e.g. marketing executives, content creators, or product line managers). If E-commerce will



grow as fast as predicted, over the next 5 years about 20 million E-commerce professionals will be needed, and this surpasses the number of IT workers available on earth [10]. There are two possible approaches to closing the gap between the demand for workers and the number of skilled workers that are available. One approach is to reshape the education system, along with training and retraining, while another is to reshape the software so that it will be much more effective in developing applications, much more reliable in operations, and it will require minimal human intervention.

One of the difficult questions facing *governments* is what should they do, or refrain from doing, with those regulatory and tax functions that are applied to the Internet environment since it is so very different from a traditional geographical environment. The U.S. Internet Council recommended that governments focus on informing industries about the high priority of the public policy goals for their nation. They should also encourage the usage of tools that help people to protect themselves from inappropriate materials contained on the Internet. Governments should rely on the Internet community to regulate itself where possible, and they should have serious discussions with industry leaders and academia on this issue. Legislators need to become increasingly Internet-aware, and they should seek out experts on the cutting edge of the technology.

People with *disabilities* may have serious problems in using the Web for business and other purposes, especially because of the extensive use of images and sounds. They may not be able to see, hear, move, or they may not be able to process certain types of information easily. The World Wide Web Consortium (W3C) has developed the Web Content Accessibility Guidelines and they discuss accessibility issues and provide accessibility design solutions. W3C has also developed HTML Accessibility Improvements, and works on a Voice Browser that will use speech recognition and speech synthesis technologies in order to enable access to the Web based services via the telephone.

Although just over 50 percent of all Internet users are native English speakers, the *English* language currently dominates the Internet. About 78% of all Websites and 96% of all E-commerce sites are in English. However, non-English usage in Websites is increasing, as can be seen by the growing interest in portals that use a domestic language. Currently, 4 of the top 10 Web domains in Germany, and 5 of the top 10 in France, are local. The *online address system* is finally starting to work with languages that do not use the Roman alphabet - this is a rather late move since about 20 percent of Internet users do not read languages based on the Roman alphabet or Arabic numerals. A serious problem at the moment is that there is no standard for compatibility between new technologies that enable users to register domain names using non-English characters, and the lack of such a standard also prevents these users from moving/switching to online addresses that use non-English characters.

## 10. CONCLUSIONS

Although still in its infancy, the Internet Economy has already become a vital force within the economy, whilst competing with major industrial branches of the physical economy. The rapid growth of the Internet users base, as well as the rapid growth of

the Internet-related revenues and employment, is continuing to stimulate the launching of new and pure online companies, as well as making traditional brick and mortar companies reshape or expand their businesses into the online world.

Electronic commerce, one of the key parts of the Internet Economy, is expanding rapidly and is constantly being transformed through major innovations. E-commerce is changing the business landscape of the whole planet, and it presents huge opportunities for business and regional growth. A speedy implementation of E-commerce is extremely important for businesses and governments; therefore, favourable conditions for its development have to be created. The most important areas that need to be dealt with here are the development of the infrastructure and services, the creating of an appropriate regulatory and legal framework, and promoting a favourable business environment.

The development of E-commerce is based on innovation, and that means a growing need for a skilled and flexible workforce, a very scarce resource today. Moreover, only well-educated workers will be flexible enough to adapt to the constant changes in the skills required for the workplace. All these facts mean that the urgent development of new models of education, training and lifelong learning is essential.

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## INTERNETSKA EKONOMIJA I ELEKTRONIČKO POSLOVANJE

### Sažetak

Rad daje pregled i trendove razvoja internetske ekonomije i elektroničkog poslovanja. U prvom dijelu rada opisan je utjecaj informacijske tehnologije na ekonomiju. Zatim su opisane osnovne komponente internetske ekonomije, tj. ekonomije temeljene na Internetu, kao i rezultati istraživanja o prihodima i radnim mjestima povezanim s internetskom ekonomijom. Elektroničko poslovanje označava izvođenje poslovnih aktivnosti s pomoću računalnih mreža. U radu su opisane osnovne komponente elektroničkog poslovanja kao i njegovi tehnički, poslovni, sigurnosni, regulatorni i pravni aspekti. U završnom dijelu rada dana je analiza trendova u poslovnim, tehnološkim i društvenim aspektima elektroničkog poslovanja.

**Ključne riječi:** elektroničko poslovanje, internetska ekonomija.