

# **ICT and e-business development by the Ukrainian enterprises: the empirical research**

Nataliia Medzhybovska

Odessa National Economic University, Odessa, Ukraine

nmedzh@oneu.edu.ua

**Abstract.** This paper presents the results of the research about the level of information and communication technology (ICT) implementation by the Ukrainian enterprises. We studied different Web-sites and made more detailed research about ICT implementation at the Odessa industrial enterprises. The conclusion is made that the state of Odessa e-commerce market does not correspond to the current state of ICT development, nor to the needs of the information society development in our country. The research of industrial enterprises shows insufficient use of the advantages, which can bring the effective use of ICT. Most businesses, despite the relatively high level of technical equipment, automate only a part of routine operations. Most administrative functions are performed by traditional methods, using only e-mail. Thus, the Ukrainian enterprises are facing an urgent task of the most effective use of available human and ICT potential to improve their performance and competitive position at the market.

**Keywords:** Industrial enterprises, business partners, information and communication technology, e-business, e-commerce, Web-site, intercompany interaction, electronic information interchange.

**Key Terms.** Development, industry, research.

## **1 Introduction**

Nowadays e-business in Ukraine relates mostly to online retail shopping and to searching of relevant information and slightly extended to intra- and intercompany interaction. Moreover, the benefits of e-business are not used by all business sectors in Ukraine. The most developed in terms of Internet penetration are banks, large retail chains, high-tech enterprises, enterprises in leisure activities and entertainment, etc. Unfortunately, the industry – the main and leading sector of material production in Ukraine – lags in the context of the use of e-business tools to improve the efficiency and competitiveness of domestic enterprises.

The paper is organized as follows. Section 2 elaborates on theoretical underpinnings, and presents an overview of the related works. Section 3 provides the research methodologies and the empirical results. Section 4 concludes.

## **2 Related works**

International researches show that “there is a growing amount of evidence from developed and developing countries that the adoption of ICTs by enterprises helps accelerate productivity grows, which is essential for supporting income and employment generation. More widespread adoption of ICTs in the productive sectors of developing countries should also accelerate innovation and thus enhance the competitive position of developing countries” [1].

A considerable amount of researches identify the benefits that brings the use of e-business tools for industrial enterprises. Researchers stated that “the potential of B2B e-commerce is not captured by merely automating document printing and mailing operations of transactions, but by encompassing all trading steps and collaboration between business partners. Firms need to realize the importance of cross-firm process integration and make determined efforts to integrate B2B e-commerce in critical business processes” [2]. Several studies concern to barriers to the implementation of B2B e-business solutions [3], the conditions necessary for their successful adaptation [4] and others.

Importantly, many researches confirm the fact that e-business in B2B is less developed compared with e-business in B2C. Scientists comprehend the reasons for this situation in the differences between B2B and B2C markets. For example, Harrison et al. identified 10 reasons, including more complex decision-making unit and associated with it increased rationality of buyers, the complexity of production, the limited number of buying units, far fewer behavioral or needs-based segments, importance of personal relationships, long-term purchases or at least purchases which are expected to be repeated over a long period of time, etc. [5]. Wright has identified the following features of B2B: decision-making structure is complex and the process involves a lot of people; decision-making could be delayed, depending on the purchase value; rational reasons for ordering; high value of product/service, contacts, projects and consulting; the final consumer probably will not be a decision-maker; since the process time increases, suppliers have the access to decision-makers [6].

In our opinion, the sufficient reason for backlog of e-business development by the Ukrainian industrial enterprises is also the backwardness of the employees who do not tend to improve their skills in the ICT field, fear of change and therefore limitation themselves to existing business practice. On the other hand, the advance of B2C sector in this area can be explained by the voice of customers who do not satisfy by the old methods of obtaining information and traditional relationships. In other words, the B2C sector is forced to respond to the market needs for maintaining its competitiveness. This need for B2B sector in Ukraine as well as for internal and intercompany automation, in our view, has not formed yet.

### **3 The Research**

#### **3.1 The methodologies used for e-business development research**

This section presents the methodologies for the evaluation of e-business and ICT in use maturity in Ukraine on the example of the Odessa enterprises. The study was conducted in two directions.

Within the first direction, we examined the large number of enterprises in Odessa region. These companies were divided into the two groups: the industrial enterprises and companies in other business fields. We analyzed all industrial enterprises listed at the Odessa official site <http://www.odessa.ua> (in total 161 companies). Enterprises of other business areas were chosen randomly using the Internet handbook “World Gold Page. All Odessa” at [www.mercury.odessa.ua](http://www.mercury.odessa.ua) and partly on the Odessa official site (total 664 companies).

Companies were chosen from different fields of business, they have different forms of ownership, scope of activities, etc. Choice of the specific number of companies in each area were dependent on its scale and popularity in Odessa and Odessa region. Odessa is a major business center in Ukraine, therefore the study of the level of ICT in use maturity at the Odessa enterprises is quite representative for Ukraine.

The purpose of this study is the investigation of these companies' presence in the Internet and a comparison between industrial enterprises and companies of other spheres of activity. We understand that having a Web-site does not fully indicate the involvement in e-commerce and/or e-business, but it is minimal and necessary condition for this purpose. In this context, we determine not only the existence of Web-site, but also make a detailed study of different kinds of Web-pages for named companies.

The second direction is represented by a detailed study of the level of ICT use and e-business development at the 12 industrial enterprises in Odessa, including 5 engineering companies, 3 food processors, 2 enterprises of fabricated metal products, 1 cable plant and 1 plant for the plastic products production. Research was made on the basis of employees' survey data and state statistical observation (form № 1-ICT “Information and communication technologies and e-commerce in enterprises”).

On the basis of these documents, 18 indicators have been allocated, characterizing the level of ICT in use maturity and e-business development at the enterprise.

On the basis of the expert survey were identified the levels of: achievement of the objectives of information systems; the Internet use; duties automation; achievement of automation benefits. These indicators were determined based on the frequency of positive respondents' answers to the questionnaire.

Part of transactions with suppliers / customers / other organizations that are implemented via electronic information interchange (EII), as well as the part of functions that are provided by Web-site, were determined on the basis of form № 1-ICT. In this case we also used the frequency of positive answers to the relevant questions of the state statistical observation.

It should be noted that we use the term of “electronic information interchange”, which assumes the use of computers and communication tools to transmit information. It includes exchange of information through the enterprise Web-site /

Web-portals including publication of information, upload / download documents, e-mails; automated data interchange systems, which exchange data in real time over a coherent structure, format and data transmission standards with minimal or no human intervention (XML, EDIFACT, etc.).

The author believes that this term adequately reflects the whole spectrum of transactions, which is mentioned in the relevant paragraphs of 1-ICT form.

Answers to questions of form № 1-ICT allow also to define the part of products which are sold via computer networks; part of material resources purchased via computer networks; availability of personal computers for administrative staff and employees; part of personal computers connected to the Internet. These parameters were defined as the quotient between the corresponding data.

The quality of the Internet connection is also determined on the basis of form № 1-ICT. The answers to this question are qualitative, so it is necessary to transform them to the quantitative form. For this reason we conducted the survey of the ICT professionals regarding the weights for different variants of Internet connection. It was found that the most relevant criteria for assessing the level of Internet connection is the connection speed, because of other communication quality parameters such as the level of support, the stability of the signal response to faults, etc. depend on the quality of a particular ISP, not on the way the Internet connection. For further calculations we used the arithmetic mean value of the respondents' answers. For each company it was compared with the maximum possible/progressive method (combination of methods) of Internet connection.

Availability of LAN, wireless LAN access, intranet and extranet were evaluated on the basis of answers to the relevant questions of form № 1-ICT. Answer "Yes" is set to 1, answer "No" is set to 0.

Assessment of the ICT in use maturity e-business development at the industrial enterprises on the above parameters was carried out using a software package for statistical analysis "Statistical Package for the Social Sciences" SPSS.

### **3.2 Comparative analysis of e-business development**

The results of comparison of e-business adoption between Odessa industrial enterprises and enterprises of other business fields are following.

The research shows that from 161 industrial enterprises only 64 have the Web-site (40%), that indicate an insufficient level of e-business implementation in Odessa industry. We are sure that high quality Web-site can become a gateway for industrial enterprises to attract new business partners, conduct competitive procurement, provide the comprehensive information about its products, offer secure and controlled communication with business partners, etc. From the other hand, 329 companies from the 2nd group (50%) have its own Web-site.

In both cases, Web-sites often provide information in Russian language (for industrial enterprises – 89% that have Web-site, for companies in other fields – 93%). Publication information in Ukrainian is at 23% and 20% of Web-sites respectively, in English – 41% for both groups. Obviously, multilingual information is essential for companies interested in attracting a great number of customers and business partners.

We discovered the following methods of communication with companies employees through Web-site. For industry each has phone number, 72% contain the mailing address, 87,5% – email address (20 of them hosted on free hosting, that indicate a lack of attention to the positive reputation in the e-commerce market), chat, feedback service and sms are not popular (8%, 27% and 8% respectively). For companies in other business fields phone number presented at 94% of Web-sites, e-mail address – at 78%, mailing address – at 53%, feedback service – at 23%, chat – at 8%, sms – at 4%. It is logical that availability of free channels of communication for B2B sector is not as critical as for B2C e-commerce, but the presence of multiple communication channels is helpful. Furthermore, in this case it is important that communication channels are personalized (e.g., the purchasing issues should be addressed directly to the sales department, proposals from suppliers – to the procurement department, etc.). Moreover, such requests should be fixed in order to monitor the timeliness and completeness of its accomplishment.

The following results describe the quality of information presented at the companies' Web-sites. Complete information about the products is available at 90% of industrial Web-sites, partial – at 8%, no product information – at 2% of Web-sites. Complete information about the products is available at 76% of Web-sites of other business fields companies, partial – at 23%, no information available – at 1%. These figures clearly show lack of attention of Ukrainian enterprises to the use of Internet as a cheap and convenient channel for information dissemination. We believe that information about the company's products should be presented at the Web-site with the required level of detail, in some cases – with the drawings and specifications. The companies Web-site is also should have the full information about the enterprise and provide standard contracts forms, business rules, etc.

Further, the research found that industrial enterprises do not use social networking. We believe that social networks should be used by companies to maintain personal contact with business partners and to create the specific professional communities. The data regarding the presence of other business fields companies in social networks are the following: the Facebook pages have 8% of firms, accounts in Twitter – 5%, in YouTube – 4%. Moreover, for B2C companies and consumer goods' producers the social networking is critical for increasing the loyalty of existing and attracting new customers.

We also investigated the availability of information about the companies which do not have Web-sites, on the popular Ukrainian Internet portals such as Prom.ua, Businessua.com, Ua.all.biz. We proceeded from the assumption that if the company does not have a Web-site, it should have an account at the niche portals to implement at least the minimum presence in the Web.

The research shows the following data: at the Prom.ua we found 9% of the industrial enterprises, which do not have own Web-site, at the Businessua.com – 3%, at the Ua.all.biz – 26%. There are no information at these portals for 64% of industrial enterprises which do not have its own Web-site.

For companies of other business areas the data is following: 3% of companies which do not have Web-site, we found at Prom.ua, 0,6% – at Businessua.com, 6% – at Ua.all.biz. The information about 90% of companies which do not have their own Web-site, we didn't find at these portals.

Thus, the example of Odessa enterprises shows the unsatisfactory level of e-business development for both groups of enterprises. Moreover, it is the obvious gap in the e-business development by the industrial enterprises as compared to businesses of other fields. Many enterprises do not have their own Web-site, most of these companies do not even presented at the most famous Ukrainian portals. Companies that have Web-sites show its insufficient quality. Furthermore, the industry did not use the resources of social networking for disseminating information and supporting its business partners loyalty.

### **3.3 Research of the ICT development at the industrial enterprises**

Evaluation of the ICT in use maturity at the Odessa industrial enterprises of the chosen sample allowed to make following important conclusions.

On average, the surveyed enterprises use information systems to achieve  $2,4 \pm 0,2$  purposes from 6, and the most popular purpose to use information systems is improving the access to information (78% of enterprises).

Internet in the surveyed companies is used to perform an average of  $4,1 \pm 0,4$  duties from 11. The most popular direction of Internet usage are message and document transfer to business partners (79% of enterprises), to employees and superiors (67%) and search for suppliers (62%).

On average, the surveyed enterprises automate  $1,9 \pm 0,3$  duties from 8. The leader among the responses is reporting (45% of enterprises).

Automation of duties allow to realize an average  $4,0 \pm 0,4$  purposes from 13 at the surveyed enterprises. The most commonly implemented objectives are speeding the paper documents preparing (84% of enterprises) and its transfer to employees and superiors (67%), reducing its number (79%).

Electronic information interchange with suppliers implemented by 5 enterprises from 12. These enterprises use EII on average  $6,0 \pm 0,2$  transactions with suppliers from 7, and all enterprises use EII for the transferring orders to suppliers, receiving electronic invoices and product information from suppliers.

Electronic information interchange with customers is implemented on the same 5 companies from 12. They realize an average of  $5,9 \pm 0,2$  transactions with customers from 7, and all these companies send electronic invoices and information about its products to customers.

Electronic information interchange with other organizations is executed by all enterprises. On average, they realize via EII  $5,5 \pm 0,2$  operations with other organizations from 7, with the most popular such as: obtaining banking and financial services (94% of enterprises), information from government agencies (90%), documents from government agencies (85%), returning of completed forms to government institutions (81%), sending or receiving data to/from government institutions (79%), sending payment orders to financial institutions (60%).

Level of EII with other organizations for all enterprises significantly exceeds the level of EII with suppliers and customers. From our point of view, this situation is caused by the availability of the relevant proposals and realized possibilities from the government institutions and banks/financial institutions (receiving and returning of

electronic documents, executing the administrative procedures, submitting proposals, using the Internet banking, etc.).

Web-site is available for 6 companies from 12, and it provides on average  $2,3 \pm 0,4$  functions from 6. All Web-sites contain product catalog or price list, but only one company realizes all features listed in the form № 1-ICT.

Although five companies in the study group show the automation of certain procurement and marketing functions, this automation is very limited and is implemented mainly by sending e-mail notifications to some business partners.

An indirect proof of this fact is the almost complete lack of material resources and finished products, which are purchased/sold via computer networks. Only one company 75% of its products realize through computer networks. Other company only a very small amount of its production sold this way (0.001081%), and a small part of material resources purchased via computer networks (0.01328%). Therefore, we have no reasons to report about mass and systematic electronic sales and procurement for the study group of enterprises.

An interesting analysis of the ICT equipment level for the study group of enterprises. Thus, the availability of personal computers for administrative staff indicates the gap in the level of company computerization. One company has this value higher than 5, three of them – near 1, but two – less than 0,1, others – near 0,5. The study also shows the gap between enterprises in PCs availability for employees. These values vary between 0,022 and 0,572.

It should be noted that industrial enterprises have different level of Internet connection (four of them – 100%, five – near 70%, three – only near 30%). Five enterprises apply the most advanced methods of Internet connection, including mobile communications, which increases the efficiency and timeliness of information transfer and processing, but four companies use broadband Internet connection with maximum speed 24 Mbit/s and three still use outdated analog modem or an ISDN connection.

Almost all companies have local computer network, 5 of them use a wireless LAN access. Two companies have internal computer network (intranet) and extend it for the business partners (extranet). In other words, they have the technical ability for intra- and intercompany collaboration.

Thus, the results of this research do not allow us to state the mass implementation of ICT and e-business by the Odessa industrial enterprises. In most businesses, despite the relatively high level of technical equipment, only a part of routine operations are automated. Most administrative functions are performed by traditional methods, using only e-mail.

## 4 Conclusions

During the conducted research, we attempted to study, firstly, the level of e-business development by the Odessa enterprises of industry and other spheres of activity, and secondly, the level of ICT usage at the Odessa industrial enterprises.

Based on this research we can make several important conclusions:

1. The state of Odessa e-business market does not correspond to the current level of ICT development, nor the needs of the building the information society in our

country. More than half of the companies do not have its own Web-sites, they are poorly represented in social networks and in niche portals on relevant topics. Detailed research of existing Web-sites showed its low quality. Web-site content and quality of its services, including on-line ordering and payment, secure communication, etc. require radical restructuring.

Comparative analysis of presence in Internet of industrial enterprises and companies of other fields of business showed the significant lag of industrial enterprises in terms of providing the information and interaction with customers and business partners. Thus, an urgent task for the Ukrainian enterprises is the most effective implementing of e-business tools into a business practice.

2. Research of the ICT equipment of the industrial enterprises showed its insufficient use, and failure to obtain the benefits that bears its effective implementation. Automation covers mostly routine paper operations, they have a very primitive mode of electronic communication with business partners and employees (often only e-mails), e-procurement and e-sales are not implemented at all, although the level of technical equipment and Internet connection are relatively high.

3. The most unfavorable situation is in the field of intercompany electronic interaction of the enterprise with its customers and business partners. The study shows almost complete absence of electronic procurement and sales. Some enterprises realize only electronic information interchange, but only with those organizations that have provide relevant technical and other possibilities for this purpose (government organizations, banks/financial institutions).

Summarizing, we can note unsatisfactory use of the ICT benefits and e-business development by the Odessa enterprises.

It should be noted that this study is only the first attempt to analyze the situation in the field of adaptation of e-business tools and ICT by the Ukrainian enterprises, so allow only to formulate the challenges in this business field. Future research should be conducted on a regular basis with the justification of representativeness (typicality) of selected companies. It also should study the companies from all regions of Ukraine, separating them by industry, type of ownership, size, etc. Also limitation of this research is the resistance of most businesses for detailed study of their activity.

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