Analysis of the exploitation of information and communication technologies in the agri-food sector companies

Analýza využívania informačných a komunikačných technológií v podnikoch agrosektoru

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Abstract: Information and communication technologies are an essential source of success in the current information society. Effective exploitation of ICT requires expert knowledge in the areas of hardware, software, IT marketing and IT security. If the company does not want to be out of *step* with competition and information progress as well, it must react flexibly to the changes in the IT market. The aim of this article is to review the exploitation of information and communication technologies in agri-food sector companies and to find the appropriate combination of various ICT elements that their use will be effective in carrying out business activities and proposing concrete company solutions.

Key words: information and communication technologies (ICT), Internet, agri-food sector companies, statistical methods

Abstrakt: V súčasnej informačnej spoločnosti sú informačné a komunikačné technológie základným zdrojom úspechu. Efektívne využitie IKT si vyžaduje odborné znalosti v oblastiach hardvéru, softvéru, IT marketingu a IT bezpečnosti. Ak nechce podnik zaostávať za konkurenciou, ani v informačnom pokroku podniku, musí reagovať pružne na zmeny na trhu IT. Cieľom príspevku je zhodnotiť stav využívania informačných a komunikačných technológií v podnikoch agrosektoru a nájsť vhodnú kombináciu jednotlivých prvkov IKT, aby ich využitie bolo efektívne pri vykonávaní podnikových činností a navrhnúť konkrétne riešenia pre podnik.

Kľúčové slová: informačné a komunikačné technológie (IKT), Internet, podniky agrosektoru, štatistické metódy

The current economic and market situation, the beginning of the information society and an open market of the European Union represent a serious challenge for companies and the verification of the abilities to adapt to new conditions. Quality, efficiency, success and competitiveness of production will depend on the skills and speed, with which the companies will be able to adapt to the social and technological development. In the first place, it is about the assimilation into the European environment, the adaptation to the new technology and information technologies, creating new marketing roles with respect to the current economic recession. Information and knowledge are a crucial source of ideas for the management and know-how in production and sales, and thus they are becoming another factor in the company success.

Information and communication technologies bring many benefits to the company and no doubt improve the work in the company at all levels. The entrepreneurial business development strategy must undoubtedly deal with the deployment and the subsequent use of information and communication technologies and internet services in the company. Due to the dynamic development of ICT, the emphasis is placed on the regular upgrade and ICT modernization.

Effective company management can only be reached with the information and communication technologies. Companies that respond flexibly to the progressive changes in the information field have a competitive

advantage over other companies. No company can be satisfied with the current situation, but it is necessary to think about the future. And the future is in information technology.

Problems connected with the use of information and communication technologies and Internet services are also discussed in the works of Popelka (2000), Hennyeyová and Okenka (2004), Šajbidorová and Tóthová (2004), Bielik and Sojková (2006), Korcová (2006), Kretter and Hennyeyová (2006), Horská and Sparke (2007), Depeš (2008), Šilerová and Kučírková (2008) etc.

MATERIAL AND METHODS

Agriculture is one of the most important sectors of the economy and its primary role is the nutrition of the population. Agriculture has a very significant impact on the quality of the countryside and the environment. A typical feature of agricultural production is the link to one of three basic factors of production – land. The land acts as a means of production and with regard to its segmentation, diversity and quality, the land is highly variable. Another, equally important, a specific feature of agricultural production is the weather and the short lifespan of primary agricultural products.

Among the agri-food sector companies , there dominate, considering their production orientation, agricultural and food companies, from the point of size, the sector is dominated by small and medium-sized companies, and from the viewpoint of legal form, it is dominated by cooperatives and business companies.

Slovakia has about 4 904 thousand ha of land in total. The utilized agricultural area in 2008 was around 1 937 thousand ha. The arable land area is about 1 349 thousand ha. The area of the utilized agricultural land has decreased since 2001 by approximately 45 thousand ha per year and the arable land area by about 8.5 mil. ha per year. The main reasons are urbanization, roads construction, planning of industrial parks and other investment activities.

Year 2009 is the fifth year of the application of the Common Agricultural Policy in the Slovak agriculture. The objectives and priorities of agricultural policy for the years 2007–2013 are based on the approved documents of the European Union and the Government of Slovak Republic. The basic long-term goal is to strengthen the functionality and stability of rural areas by agricultural development in all production conditions of the Slovak Republic. Partial priorities are the rational use, protection and restoration of natural resources, maintaining cultural landscapes and rural settlements (Green Report 2008).

In the future, the Ministry of Agriculture will focus on the following three main objectives and priorities of agriculture and food processing:

(1) to ensure a competitive agriculture and food processing and a viable rural development and rural employment
(2) to ensure a sufficient supply of safe and quality food for a healthy nutrition of the population
(3) to improve the environment and agricultural land.

In the second half of 2008, there was completed a questionnaire to determine the current status of information and communication technologies and their components in the agri-food sector companies. Within the questionnaire, there were involved primary agricultural companies, food companies and other agricultural companies.

The questionnaire presents a research technique for the collective and relatively quick survey of information about the opinions and attitudes on issues and facts through a written notice of the investigated entity. The main goal of the questionnaire was to find out the status of the ICT exploitation in the agri-food sector companies, to analyze the results and to make a conclusion offering concrete suggestions and solutions for the company.

The questionnaire consisted of 28 questions in four main subject areas:

(1) Use of ICT (hardware + software) in the companies.
(2) Use of internet and various parts of internet in the companies.
(3) Exploitation of advertising as a marketing tool and electronic promotion as a form of electronic advertising.
(4) Economic situation and the assumptions of the ICT development in the future.

There have been used several statistical methods to achieve the set objectives:

– **Analysis of variance (ANOVA)** – examines the dependence of the interval variable Y on one or more nominal variables (factors). The simplest case is a one-factor ANOVA. The ANOVA comprising two or more factors is called the Multi-factor analysis of variance (Multifactor ANOVA). The selected sample is divided into groups according to the factor variations and tested as to whether the measured differences between the group averages are only random or statistically significant. If the averages of these groups differ, it is a statistically significant factor, so the dependent variable really depends on the factor.

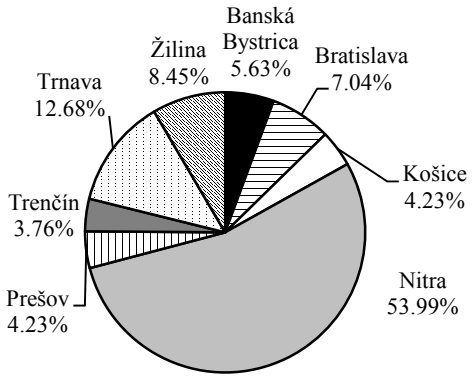

Figure 1. Division of companies by region

Source: Custom processing

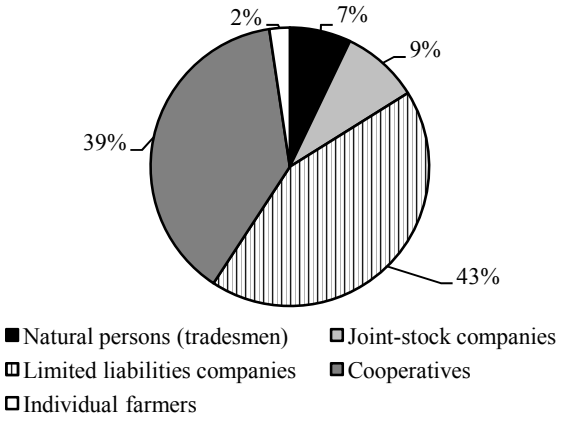

Figure 2. Division of companies according to legal entities

Source: Custom processing

– χ^2 **distribution** (or chi-squared distribution) was used by testing between the qualitative variables. Pivot tables are an important part for examining the association. The test consists in comparing the empirical and theoretical frequencies; it means what would be the empirical frequency, though they were independent characters.

RESULTS AND DISCUSSION

213 agri-food sector companies were involved in the survey; all regions of Slovakia were represented. Most companies, more than one half (53.99%), are situated in the Nitra region. The smallest share of companies (3.76%) was in the region of Trenčín. The percentage division of companies by regions can be seen in Figure 1.

According to legal form, there dominated the limited liability companies (43.13%) and cooperatives (38.39%). Joint-stock companies represented 9%, natural persons (tradesmen) 7.11% and least represented group were individual farmers – 2.37% (Figure 2).

The companies are increasingly aware of the need and benefits of ICT. If the company wants their employees to work as efficiently as possible, they must work with information technologies. In almost half of the respondent companies (49.30%), from 0–20% of employees use computers. From 20 to 40% of employees use computers in almost every fourth company (24.41%). In 13.62% of companies, 40–70% of employees use computers, and over 70% employees use computer in 12.68% respondent companies. Figure 3 shows the difference between the shares of employees using computers according to the company orientation.

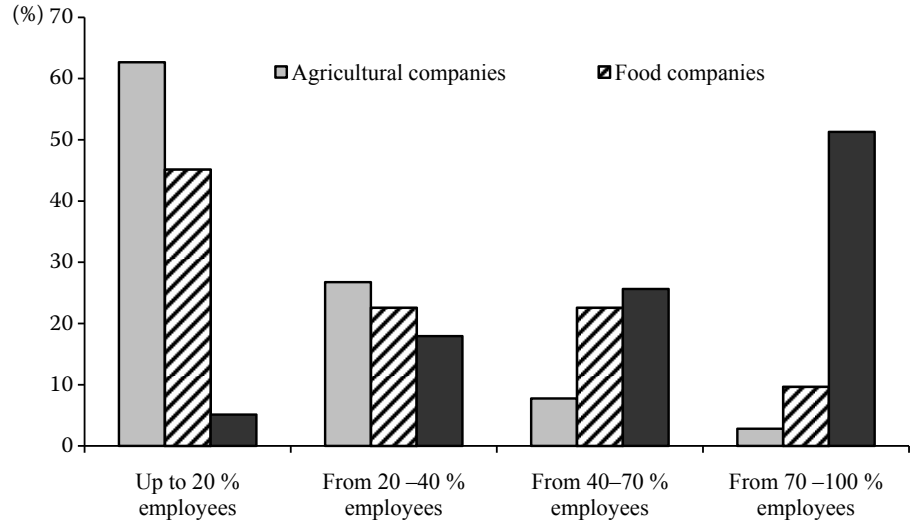

Figure 3. The share of employees using a computer in agri-food sector companies.

Source: Custom processing

Table 1. Testing dependence between the share of employees using computers and legal entity, company orientation and economic situation

Statistics	Legal entity	Company orientation	Economic situation
Chi-Square	56.5941	94.6027	10.2924
P-value	< 0.0001	< 0.0001	0.3273

Source: Custom processing

Table 2. Testing dependence between exploitation of camera system or an access system and legal entity, company orientation and economic situation

Statistics	Legal entity	Company orientation	Economic situation
Chi-Square	12.2802	29.6613	10.4701
P-value	0.2667	<.0001	0.1062

Source: Custom processing

In examining the differences in the share of employees using computers among the legal forms, the company orientation and the economic situation, there was used the chi-square test. A statistically significant difference in the share of employees using computers is in relation to the legal form and the company orientation, whereas the P value is significantly lower than the chosen level of significance – 0.05. The share of employees using the computers in relation to the economic situation was not confirmed, as *P* value ($P = 0.3273$) was greater than 0.05. Table 1 displays the test results.

The camera system as a means of security of the company objects is used in the total 19.81% of agri-food sector companies and the access system is used in 12.26% of all companies. Almost half of the respondent food companies use the access system and the camera security system (45.16% of all food companies). Just about every twentieth agricultural company (farm) has the access system (5.67%), a slightly more often they use the camera system (15.60%). Other agricultural companies use the access system only partially (7.69%); a slightly greater is the use of the camera system (12.82%). As can be seen in Figure 4, the greatest emphasis on the safety is placed by the food companies, even though the overall lack of security in the agri-food sector companies is high.

The exploitation of the camera system or the access system is not significantly affected and thus not independent on the legal form and on the economic situation. The estimated hypothesis of independence is also partly confirmed. A statistically highly significant dependence exists in the exploitation of the camera system or the access system in relation to the company orientation, as the *P*-value for the chosen level of significance – 0.05 was almost zero ($P < 0.0001$). The results are shown in Table 2.

More than 80% of food companies and other agricultural companies already have created a web page, eventually they think about it. In contrast, only 29.41% of agricultural companies have its own web page, which they explain mostly by the fact, that they have long-term contracts and there is always an interest in their products, so they consider their own web page useless (Figure 5).

In examining the differences in the use of own web page in relation to the legal form, the company orientation and the economic situation, there has been confirmed the hypothesis of dependence in two

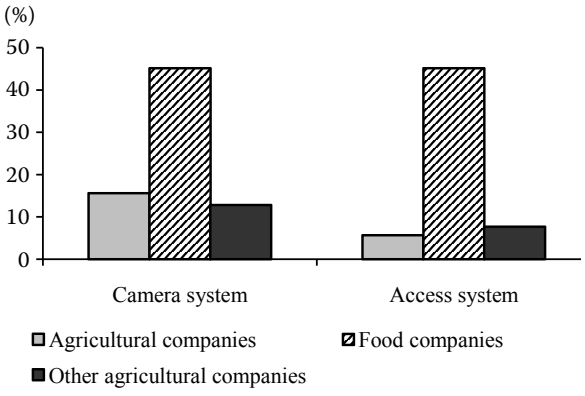

Figure 4. Exploiting of access system and camera system in agri-food sector companies according to company orientation

Source: Custom processing

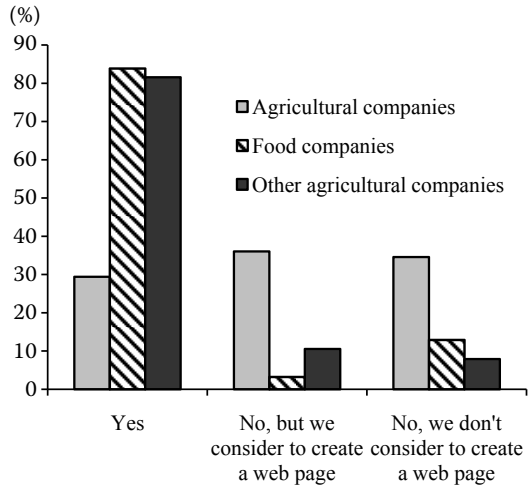

Figure 5. Web page in the agri-food sector companies according to company orientation

Source: Custom processing

Table 3. Testing dependence between exploitation of own company web page and legal entity, company orientation and economic situation

Statistics	Legal entity	Company orientation	Economic situation
Chi-Square	54.4618	55.1784	7.6883
P-value	< 0.0001	< 0.0001	0.2618

Source: Custom processing

cases. Using its own web site depends on the legal form and the company orientation, as the resulting *P*-values are almost zero. Independence has been confirmed in respect of the use of the web page on the economic situation, whereas the *P*-value is higher than the level of significance – 0.05 ($P = 0.2618$). Table 3 shows the testing results.

Almost three quarters of the agri-food sector companies (74.88%) are planning a further ICT development, of which 62.32% of the companies in which the ICT status is sufficient and 12.56% of companies where the ICT status is not sufficient. Of the remaining 25.12% of companies, there are only 2.90% of such companies in which the ICT status is not sufficient, even though they do not plan a modernization. 22.22% of agri-food sector companies consider the ICT status as sufficient and they do not plan a modernization. The planned ICT modernization in agri-food sector companies according to the company orientation is given in Table 4.

Table 4. Planned ICT modernization in agri-food sector companies according to company orientation (%)

ICT modernization	Agricultural companies	Food companies	Other agricultural companies
Planning modernization	75.54	79.31	69.23
Non-planning modernization	24.46	20.69	30.77

Source: Custom processing

Table 5. Testing dependence between ICT modernization in agri-food sector companies and legal entity, company orientation and economic situation

Statistics	Legal entity	Company orientation	Economic situation
Chi-Square	28.0930	38.3882	25.1857
P-value	0.0017	< 0.0001	0.0003

Source: Custom processing

In examining the relationship of the development and ICT modernization in agri-food sector companies according to the legal form, the company orientation and the economic situation hypothesis of independence, the working was not confirmed. In all cases, *P*-values were significantly lower than the 0.05 level of significance. The difference observed in the planning of the ICT development in relation to the legal form, the company orientation and the economic situation is too great to be only a consequence of the random selection, so it is statistically highly significant (Table 5).

CONCLUSION

Information and communication technologies are nowadays an integral part of every company. If the company wants to be successful and competitive, it must regularly invest in ICT. The ICT make the process of management and production more effective. The information technologies costs represent certainly an investment in the long term that brings in high returns. In the event that the company uses the internet enough, there is increasingly a possibility of the company promotion and the internet makes also the access to information more effective. At present, almost all information is increasingly available to everyone.

On the basis of the performed analysis, there were tested some hypotheses. When verifying the validity of the statistical hypothesis, the testing procedures lead to the following conclusions:

- The share of employees using a computer depends on the legal form and the company orientation (*confirmed hypothesis)* and it depends on its economic situation *(non-confirmed hypothesis)*,
- The use of the camera system or the access system does not depend on the legal form and the economic situation *(confirmed hypothesis)* and it does not depend on the company orientation *(non-confirmed hypothesis)*,
- Exploiting of the company web page depends on the legal form and the company orientation *(confirmed hypothesis)* and it depends on the economic situation *(non-confirmed hypothesis)*,
- The ICT modernization and further development of ICT does not depend on the legal form, the company orientation and the economic situation of the company *(non-confirmed hypothesis)*.

Information and communication technologies are the most used in the food companies, in which there is also shown the highest care for the ICT security

and the ICT marketing (they mostly use own company web page). Agricultural companies considering various specific features of agricultural production are lagging behind in the ICT use. It is mainly due to the long-term contracts, which do not motivate agricultural companies to further develop their business, but also due to their satisfaction with the current situation and the moderate approach to the marketing. The sooner the agricultural companies will try to change their approach to some aspects of the ICT, the more competitive towards other businesses they will be and they also will be more adaptable to the new market conditions of the European Union.

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