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Business Informatics and its Role in Agriculture in the Czech Republic

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Anotace

Předkládaný článek se zabývá analýzou využívání podnikové informatiky v zemědělských podnicích v České republice. Zdrojová data pro tento článek byla získána v rámci průzkumu v zemědělských podnicích z různých regionů České republiky. Článek představuje výsledky průzkumu využívání podnikové informatiky v resortu zemědělství včetně poskytnutí přehledu o řešené problematice. Zjištěno bylo, že v zemědělských podnicích pracuje s podnikovou informatikou převážně majitel farmy. Pro většinu respondentů představuje informatika nutné technologické řešení. Z pohledu hardwarového vybavení jsou investice v současnosti směrovány v daleko větší míře do využití mobilních technologií. Mezi nejčetnější používané programové vybavení patří informační systémy pro účetnictví, skladové hospodářství a dále specializované programy pro rostlinnou a živočišnou výrobu.

Klíčová slova

Podniková informatika, informace, eGovernment, informační systém, zemědělství, zemědělský podnik.

Abstract

Presented paper deals with analysis of use of business informatics in agricultural enterprises in the Czech Republic. The source data for the paper were gathered in the survey among agricultural enterprises from various regions of the Czech Republic. There are results of the survey and the overview of the current state of the use of business informatics is described here. Main findings are that it is the owner of the farm who mostly works with business informatics and for most of them the informatics is a necessary technological solution. The investments in farms are currently directed to mobile hardware equipment. Most frequently used programs are accounting information systems, stock control and specialized programs for plant production and livestock.

Key words

Business informatics, information, eGovernment, information systems, agriculture, farm.

Introduction

Data and information are indispensable part of current society and companies. Agrarian sector in the Czech Republic is based on principles of Common Agrarian Policy in the European Union member states. It provides access to subsidy programs as a certain guarantee for agricultural enterprises. Despite convenient operation conditions, the limiting factor is a large bureaucracy of the state authorities that results in lack of time of farm managers. The shortage of time and inefficient methods of processing of business data and information may lead to wrong management decisions.

Research and development of information systems for the support of company management have been goals of Business Informatics (BI) or in German Wirschaftsinformatik (Heinrich, Riedl, 2013). With respect to Business Intelligence that is abbreviated in literature as BI, we will rather use the shortcut (BInf) for Business Informatics that is proposed by (Maryška, Novotný, 2013).

The constraint of effective usability of information in the agriculture is the level of business informatics in particular enterprises where the quality of business informatics is given by following equation (Vostrovský et al, 2013):

$$BInf = f(HW,SW, U),$$

where HW – is a particular level of technical equipment (HW) in given subject,

SW – is a particular level of software equipment (SW) in given subject,

U – is a quality level of ICT skills of users in given subject.

Actual usability of information (UI) in agricultural enterprise can be stated as:

$$UI = f(U_{EG}, U_{BInf}),$$

where U_{EG} is the actual level of agricultural eGovernment and U_{BInf} is the level of business informatics in given business entity.

Business informatics includes the way of representing information, its processing, communication and use in the business (Pour et al., 2009; Heinrich & Riedl, 2013; Maryška, Novotný, 2013). The agricultural eGovernment is *"a type of e-government that is based on the use of information technology by state administration to facilitate reciprocal information exchange between the involved agricultural public authority and agricultural enterprise to improve efficiency of its internal use and to provide fast, accessible and quality information services."* (Ulman et al., 2013) Frameworks for implementing e-government systems and services in agriculture are described in (Ntaliani et al., 2010; Ulman et al., 2013).

To evaluate particular level of business informatics in a qualified way, to solve its problems, to define proposals for further development, it is necessary to specify at least basic requirements for quality, performance, and effects that should be brought. The business informatics has to (Pour, Novotný, 2010):

- provide certain functionality for users (it has to support control, business or administrative functions at all levels and for all profession of company workers in given extent and quality),
- contribute to rationalisation of business processes (e.g. shortening of average time of contract realisation),
- ensure an adequate level of information availability, technical and other tools (availability for the user in right time and right place),
- operate information systems (IS) at a required level of security, reliability, performance and response time,
- bring expected economic and non economic effects,
- increase of qualification of employees,
- maintain and develop informatics resources with reasonable costs.

There are diametric differences among enterprises in circumstances for application of effects of business informatics, and also the opinions of business representatives vary in terms of informatics and its capabilities and limitations (Pour and Novotný, 2010). We can conclude that business informatics in the agricultural enterprise should be beneficial for its profitability depending on implementation and use of informatics. The goal of the paper is to analyse the current state of the use of business informatics in the agricultural sector and to identify relevant assumptions of its quality in agricultural enterprises.

According to the study (Hoffmann et al, 2013), there is a lack of knowledge about the state of mobile business in agriculture and low number of available mobile applications for agriculturists. The potential is in mobile documentation. In the Czech Republic, the access to the broadband Internet connection (256 kbit/s) has been increased recently among agriculturists to 70.5 % (Vaněk et al, 2011). But there is still a gap mainly in Czech rural areas and the digital divide remains an issue.

Among issues that relate to the use of Internet, there are: privacy protection, expected uncertainty in data transmissions and relatively large amount of time spent on Internet with searching information, communication and business transactions. Other problems might be the lack of personal interest or limited amount of information, insufficient ways of professional training of Internet skills, its complexity, unsolved legal questions, improper provision of stable transmission speeds, partially low recency of web sites and too few attention paid to agriculture in Internet services. Regarding future use of Internet the main stress is put on information retrieval, business management and communication, while private habits will play a secondary role (Doluschitz, Pape, 2001).

Business informatics in agriculture provides all information needs in the enterprise related to management and control of business processes. Business informatics in agriculture is specific with its acceptation of changing climate and local conditions, and with unpredictable length of production process. Another aspect to be taken into account is that the business informatics differs with the size of farm and its specialization. In small farm managed by physical persons, these needs can be fulfilled with one accounting program

and the use of others depends on farmer's experience. In middle-sized farms, these needs can be satisfied with information systems enhanced with plugins according to the focus of the enterprise (e.g. plant production, animal raising). Third group are large enterprises (capital ventures) that do business in agriculture and use all common information systems, namely ERP (Sørensen et al., 2010), CRM (Kumar, 2010), EDI (Choudhary et al., 2011), statistical software, database systems and business intelligence tools (Chaudhuri et al., 2011; Duan, Da Xu, 2012).

Sufficient financial resources and subsidies that has been coming to Czech agriculture from the European Union and national funds since 2004 has made the agricultural production more perspective and they helped agriculturists to overcome poor economic results from the transformation period in 1990s. These have become reasons why farms could modernise their equipment (Věžník et al., 2009). By using financial subsidies and sources, and by efficient conduct of agribusiness, it is possible to build and run quality business informatics.

Materials and methods

There was a thorough questionnaire survey conducted between members of Association of Agricultural Business Owners in the Czech Republic in 2013. It was prepared and done by Department of Information Technologies and Department of Software Engineering at the Faculty of Economics and Management at Czech University of Life Sciences in Prague and supported with grant no. 20131038: Analysis and design of model for evaluation of e-services in agriculture. Previous survey was realized and published by Rysová et al. (2013). There are only few similar surveys done in Czech agricultural sector such as Agrocenzus made by Czech Statistical Office (ČSÚ, 2013) and study on information and communication technologies in rural areas (Vaněk et al, 2011). Another similar study about the use of information and communication technologies in Czech enterprises is done by Czech Statistical Office on annual basis but it excludes enterprises from agriculture, forestry and fishery. Agricultural sector reaches a high level as to the adoption and the use of information and communication technology such as precision agriculture.

There were 500 subjects asked to fill the form and 135 relevant replies were obtained. The respondents could fill in paper form, via e-mail or in online web form at the address **http://dotaznik.czu.cz**.

We used methods of exploratory analysis, frequency tables and Pearson's chi-square test to evaluate current state of business informatics in farms. Statistical computations were done in program STATISTICA 12. General methods of synthesis and analysis were utilized to examine the quality and the level of use of business informatics in agriculture and it also provided means to overview the current state of the art and to identify strengths and weaknesses.

Results and discussion

Questions were primarily focused on the level of business informatics. Agricultural producers mostly (85 %) farmed at land of size up to 500 hectares (see Table 1). Highest relative frequency was measured in the category from 100 to 499 hectares (49.6 %), which signalizes that the respondents were mostly privately held small farms.

90 % of respondents run plant production, 52 % animal raising and 16 % deal with other types of production (see Table 2).

Next question was: *"Who works with computer (PC) at your farm?"* It was a multiple choice question with more answers allowed. PC is handled by the farm owner in 85 % of all cases, by accountant (26 %) or by other workers (26 %) (see Graph 1).

There is an obvious argument that the owner who is responsible of management of farm can hardly work efficiently with all business informatics tools. It is a relevant question whether he or she can gain higher effect for the business from the IT equipment.

Answers to the question *"Which information do you mostly use from the Internet?"* are depicted at the Graph 2. There were also multiple choices allowed. We can conclude that the farm can dispose with large amount of information sources that some might used for their own business informatics.

The technical equipment and investments to it in agricultural enterprises is not an issue due to profitability of farmers. Respondents provided the year of purchasing devices such as PC, laptop, smartphone and tablet (see Graph 3). We can see that most of ICT investments were towards mobile platforms in years 2012 and 2013.

Category	Frequency	Cumulative frequency	Relative frequency	Cumulative (rel.frequency)
less than 50 ha	24	24	17.77778	17.7778
50 - 99 ha	29	53	21.48148	39.2593
100 - 499 ha	67	120	49.62963	88.8889
more than 500 ha	12	132	8.88889	97.7778
ChD	3	135	2.22222	100.0000

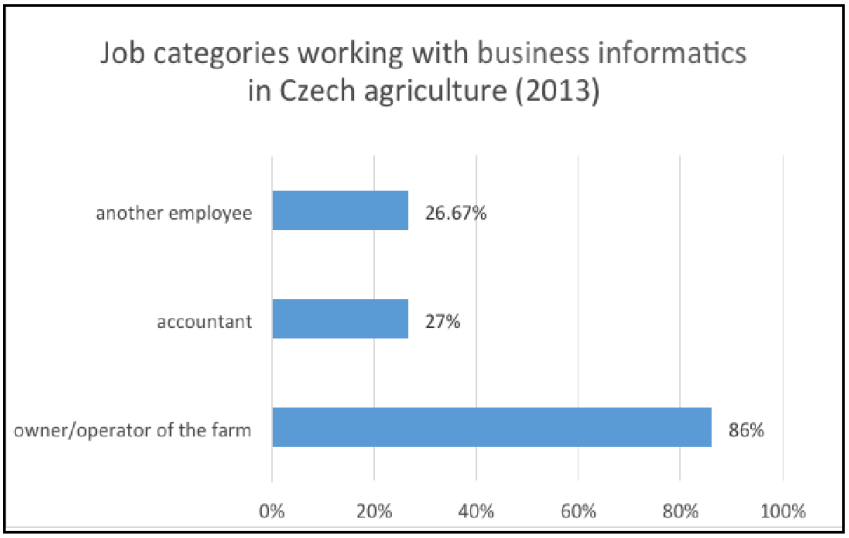
Source: own processing

Table 1: The structure of farms by agricultural land.

The structure of the company by type of production	Count	Percent
Crop production	122	90.37%
Livestock	70	51.85%
Other	21	15.56%

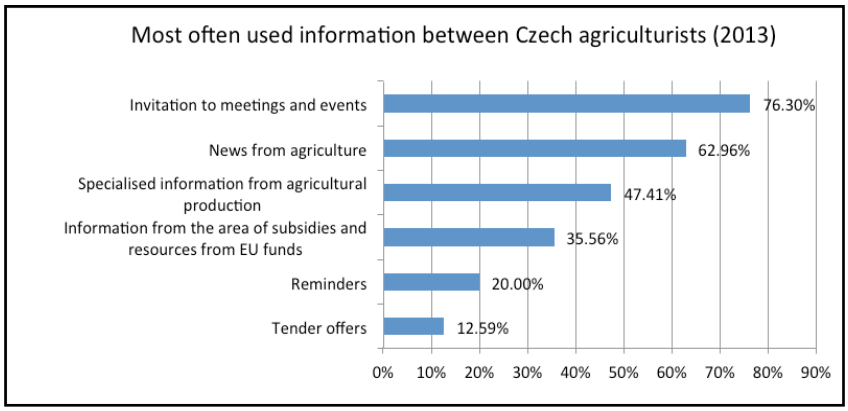
Source: own processing

Table 2: The structure of farms by agricultural land.



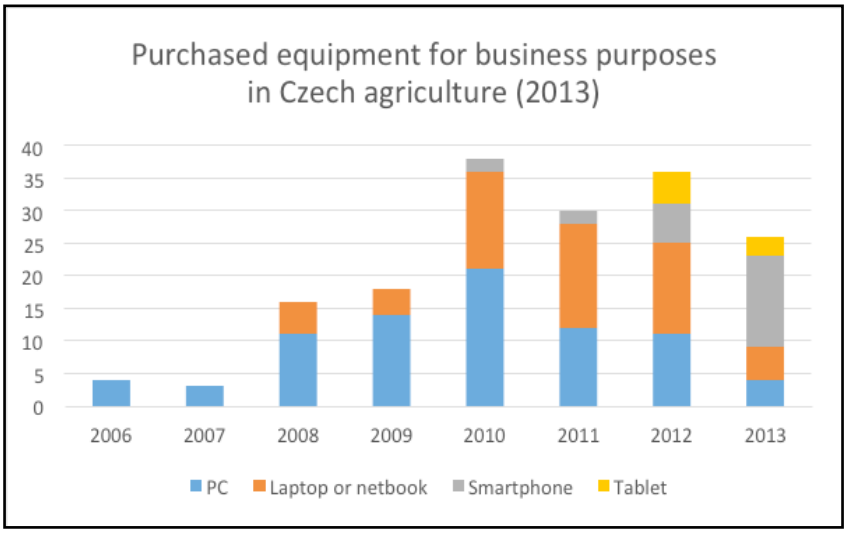
Source: own processing

Graph 1: The structure of job categories working with business informatics in agriculture.



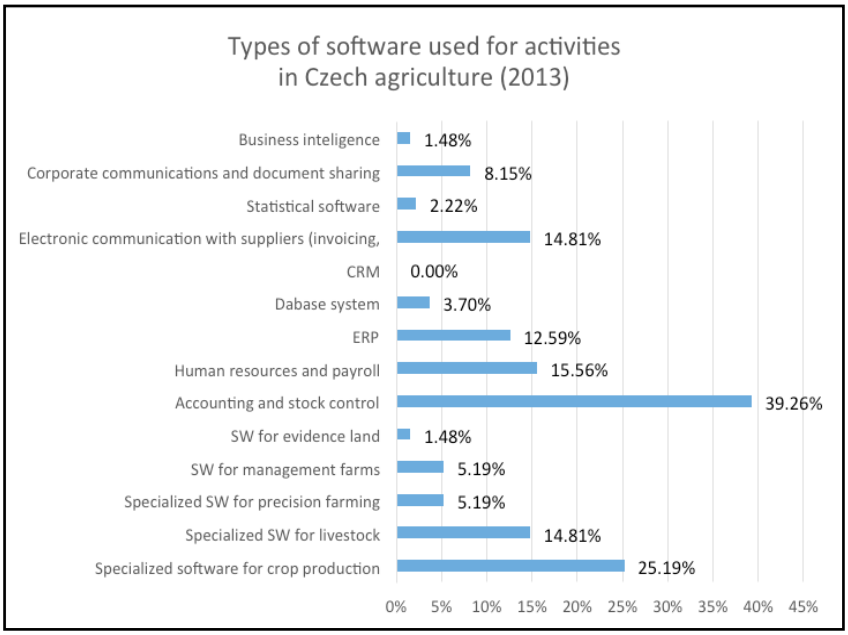
Source: own processing

Graph 2: The structure of information from the Internet.



Source: own processing

Graph 3: Structure of purchase hardware for the last period.



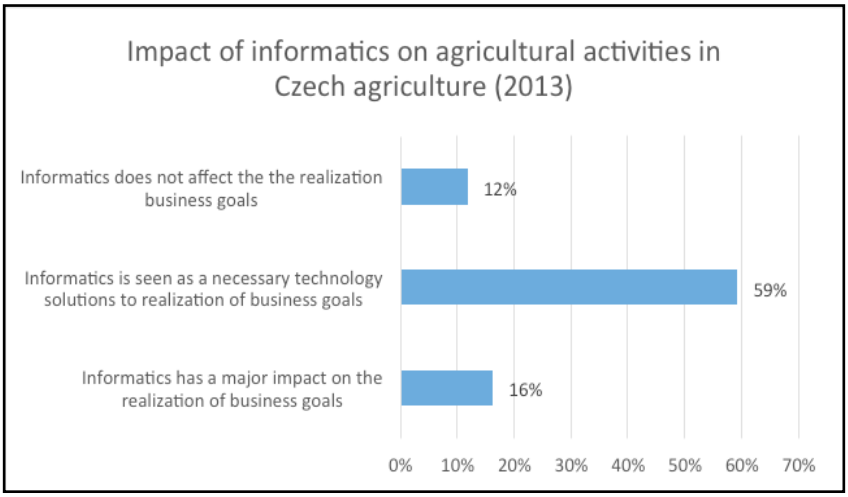
Source: own processing

Graph 4: Types of software used for activities in agriculture..

Next topic of the survey dealt with types of software in farms. The use of accounting software and stock control were unanimously the most frequent, and also specialized software for livestock and crop production (see Graph 4).

These findings match the production structure specified in Table 2. Another useful finding is that farmers use further specialized information systems such as database systems (as a solution for customized queries and outputs), statistical software (SPSS, Statistica, SAS), ERP and software for precision agriculture. These are more sophisticated components run in business informatics.

One of the significant findings of the survey is that *"informatics is perceived as a necessary technological solution to realize business goals."* That was the answer of 59 % farmers, while 16 % think that *"informatics has a substantial influence on realization of business goals"* and only 12 % have opinion that *"informatics has no influence on realization of business goals."* The rest 13 %



Source: own processing

Graph 5: Impact of business informatics on agricultural activity in Czech.

of respondents cannot answer or cannot evaluate the impact of informatics on their agricultural business (see Graph 5).

To explore more in details which reasons influence perception of business informatics among farmers, we conducted regression analysis. Null hypotheses were set such as:

H1: There is no significant relationship between perceived influence of business informatics and number of employees.

H2: There is no significant relationship between perceived influence of business informatics and size of farmed land.

Due to values of Person's chi-square test ($p = .21574$ and $p = .89025$) both hypotheses were accepted at 5 % significance level. Thus, no statistically significant relationship was proved between level of business informatics perceived by farmers and size of the farm or number of employees.

We found the above stated findings as relevant for further research and for effort to identify barriers to effective use of information and communication technologies, concepts and methods in agricultural enterprises.

Conclusion

The aim of the paper was to present current state of business informatics in agricultural enterprises. Similar studies have been rare in Czech agricultural sector so far. Based on the result presented above we can tell that most of farmers work with IT tools by themselves, they are interested mostly in information about subsidies and EU funds, and they use mainly accounting and stock control software. The purchase of new hardware and software is not an issue for farmers nowadays.

We can conclude that the current state of the use of business informatics potential is not fully reached and there is still a capacity for its use with higher efficiency and in broader extent, which provides further space for research.

As a next research topic in this field, we can see in looking for opportunities to utilize mobile hardware platforms (tablets, smartphones, etc.) in agricultural operational routines. The main purpose of business informatics is to provide effective support by ICT to reach savings and higher labour productivity in the agricultural business.

We propose to conduct regular analyses and studies on information needs and information tools in agricultural sector.

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