VERIFICATION OF SELECTED WEAK POINTS OF INFORMATION SYSTEM IN TERMS OF OTHER PARAMETERS AS A PART OF ICT EFFECTIVENESS EVALUATION

Miloš KOCH

Brno University of Technology
Faculty of Business and Management, Department of Informatics
Kolejní 2906/4, Brno, Czech Republic
E-mail: koch@fbm.vutbr.cz

Abstract. The article describes the results of a research dedicated to the situation in selected areas of information systems, testing the hypotheses about the variances of results in relation to the company size using the good correspondence test with the relevance level of 0.05. The investigation used data from the research portal ZEFIS. Questions were answered by about 660 respondents from 283 companies. The sample in the survey was comprised of approx. 77% of respondents from the Czech Republic, 18% from the European Union countries, and the rest from other countries. The obtained results do not confirm the validity of working hypotheses that larger firms perceive data as more important and they have better data protection than small firms. Three selected risk areas were analysed in terms of company size, geographic coverage and profession.

Keywords: effectiveness, information systems, key factors, ICT
JEL classification: M15, M21

Introduction

The article was written as part of the project called The Development of Knowledge Needed for the Improvement of Information Support of Economic Business Management". This project is supported by the Internal Grant Agency at Brno University of Technology and registered under No. FP-S-11-1. The results used in the article were taken from the author´s research portal ZEFIS, the objective of which is to make it possible for companies from all over the world to assess the effectiveness of their information systems free of charge, to find the weak points thereof and compare the results with the reference database of other companies.

The concept of effectiveness is understood here according to Drucker as a synergy of efficiency and meaningfulness. The survey covers the following areas:

- User satisfaction with the information system
- User satisfaction with the information support level
- Quality of user training
- The information systems used
- Employee awareness of corporate objectives in view of their respective roles
- Existence of an information strategy in the company
- Experience with outsourcing and ASP
- Perception of trends in the area of information and communication technologies

The inquiries studied in the research cover all six key areas of the Information Systems Successfulness Model (Delon & McLean, 2003). Although the research primarily focused on ICT users in the Czech and Slovak companies, it also extended to other countries on the grounds of possible comparison and identification of variances, if any.

General Assumptions

Many authors deal with the issue of information system effectiveness. It is important to distinguish between the words Software and Information System (Ozkan, 2006).·Among the world respected authors dealing with the general effectiveness model are DeLone and McLean. Their model was published back in 1992 and subsequently updated in 2002 and 2003. It is the model used by many authors at present. Ramezan has built up a model to assess IS effectiveness in the Iranian oil industry. In his work, he primarily deals with the assessment of user satisfaction (Ramezan, 2009).

Furthermore, in his article, Pitt approaches the issue on the basis of the assumption that the ICT is actually a service provider and makes use of the SERVQUAL model to assess quality, or else a marketing tool for service quality measuring (Pitt, 1995). The basic cornerstone of this approach is the paradigm of contradiction between clients´ ideas and the service actually provided to them. In this model, the information system user plays the role of a client and the IS that of a service provider (supplier).

In many cases the models are created for very specific conditions. An example may be the one described in the article by Sajady, who tries to assess benefits of an information system on a stock exchange (Sajady, 2008), or Mashour who set up a model for the assessment of effectiveness in the bank sector (Mashour, 2008). Panigyrakis concentrates on marketing information system and its assessment in practice (Panigyrakis, 2006).

The articles mentioned above judge information systems from various points of view and for specific needs and requirements. The data processed are always focussed on a narrow segment compliant with the modelled issue.

Further on, in his article, Maryška deals with economic effectiveness of the information system by comparing two different approaches to the issue (Maryška, 2007).

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Research Organisation

The data used in this article are based on the respondents´ answers in the ZEFIS portal. Within the controlled survey taking place in 2011, questions relating to security were answered by randomly selected 662 respondents from 283 companies who use an information system in their work. Although the sample is not very large it is the maximum of data we managed to obtain during the particular period. The total number of respondents in the ZEFIS system is 2176 from 1176 companies. The questions regarding security have been added to the campaign from the 2011 survey, and therefore the answers by all respondents kept in the database are not available. The structure of the answers of the new respondents to questions from other areas, investigated previously, does not differ from those of the remaining respondents, and hence we may suppose that the results obtained are in the least indicative to conceive about the situation of some areas of the information system usage.

Fig. 1. Structure of respondents by country – number of respondents
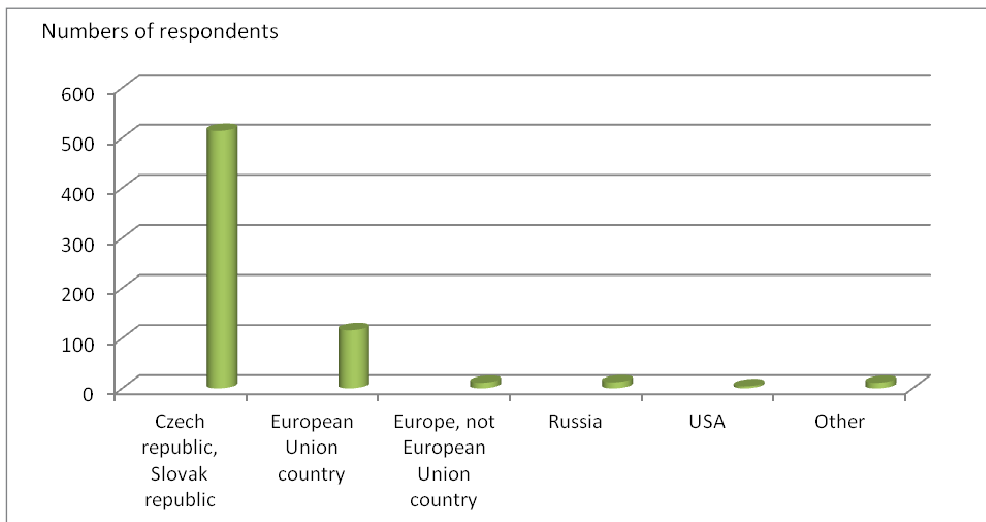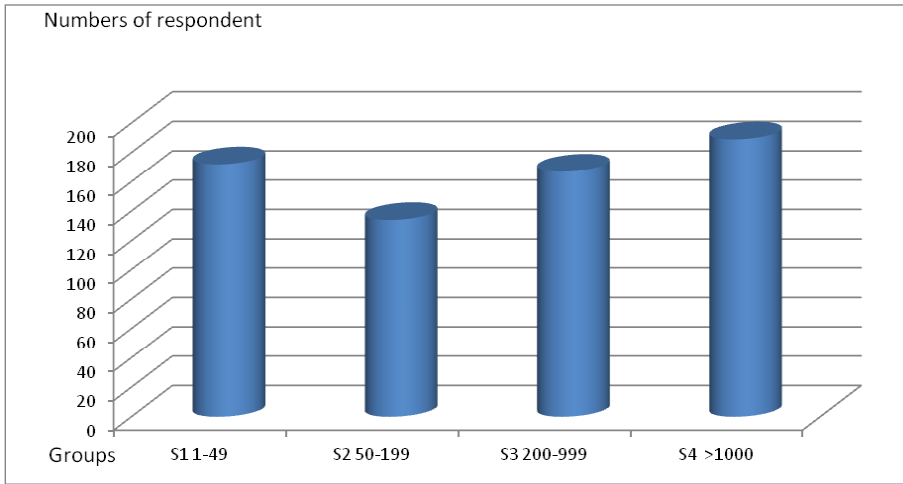

Source: Author's research.

Gathering data companies were divided into groups by number of employees in line with the methodology of the Czech Statistical Office. In the table below, the respondents are divided by company size. In order to study the results by company size, the respondents were put into groups of similar sizes – see Table 1 and Figure 2.

Table 1. Number of respondents by company size – grouped

Company size	S1	S2	S3	S4
Number of employees	1-49	50-199	200-999	>1000
Number of respondents	172	134	167	189

Source: Author's research.

Fig. 2. Number of respondents by company size – grouped

Source: Author's research.

Furthermore, the respondents may be categorised according to their profession. In the analysed sample, there are 252 managers and 410 non-managers – see Figure 3.

Fig. 3. Structure of respondents by profession
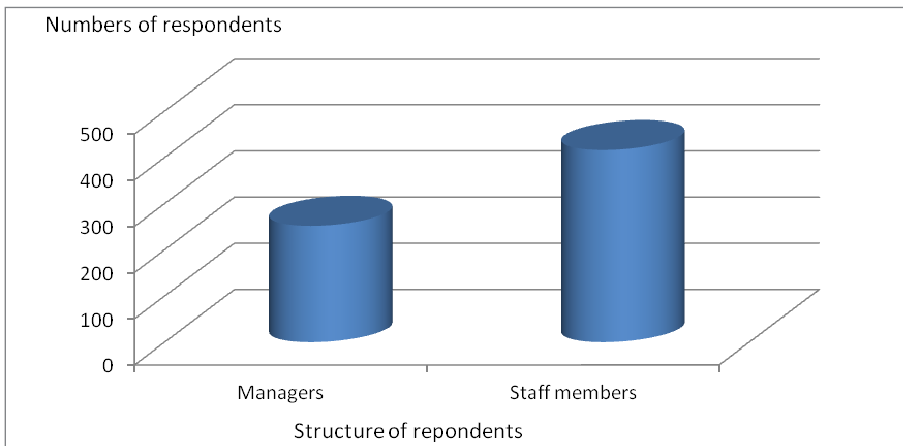
Source: Author's research.

Selected areas

In this paragraph we will discuss some of the surveyed areas of the information system security. They were formulated on the basis of the following working hypotheses:

- H1 : Larger firms perceive the data as more important than small firms
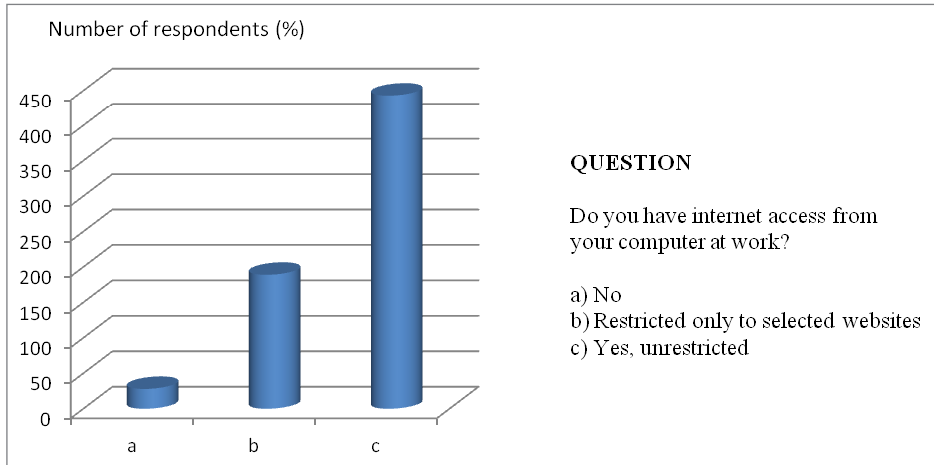- H2 : Larger firms have better data protection and security than small firms

Given the scope of this article, it was not possible to describe the results of all examined areas of data safety, therefore it is limited to a comparison of three factors:

- Internet access

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- Possibility of connecting external memory devices
- Data backup responsibility

Access to the Internet

Fig. 4. Internet access

Number of respondents (%)

QUESTION

Do you have internet access from your computer at work?

a) No
b) Restricted only to selected websites
c) Yes, unrestricted

Source: Author's research.

It was investigated whether respondents had access to the Internet at work and whether the access was completely free or limited to certain websites only. Generally, the access to the Internet is not necessary for a number of company professions and represents a safety risk.

Fig. 5. Internet access by company size in percentage terms

Number of respondents (%)

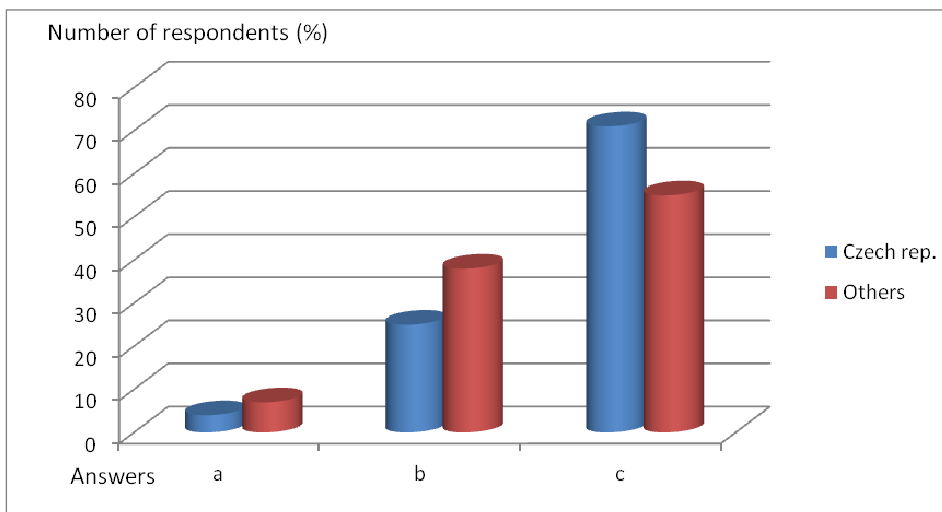Answers
- a
- b
- c
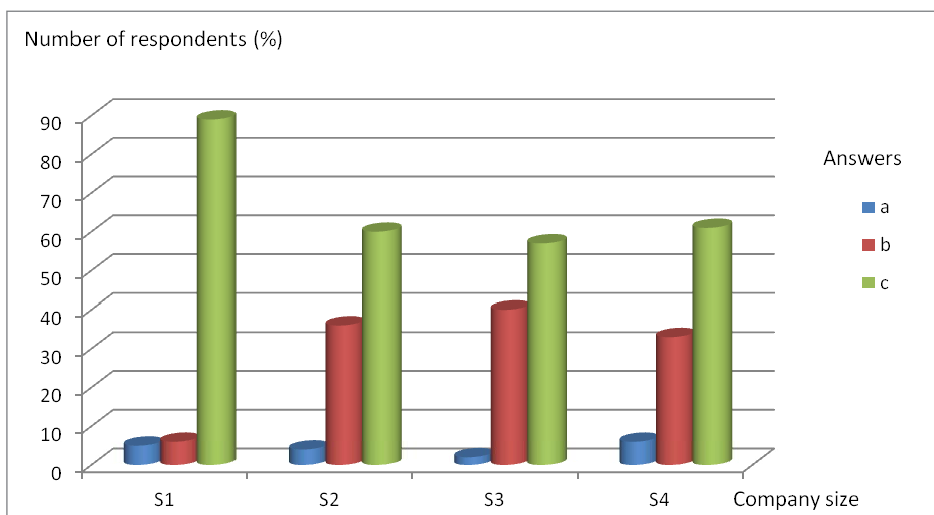
Company size

Source: Author's research.

Table 2. Accepting/rejecting the hypothesis about the correspondence of the internet access based on company size

Company size	S1	S2	S3	S4
χ2	37.208	2.935	9.026	2.768
Rejection of the hypothesis significance level of 0.05 (5.99)	yes	no	yes	no

Source: Author's research.

We reject the hypothesis about the correspondence of structure of the answers regarding Internet access at work for small companies up to 50 employees and for mid-size companies having 200-999 employees – see Table 2. In the smallest companies, the restriction is insignificant, as expected, while nearly all employees have unrestricted access to the Internet, which increases safety risks and may reduce work productivity if the Internet is used for entertainment and relaxation. On the other hand, in mid-size companies the restriction is at the highest level – most respondents have the Internet restricted to certain websites. This result was expected rather in the largest companies from group S4.

It is very interesting to compare the respondent results in the Czech Republic and in the Slovak Republic with those of other countries – see Figure 6. The results shown in this article are from the survey data available by 30.8.2011. Due to the difference in data size (514 respondents from CR and 154 respondents from other countries answered this question) the latest data obtained from respondents outside the Czech Republic in the ongoing survey were used for the purpose of a control comparison, so that it would be possible to compare two groups of approx. 500 respondents each, but actually the results were not very different from the first ones.

Fig. 6. Internet access by country in percentage terms

Source: Author's research.

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Therefore, we may say that in the Czech Republic and in the Slovak Republic employee access to the Internet at work is less restricted than in other countries while the difference is about 15%. The hypothesis of response structure correspondence is hereby rejected at the significance level of 0.05 (the value of the testing criterion is 6.9528). This may bring negatives for the companies in the form of the employee entertainment during working hours and increased risks for the computers.

If we are to compare the results by profession, where group S1 are managers and group S2 executive employees, the results show that managers have a somewhat easier access to the Internet than other employees, yet the correspondence hypothesis at the significance level 0.05 cannot be rejected (testing criterion 4.875619269) – see Figure 7.
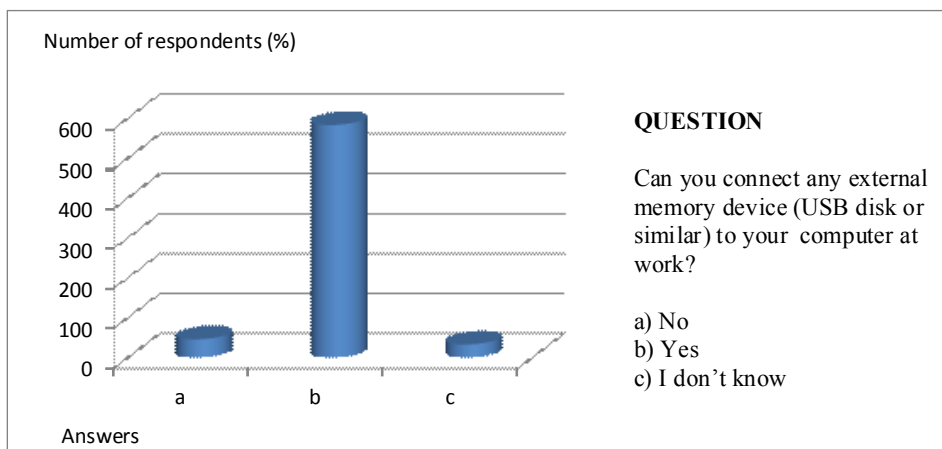
Fig. 7. Internet access divided to managers and executive employees
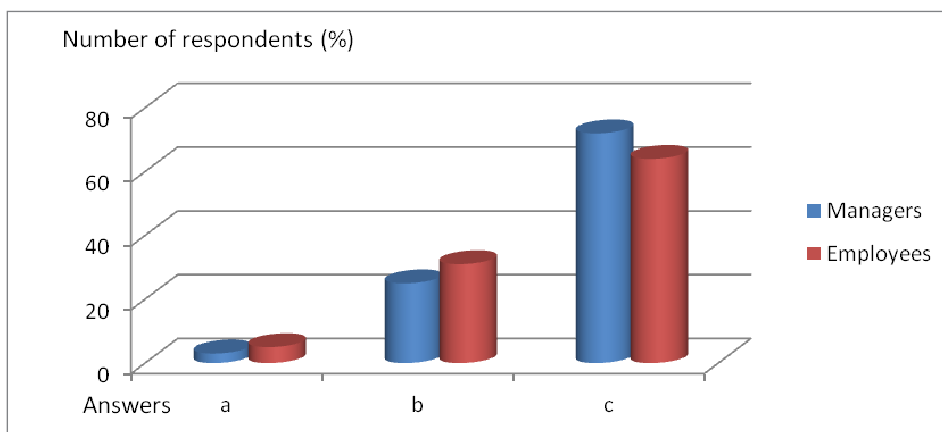
Source: Author's research.

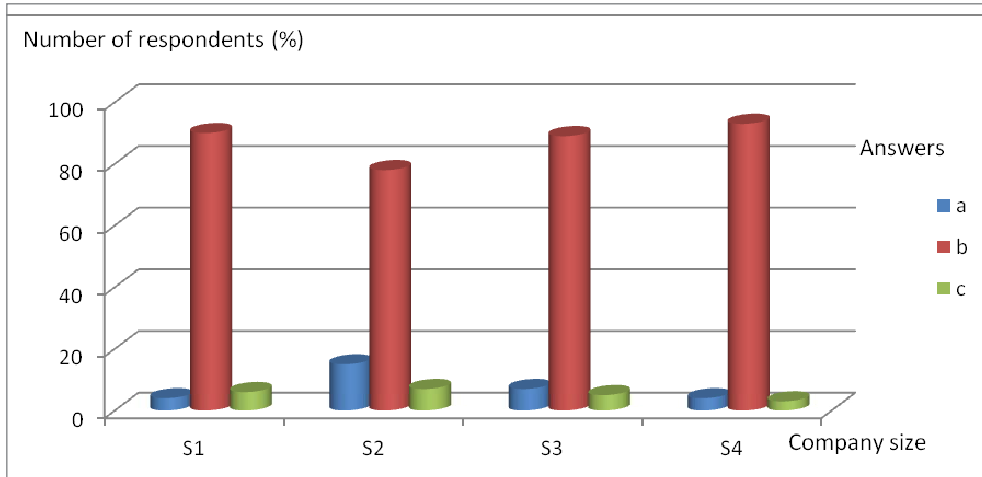## The Possibility of Connecting External Memory Devices

Fig. 8. The possibility of connecting external devices

Source: Author's research.

The possibility of connecting external devices is usually considered a relatively high safety risk because of potential viral infection and copying and abuse of company data.

Fig. 9. The possibility of connecting external devices by company size

Source: Author's research.

Table 3. Accepting/rejecting the hypothesis about the correspondence of the external memory device connection based on company size
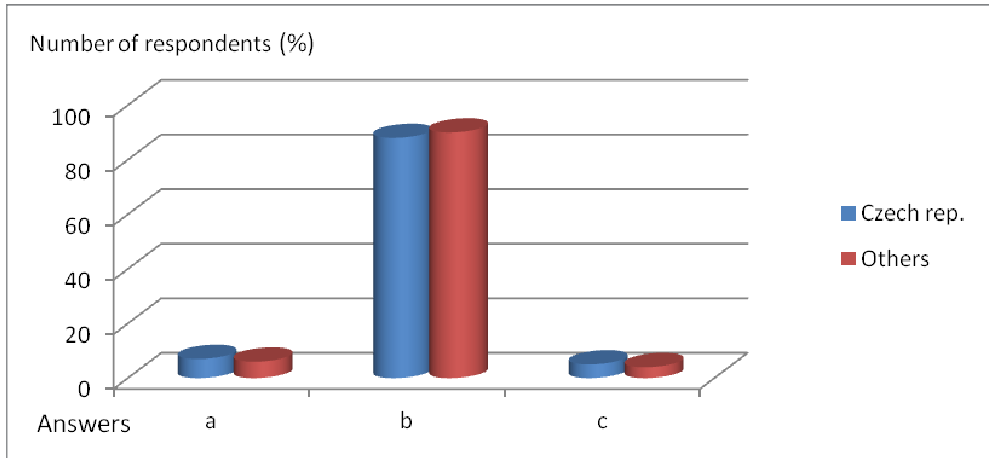
Company size	S1	S2	S3	S4
χ2	2.328	10.400	0.040	3.932
Rejection of the hypothesis significance level of 0.05 (5.99)	no	yes	no	no

Source: Author's research.

The hypothesis about the correspondence of the structure of answers regarding the possibility of connecting external devices may be rejected only for companies with 50-199 employees but not for small companies – see Table 4 and Figure 9. In these companies we see somewhat higher restrictions laid down by the employer when permitting external devices and the reason may be a greater fear of data abuse in large companies that usually have one or more owners taking more care about the data than in the small companies where professional management in the area of ICT is usually missing. In total, the high number of companies permitting their employees external memory devices is very surprising.

In this case, the country has no effect on the answers. In Figure 10, the structure of answers is S1 – the Czech Republic and the Slovak Republic and S2 – other countries. The correspondence hypothesis cannot be rejected (testing criterion 0.86914) - see Figure 10.
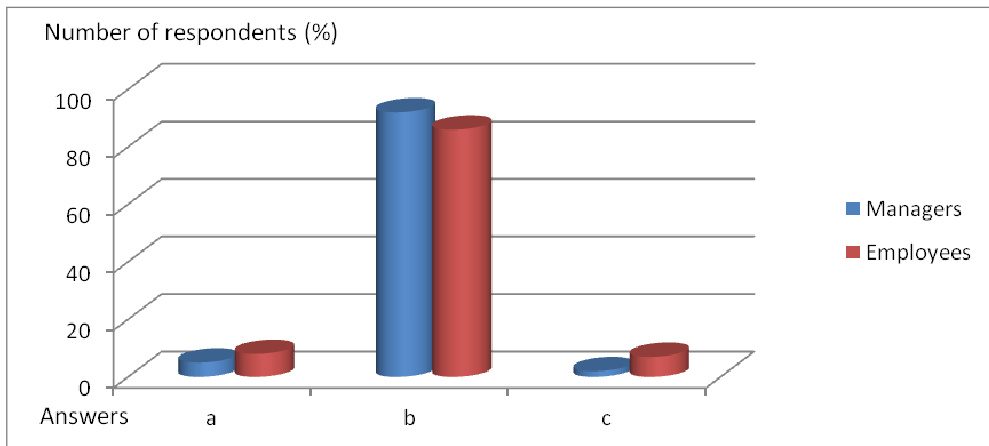
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Fig. 10. Possibility of connecting external media by country

Source: Author's research.

Analysing group S1 - managers and S2 – other employees the structure of answers differs and we can reject the correspondence hypothesis (testing criterion 8.204811682). Managers may connect external memories more than other employees but the difference is not too big.
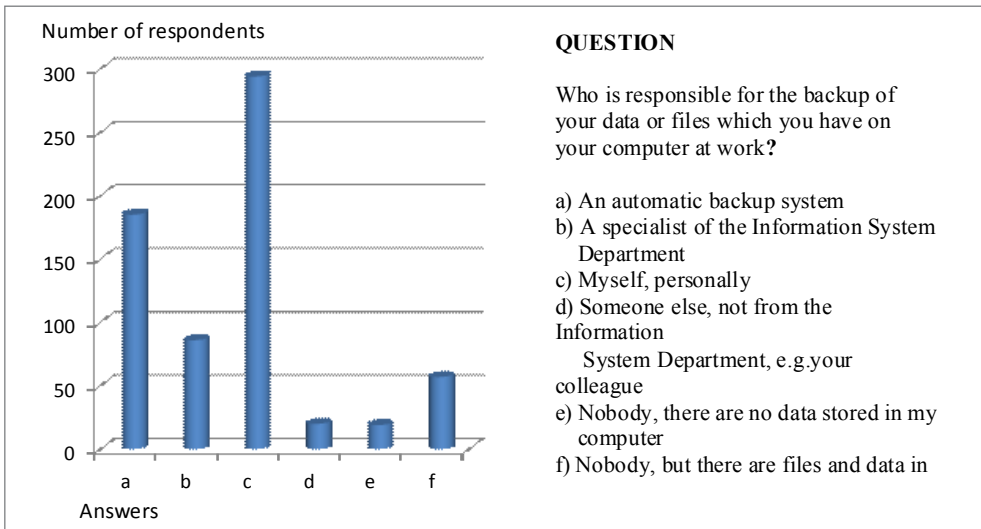
Fig. 11. Possibility of connecting external media by profession
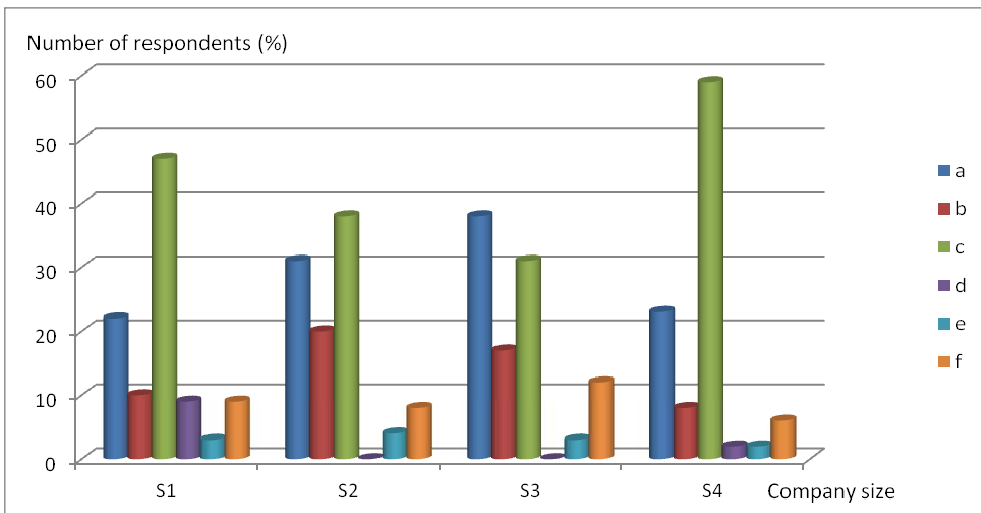

Source: Author's research.

Data Backup

Fig. 12. Who is responsible for backup

QUESTION

Who is responsible for the backup of your data or files which you have on your computer at work**?**

a) An automatic backup system
b) A specialist of the Information System Department
c) Myself, personally
d) Someone else, not from the Information
   System Department, e.g. your colleague
e) Nobody, there are no data stored in my computer
f) Nobody, but there are files and data in

Source: Author's research.

Fig. 13. Who is responsible for backup by company size

Source: Author's research.

We hereby reject the hypothesis about the correspondence of structure of the answers with the total data backup condition for all groups, except for companies with 50-199 employees. It is interesting that relatively few companies use automatic backup or location of all data outside the employee´s computer. Likewise, direct re-

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sponsibility of an employee for data backup is very high in all groups of companies. On the other hand, though it is encouraging to see that the worst possible alternatives 'd' and 'e' – no user data backup or backup carried out by an employee other than it should be – occur in all groups of companies in a very limited number – see Table 4.

Table 4. Accepting/rejecting the hypothesis about the correspondence of backup responsibility based on company size

| Company size	S1	S2	S3	S4
χ^2	16.049	9.207	18.473	13.931
Rejection of the hypothesis significance level of 0.05 (11.07)	yes	no	yes	yes

Source: Author's research.

Fig. 14. Who is responsible for backup by country
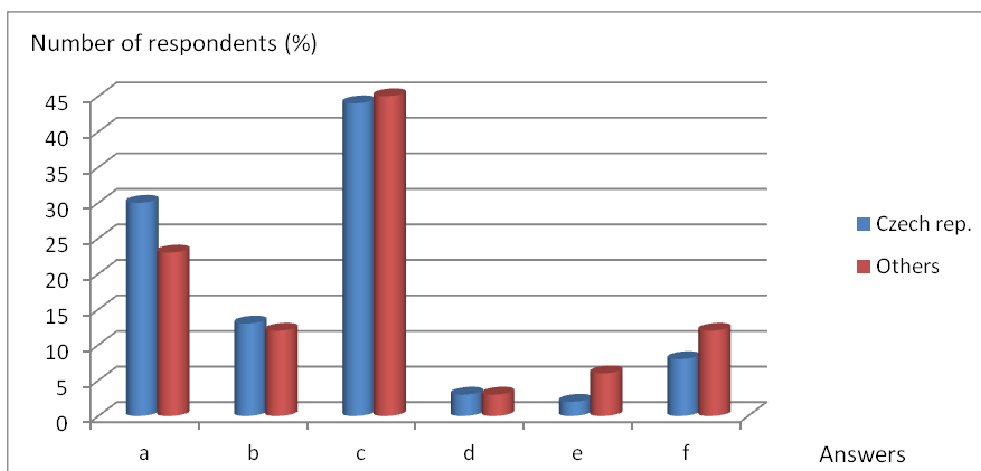
Source: Author's research.

Comparing by country, we also reject the answer correspondence hypothesis (testing criterion 11.6546 and table value 11.07 – see Figure 14. It seems that in the Czech Republic and in the Slovak Republic the number of automatic backups is higher, and on the contrary, the number of data location outside the user´s computer is somewhat lower. The number of non-backed up computers with data in the Czech Republic and in the Slovak Republic is lower than in other countries.

By comparing the answers of managers and other employees, we reject the answer correspondence hypothesis (testing criterion is 18.4134 and table value 11.07) – see Figure 15. It appears that managers backup their data more often by themselves than employees of other professions, and likewise the number of cases when data are not backed up on their computers is lower.

Fig. 15. Who is responsible for backup by profession
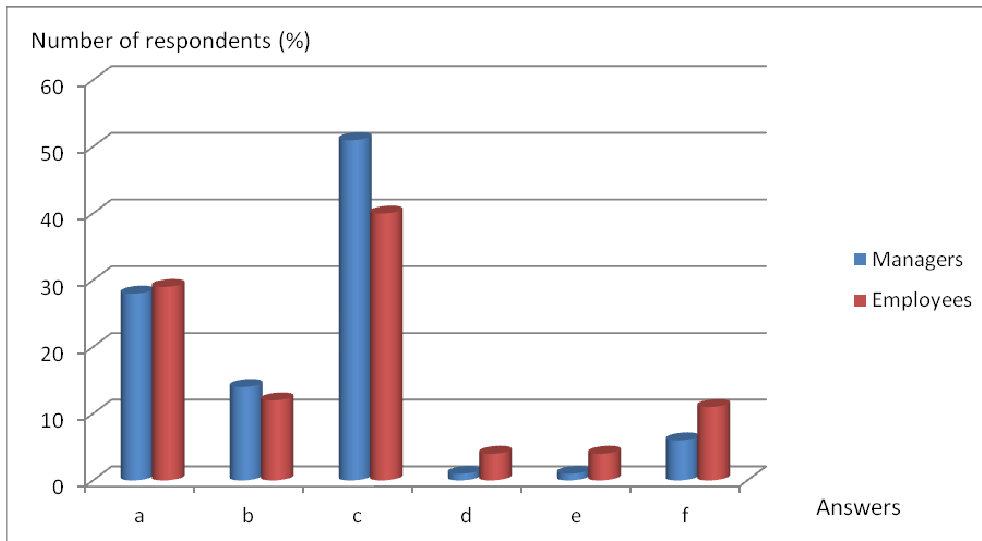
Source: Author's research.

Conclusion

Due to the scope of the article it was not possible to publish more areas included in the investigation – the issue of ICT 'security area' in the ZEFIS system is covered by ten questions, and furthermore we studied the possibility of programme installation by the user, impact of loss or destruction of the user´s computer, and others from the point of view of ICT effectiveness.

The article presents a description of the results of a research of weak points in three selected areas. The selected criteria for this article are not used for evaluation of ICT security, but as a part of basic assessment of ICT effectiveness, especially for smaller companies, which do not use ISO/IEC 27000 and other standards. Three areas not so important and not often discussed in the literature were selected for this article, however, I believe that the results could be interesting for managers.

In all companies included in the survey unrestricted Internet access prevails and the worst situation is in small companies, in line with our expectations, where ICT management is not the best and is usually performed by managers who are not experts in ICT.

In the area of risks arising out of the possibility of connecting external devices, in general the situation is very bad in all companies, regardless of their size. The best situation appears to be in small companies of up to 200 employees but even here nearly 80% of employees can connect external devices to their computers, which may be a significant safety risk of data abuse by the employee.

In terms of data backup as a key attribute of ICT effectiveness, the situation varies according to company size. The situation appears to be the best in large companies with 200-999 employees. In all companies, the percentage of backups carried out by the users is relatively high.

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The obtained results do not confirm the validity of working hypotheses H_1, H_2 that larger firms perceive data as more important and they have better data protection than small firms.

It is not possible to generalise the results due to the size of the selection file, but they are interesting and can serve as a basis for further research and as a warning to managers about the insufficiency of their data and information system.

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PASIRINKTŲ INFORMACINĖS SISTEMOS SILPNŲJŲ VIETŲ TIKRINIMAS

KITŲ PARAMETRŲ POŽIŪRIU KAIP INFORMACIJOS IR RYŠIŲ TECHNOLOGIJŲ EFEKTYVUMO ĮVERTINIMO DALIS

Miloš KOCH

Brno technologijos universitetas

Santrauka. Straipsnyje aprašomi tyrimo rezultatai, skirti parodyti informacinių sistemų padėtį pasirinktose srityse. Tikrinama hipotezė, kaip dispersijos rezultatai reaguoja į įmonės dydį, naudojant gerą korespondencijos testą su tinkamu 0,05. dispersijų mokslinių tyrimų lygiu. Tyrimui naudojami duomenys iš tyrimų portalo ZEFIS. Į klausimus atsakė maždaug 660 respondentų iš 283 įmonių. Tyrimo imtį sudarė maždaug 77 % respondentų iš Čekijos, 18 % iš Europos Sąjungos šalių ir likusi procentinė dalis iš kitų šalių. Gauti rezultatai nepatvirtina darbo hipotezės, kad didesnės įmonės geriau suvokia duomenų svarbą ir turi geresnę duomenų apsaugą nei mažos įmonės. Analizuotos trys pasirinktos rizikos sritys, atsižvelgiant į įmonių dydį, geografinę aprėptį ir profesiją.

Reikšminiai žodžiai: efektyvumas, informacinės sistemos, pagrindiniai veiksniai, ICT (informacijos ir ryšių technologijos).