FACTORS AFFECTING THE ADOPTION OF ELECTRONIC DATA INTERCHANGE

Lucie Veselá[1]

[1]Department of Economics, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Abstract

VESELÁ LUCIE. 2017. Factors Affecting the Adoption of Electronic Data Interchange. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 65(6): 2123–2130.

Implementation of electronic data interchange (EDI) is thus more desirable and will be one of the major determinants of business success of a company. Despite the current pressure of the public sphere and all the benefits that the adoption of EDI provides, the expansion of this technology is still a minority in the Czech Republic. The aim of this paper is to identify the specifics of EDI adoption, quantify their significance, mutual conditionality and propose a new general model of EDI adoption in businesses. The conclusions of this document are based on the primary data collected through a questionnaire survey in 2015. There were the key factors influencing the likelihood of EDI adoption and their interconnectedness identified. This model reflects the main determinants of the adoption of exchange structured messages for businesses as perceived benefits, external pressure, readiness, attitude of CEO, type of product, participation of trading partners, character of company etc. This study provides a comprehensive survey of motives and barriers of EDI adoption for enterprises, which are aware of the necessary interoperability within the single European market and its highly competitive environment.

Keywords: EDI, electronic data interchange, EDI adoption, model

INTRODUCTION

The basic idea of an international standard EDI (Electronic Data Interchange) is the exchange of standardized structured business and other documents in electronic form. This is the ability of an enterprise system that allows a document taken in the vendor's information system to be automatically transferred to the customer's information system. The principle of electronic data exchange can be used across all business processes.

The importance of interoperability (the ability of different systems to work together) for the enterprise is a given, as is the need for standardization and transparency of the flow of information. Accordingly, one of the aims of the European Commission is to reach the objectives of its Europe 2020 strategy in the digital agenda, to introduce mandatory electronic invoicing to public authorities for all public procurement (Edizone, 2014).

Implementing the electronic exchange of data is thus more and more desirable, and destined to be an essential determinant of business success, even for medium-sized and small businesses. The adoption of electronic data interchange (EDI) is now an option even without any need of high initial investment, since EDI can be provided as a flat-rate fee service. This overcomes one of the main obstacles to the massive expansion of the technology, which used to be its high and unavoidable cost of initial technical investment. Despite this, and the many benefits that companies have experienced using the technology, EDI in the Czech Republic is not yet part of the mainstream.

Electronic Data Interchange enables swifter and better communication between trading partners, reducing staff costs and errors in the exchange of business documents, forging stronger links between business partners, making the company more flexible and bringing many other benefits. Once the EDI system is adopted and implemented it is very easy to use. Goksoy *et al.* note that after they brought in EDI, business recorded a rise in customer satisfaction, while the performance of the entire supply chain went up significantly (Goksoy, Ozalp and Gulnur, 2012). A growing number of small

businesses are becoming aware of the transparency, speed and strategic advantages that EDI brings for their future (Reeves and Deimler, 2011; Kung and Kung, 2015). It could however be surmised that there is still an overall lack of awareness among businesses about the wider-used EDI systems, which leads to the following shortcomings: (1) the unavailability of information about real-world business process management, (2) redundancy in the business documents transferred, and (3) a lack of support for the systematic analysis of company performance and decision making. (Engel *et al.*, 2011).

What then are the determining factors for EDI adoption itself? From studies to date, these seem to be primarily the cost of introduction, competitive advantage, EDI compatibility with the existing system (O'Callagan et at., 1992; Hoti, 2015), business partner influence (Neo *et al.*, 1994), competitive pressure (Premkumar and Ramamurthy, 1995; Musawa and Wahab, 2012), EDI know-how, the company's IT savviness, market standing (Iancovou *et al.*, 1995; Shahwan, 2013), perceived benefits (Chwelos *et al.*, 2001), etc.

Barriers to the adoption of EDI can be, e.g.: resistance to change among financial management, obsolete software that requires modification, as well as the presumption that Electronic Data Interchange is not simple and cost effective, and low inducement pressure by public administration (Salmony and Harald, 2010).

There are a number of international studies focused on the adoption of EDI, yet very few of them reflect on the prevailing conditions for the adoption of Electronic Data Interchange. Thanks to the burgeoning developments in digital technologies these have changed rapidly over the last decade, and EDI is now accessible to a wide range of companies. Furthermore, each of the studies looks at the subject matter from a certain perspective, which does not help one gather a comprehensive set of conclusions as to the factors determining the adoption of EDI.

We must also take into account, when creating an adoption model, the specifics of the individual implementation venues, since most of the existing studies were carried out on other continents (the USA, Japan, Nigeria, etc.), where a different business mind-set may well play its part, as well as the overall conditions for communications implementation. In the Czech Republic, this issue is still not sufficiently researched, academically. Most Czech authors tend to cover the topic in technological terms and the specifics that affect the relevant bodies' decisions on EDI adoption have not yet been the focus of study. This paper is therefore primarily aimed toward identifying the main factors that affect the decision to adopt exchanging business documents using structured messages per the EDI standard and to create an adoption process model. It would be the first stage of mapping the current situation as regards Electronic Data Interchange among Czech businesses.

Literature review

For mapping the EDI adoption status and comprehensively surveying to form a unifying overview of the EDI adoption influencing aspects, there is a foundation of several international studies; while each of them focuses only on some particular theoretical perspective as to defining the determinant factors that increase or reduce the likelihood of EDI adoption, these form the theoretical and empirical basis for investigating the circumstances of Czech companies.

The approaches thus far to the issue of EDI adoption can be divided up into several main currents. One of the basic approaches toward the adoption of new technology is founded on the theory of diffusion of innovation (DOI) (Tornatzky and Klein, 1982; Rogers, 1995), this study stream focuses mainly on the characteristics of specific technologies and their readiness for innovation (O'Callaghan *et al.*, 1992; Premkumar,
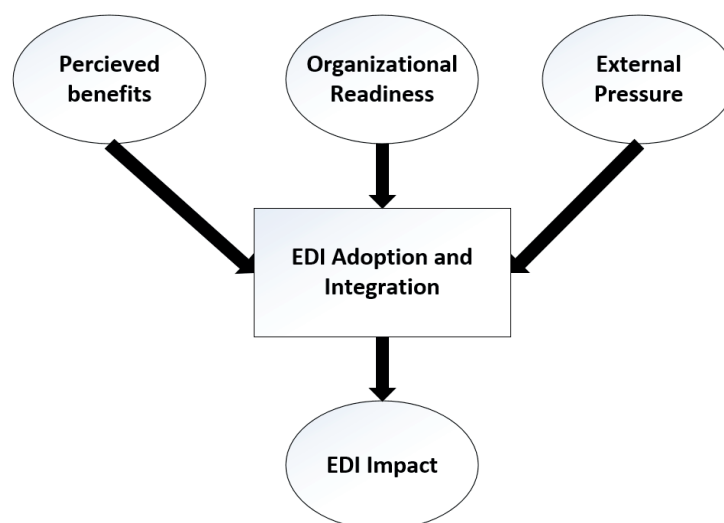
1: *Model of EDI Adoption (Source: Iacovou et al., 1995)*

1994; Teo *et al.*, 1995; Kaefer and Bendoly, 2000; Shahwan, 2013), so this can be called a 'technological' approach. However, the adoption of EDI is almost without exception a decision made in the particular circumstances of the organization, and one cannot take into account only the technological perspective issues. This is one of the reasons why this aspect has turned into a directional stream for further studies, with an 'organizational' approach. These studies focus specifically on the organization profile (Thong, 1995; Gopalakrishnan and Damanpour, 1997). Another major stream of theory are the adoption of Electronic Data Interchange is the viewpoint taken by some authors (Saunders and Clark, 1992; Bouchard, 1993; Ramamurthy, 1995; Hwang and Lee, 2016) which takes into account the fact that very often the adoption is affected by pressure from a business partner, which we can call the 'reactive' direction, or approach. The first study (Iacovou *et al.*, 1995) to have attempted to introduce a generic adoption framework (Fig. 1) notes that EDI adoption is dependent on three main determinants, namely the expected benefit (technical), organizational readiness (organizational) and contextual pressure (reactive).

This model was followed up with further studies that expanded on it over time (Kuan and Chau, 2001; Chwelos *et al.*, 2001), going deeper into the detailed structure of the individual aggregate factors, quantifying the impact of the respective variables and empirically testing the applicability of the model under different starting conditions (Musawa and Wahab, 2012). Furthermore, a significant source of information was the meta-analysis comprehensively devoted to the topic of Electronic Data Interchange. The author of the analysis covered the greater part of the factors examined in this study and also their impact on EDI adoption (Fig. 2). Also mentioned is the need to extend the knowledge about the introduction of EDI among future managers; the author considers that due to the small body of reference literature in this field there is a lack of knowledge of the benefits of introducing EDI (Narayanan, Marucheck and Handfield, 2009).

MATERIALS AND METHODS

The primary research was focused on the identification of internal and external factors that influence EDI implementation, with reference to the likelihood of different needs in the different sectors. Based on a study of the literature and scientific studies, appropriate questions were prepared to determine the main components entering into the adoption process that we need to include in a generic model of EDI adoption, whereby respondents rated their significance (perceived importance) on a scale (1–10). The chosen format for this survey was that of an electronic questionnaire, created using the "Umbrela" system (software developed at the Mendel University in Brno) and a link to it was subsequently circulated to businesses via email. Before the questionnaire was sent out, it was pre-tested by way of personal polling in order to finalize it. Data collection then took place from June to September 2015. The respondents were selected on the basis of quota selection per the business
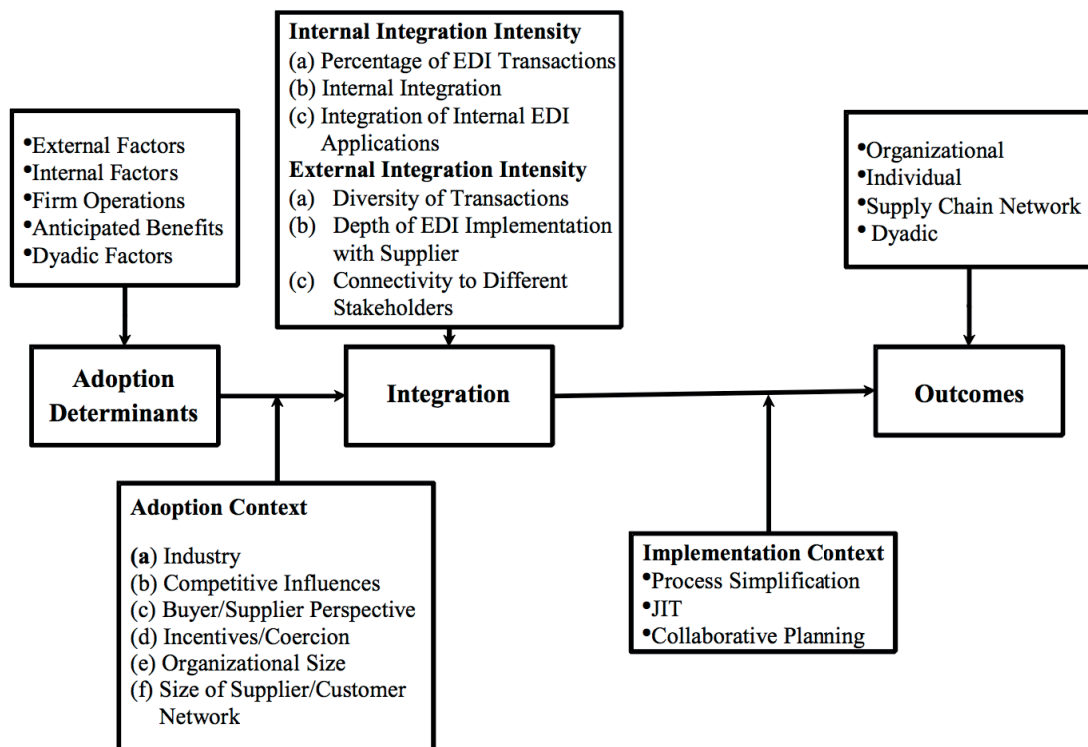
2: *Expanded conceptual model (Source: Narayanan, Marucheck and Handfield, 2009)*

I: *Criteria for assessing the suitability of factor analysis*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.859
Bartlett's Test of Sphericity	Approx. Chi-Square	10839.328
	df	946
	Sig.	0.000

entity classification scheme within the classification of economic activities (CZ-NACE) and the investigation unit was a business, responding via the person responsible for document exchange with trading partners. In all some 6230 business entities were approached, and 290 valid questionnaires collected, being a questionnaire yield rate of 4.7%.

The processing of the acquired data was done using descriptive statistical methods, to determine the absolute and relative frequency of each characteristic feature examined. Being examined were dependencies between qualitative characteristics where independence hypothesis-testing was done using the Chi-square test and, where appropriate, its extent was measured with Cramer's contingency coefficient.

Also used was a multivariate statistical method, specifically factor analysis, which was undertaken as the analysis of the main components and Varimax orthogonal rotation of factors, the appropriateness of which to the acquired data was verified using the Kaiser-Mayer-Olkin (KMO) and the Bartlett tests (Hendl, 2012). Here the KMO coefficient can reach values of 0–1 and can be expressed as the ratio of the sum of the squared correlation coefficients to the sum of the squares of the correlation and partial coefficients. If the KMO comes out at 0.5, it is not appropriate to apply factor analysis to the data, on the other hand, the higher the value, the better the explanatory power. Bartlett's sphericity test is based on testing the null hypothesis that the correlation matrix of the observed variables is of unit size. This means the correlation coefficients between the variables are zero and thus not even the basic prerequisite for the use of factor analysis applies. If this null hypothesis is rejected, we can apply factor analysis (Škaloudová, 2010). The extracted factors also had their values calculated (for each statistical unit) for use in further statistical processing. The value of these new composite indicators was determined using the weighted average, where the chosen weighting of each sub variable was its factor loading.

The study also applied the non-parametric testing of independent variables using the Kruskal-Wallis test for the detection of respondent preference differences, which is a generalization of the Mann-Whitney test for cases where it is necessary to compare the distribution of three and more independent samples (Howell, 2010).

The primary data gleaned were processed in Excel, Statistica12 and IBM SPSS Statistics.

RESULTS

The study included all the foregoing EDI adoption perspectives, including additional factors. The survey thus aims to bring a comprehensive view to the subject-matter of study and provide a foundation for creating a unified generic model of EDI adoption in the Czech business context.

To handle the perceived importance of adoption factors rated by the users in the second survey on a scale from 1 to 10, these 44 variables were treated with factor analysis. The applicability of this method was shown by calculating the KMO coefficient and the Bartlett sphericity test (see Tab. I). The KMO value is high, approaching 0.9, whilst also the outcome of the Bartlett sphericity test, which is statistically significant at the 1% level, means we can reject the null hypothesis of an absence of correlation between the input variables, indicating that the criteria have been met, and confirming that factor analysis can rightly be applied.

Based on the Cattel eigenvalue graph we determined the number of factors, which was set at ten new artificial variables, also corresponding to the Kaiser criterion, where the number exceeds 1 and accounts for 75% of the response variance (Tab. II).

The extracted variables are thus the indirect benefits (1), industry pressure (2), management knowledge of IT (3), anticipated costs (4), satisfaction with the current system (5), the competitive environment (6), provider profile (7), operational benefits (8), degree of business dependence (9) and the company's awareness (10).

Table 2 also lists the respective input variables, their factor loading, as well as listing the respective identifier values of the newly extracted factors and the variability percentage each factor accounts for. Furthermore, the values of these factors have been calculated (for each statistical unit) for further statistical processing. The value of these new composite indicators was determined using the weighted average, where the chosen weighting of each sub-variable was its factor loading. (Tab.II).

Additionally, the factors were treated under the Kruskal-Wallis method, to examine the differences in preferences among the respondents. At the 5% significance level we rejected the null hypothesis of no difference in responses between groups of respondents, for example, in the following cases. Each group of respondents who did or did not know about EDI responded differently to questions relating to indirect benefits (p = 0.0162), operational benefits (p = 0.0350), management knowledge of IT (p = 0.0001). There was also a noticeable disparity in how they rated the company's awareness (p = 0.0002),

II: *Factor analysis and variance explained (Extraction Method: Principal Component Analysis)*

Factors		Components	Factor loadings	Eigen values	Percent of variance explained
Management knowledge of IT	1	Has good IT skills	0.805	3.201	7.3
	2	Is technical innovation-friendly	0.861		
	3	Feels that computers improve employee productivity	0.754		
	4	Has good references about EDI from business partners	0.487		
	5	Is aware of the benefits of new technologies	0.839		
	6	Expects to gain competitive advantage with new technology	0.626		
Industry pressure	7	EDI is required for communication with major trading partners	0.946	6.405	14.6
	8	EDI is required for communication with most business partners	0.931		
	9	EDI is required by the public administration	0.861		
	10	EDI is recommended by major trading partners	0.944		
	11	EDI is recommended by most business partners	0.952		
	12	Important competitors are using or will soon be using EDI	0.951		
	13	Most of the competitors are using or will soon be using EDI	0.938		
Operating benefits	14	Less paperwork	0.744	1.486	3.4
	15	Lower error rates	0.661		
	16	Reduced overhead costs	0.718		
	17	Greater productivity	0.657		
Indirect benefits	18	Increased data security	0.525	10.502	23.9
	19	Inventory reduction	0.583		
	20	Faster ordering process	0.659		
	21	Faster communication with business partners	0.637		
	22	Improved company image	0.856		
	23	New competitive advantage	0.896		
	24	Improved customer service	0.848		
	25	Improved business partner relationships	0.889		
	26	Better workflow	0.700		
	27	EDI as an eco-friendly technology	0.469		
Competitive environment	28	Easy to switch to competitors with similar products	0.842	1.977	4.5
	29	Intense rivalry between competitors in the field	0.793		
	30	Many products on the market that perform the same function	0.696		
Company awareness	31	The company needs access to reliable, relevant information	0.746	1.111	2.5
	32	It is crucial for the company to access information quickly	0.827		
	33	It is crucial for the company to respond quickly to market trends	0.698		
Business dependence	34	The company largely relies on one principal contractor	0.704	1.196	2.7
	35	The company largely relies on one main customer	0.765		
Current IT systém	36	Laboriousness	0.925	2.413	5.5
	37	Speed	0.942		
	38	Error-proneness	0.860		
Anticipated cost	39	Cost of making the IS ready for EDI	0.898	2.735	6.2
	40	Cost of staff training	0.860		
	41	EDI running costs or periodic fee payments	0.831		
Provider selection	42	Positive references	0.827	1.851	4.2
	43	Expertise in supporting EDI software	0.884		
	44	IT support provided to a high standard	0.859		
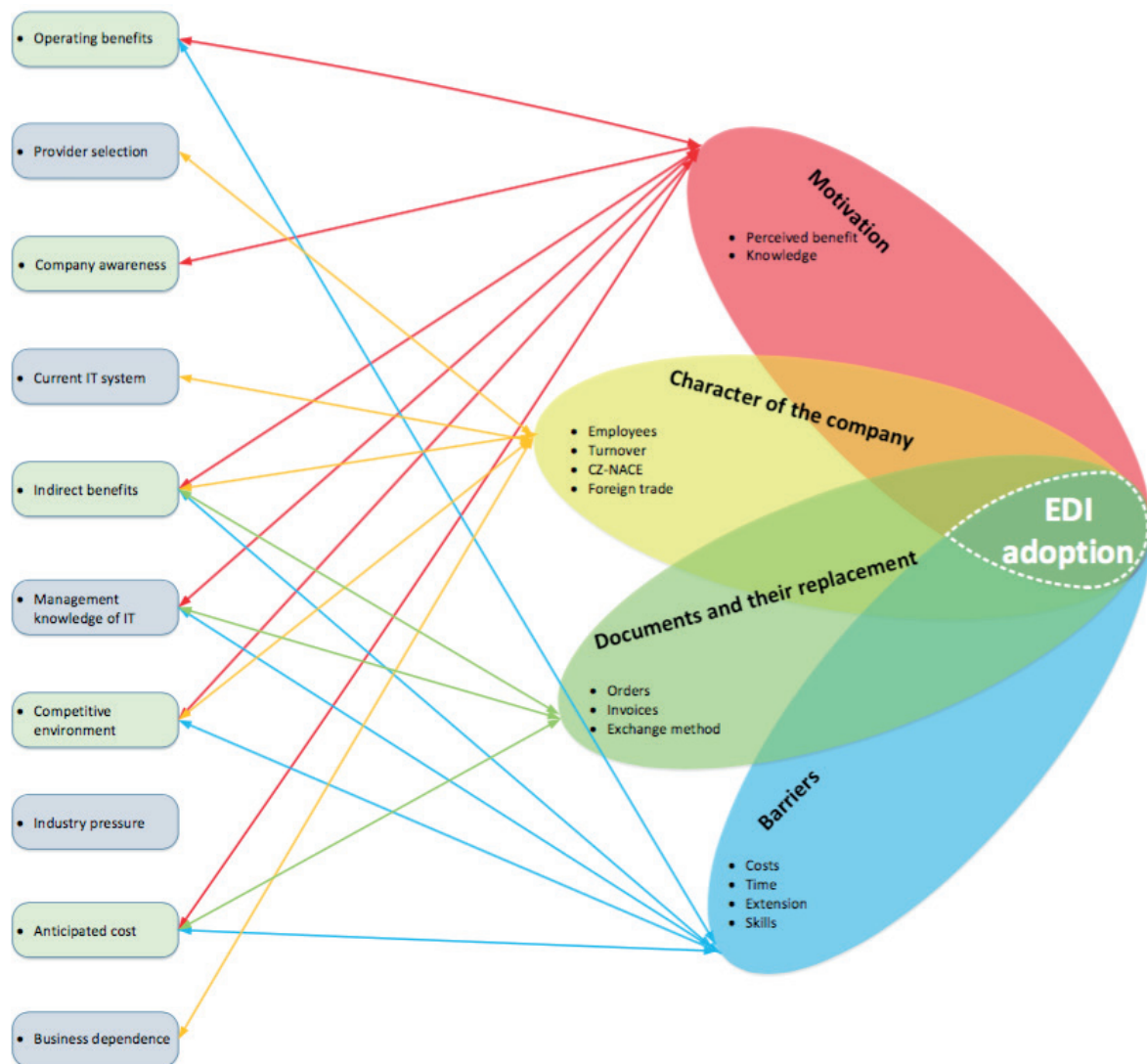
3: *Determinants of EDI adoption*

the competitive environment (p = 0.0001) or the cost of introducing EDI (p = 0.0172), between the groups of respondents with differently perceived EDI benefits.

Businesses identified the most important factors, which we can call motivators, as being in particular: improved labour productivity, reduced error rates, access to reliable, relevant and accurate information, reduced overhead costs, and better workflow. Conversely, rated as the main drawbacks were: low penetration among business partners, the cost of making the existing information system ready for the introduction of EDI, periodic fee payments, costs of training, time-consuming introduction, and the need to learn new skills.

Surprising was the finding that although in the international literature the peer group pressure factor is very highly rated, Czech companies as yet feel hardly any pressure from trading partners, nor on the part of the public administration. This would suggest that EDI penetration among Czech companies is still very low, almost 70% of businesses

don't know what EDI is, and by contrast, only some 2% of respondents use the service. The prevailing method of communication (47%) between business partners is via email. A large portion of respondents (58%) are very satisfied with their current way of ordering goods. Other findings include the fact that 98% of businesses print off received invoices for further processing. The automated means of electronic documentary exchange is deemed beneficial for the company by only 41% of respondents.

This was followed up by testing the perceived benefits of EDI via several defined hypotheses about the independence of the variables under scrutiny:

H01: There is no dependency between the perceived benefit of EDI and the evaluation of the importance of the indirect benefit factors.

The null hypothesis can, on the basis of testing using the Chi-square test, be rejected at the 1% significance level (p = 0.0001, and V = 0.2470). We can thus accept the alternative hypothesis that there is indeed a relationship between the two variables, since

this appears as a statistically significant dependency. If we consider the strength of the dependency, on the basis of Cramer's coefficient we are inclined toward a less than stringent dependency.

H02: There is no dependency between the perceived benefit of EDI and the evaluation of Management knowledge of IT.

Once again, the null hypothesis can be rejected here on the basis of the p-value at the 1% significance level (p = 0.0069 & V = 0.2494) although the dependency is rather a weak one.

H03: There is no dependency between the perceived benefit of EDI and the need for company awareness.

Even for this null hypothesis, after performing the Chi-square test, we can reject the notion of independence of the variables and note their weak to moderately strong relationship (p = 0.0019 & V = 0.2730).

From the pivot-table reports we can conclude that if the indirect benefits of EDI are on the up (better workflow, better company image, reducing inventory, greater data security), there is an associated greater Management knowledge of IT and the need for company awareness and a drop in the subjectively perceived costs of introducing EDI, as well as a rise in the perceived benefits of introducing EDI to the business.

Based on these findings we drew up the following overview of the key factors affecting the adoption of EDI, i.e. the determining factors (Fig. 3), where we can also observe the tested dependencies of the reference variables; identified on the basis of testing the null hypotheses about the independence of the reference characteristics with the Chi-square test at the 5% significance level, shown on the chart by the coloured arrows.

CONCLUSION

On the basis of the investigation conducted we can surmise that the awareness among Czech companies about the opportunities brought by EDI is very low, with over 2/3 of businesses never having come across the EDI concept at all. The data collected shows that a very important deciding factor about adopting EDI is knowledge thereof. With growing knowledge about EDI comes a growing perception among the companies of its benefits, and therefore their willingness to adopt. Despite the fact that the enterprise information system often supports EDI, this option is not exploited due to the company ignorance. There is thus an open opportunity to grow the necessary subject-matter knowledge among company managers. The data obtained also indicates the rather modest coverage by the technology, which is directly related to unusually low pressuring of businesses by trading partners and competitors toward introducing EDI.

Having applied factor analysis and hypothesis-tested for the independence of qualitative characteristics, we can specify several key factors that determine the adoption of EDI, and also the dependencies between them. The concept of EDI adoption, as seen in Fig. 3, is divided into two main parts. The first of these are the components on the right side of the model concept which are devoted to the basic aspects of electronic documents sharing. Here you can find the variables that can be characterized as "rather objective", not dependent on the subjective perception of the respondent, for example: turnover, industry, amount of exchanged documents, way of exchanging the documents, etc. The second part, the components on the left side of the model, are derived from factor analysis and thus they reduce the number of variables to the newly extracted factors that are able to explain three-quarters of the variance of the original 44 observed variables where respondents rated their perceived significance of each factor (on a scale of 1 to 10). The factor analysis thus helped to simplify and better understand the interrelationships between the variables that may influence the EDI adoption. Yet the methods used only reduce the number of variables down to the newly extracted factors that account for 75% of the response variance, indicating dependencies between the variables, but cannot clearly determine the direction of any dependency or to quantify the dependency. For directionality we can only describe the results of the pivot-table report, where inferences can be made. This makes for a further research opportunity to subject the findings to logistical regression analysis, thereby to quantify the impacts of the respective explanatory variables (key factors) and to determine the direction and extent of influence of the various factors on the likelihood of Czech businesses adopting EDI.

REFERENCES

BOUCHARD, L. 1993. *Decision criteria in the adoption of EDI.* Québec: Direction de la recherche, Faculté des sciences de l'administration, Université Laval.

CHWELOS, P., BENBASAT, I. and DEXTER, A. 2001. Research Report: Empirical Test of an EDI Adoption Model. *Information Systems Research*, 12(3): 304–321.

EDIZONE. 2014. EU has gone a step further with the introduction of electronic invoicing in public procurement. *EDIZONE: Informační portál.* [Online]. Available at: http://www.edizone.cz/clanky/fakturace/eu-postoupila-

o-dalsi-krok-dal-se-zavedenim-elektronicke-fakturace-ve-verejnych-zakazkach/ [Accessed: 2014, August 10].

ENGEL, R. et al. 2011. Process mining for electronic data interchange. *E-Commerce and Web Technologies*, 85: 77–88.

GOKSOY, A., OZALP, V. and GULNUR, K. 2012. The New Competitive Advantage: Technological Change: An Application of Electronic Data Interchange Implementation in SME in Automotive Industry. *International Journal of Business Administration*, 3(6): 25–40.

GOPALAKRISHNAN, S. and DAMANPOUR, F. 1997. A review of innovation research in economics, sociology, and technology management. *Omega*, 25(1): 15–28.

HENDL, J. 2012. *Přehled statistických metod: analýza a metaanalýza dat*. 4th Edition. Praha: Portál.

HOWELL, D. C. 2010. *Fundamental statistics for the behavioral sciences*. 7th Edition. Belmont, CA: Wadsworth Cengage Learning.

HOTI, E. 2015. The technological, organizational and environmental framework of IS in-novation adaption in small and medium enterprises. Evidence from research over the last 10 years. *International Journal of Business and Management*, 3(4): 1–14.

HWANG, K. M. and LEE, S. J. 2016. How Does Electronic Data Interchange (EDI) affect the Com-petitiveness of a Firm's Supply Chain Management? *Journal of Marketing Thought*, 3(2): 13–18.

IACOVOU, C. L., BENBASAT, I. and DEXTER, A. S. 1995. Electronic data interchange and small organizations: adoption and impact of technology. *MIS Quarterly*, 19(4): 465–485.

KAEFER, F. and BENDOLY, E. 2000. The adoption of electronic data interchange: a model and practical tool for managers. *Decision Support Systems*, 30(1): 23–32.

KUAN, K. K. and CHAU, P. Y. 2001. A perception-based model for EDI adoption in small businesses using a technology–organization–environment framework. *Information & management*, 38(8): 507–521.

KUNG, L. and KUNG, H. J. 2015. External Environment Pressure on Organizational Innovation Adoption: from Literature to a Conceptual Model. *International Journal of Management Theory and Practice*, 15(1): 99–115.

MUSAWA, M. S. and WAHAB, E. 2012. The adoption of electronic data interchange (EDI) technology by Nigerian SMEs: A conceptual framework. *Journal of Business Management and Economics*, 3(2): 55–68.

NARAYANAN, S., MARUCHECK, A. S. and HANDFIELD, R. B. 2009. Electronic Data Interchange: Research Review and Future Directions. *Decision Sciences*, 40(1): 121–163.

NEO, B. S., KHOO, P. E. and ANG, S. 1994. The adoption of Trade Net by the trading community: An empirical analysis. In: *Proc. 15th Annual Inter. Conf. Inform. Systems.* Carolyn, pp. 159–174.

O'CALLAGHAN, P. J., KAUFMANN, K. and KONSYNSKI, B. R. 1992. Adoption correlates and share effects of electronic data interchange systems in marketing channels. *Journal Market*, 56(2): 45–56.

PREMKUMAR, G. 1994. Implementation of electronic data interchange: an innovation diffusion perspective. *Journal of Management Information Systems*, 11(2): 157–186.

PREMKUMAR, G. and RAMAMURTHY, K. 1995. The role of inter organizational and organizational factors on the decision mode for adoption of inter organizational systems. *Decision sciences*, 26(3): 303–336.

REEVES, M. and DEIMLER, M. 2011. Adaptability: The new competitive advantage. *Harvard Business Review*, 89(7–8): 135–141.

SALMONY, M. and HARALD, B. 2010. E-invoicing in Europe: Now and the future. *Journal Of Payments Strategy & Systems*, 4(4): 371–380.

SAUNDERS, C. S. and CLARK, S. 1992. EDI adoption and implementation: A focus on interorganizational linkages. *Inform. Resources Management*, 5(1): 9–19.

SHAHWAN, Y. 2013. The Application Of EDI: Empirical Evidence. *International Journal of Management & Information Systems*, 17(2): 97–104.

ŠKALOUDOVÁ, A. 2010. *Faktorová analýza*. [Online]. Available at: http://kps.pedf.cuni.cz/skalouda/fa/ [Accessed: 2015, March 29].

TEO, H. H., TAN, B. C. Y. and WEI, K. K. 1995. Innovation diffusion theory as a predictor of adoption intention for financial EDI. In: *Proceedings of the Sicteenth Annual International Conference of Information Systems*. Amsterdam, December 1995, pp. 155–165.

THONG, J. Y. L., YAP, C. S. and RAMAN, K. S. 1996. Top management support, external expertise and information systems implementation in small businesses. *Information Systems Research*, 7(2): 248–267.

TORNATZKY, L., and FLEISCHER, M. 1990. The process of technology innovation, Lexington, MA. Lexington Books. Trott. The Role of Market Research in the Development of Discontinuous New Products. *European Journal of Innovation Management*, 4(3): 117–125.

Contact information

Lucie Veselá: lucie.vesela@mendelu.cz