MODEL OF EDI ADOPTION IN RETAIL

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Abstract

The article is concerned with the issue of document exchange in companies, operating in the retail sector. The aim of the paper is to identify determinants of electronic data interchange (EDI) adoption and then to create a general model of adoption of EDI that would reflect the conditions specific for retail sector. The paper connects objective and subjective aspects of EDI adoption. Using a binary logistic regression, the course of action is then determined and the influence of individual factors of adoption is quantified. The key factors (determinants), are then an input into the construction of the proposed model which extends the existing theories of adoption of EDI. Where the results of the analysis point to management EDI awareness and external pressure from business partners as the main cause of low EDI penetration.

Keywords: electronic data interchange, adoption, exchange of documents, retail, supply chain management

JEL: M15

## 1.	Introduction

The submitted article presents an extensive survey of the factors affecting the willingness to accept the technology of electronic data interchange between companies in the environment of the Czech Republic. Big and small companies in the EU are increasingly confronted with new trends and technologies of partners and competitors of the global business environment where communication is not only quick, but also constant. This concerns communication between colleagues, customers, but also other key groups separated from one another in time and space which requires work with big data and more personal, responsible and ethical procedures in effective business communication management (Ruben & Gigliotti, 2017). The knowledge of the latest trends in IT solutions becomes a powerful tool for the management of the entire supplier-consumer chain where the implementation of EDI significantly increases the interoperability (the ability of various systems to mutually cooperate) of corporate systems, just as the standardisation and transparency of the flow of information between business partners. Thus electronic data exchange is one of the basic global communication platforms on which businesses develop their supplier relationships at minimum transaction costs. With the development of the social environment where there is pressure on speed, reliability and above all data security, terms such as big data, artificial intelligence internet of things are coming to the fore, it can be assumed according to Bughin et al. (2017) that digitisation will prove decisive to the income and profit of companies where one of the most important competitive advantages will play a role.

Despite these assumptions and the fact that electronic document interchange provides many advantages, the massive acceptance of this communication is as yet surprisingly a question of the future. In the Czech Republic the number of businesses that use structured rights to the automatic transmission of business documents (EDI) is calculated only at 13% (Eurostat, 2017) and so it can be said that there is a relatively low expansion of this technology among Czech businesses where to get a better idea and comparison according to statistical surveys the European-wide average reaches 18% of businesses using EDI (Eurostat, 2017). The motivation for this survey then becomes the absence of the recognition of why despite the efforts of the EU (see the document TEDIS from 1990) to implement

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EDI (which would result in interconnection between European countries and help simultaneously to harmonise the single European market) EDI technologies are still not reflected by companies and their expansion (as is also shown by our extensive research) is so low (according to the EUROSTAT database only 18% for the EU area). The question remains a certain paradox, as to why, despite the pressure on the electronisation of business processes which in the current conditions of the global market environment is not discussed and has a fundamental effect on the entire supply chain management, the adoption of EDI is still not expanded very much and companies often give preference to the demanding manual processing of B2B agenda over automation which clearly leads to cost cuts or acceleration and greater efficiency of administrative processes? It is therefore appropriate to determine the current causes for the low expansion of this technology. It cannot be assumed that historically one of the main reasons of low EDI expansion i.e. the inadequate hardware of businesses and the too expensive initial investment in the implementation of the module (Ferguson et al., 1990; Zhu et al., 2006), is still the dominant cause of low EDI penetration of the market. Currently this barrier is being suppressed and EDI can be set up even by smaller companies, very often in the form of a service offered by a provider.

Factors affecting EDI adoption are therefore the subject of interest across various continents and scientific disciplines and electronic data interchange is still a highly current topic. So this phenomenon is a great challenge because being well-informed is gradually becoming a critical indicator for the running of a business. The desire of management to increase the control and make the measurement of performance possible in real time is, apart from production factors, an significant driving force for automation as well as industry 4.0 as such (Horvát & Szábo, 2019; Pasula, 2019). This is also shown by the fact that within the "Europe 2020" strategy pressure is created on the implementation of mandatory electronic invoicing for all public procurement within the EU, and EDI will soon become a necessity for all businesses who participate in public tenders. Based on these facts which cause increasing interest in electronic data interchange, this issue becomes the basis for further research which would clarify the main impetus for EDI adoption in businesses.

The aim of the study is therefore to identify the determinants and create a model which would comprehensively embrace the issue of EDI adoption in the Czech Republic in the area of wholesale and retail.

2.   Literature review

Electronic data interchange is a modern method of communication between two independent information systems which involves automatic interchange of standardised structure business and other documents electronically without the need of manual human intervention.

Among the main benefits of the implementation of EDI often stressed in surveys (Shahwan, 2013; Kung & Kung, 2015) is greater speed, efficiency and savings in the implementation of electronic document interchange. They also describe this technology as one of the important competitive advantages for businesses (Musawa & Wahab, 2012; Hwang & Lee, 2016). However greater experience with EDI indicates that rather than the expected short-term competitive advantages from the implementation, it is necessary to consider the impact in system integration where EDI offers the greatest actual advantages (Liang et al., 2004; Skydel, 2012; AL-Doori, 2019). Employees who were busy coping with the heavy workload of administrative activity, have far greater room for strategic planning and development of business skills (Kim & Lee, 2008). There is better communication with customers and overall increase in the standard of provided service (Goksoy et al., 2012). Another at first glance not that apparent benefit is the strengthening of relationships between individual business partners who use electronic data interchange. Communication becomes more intensive, businesses are more transparent and better informed (Lim & Palvia, 2001; Oliveira & Martins, 2011). One of the less fundamental benefits is a competitive advantage in the form of the possibility of data interchange with businesses that have adopted EDI and are often strong market players (Engel et al., 2011). After the

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implementation, there is usually organisational restructuring which helps to make the running of the entire business chain more effective (Goksoy et al., 2012; Wu & Chang, 2012) and provides the essential basis for SCM and a real strategic approach to business (Delfmann & Albers, 2000; Zhu et al., 2006). While electronic data interchange is a relatively simple technology, the consequences of its strategic use are subsequently very important for the business (Hazen & Byrd, 2012). Online sharing of information then leads to the growth of the entire productivity of a business which is also confirmed by newer surveys (Al-Doori, 2019; Blumberg et al., 2017).

On the other hand Zhu et al. (2006) and also Cao et al. (2014) talk of the following factors as of barriers to successful EDI adoption: organisational resistance to changes, initial costs of implementation, security problems and lack of control, compatibility of existing software or hardware, low awareness of the benefits of EDI, absence of education in this area and low involvement of business partners.

The adoption of new technologies, learning of new skills, periodical innovation of technology and the ability to respond sufficiently quickly to technological innovation, are according to Anjani & Dhanapal (2011), essential processes whose absence they describe as the frequent cause of the lagging behind of society. The adoption of new technology has been in the sight of leading scientists for decades throughout the world and three main directions can be marked out which have become the basis for further surveys:

- Technology Acceptance Model (hereinafter "TAM"), introduced by Davis (1989),
- Technology-Organisation-Environment Framework (TOE) proposed by Tornatzky & Fleischer (1990).
- Diffusion of Innovation (DOI) Theory published by Rogers (1995).

There are a series of studies which were devoted to the specific adoption of electronic data interchange, and as a basis for research of adoption used different theoretical bases. Existing studies differ significantly according to the place where the survey took place and the sector of the analysed businesses. The following Table 1 shows an overview of the selected studies devoted to EDI adoption and identification of key factors affecting adoption from which it is apparent that so far not much attention has been paid to the study of EDI adoption in the EU.

Table 1 Overview of EDI adoption studies

Autor	Year of publication	Theoretical basis	Data used and sector	Methods
Kaefer a Bendoly	2000	TOE	506 enterprises, USA, various sectors	Logit (prediction 86 %, specificity and sensitivity is missing)
Chwelos et al.	2001	DOI, TOE	317 enterprises, Canada, various sectors	PLS (R^2 = 0.32)
Kuan a Chau	2001	TOE, model Iacovou et al.	575 enterprises, Hong Kong,various sectors	Logit (prediction 77 %, specificity 80 %, sensitivity 73 %)
Teo et al.	2003	DOI, institutional theory	583 enterprises, Singapur, various sectors	PLS (R^2 = 0.37)
Zhu et al.	2003	TOE	3103 enterprises, 8 states,various sectors	Logit (prediction 71 %, specificity 55 %, sensitivity 82 %)
Gibbs a Kraemer	2004	TOE, institutional theory	2139 enterprises, 10 states, manufacturing	OLS (R^2 = 0.29)
Kim a Lee	2008	TOE, managerial characteristics	202 enterprises, Korea,various sectors	Multiple regression analysis (prediction capability missing)
Narayanan et al.	2009	Model e-business adoption	39 studies	Metaanalysis
Musawa a Wahab	2012	TOE, model Iacovou et al.	306 enterprises, Nigeria, various sectors	OLS (R^2 = 0.27)
Shahwan	2013	TOE	UAE,various sectors	Logit (prediction capability missing)
Mohamad et al.	2015	Concept frame	10 enterprises, Malaysia, Oil and gas enterprises	Method of thematic analysis
Lee et al.	2015	TOE	284 enterprises, Malaysia, various sectors	Logit (prediction capability missing)

It is apparent from the Table 1 that it is not possible to clearly identify the general EDI adoption model which would define the adoption determinants and would be convenient for businesses across individual countries or fields of economic activity. This fact has become the basis for the chosen methodology of the article which examines EDI adoption at businesses from the wholesale and retail sector in the Czech Republic. Given that the aim of the article is to assess EDI adoption comprehensively the main theoretical bases such as TAM, DOI and TOE theories are included in the concept of the survey and two significant models are included. The model by authors Iacovou et al. (1995), which is based above all on the TOE theory and as one of the first models of EDI adoption became the basis for many further studies and the second newest model which came about from the

meta analysis carried out in 2009 (Narayanan et al., 2009) and summarises the main findings about EDI adoption (Figure 1).

Figure 1 Expanded conceptual model (Narayanan et al., 2009, p. 145)
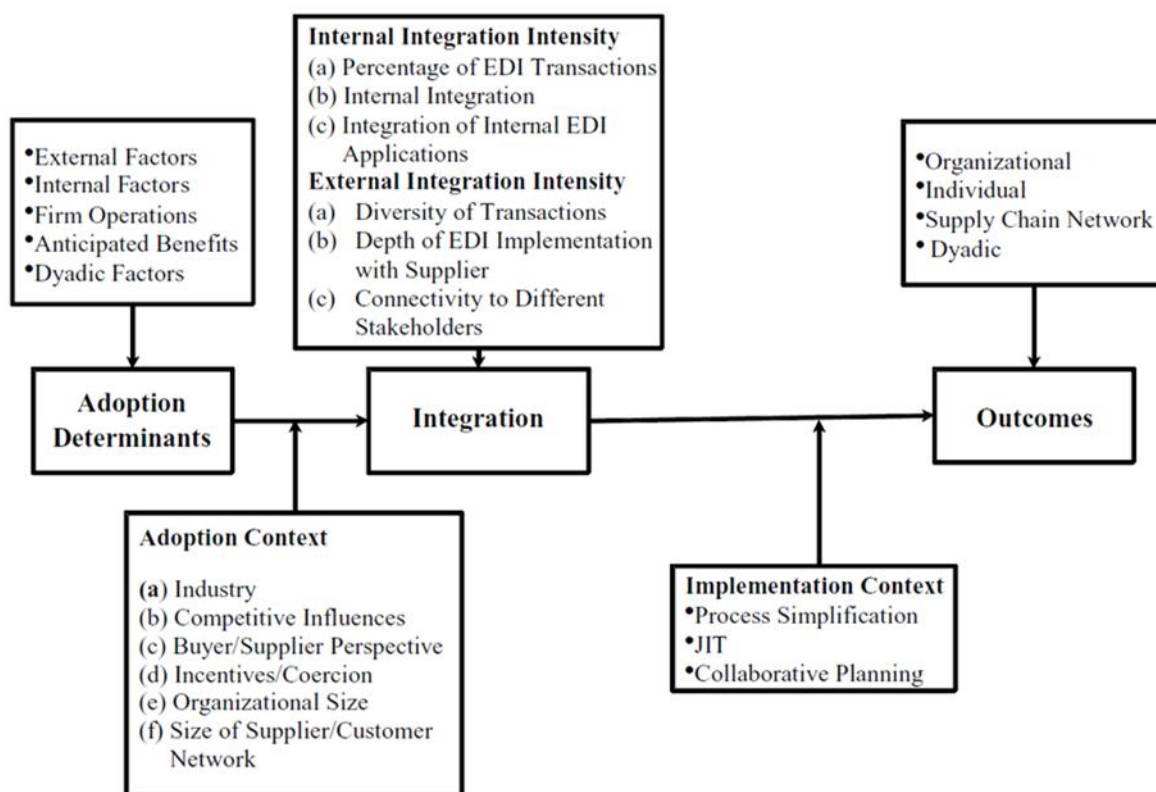
3. Methodology and Data

The aim of the article is to identify the determinants and present a model which would comprehensively embrace the issue of EDI adoption in the Czech Republic in the wholesale and retail sector (Section G according to CZ-NACE). It is convenient to consider the biggest number of possible variables which enter into the decision-making on EDI implementation and take into account the various aspects of EDI adoption. Above all the effect of the nature of a business and sector, financial variables, internal need to improve the operational activity of a business, attitude of company management, nature of the products or services, legislation, ecology, the technical capability of the provider and knowledge of EDI.

In the survey questionnaire in the wholesale and retail sector a total of 51 input variables were included. These were identified on the bases of foreign literature sources, but also on the basis of previous primary surveys where several expressed hypotheses were verified. The first survey entitled "Aspects of electronic document interchange" (Author et al., 2015), focused above all on determining objective variables where the subjectivity of the respondent is not projected. The second survey entitled "Factors affecting EDI adoption" (Author, 2017), focused on determining the subjective assessment of the effect of individual variable respondents. On this basis the EDI adoption model construction concept was subsequently drawn up which became the basis for this research combining the subjective and objective adoption variables. Data was collected using an electronic questionnaire which underwent a pretest and consultation verifying its clarity in 2016 and 2017. The respondents expressed the regarded the importance of individual analysed variables on a scale of 1 to 7. The return of this survey questionnaire reached 5.4 %. The number of respondents therefore corresponds to 907 fully completed

questionnaires with 310 businesses operating in retail (Section 47). The following Table 2 shows a summary of the rate of EDI adoption at the respondents.

Table 2 EDI adoption rates in wholesale and retail, Eurostat and own survey data (N=907)

Company size	Eurostat data	Own survey data
	Use EDI (%)	Use EDI (%)
Total	22.40%	9.70%
10–49	19.40%	7.90%
50–249	40.60%	25.50%
250+	42.20%	52.90%

The data acquired was then processed statistically. In view of the scope of determined variables there was firstly a reduction of data dimensionality using a factor analysis which became the basis for the calculation of new composite variables, i.e. adoption factors. These factors then entered the binary logistic regression (logit model) and construction of the adoption model as an independent variable (regressors). The dependent variable can then acquire two values, i.e. that EDI adoption did not take place (the dependent variable value acquires value 0) and EDI adoption did take place EDI (the dependent variable value acquires value 1). Several indicators are monitored to consider the adequacy of the model. The first of these is the omnibus test of model coefficients which shows a difference in the original (zero) model with a constant and model with independent regressors. The criterion of the 2 and Cox & Snell R-squared and Nagelkerke R-squared is also monitored for the model. According to Řeháková (2000) the calculation of these squared measures represents an analogy of the index determination in linear regression, of course they cannot be interchanged, so these equivalents are based on the maximum likelihood estimation. A further test which verifies the adequacy of the model is the Pearson chi-squared goodness of fit test, Hosmer and Lemeshow test. For the assessment and optimisation of the calculated logit model the sensitivity and specificity of the model is also calculated for the data used. The tool which indicated the relationship between the sensitivity and specificity of the model for all admissible threshold values is the ROC curve, which can then determine the threshold value or also the separation criterion that affects the number of false positive or false negative observations. The Youden index can then be used for the optimisation of the threshold value which represents the maximisation of the sum total of the sensitivity and specificity of the model where the index should reach higher values than 0.7 (Hopley & Van Schalkwyk, 2001).

The interpretation of the regression coefficients of the model of the adoption of electronic data interchange then results in detection which from the composite variables are crucial, i.e. determining, for EDI adoption, for this operation sequential elimination is used which removes those variables from the model that are assessed as being statistically insignificant (the p-value was less than 0.05) 5% on the level of significance.

Then the limiting influence is also determined of these determinants for EDI adoption by which we consider how the likelihood of EDI adoption is affected at a business if we change one of the presented independent variable in the model.

4. Results

The variables which were determined based on the literature review and subsequently assessed by respondents in the primary survey were the input for the identification of individual factors of adoption and with the aid of the selected LOGIT model the strength and direction was calculated of individual explanatory factors. Subsequently those were determined based on their statistical significant which are

determining for the adoption of electronic data interchange and are taken into account in the resulting model (Table 3).

Table 3 EDI adoption model – determinants

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	Importance of perceived benefits	-0,335	0,158	4,502	1	0,034	0,715
	Industry pressure	2,007	0,14	7,317	1	0,007	1,46
	IT knowledge of management	-0,443	0,158	7,836	1	0,005	0,642
	Satisfaction with the current IS	-5,049	0,166	5,48	1	0,019	0,678
	Total data volume	0,64	0,153	17,402	1	0	1,896
	Manual ordering	-1,475	0,795	3,447	1	0,063	0,229
	Experience with EDI	4,295	0,24	44,681	1	0	4,968
	Time	-3,313	0,898	12,632	1	0	0,041
	Rate of business dependence	-1,818	0,566	12,321	1	0	0,137
	Well-informed company	1,571	0,546	8,277	1	0,004	4,81
	Constant	-9,104	1,447	39,585	1	0	0

The ability of predicting the extended adoption model after the reduction of explanatory independent variables to those which are statistically significant (while maintaining the optimum threshold value of 0.15, which corresponds to the Youden index) corresponds to 89.5 of the correctly predicated cases.

For this research specially monitored model sensitivity corresponds to the ability of the model to correctly estimate 86.4% of business cases with EDI adoption. The model specificity, the so-called number of the correctly predicated businesses without EDI adoption is 89.9% of correctly predicated phenomena.

A graphic draft model (Figure 2) was created for the lucidity and simplification of the EDI adoption model in retail.

It is apparent from the resulting draft model which determinants act in the rise of values on the increase of the likelihood of adoption (+; left side of the model), they are therefore positively correlated with EDI adoption and on the contrary which key factors act on the decrease of the likelihood of the implementation of EDI (- ; right side of the model), where this can be seen as negative dependence. Here the directions are illustrated of the dependence of statistically significant factors which may be called determinants of EDI adoption in retail.

The positively acting determinants or composite variables which are calculated from the original variables are industry pressure, experience with EDI, total data volume, well-informed company and rate of business dependence. These results are not so unexpected and correspond to the assumptions which arise from the first primary surveys, and simultaneously the original theoretical models.

It can be stated that even in the conditions of the Czech retail sector it is very important how external pressure from business partners as well as competitors, in other words industry pressure acts on the business. The stronger the pressure on the implementation of EDI from the surrounding environment the more often businesses will adopt technology.

Figure 1 Model of EDI adoption in retail
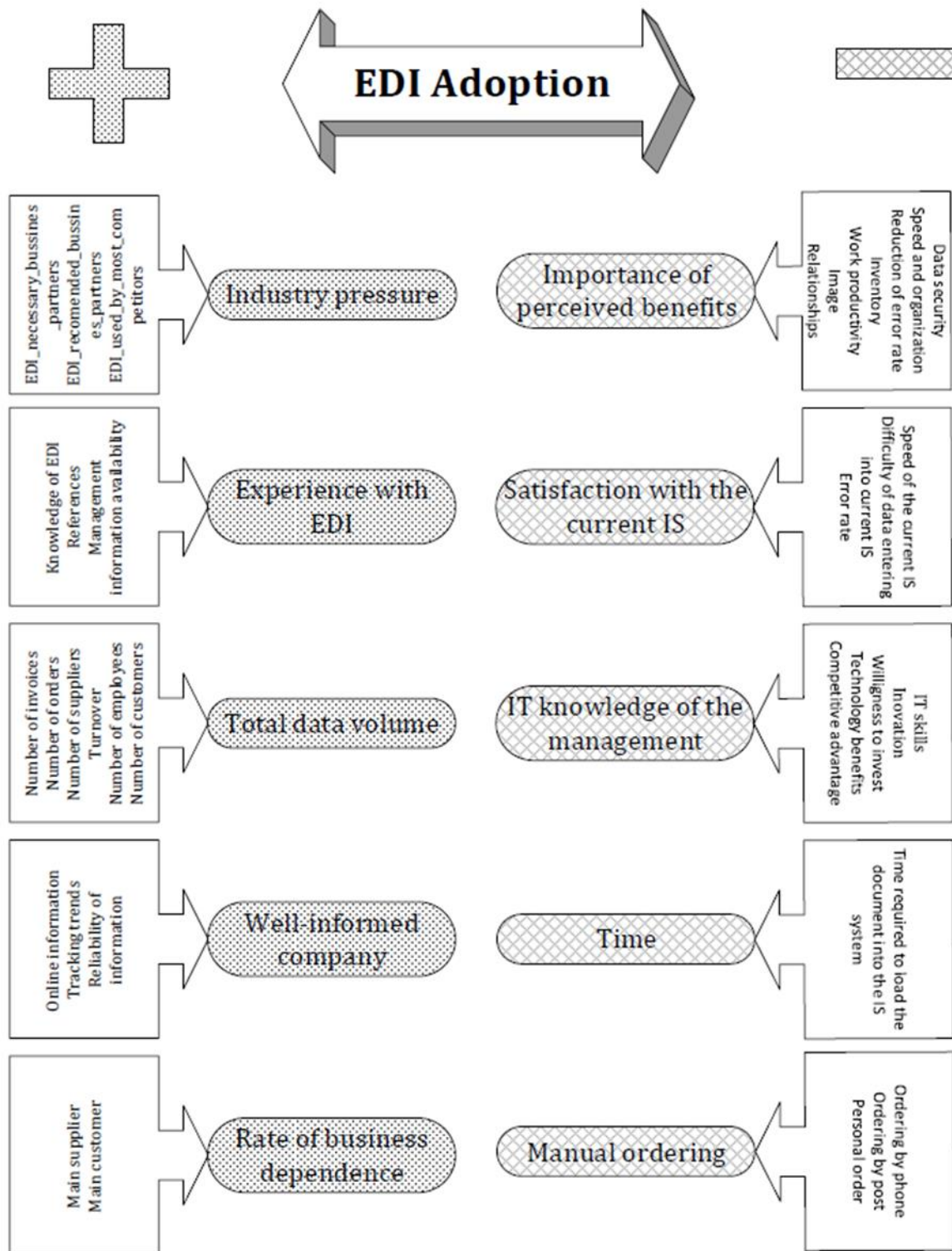
This also relates to the dependence of the business on the main supplier or customer, i.e. rate of business dependence. It is apparent that if the business will have one main supplier or customer, up to a certain extent the EDI adoption will depend on the attitude of this business partner. In case of a strong business partner where electronic data interchange can already be observed or expected in the near future, then EDI becomes a necessity for communication with him. Firstly often smaller suppliers choose this form of communication over the web interface which means almost zero primary investment.

Nevertheless this method does not allow the full use of the advantages of electronic data interchange and documents must be entered manually again in the interface. So the advantage lies only in maintaining the ability to communicate with the business partner which requires EDI communication. Therefore later most businesses switch to the implementation of EDI in their information system so they have information about business operations online and the factor of manual integration of documents in the information system is removed which leads to the full use of the benefits that EDI provides.

This subsequently also affects the independent variable of the well-informed company. If a business wants to be successful in today's global competitive environment there is the assumption here that it will be necessary for it to quickly respond to current trends based on reliable and prompt information. It can be assumed that for some companies (e.g. those that trade in perishable goods) availability of information online (transport time, storage, storage temperature, etc.) is a necessity.

However one of the most important determinants of adoption is above all experience with EDI. It is very important that company management has sufficient information about what EDI is and what it makes possible. Without experience, it is almost impossible for a business to accept this technology. Therefore sufficient information about the possibilities, advantages and disadvantages of individual solutions plays a big role as well as important references from other business partners. Unfortunately in the conditions of Czech businesses in the wholesale and retail sector information is still not at a high level. In the end almost half of the respondents (48.1%) do not know what electronic data interchange means. This is alarming in this day and age when automation is an increasingly strengthening trend. Therefore it is very important for company management to be properly educated in this issue.

The final positively correlating determinant with the likelihood of the choice to adopt EDI is total data volume variable. This composite variable expresses data volume or business documents for transfer and includes the aspect of the company's size. This determinant is also crucial given that the number of interchanged messages has a direct impact on the return of the investment in electronic data interchange. It is apparent that with the growing interest in the number of interchanged documents administrative cost savings or better use of human resources is more marked.

On the other hand, determinants are placed which, on the contrary, with the increase of the value reduce the likelihood of EDI adoption in retail, and these include importance of perceived benefits, satisfaction with the current IS, IT knowledge of the management, time or manual ordering. This needs special attention given that their negative effect was not apparent at first glance with the exception of the satisfaction with the IS variable.

In the case of the satisfaction with the current information system determinant the negative correlation was expected. The conjecture can therefore be confirmed and it can be stated that in case a business is satisfied with its information system, i.e. with the existing method of data interchange, it can be expected that the business will not be willing to adopt new technology and change the existing system. The likelihood of the implementation of EDI falls with the growing satisfaction with the speed, laboriousness or error rate of the submission of documents.

On the contrary, a situation when the importance of perceived benefits grows for a business and the likelihood of implementing EDI falls is surprising. The original assumption was based on the premise that the bigger the need of a business to implement individual benefits which EDI provides the greater the likelihood of the acceptance of EDI. On closer analysis of the distribution of the frequency of individual answers where for fourteen input variables which represent the benefits that EDI brings, each respondent assessed their perceived significant by a value from 1 (not important) to 7 (very important), it is apparent that most respondents chose high values regardless of whether they have EDI or not and it is very difficult to find any nuance here. Nonetheless if we look at the factors which were analysed in other studies too, it can consistently be stated that these perceived direct and indirect benefits are not in themselves determining for EDI adoption (Lee et al., 2015; Mohamad et al., 2015). Lee et al. (2015) also state that some businesses notice the benefits of EDI only after a long time, not immediately after implementation. So it would be appropriate to focus on this interesting subject in a longer time perspective and follow up on detected results and elaborate them further. Otherwise it can be

considered for further research to draw up a structure of questions concerning determining the assessment of the importance of individual benefits so the interconnection of the perceived benefits of EDI implementation is apparent to the respondents from them.

Another surprising finding is that the increasing IT knowledge of the management negatively correlates with EDI adoption. This result was consulted with electronic data interchange expert who confirmed that he comes across a similar situation in practice and adds "If the management is convinced of its IT knowledge which however is often inadequate, this often results in businesses rejecting new information or consultation and cannot correctly assess the situation or analyse the needs of the business. It is then very difficult to establish cooperation, even in case that the appropriateness of implementing electronic data interchange for the business is apparent." In case that the knowledge of IT technologies is really of a high level, there may also be integration of own automated solutions within a partnership network.

The time required for integrating a document into the information system also shows the negative dependence with EDI adoption. This draft variable arose on the basis of consultation with experts in this issue and providers of these services who stressed the practical experience that often the time required for the manual transcription of a document into the IS in combination with the growing number of interchanged data can influence the need to implement EDI. So according to the regression results time is really one of the determinants of adoption, nonetheless the original assumption that as time passes there will also be an increased willingness of a business to adopt EDI was not confirmed. On the contrary, the results show negative dependence. In this case a possible explanation is offered that if businesses enter documents in the system even for several minutes, with the greatest likelihood this will be smaller businesses where there is not such a quantity of documents or a situation in which documents cannot be interchanged without personal participation. The stated facts then also clarify the negative correlation of EDI adoption with the manual ordering of goods which is one of the further determinants of the proposed model. Here the question arises that if the business still makes manual orders it is either necessary or this concerns specific cases of orders where automated processes cannot be replaced by personal contact with the business partner.

5.   Discussion and Conclusions

The aim of the article was to identify the determinants of the adoption of electronic data interchange. It also quantifies the effect of individual determinants and determines the direction of their effect so that it is possible to predicate the likelihood of the adoption of electronic data interchange in a business. Foreign professional literature became the basis for creating a theoretical framework indicating certain differences of the adoption of electronic data interchange due to the different theoretical aspects which the study includes and also the different conditions of various countries and sectors (see Table 1 above). Therefore 51 different variables enter the model and were identified using a synthesis of findings from existing studies so the issue can be examined comprehensively.

To achieve the reduction of data dimensionality several composite variables were created using a factor analysis that then represented independent variables in the logit model where a dependent variable acquired the value 0="business has no EDI" and 1= "business had adopted EDI". Table 4 below shows a summary of major EDI adoption studies where it can be observed which factors the authors took into account (the field is not empty) and which factors they determined crucial for adoption (value Y), respectively as EDI adoption non-determining factors (value N). It is apparent that the new composite variables correspond to the key factors which are also analysed in foreign studies.

A coefficient of determination cannot be accurately expressed for the resulting EDI adoption model in this article based on the binomial choice model. The Nagelkerke R^2 value, which represents a certain analogy of the determination index in linear regression for the logit for the model proposed in this article acquired value 0.7. which in comparison with other models (Table1) indicates a quality EDI adoption model.

Table 4 Overview of EDI adoption factors analysed in different studies (Y = determine EDI adoption, N = do not determine EDI adoption, empty field = not observed)

Factors of adoption	Kaefer & Bendoly 2000	Chwelos et al. 2001	Kuan & Chau 2001	Teo et al. 2003	Zhu et al. 2003	Gibbs & Kraemer 2004	Kim & Lee 2008	Narayanan et al. 2009	Musawa & Wahab 2012	Shahwan 2013	Mohamad et al. 2015	Lee et al. 2015	EDI MODEL 2019
Total data volume	Y	N		Y	Y	N	N	N		Y	Y	Y	Y
Industry pressure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Expected costs	Y	Y	Y			Y		N	N		Y	Y	N
IT knowledge of management		Y	Y	N	Y	Y	Y				Y	N	Y
Competitive environment	Y	Y		Y	Y		Y	Y				N	N
Importance of perceived benefits		Y	Y			Y		Y	Y	Y	N	N	Y
Satisfaction with the current IS		N							N		Y		Y
Experience with EDI			N				Y				N	Y	Y
Well-informed company							N	Y					Y
Rate of business dependence		Y	N	Y	Y			Y					Y
Multinational company											N		N
Data exchange method			N	N			N						Y
Time													Y

Other studies in compliance with this article were drawn up based on binary logistic regression, i.e. a logit model. However not all studies (e.g. Kaefer & Bendoly, 2000; Shahwan, 2013; Lee et al., 2015) provide fundamental information on the quality of classification in proposed models. In particular data were incomplete on the number of correctly predicated cases of adoption and on the general ability of the model to correctly predicate (whether a business adopts EDI or not), but also on the specificity and sensitivity of models. Other authors (Kuan & Chau, 2001; Zhu et al., 2003) have omitted this fundamental information in their studies, nonetheless it can be stated that not one of these models achieves a better ability of general prediction than the model presented in this article. In addition the specificity and sensitivity of the EDI adoption model in retail proposed in this article achieves higher values in comparison with previous studies. To fulfil the aim of the article the sensitivity of the model is the most important which shows how able the model is to correctly predicate businesses which adopt EDI, i.e. Pr (Y=1). For proposed model the sensitivity is 86%.

However when making the comparison, it must be pointed out that a certain role may be played by the fact that only businesses from the Czech Republic were included in the primary surveys and the circumstances of electronic data interchange can be slightly different for each country. Likewise, the resulting model focuses only on businesses from the wholesale and retail sector which allows close specificity of subjects of study and better specifies their needs. Further study of sector specifics and differences and their international comparison may represent an interesting future expansion of this issue. The model in this article is based on the considerable quantity of observations (a total of 907 businesses are included) in comparison with the mentioned studies, this article implements a data file with the highest number of respondents included in the survey questionnaire.

Among the most significant factors of the proposed adoption model is experience which represents own knowledge of EDI, availability of information about EDI and good references from business partners. Of course in the comparison table it is apparent that not all studies include it. It is alarming that almost half of the respondents (48.1%) still do not know what electronic data interchange means. The authors describe as key factors of EDI adoption to be above all the industry pressure, in which the business operates, total volume of data for transfer, IT knowledge of the management and importance of perceived benefits, which is in accordance with the results of the proposed model.

In contrast, the significance of the competitive environment or expected costs, which authors often draw attention to, were not shown in the proposed model as is indicated by the results of binary regression (see Table 3), and the factors for businesses in the Czech environment cannot be described as determining.

The factor of the competitive environment includes three variables which assess the rivalry between competitors as to how difficult it is to switch to the competition. Given that this regressor did not appear as being statistically significant, it can be assumed that businesses as yet do not regard electronic data interchange as a strong competitive advantage and the reason to adopt EDI, which is probably the consequence of the low expansion of EDI in the Czech Republic. This assumption is also a suitable subject of research for further study of the given issue.

As regards the factor of the expected costs which according to the resulting model is not determining, there is a further appropriate direction of research of the issue of EDI adoption. Specifically whether the expansion of technology and the internet in recent years is so marked and has caused such an upheaval that electronic data interchange is really becoming more available and as a result businesses, by overcoming the initial investments in the implementation of EDI into the system, no longer regard it as a major obstacle as was formerly the case.

Just as in other studies, so this article has several limitations which need to be taken into account when assessing the results and in further research. For further expansion it would, for example, be appropriate to conduct a series of further interviews with businesses which have implemented EDI and discover the real impact of its implementation in the longer term, as well as with businesses which have decided not to have EDI and devote more time to their reasons. A further limiting factor is also the unequal number of businesses in the analysed sample which have adopted EDI and those that have not.

Despite these limitations, the proposed model clearly identifies the adoption determinants, combines several theoretical directions and aspects of the acceptance of new technology and expansion of the existing research on some further variables which can affect the decision to adopt EDI. Some surprising conclusions were subjected to comment and during discussion there was a comparison of the proposed model with the conclusions of earlier studies.

The knowledge of key factors of EDI implementation is very important for businesses that are aware of the need of interoperability within the single European market and its highly competitive environment. The proposed model is an appropriate source of information for companies which want to find their way round the issue and can also become the basis for making a decision about EDI implementation in the corporate system. The article also provides results which can also be interesting for EDI service providers. It is expedient for providers to focus on increasing the awareness of EDI

among businesses. The adoption model can also be used by state organisations in their efforts to facilitate and increase transparency of all corporate activity connected with state administration using EDI.

In addition, given the general development of regulation in the standards of the protection and electronic communication – see for example the greatly discussed Regulation (EU) No. 910/2014 of the European Parliament and of the Council (eIDAS Regulation) and Regulation (EU) 2016/679 on the protection of personal data (GDPR), or also Directive 2014/55/EU on (mandatory) electronic invoicing in public procurement, it is right to expect that over time these requirements and demands on the ability of businesses will become an important circumstance to which businesses will have to adapt. The automation of data interchange among businesses will become a necessary part of the competitiveness of the European market where it is necessary for policy makers to strongly promote education in IT so that relatively cheap and effective technology such as EDI is not alien to anybody and becomes the first step of businesses to implement so-called In-dustry 4.0, Internet of Things, artificial intelligence and further technological innovations that come with the times.

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