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## Article

# A contemporaneous statistical note on E-Commerce adoption in Romania: Based SMEs

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## A CONTEMPORANEOUS STATISTICAL NOTE ON E-COMMERCE ADOPTION IN ROMANIA – BASED SMES

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### Abstract

During the recent period, the scientific literature has highlighted the role of E-commerce in business development and growth. In this article we revisit the specifics of E-commerce adoption, focusing on the case of Romanian SMEs. Using the online questionnaire survey method and the principal component analysis, we draw a comprehensive picture of Romanian SMEs with E-commerce activities, with reference to the determinants and barriers of E-commerce adoption, benefits emerged with the use of E-commerce and main problems in the E-commerce development. We find that the main factor determining E-commerce adoption is the perceived relative advantage brought by E-commerce activities pointing to higher productivity and efficiency inside the company, while the major barrier is the lack of compatibility between E-commerce activities and the SME's way of doing business, and not the costs, as initially expected. The low competitiveness of the business environment has an important role in deterring E-commerce activity. We conclude that the launch of information campaigns for enhancing familiarity with E-commerce practices for increasing confidence in E-commerce activities for both SMEs managers and their clients is among the most effective measures for intensifying E-commerce activity in Romania.

**Keywords:** SMEs, E-Commerce, adoption barriers, benefits.

**JEL Classification:** M10, M15, M31, O33

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## Introduction

Electronic commerce (EC) was a major innovation that modified in a significant amount the traditional approach to doing business (Lefrebre, et al., 2005). At present, there is a general consensus on the fact that e-business and e-commerce hold key advantages for business growth, especially given the recent dynamics of the business environment. The scientific literature recognizes these favourable effects and an important dose of academic effort was oriented towards determining the most relevant factors specific for EC adoption. Though generally country-specific, these benefits range from access to an enhanced pool of customers and markets, towards cost reduction and positive results in terms of productivity and brand image. Despite this general agreement, the dedicated literature points out to the fact that, as the case of any innovation, the benefits of EC have been successfully harvested by companies in developed economies or big companies. In present times, small and medium sized enterprises (SMEs) hold a prominent role in mature economies (Eikebrokk and Olsen, 2007) and also in frontier developing economies. Despite this fundamental relevance, SMEs have traditionally experienced a series of deficiencies in the adoption of EC. These problems are, as Rahayu and Day (2015) note, more visible for the case of developing countries.

Such obstacles in adopting EC are either firm specific (internal barriers) or environment (country) – specific (external barriers). Kapurubandara and Lawson (2006) document on the external barriers focusing on various types such as: Cultural, Infrastructure, Legal and Regulatory, Political or Social and argue that they represent one of the main sources of different EC development between mature and emerging economies. Given the fact that several, if not all of these realities might be country-specific artefacts, and given the rapid changes and high volatility in the present business environment, the study of local SME's involvement in EC is fundamental for the construction of sound governmental support policies. Moreover, we detect a gap in the literature consisting in a recent and specific study dedicated to the EC practices of Romanian SMEs.

Therefore, in this paper we scrutinize a sample of Romanian SMEs in order to capture a present-day image of EC evolution and development. The vast majority of EC-dedicated studies focus solely on one facet of e-commerce, concentrating on either adoption, benefits or barriers. The merit of the present study is that of gathering all these issues of interest for drawing a complete framework of Romanian SMEs with EC activities, related to the determinants and barriers of EC adoption, benefits emerged with the use of EC and main problems in the EC development in Romania. To our knowledge, until present, there is not a similar study in the literature. This is why we consider that our study has the potential of being a reference one in the current literature and on the segment of studies dedicated to the Romania. Therefore, the aims of this paper are:

- to identify Romanian SMEs' perception on the main determinants and obstacles in EC adoption and the main advantages and obstacles in developing EC activities using the principal component analysis;
- to establish whether there are differences in EC perception depending on the SMEs' sector of activity.

The remainder of this paper is organized in the following manner. Section two offers a brief review of the scientific literature, while section three presents our methodology that draws

from a questionnaire approach. Section four presents the results obtained for both benefits and barriers, while the last section concludes.

### 1. Review of the scientific literature

This paper is related to the block of academic interest that focuses on E-commerce implementation in SMEs. A large part of this literature discusses EC adoption in SMEs, while aiming to isolate country-specific factors (see for example: Rahayu and Day (2015), Kabanda and Brown (2017), Sin, et al. (2015), Lefebvre (2015), or Savrul, Incekara and Sener (2014). These efforts offer a wide range of motivations, contexts, determinants or perspectives for EC adoption in SMEs in both developed and developing countries. A selection of such studies employs a questionnaire approach and considers also the benefits deriving from SME adoption of EC. For example, Rahayu and Day (2015) survey 292 Indonesian SMEs and report that the most relevant factors leading to EC adoption were in this case: marketing, procurement activities, extending the market, increased sales or company image. Along the same line, and again in a questionnaire-based approach, Kaynak, Tatoglu and Kula (2005) notice that for the case of Turkish SMEs, the adoption process was highly influenced by the perceived benefits deriving from EC. Another important conclusion of the study is the fact that in this case, the adoption process was invariant on company and industry-specific factors. Other similar contributions can be traced back to Alam, et al. (2011) for Malaysia, Simpson and Docherty (2004) for the UK, Lertwongsatien and Wongpinunwatana (2003) for Thailand, Scupola (2003, 2009) for the south of Italy, Denmark and Australia, Jeon, Han and Lee (2006) for Korea or Nasco, Toledo and Mykytyn (2008) for Chile.

Our paper is also related to the strain of literature that focuses on EC barriers, both in the moment of adoption or later on in the development state. Kapurubandara and Lawson (2006) notice different E-commerce patterns among developed and developing countries and consider that some of these differences derive from barriers. The authors divide the barriers into internal and external sources. Among the most relevant internal barriers, the survey isolates the employees lack of skill, doubts on the financial gain capacity of EC, the fact that e-commerce might not be suited to the products and services of the company. The external barriers are then divided into categories such as: Cultural, Infrastructure, Legal and Regulatory, Political or Social. Kartiwi and MacGregor (2007) focusing on adoption barriers aim firstly to identify the main obstacles and then, using as proxy Sweden and Indonesia for developed and developing countries, try to determine whether these realities vary with the level of country development. The main finding of the study is that the respondents from the developed country were more concerned with technical barriers, while respondents from the developing country had organizational concerns.

In addition to the above-mentioned work, there is a rich literature that deals with the E-commerce aspects for the case of Romania, with contributions such as: Wang and Sun (2010), Belingher and Calin (2011), Onete, Teodorescu and Vasile (2016) or Antonescu, et al. (2017). Despite this focus, the literature paying particular attention to the case of E-commerce in Romanian SMEs is rather scarce. Damaskopoulos and Evgeniou (2003) study the drivers of new commerce practices in a set of Eastern European SMEs, including Romania. Employing a survey with a sample of 900 SMEs, the authors offer details on EC adoption. Martin, et al. (2012) offer a theoretical comment on the e-readiness of Romanian

SMEs, commenting on the lack of governmental aid. Besides the above-mentioned contributions, other studies focus on ITC development in SMEs without a special orientation towards E-commerce.

## **2. Research methodology**

The present study is an exploratory research for a better understanding of the barriers and advantages that motivate SMEs to conduct EC activities using the online questionnaire survey method<sup>†</sup>. As stated above, the questionnaire was built in relation to previous academic efforts such as Eikebrokk and Olsen (2007), Kartiwi and MacGregor (2007), Ghobakhloo, et al. (2011) or Rahayu and Day (2017). The approach was refined and adapted to the intrinsic characteristics of Romania's business environment. The questionnaire targeted SMEs that are already involved in electronic commerce activities in Romania, in order to isolate both the drivers of electronic commerce adoption and the dynamics of the company after the above-mentioned adoption.

The questionnaire has two main parts. The first part relates to demographic factors describing SMEs, such as age, duration of involvement in EC practices, number of employees, area of activity. The second part is divided into other four parts, in order to reach our aims, and correspond to two moments of time. The first one envisages the period prior to the EC adoption, meant to establish the main factors pushing to EC embracement and the principal deterrent elements. The respondents' opinion was requested for 17 potential causes or items for the start of the EC activity and 11 potential barriers (items) faced when adopting EC. For the easiness of writing, we will relate to the part A when discussing about the determinants of EC adoption and part C when referring to obstacles when adopting EC. The second moment of time has to do with the actual activity of SMEs that already unfold EC activities and focuses on the EC benefits and obstacles in the development of the activity following adoption. Again, the respondents were asked to express their opinion on 12 benefits and 13 impediments in the EC activity in Romania. We will relate to part B when talking about benefits brought by EC and part D when discussing the main problems in the EC development in Romania. The options for each question were established based on previous studies in the literature, given that this is the first study of this type conducted for Romania so far, at least to our knowledge. The perception of the respondents in the second part of the questionnaire was measured using a five-point Likert-scale, which ranges from 1 ("total disagreement") to 5 ("total agreement").

The SMEs in the sample are companies that have already adopted the EC solution, at different moments in time, which allows us to investigate both the drivers at the moment of EC adoption and the success in unfolding the business at present, after gaining some experience in using EC. The respondents are owners or managers of the SMEs in the sample. The questionnaire was electronically filled by SMEs representatives in the first quarter of 2018. It targeted 500 SMEs in three cities in the country that organized conferences for discussing this topic (Bucharest, Constanta and Craiova) during this period. 109 questionnaires were filled, which suggests a response rate of 21.8%, while the final sample was made of 97 responses fully completed. The profile of the respondent SMEs is presented in Table 1.

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<sup>†</sup> The questionnaire can be provided at request.

The sample consists of SMEs that usually develop activities in the field of trade and related domains (almost 32%). The second economic sector of origin is Marketing, which stands for 18.56% of the sample, being followed by Finance and related services with close to 16.5% and IT (15.46%). Other sectors register percentages lower than 10% (such as Transport and communication and Manufacture).

The sample is almost balanced between micro (35.05%), small (34.02%) and medium enterprises (30.93%), as classified by the number of employees. We notice that our sample is generally populated by young companies. The largest part of the sample (almost two thirds, namely 66%) includes companies with maximum 10 years of activity, while almost 20% report an experience of over 15 years. Only a fraction of about 14% of the sample has a market activity between 11-15 years.

**Table no. 1. Profile of respondent SMEs**

	Frequency	%		Frequency	%
<b>Industry type</b>			<b>Age of the company</b>		
Manufacture	5	5.15	Less than 5 years	32	32.99
Trade and related activities	31	31.96	5-10 years	32	32.99
Marketing	18	18.56	11-15 years	14	14.43
Transport and communication	8	8.25	Over 15 years	19	19.59
Finance and related services	16	16.49	TOTAL	97	100.00
IT	15	15.46	<b>Experience in EC activities</b>		
Others	4	4.12	Less than 3 years	29	29.90
TOTAL	97	100	3-5 years	38	39.18
<b>Firm size</b>			6-10 years	22	22.68
Micro (0-9 employees)	34	35.05	Over 10 years	8	8.25
Small (10-49 employees)	33	34.02	TOTAL	97	100.00
Medium (50-249 employees)	30	30.93			
TOTAL	97	100.00			

The above investigation was enriched with references towards the duration of EC activities. As expected, usually the EC activities are new for the companies. The results reveal the fact that 69.08% of the sample conducted EC activities for a maximum of 5 years. Out of this figure, almost 30% have been implementing EC for a period lower than three years, while 39.2% are accustomed with EC activities for 3-5 years. The results also point to a fraction of companies of almost 23% that have conducting EC activities for 6 to 10 years. Only about 8.25% of the contacted companies can prove an EC activity older than 10 years.

We used the principal component analysis for identifying the main factors related to the determinants and obstacles in EC adoption and the advantages and barriers in developing EC activities in SMEs by sector of activity.

3. Results and discussion

We were firstly interested to find whether there are significant differences in the SMEs' EC perception considering their sector of activity. Therefore, given the distribution of the companies according to the sector of activity, we divided the sample into two larger groups, the first one containing SMEs with activities in the field of Commerce (including here the SMEs in the field of Trade and related activities and Marketing) and a second group, formed by SMEs in Other fields of activity (Manufacture, Transport and communication, Finance and related services, IT and others). This division allows us to benefit of two almost balanced groups, the first one containing 49 SMEs in the field of Commerce and the second one encompassing 48 SMEs with a wider range of activities. We used the two-tailed t-tests for equality of means in order to establish if there are significant differences between the perception of SMEs in the two groups, for each of the advantages and barriers identified in the two stages of EC related activity: during its initial adoption and at present. The results are presented in Table 2.

Table no. 2. Two-tailed t-tests

Item	Mean Commerce	Mean Others	t	p-value		Mean Commerce	Mean Others	t	p-value
<b>Moment: EC adoption</b>									
<b>Advantages</b>					<b>Obstacles</b>				
a1	4,1429	3,8750	1.392	.167	c1	3,4490	3,3750	.331	.742
a2	4,3061	4,4583	-.786	.434	c2	3,3673	3,3333	.142	.887
a3	4,0612	4,0417	.097	.923	c3	3,3265	3,5000	-.874	.384
a4	4,1020	3,9583	.725	.470	c4	3,4490	3,6250	-.914	.363
a5	3,8571	4,1667	-1.400	.165	c5	2,8571	3,1250	-1.067	.289
a6	3,7347	3,8333	-.516	.607	c6	2,7551	3,0417	-1.184	.239
a7	3,8367	4,0833	-1.193	.236	c7	2,7143	2,8333	-.520	.604
a8	3,7959	4,0208	-1.007	.317	c8	2,8571	2,9167	-.268	.789
a9	4,2857	4,4167	-.713	.477	c9	2,8367	3,0000	-.832	.407
a10	3,8980	3,7917	.514	.608	c10	2,7347	2,5417	.790	.431
a11	4,1429	4,0417	.581	.563	c11	3,0612	2,7083	1.418	.160
a12	4,1020	4,1250	-.123	.902	c12	2,7143	2,5000	.999	.320
a13	3,9592	4,0417	-.371	.711					
a14	3,7755	3,3333	2.013**	.047					
a15	3,2857	3,2500	.132	.895					
a16	3,5918	3,6250	-.134	.894					
a17	3,7143	3,5532	.638	.525					
<b>Moment: present</b>									
<b>Advantages</b>					<b>Obstacles</b>				
b1	4,0000	3,7708	1.120	.266	d1	3,4082	3,4792	-.314	.754
b2	4,3265	4,0833	1.176	.242	d2	3,6531	3,4792	.847	.399
b3	4,4286	4,1875	1.211	.229	d3	3,1224	3,2292	-.446	.656
b4	3,7143	3,8958	-.697	.488	d4	3,1429	3,0000	.571	.569
b5	3,5714	3,3333	1.139	.258	d5	2,6531	2,8333	-.748	.456
b6	4,0408	3,8542	.752	.454	d6	3,2857	3,6042	-1.313	.192
b7	3,6939	3,7083	-.060	.952	d7	3,6531	4,1042	-2.274**	.026
b8	3,8367	3,9583	-.620	.537	d8	3,2653	3,6458	-1.552	.124
b9	4,0612	3,7500	1.559	.122	d9	3,7143	3,3542	1.703***	.092
b10	3,8776	3,6667	.838	.404	d10	2,7959	2,9167	-.575	.567
b11	4,0612	3,8333	1.009	.315	d11	3,3878	3,6250	-1.072	.287
b12	3,7959	3,9792	-.711	.479	d12	2,9388	3,2708	-1.267	.208
					d13	2,7143	3,1250	-1.909***	.060

Note: \*\* and \*\*\* indicate significance at 0.5 and 0.1

Given the results in Table 2, we conclude that for the largest part of items, there is not a significant difference between the means of SMEs in the Commerce area of activity and the other sectors of activity, with the exception of four items (a14, d7, d9 and d13). There is one determinant for EC adoption (a14, namely “*EC enhances customer loyalty*”) and three obstacles (d7: “*Lack of governmental support*”, d9: “*Reduced used of cards (credit/debit) as instruments of payment*” and d13: “*Low availability of new technologies*”) for which the means are significantly different and support the need of distinguishing between sectors of activity. The means are lower for SMEs with Commerce activity in all the items encompassing obstacles. Still, given the low number of such items, we consider that the analysis of the whole sample is appropriate in this case, the sector of activity not being a factor that influences the EC activity.

For each of the four dimensions investigated, we check for the reliability or internal consistency using Cronbach’s Alpha. The results of the coefficient of consistency are presented in Table 3. As all the coefficients are above the minimum threshold of 0.7, we establish that all the four parts of the questionnaire have a relatively high level of internal consistency.

**Table no. 3. Cronbach’s Alpha results**

Part of the questionnaire	No. of items	Mean	SD	Cronbach's Alpha
A	17	66.7604	11.47239	.912
B	12	46.7216	9.98722	.928
C	12	36.3093	7.38010	.794
D	13	42.6907	7.85992	.791

As we intend to use principal component analysis for reducing the larger set of items used in the questionnaire, we also tested if the data in the sample is appropriate for factor analysis by applying the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO MSA) and Bartlett’s Test of Sphericity for the four sets of data. The results are presented in Table 4 and indicate that the samples are mediocre adequate for using factor analysis according to KMO results’ interpretation (Kaiser, 1977), while Bartlett’s test of sphericity support the use of the factor analysis for our data.

**Table no. 4. Tests for the assumption of factorability**

Part of the questionnaire	KMO MSA	Bartlett's Test of Sphericity	
		Chi-Square	p-value
A	.636	1376.115	.000
B	.772	959.082	.000
C	.610	576.619	.000
D	.597	646.170	.000

A principal component analysis with Varimax rotation was employed for establishing the factor structure for each of the four parts of the questionnaire.

#### a) Determinants of EC adoption

For the first part of the questionnaire, related to the determinants enhancing the start of EC activity in SMEs, the results are provided in Table 5. There are five factors with eigenvalue



above 1, explaining 79% of the variance in the data. The first factor is the largest one, encompassing seven determinants that are usually related to the perceived relative advantages brought by EC activities, as described by Ghobakloo, et al. (2011) and Ahmad, et al. (2015), and point to higher productivity and increased efficiency inside the company. 44.75% of total variance is explained by this factor. The second factor also relates to the perceived advantages of EC, but this time with an orientation towards the exterior, pointing to the positioning of the company as compared to competitors. The brand/image of the company, the impact on customers' loyalty, better knowledge of competitors and profitability are important for determining SMEs to adopt EC.

The other three factors explain each less than 10% of the variance. The third one is related to better advertising and marketing and to gaining information in a time interval that allows decision taking. Both items are part of the perceived relative advantage described by Ghobakloo, et al. (2011), which positively affects Iranian SMEs in EC adoption. The fourth factor is related to the external factors in adopting EC activities, by encompassing the pressure from both clients and competitors in EC adoption. The pressure from business partners is integrated in the first factor. The result is in line with Oliveira and Martins (2010) or Al-Qirim (2007) who invoke the SMEs' dependency on partners in the value chain and on clients, and Teo, et al. (2004) and Levy, et al. (2001) who emphasize the need of compliance with industry standards or competitors' technology level due to the risk of otherwise losing the competitive advantage. Ahmad, et al. (2015) find, for the case of Malaysia, that the external change agent and perceived compatibility are the most important factors enhancing EC adoption in SMEs. For Romanian's SMEs, this factor has a lower explanatory power, given the characteristics of business environment that are not conducive to EC activities (low quality of telecommunications and transport infrastructure, poor usage of electronic channels in relation with other companies or with the public authorities).

The last factor's reduced impact in explaining the variance in the data sample somehow confirms the results related to EC adoption barriers. As we shall see below, there is a large reticence in perceiving EC sustainability for the SMEs' activities and the lack of compatibility with the way of doing business is one of the obstacles. Therefore, the impact of the perceived compatibility, as described by Lertwongsatien and Wongpinunwatana (2003) is reduced. The results are interesting: while the perceived benefits are high, the perceived compatibility with EC adoption is reduced.

**Table no. 5. Rotated component matrix for determinants of EC adoption**

Item	Description	Component				
		1	2	3	4	5
a3	EC offers a faster solution for specific activities	.681				
a4	EC contributes to productivity growth	.704				
a5	EC allows for time saving while looking for new resources	.872				
a6	EC expands workplace performance	.761				
a7	EC allows for goods and services acquisition for business development	.665				
a8	EC offers better knowledge on competitors	.663				
a15	Pressure from business partners	.774				
a11	EC improves brand/company image		.562			
a12	EC leads to growth in business profitability		.736			
a13	EC offers better knowledge on competitors		.614			

Item	Description	Component				
		1	2	3	4	5
a14	EC enhances customer loyalty		.884			
a9	EC leads to better advertising and marketing			.941		
a10	EC offers information in a time interval that allows decision taking			.541		
a16	Client pressure				.757	
a17	Competitor pressure				.634	
a1	Nature of company activities					.897
a2	EC offers new opportunities					.421

**Table no. 6. Total variance explained for factors related to determinants of EC adoption**

Component	Extraction Sums of Squared Loadings		
	Eigenvalue	% of Variance	Cumulative %
1	7.608	44.752	44.752
2	2.029	11.936	56.688
3	1.546	9.091	65.780
4	1.162	6.838	72.617
5	1.097	6.454	79.071

#### b) Obstacles when adopting EC

The simple structure of factors obtained after the Varimax rotation is presented in Table 7. The four factors account for the explanation of 73.3% of variance in data (Table 8) and could be integrated into the framework described by Kartiwi and MacGregor (2007), who group the barriers to EC adoption into three factors pointing that EC activities are either too difficult to be adopted, either are unsuitable with the activity of the SME, either require too much time for being implemented.

The first factor comprises six barriers, usually related to the unsustainability of the EC activity for the company. The lack of compatibility between EC and the goods and services offered by the company loads the highest in the first factor, followed by the absence of compatibility between EC and both the company's clients and its own values and culture, which generally points to a lack relevance of the EC to the company's activity. Another obstacle included here is the Deficiencies in using other languages. In relation to the obstacles included in the "Unsustainable" factor, we obtain a similar result with the one provided by Kartiwi and MacGregor (2007), which refer to the inappropriateness of EC to the company's products or services, to the clients' preferences and way of doing business.

The second factor is composed of four barriers pointing to the high complexity of the EC infrastructure on both the implementation and costs with the equipment. Kartiwi and MacGregor (2007) include similar barriers in the "too difficult" factor for the implementation of EC and find that it is the most important in explaining the variance in data for Sweden companies, but it is the second in importance from companies in Indonesia. It is interesting for Romania that the main factor that explains the variance in data is not the one related to costs, although it still has a large importance and explains 19.3% of variance. In fact, other empirical analyses, such as Ghobakhloo, et al. (2011) for Malaysia and Al-Qirim's (2007) for New Zealand do not find that cost is a significant factor in EC adoption and extension.

The third factor comprises in a single obstacle, namely Legal issues, which explains 11% of total variance in data and is rather an external barrier for the SMEs. Hadjimanolis (1999) provides strong evidence for the impact of legal and especially governmental policies and environment towards EC adoption in Cyprus’ SMEs.

The last factor group contains two obstacles related to the labour force, pointing towards the difficulties and costs in having specialized personnel for dealing with EC activities. Such obstacles emerging from the smaller size of SMEs are envisaged by Rao, et al. (2003), Kartiwi and MacGregor (2007).

As compared to previous studies, the obstacles related to the legal issues and specialized personnel for SMEs in Romania constitute independently factors. Moreover, Romania seems to be closer to the model of developing countries described by Kartiwi and MacGregor (2007), where the organisational factors (related to the “unsustainability” of the EC activities weights more than the technical difficulties. This inappropriateness of EC for the way of doing business in a company could be the result of an unfavourable organizational context for EC adoption. Teo, et al. (2004) and Lertwongsatien and Wongpinunwatana (2003) point to the importance of the management’s attitude towards EC adoption. If executives are aware of the EC benefits for their business, they are more likely to adopt such technologies (Ghobakhloo, et al., 2011). Another factor favourable to EC adoption is the degree of innovation of CEOs (Lee, 2004; Al-Qirim, 2007), more willing to apply new solutions and ideas. It follows that among the first measures that could be used for enhancing the use of EC among SMEs reside information campaigns that will enhance familiarity with EC for increasing confidence in EC adoption.

**Table no. 7. Rotated component matrix for obstacles in EC adoption**

Item	Description	Component			
		1	2	3	4
c5	Lack of compatibility between EC and the values and culture of company	.681			
c6	Lack of compatibility between EC and the goods and services offered by the company	.926			
c7	Lack of compatibility between EC and the company’s clients	.806			
c10	Lack of relevance of the EC to the company’s activity	.641			
c12	Deficiencies in using other languages	.656			
c1	High costs of technological EC infrastructure		.856		
c3	High development and maintenance costs for the EC actions		.661		
c9	High complexity of the IT component		.668		
c11	Fear of fraud and defaults on payments		.626		
c8	Legal issues			.753	
c2	Lack of IT personnel in the company				.646
c4	Costs with the training of employees for EC purposes				.902

**Table no. 8. Total variance explained for factors related to obstacles in EC adoption**

Component	Extraction Sums of Squared Loadings		
	Eigenvalue	% of Variance	Cumulative %
1	4.006	33.383	33.383
2	2.319	19.325	52.708
3	1.350	11.250	63.958
4	1.120	9.334	73.292

### c) Benefits brought by EC activities

For the part B of the questionnaire, we obtained the lowest number of factors after the Varimax rotation (Table 9), only two, responsible for explaining 67.8% of the variance in data (Table 10). Still, the difference between the two factors is important this time: while the first one explains 57.8% of total variance, the explanatory power of the second one reaches only to 10%.

The first factor groups nine out of the 12 potential benefits used in the study, oriented both towards the relation with business partners (clients and suppliers) and to the increased efficiency inside the company (growth in productivity, in sales, reduced costs of communication and of handling orders etc.). The results are generally in line with those obtained by Rahayu and Day (2017). Kabanda and Brown (2017) conclude in their study that image-building and establishing partnerships with the aim of solving technical issues are some of the main landmarks followed by Tanzanian SMEs in their EC activity. On the same vein, Kula and Tatoglu (2003) emphasize the SMEs perception on the EC as having high importance in building their image. If we relate to the results obtained for the part A of the questionnaire, we could conclude that EC benefits are usually those expected when looking for the EC adoption.

For Romanian SMEs, market enlargement, faster delivery capacity and stimulus for exports and imports are less seen as benefits of the EC activity, being grouped in the second factor of the analysis. In fact, this result could be explained by the fact that Romania ranks third in the EU with the lowest Internet coverage, with only 72% of households being connected to the Internet, while Romanians are the most reluctant Europeans when purchasing on the Internet, as only 12% of the population have bought at least once in the last 12 months, according to Eurostat data for 2016. Although the statistics show an increasing trend, the increasing rate is quite low as compared to other European countries, therefore the market is still underdeveloped, despite its potential. The delivery capacity is inhibited by the mediocre quality of the transportation infrastructure and this could also hinder the SMEs willingness to involve in international trade.

**Table no. 9. Rotated component matrix for benefits brought by EC**

Item	Description	Component	
		1	2
b1	Growth in company productivity	.647	
b2	Sales growth	.787	
b4	Lower advertising and promotion costs	.810	
b5	Growth in client loyalty and retention	.777	
b6	Reduced costs by electronic handling of orders	.841	
b8	Reduced costs in communicating with clients and suppliers	.678	
b9	Better integration in the value chain of the partners	.542	
b10	Goods and services better adapted to customer requirements	.772	
b11	Innovative cooperation with clients and suppliers	.694	
b3	Market enlargement		.722
b7	Faster delivery capacity		.691
b12	Stimulus for import and export activities		.852

**Table no. 10. Total variance explained for factors related to benefits brought by EC**

Component	Extraction Sums of Squared Loadings		
	Eigenvalue	% of Variance	Cumulative %
1	6.937	57.808	57.808
2	1.202	10.013	67.821

**d) Main problems in the EC development in Romania**

The 13 potential problems in the EC development in Romania were grouped into four factors after the use of the Varimax rotation procedure (Table 11), responsible for explaining almost 70% of the variance in data (Table 12).

There is not a clear distinction between difficulties encountered internally or externally, the factors being rather a combination of elements belonging to both environments. Almost one third of the variance (31.4%) is explained by the first factor, which is focused on the impact on those who come into contact with the EC technology, either clients (through their disbelief in using both this technology and the card as payment instrument), either employees who have reduced skills in this area. The low research and development expenditure are also part of this factor, but with a lower loading than the previous items.

The second factor focuses on difficulties related to technology and transport infrastructure, while the third one regards the telecommunication infrastructure, which is not only of poor quality, but also has a low coverage and is less frequently used in Romania (we narrowed our study to the Internet usage). We could assume that these two factors are related to the competitiveness of the environment in which the SMEs act. Our results are congruent with those obtained by Ghobakhloo, et al. (2011), Oliveira and Martins (2010) and Lin (2006), who find that the competitiveness of the environment is a factor affecting the EC adoption and development.

Finally, the last factor is related to the legislative environment and includes two items: the low governmental support and the difficulties in accessing financing. It seems that the external pressure imposed by either government, either business partners, which in other cases has high influence in EC adoption (see, for example, Hadjimanolis, 1999; De Burca, et al., 2005; Sutanonpaiboon and Pearson, 2006; Ghobakhloo, et al., 2011 etc), does not enjoy a similar role in adopting EC in Romanian SMEs. The result is consistent with the findings for the sub-samples A and D and is caused by the low development of the digital economy in Romania, ranked the last in the EU in 2017 and 2018 according to the index of the economy and the information society (European Commission, 2018). In addition to this, the access to financing is among the most difficult in the world for the companies in Romania, as provided by the Global Competitiveness Report (2016), ranking Romania on the 110<sup>th</sup> place out of 138 countries. The financial sector provides to a small extent the products and services that satisfy the needs of the companies and the cost of financial services is high enough to place Romania on the 121<sup>st</sup> place in the world, according to the same report.

**Table no. 11. Rotated component matrix  
for problems in the EC development in Romania**

Item	Description	Component			
		1	2	3	4
d1	Consumer disbelief	.736			
d2	Reduced digital competences of clients	.850			
d3	Reduced digital competences of employees	.676			
d9	Reduced used of cards (credit/debit) as instruments of payment	.743			
d11	Low research and development expenditure	.561			
d6	Low quality transport infrastructure		.720		
d12	Low level technology absorption in the company		.600		
d13	Low availability of new technologies		.827		
d4	Low Internet coverage among households			.801	
d5	Low quality telecommunication infrastructure			.780	
d10	Reduced frequency of Internet use			.524	
d7	Lack of governmental support				.933
d8	Difficult access to financing				.789

**Table no. 12. Total variance explained  
for factors related to problems in the EC development in Romania**

Component	Extraction Sums of Squared Loadings		
	Eigenvalue	% of Variance	Cumulative %
1	4.086	31.434	31.434
2	2.029	15.608	47.043
3	1.560	11.998	59.041
4	1.342	10.320	69.361

## Conclusions

This paper builds on prior research related to SMEs perception on EC adoption and development, but its merits reside in providing a comprehensive picture of the Romanian SMEs with EC activities, related to the determinants and barriers of EC adoption, benefits emerged with the use of EC and main problems in the EC development in Romania. We believe that our results make a significant contribution to research focused on this topic in Romania, as to our knowledge until now, there is not another similar study in the literature. For achieving our goals, we used the online questionnaire survey method addressed to SMEs that have already adopted the EC solution.

The questionnaire was divided into four parts, in order to reach our aims and to allow us to investigate the determinants of EC adoption, the obstacles encountered when adopting EC, the benefits brought by EC and the main problems in the EC development in Romania. A wide range of variables were used for establishing the main elements describing EC evolution in SMEs and we used the principal component analysis with Varimax rotation for establishing the factor structure for each of the four parts of the questionnaire. We did not find significant differences in the SMEs' EC perception considering their sector of activity.

Among the five factors with eigenvalue above 1 obtained in the case of the EC adoption determinants, the most important are those related to the perceived relative advantages brought by EC activities pointing to higher productivity and increased efficiency inside the

company, followed by the positioning of the company as compared to competitors. The pressure of external factors ranks among the elements with the lowest power in explaining the variance in data due to the characteristics of Romania's business environment. Interestingly, while the variables indicating that the perceived benefits of EC adoptions are high, the perceived compatibility with EC adoption is reduced, which is confirmed by our further results.

The main factor for explaining the variance in data related to obstacles in EC adoption is represented by the unsustainability of the EC activity within the company, more specific, the lack of unsustainability of the EC activity and the SME's way of doing business. The second factor is related to the high complexity of the EC infrastructure on both the implementation and costs with the equipment. As compared to the literature, the obstacles related to the legal issues and specialized personnel for SMEs in Romania constitute independently factors.

The main benefits of the EC activities are mostly related to the advantages brought in the relation with the business partners (clients and suppliers) and an increased efficiency inside the company (growth in productivity, in sales, reduced costs of communication and of handling orders etc.). Other benefits, such as market enlargement, faster delivery capacity and stimulus for exports and imports, are less important mainly due to the characteristics of the business environment. The major problems in the EC development in Romania is caused by the reticence towards EC of those who come into contact with the EC technology, either clients or employees, followed by two factors related to the competitiveness of the environment (technology and transport infrastructure, and telecommunication infrastructure).

Based on the results obtained so far, we conclude that one of the fastest and the most effective measure that could be taken for enhancing EC adoption and development in Romania is to launch information campaigns that will enhance familiarity with EC practices for increasing confidence in EC activities for both SMEs managers and owners and their clients.

We signal that the findings in this study should be interpreted in the light of certain limitations. The first one is the sample size, which is rather small and gathers SMEs in the South-Eastern part of Romania, although Bucharest is the most developed hub in the IT technology. Another limitation is that the study does not consider different stages of EC adoption or ways of using Internet, as usually encountered in studies related to SMEs, such as Kabanda and Brown (2017) or Rahayu and Day (2017). Further studies addressing both a larger sample of SMEs in different sectors of economic activity and different stages in EC adoption would bring high added value to the literature in this area.

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