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Impact of the ICT tools on the Hungarian small and medium-sized enterprises (SMEs)

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Available information systems and IT solutions for the economic organization are crucial to the success of an enterprise. This study focuses on the Hungarian SMEs and aims to explore the regional differences regarding the ICT tools penetration and the way these tools can influence revenue. The examination is based on statistical analyses, using variance and regression analyses. With careful examination of the ICT tools connected to the processes of an enterprise, we reached the conclusion that enterprises operating in different regions rely on the ICT tools base to varying degrees in average, but no significant difference could be identified. This means that enterprises from each region do not rely on a particular tool to the same extent. Moreover, we can see that the ICT tools have an impact on sales trends, whether directly or indirectly. Hence it is important for enterprises to know their own business processes, because the ICT tools influence not only those processes, but revenue as well.

Keywords: business process reengineering, SME, ICT, ERP, service process.

JEL code: O32.

Introduction

After applying various process improvement tools, many companies felt disappointed. They felt it is not operating very good, but even after a series of BPR (Business Process Reengineering) projects or a traditional lean-type attempt, they realized that the reserves in the system do not seem to be enough to further improve it anymore. Studying the placement of each process within the economic system, their relationship to each other and the feelings of the individuals participating in the processes becomes particularly important in such

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cases, especially if the BPR has not brought any results. With that in mind, we must find a tool that does not involve drastic measures.

There have been significant discussions and debates both in the research literature and among the managers for almost two decades about the role, nature and interdependence of process "reforming" or "repairing" techniques, methods and strategies. Despite this long and deep debate, confusion is still prevalent among researchers and experts. Still, it is generally agreed that business processes need to be improved as the basis and core of competition is turning from a cost and quality oriented approach towards flexibility and sensitivity. Thus, the significance of process improvement tools is recognized in acquiring sustainable competitive advantages, but their application is seriously lacking in the service sector (Gubán–Kása 2013; Gubán et al. 2003).

Considering these facts, it becomes obvious why companies need process improvement. Organizations need to be engineered in a process-oriented way for the following reasons (Dobák–Antal 2010):

- customers expect not functional but process performance from companies, but often there is no responsible person for these processes,
- there is plenty of room for mistakes due to the lack of harmonization, and the consequent costs are high,
- there is no comprehensive customer service,
- innovation is almost impossible in a fractured process due to the resistance of other departments.

Despite their crucial importance, processes are often not examined systematically, not even today. It is not unusual for the top management of a corporation to be unaware of the precise execution of a key process or even the role of a side process. Nevertheless, these processes are carried out on a daily basis without clear guidelines, following only traditions that lose much of their rationality with changing circumstances (Dobák–Antal 2010).

To apply process improvements, we need to explore what type of Information and Communication Technology (hereinafter ICT) tools are used within enterprises. This paper aims to examine the Hungarian

small and medium-sized enterprises, with respect to the types of ICT tools used, differences in usage by regions and their effect on the profitability of the company.

Relevant studies related to process improvement

In the course of research 1151 studies related to process improvement, redesigning or management were examined between 1978 and 2013 (Gubán–Kása 2013). Most of these studies introduce cases where one or more process redesigning tool is utilized.

There are relatively few studies regarding applications and theory in relevant journals; one possible reason for this can be the decreasing number of new tools development. There is no doubt about the importance of continuous improvement of business processes. The driving forces of radical changes can be attributed to the expansion of competitive advantage by Porter (1980, 1985, 1990), as summarized by Hammer–Champy (1993):

- customers, who are now diverse and have individual needs,
- competition, which increases the satisfaction of customer needs in all niche markets, and
- change, which has become penetrative, constant and faster and became a prerequisite in some markets, as O'Neil and Sohal claim (1999).

Looking back at the development course of process improvement, its first appearance was between 1750 and 1970, at the beginning of the industrial age. Their main tools were the PDCA improvement cycle and financial modelling (Grover–Malhotra 1997).

The next generation of process improvement is the information age, between 1970 and 1990. This is the age of quality management and work efficiency with solutions such as Material Requirement Planning (MRP) and Management Information System (MIS) (Grover–Malhotra 1997).

We can call the second phase of the information age the third generation, with business process improvement in its focus. This age is covering the 1990's. This is basically the age of process innovation, in

which the slogans “better”, “faster” and “cheaper” might have been the best practices. This is the age when the ERP, CRM and supply chain models and enterprise architecture started to be utilized. New tools were developed such as Six Sigma, TQM, BPR and BPB (Gubán–Kása 2013).

Among the tools, the BPR can be mainly emphasized, a technology with a high degree of freedom, as several other techniques can be developed from it. When the BPR methodology was developed, not only e-business did not exist, but business life hadn't had even discovered the internet yet. Despite this, the special role of IT was noticeable, so the BPR obviously listed the creative application of IT as an important accessory of reorganization (Gubán 2013). Thus, we can see how big a role IT plays in process reorganization, making IT approach important for us as well.

The third and last phase of the information age is the fourth generation, focusing on Business Process Management (BPM). This age started around the year 2000. The main emphasis of this age is on continuous transformation, flexibility and modularity. The main technologies in this age are the Enterprise Application Integration (EAI), the Service-Oriented Architecture (SOA), the SOM, the Performance Management Systems (PMS) and the BPM systems. The tools may change from customization to the BPM procedure such as the IDBF, the Benchmarking-Oriented Process Redesign (BOPR), Business Process Standardization (BPS) and the Event-Condition-Activity (ECA) calculation. Some of these tools are strongly service-oriented, such as the Service-Oriented Architecture or the Event-Condition-Activity (Gubán–Kása 2013; Kovács 2012).

Besides the methods mentioned above, the organizational structure of a company should also be considered as it is by no means a negligible aspect in the process design. Moreover, activities in an organization are executed in close relationship with each other. These activities consist of longer coherent chains, which are called processes (Dobák–Antal 2010).

The study on organizational impacts of information technology started after computers, internet and IT consumerization became widely available. With the rapid development of ICT, forecasts of

potential organizational consequences started to appear. At first, only the centralization of management and changes in the content and quality of jobs were predicted. Another important debate was about the automatization based on electronics, i.e. how will the automatization of processes affect the content and quality of jobs (Dobák 2008).

IT consumerization refers to the phenomenon in the life of a company or enterprise when every person strives to apply the communication devices of their own use in workplace communication – and with the appearance of smart devices, even in accessing company IT service (Gubán et al. 2012).

The most important changes are data processing, data analysis and data mining becoming faster and more accurate, and the improvement of information connection between each part of the process with all the organizational and attitude consequences. We can often observe an organizational resistance of the company employees when information technology is introduced. Significant forces are applied so that organizational changes accompanying the introduction of new systems remain as small as possible. Consequently, the introduced solution will achieve lower efficiency than its potential would allow (Dobák 2008).

Summarizing the above statements, we can conclude that state-of-the-art systems create opportunities for organization design, but information technology might also raise the need for organizational change (Dobák 2008). Therefore, we must not ignore factors related to information flow within the organization, on the contrary, it is advisable to concentrate on the internal structure and influencing factors of information and data flow on a high degree.

Usage of the information and communications technologies within Hungarian small and medium-sized enterprises

Research studies show that exploring and improving internal problems of business processes is playing a central role in many analyses. In present-days economic systems the quality and completeness of research is exclusively determined by the quality of the IT background.

Small and medium-sized enterprises need to implement and utilize the latest technologies to keep and enhance their competitiveness (Avornicului 2013). For this, it is also important to examine what kind of IT equipment, information systems and IT solutions (cloud service, business intelligence, databases, data warehouses) can be identified in the economic organization in question. It is necessary to examine the causes influencing the IT environment.

From a process improvement point of view, we must first examine the types of IT equipment and IT solutions used by the companies, in this case the Hungarian SMEs. As for IT equipment, the ratio of enterprises using computers in 2014 was the highest in Central Transdanubia (93%), in other regions it was between 88-92%. Internet usage also had the highest ratio among companies in Central Transdanubia, in other regions it was scattered between 84-89%. There was no change in the number of laptops per enterprise (8 pcs), but the number of PDAs per enterprise (6 pcs) has slightly risen. There is no significant difference between the most used fixed broadband internet connection between enterprises in regional distribution. In 2014, the Central Transdanubia had the highest usage ratio (90%) while the North Great Plain had the lowest (84%) (Infoter 2015).

In surveys carried out by the Ipsos Mori public opinion polling company in 2015, more than 300 Hungarian SMEs were asked what kind of difficulties they were facing. According to these, one specific problem for Hungarian small and medium-sized enterprises is the shortcomings of internal communication, as sometimes employees of a company are not well connected with each other even within the company. Furthermore, it was also revealed that more than one third of the SME's execute their business fully on paper-base, offline. However, the research has not only revealed the problems but also showed the direction of potential solutions. Among the Hungarian SME's participating in the research, more than 30% of the respondents said that they are convinced that with the application of the state-of-the-art ICT solutions – primarily cloud services – internal information flow would improve, thus making internal cooperation and knowledge sharing more efficient and all of these would improve employee productivity (Trademagazin 2015).

Based on a research by Microsoft Hungary (2016), 76% of the Hungarian small and medium-sized enterprises that use the advantages of digitalization and at the same time start an intensive IT equipment use, think that their innovation skills have increased, while in the case of paper-based companies this ratio is only 58%. Moreover, 66% of the employees consider that technology contributes to customer relations and successful client retention. 57% of the Hungarian small enterprises support the use of own devices in the office, which is a significant progress compared to the 38% measured in 2014. This attitude is even more widespread among micro-enterprises, their ratio being 67 percent as opposed to the 51 percent of medium-sized enterprises. Regarding IT solutions, cloud-based services are growing in popularity; more than half of the companies working with data (54%) use them. Furthermore, significant results can be reached with only the introduction of Office 365, as internal processes become more transparent and easier, and the system becomes more efficient and customer needs could be satisfied faster (Microsoft Hungary 2016).

Based on a study on the ICT tools by the Hungarian Central Statistical Office (HCSO 2013) if we examine the use of the ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management) systems within the ICT tools among the enterprises, we can see that the application of both ERP and CRM systems increased in recent years on a national level. The usage ratio of the ERP systems increased to a greater degree in comparison with the CRM systems. Almost two thirds of the enterprises with more than 250 employees were already using enterprise resource planning systems in 2013. The ERP system was used to the largest extent by enterprises of electricity, gas and steam supply, air conditioning (34%), information and communication (28%), while customer relationship management systems were mostly used by enterprises operating in the fields of information, communication and financial activities. In 2012, Hungarian enterprises reached 16% of their total net sales with the use of a computer network (HCSO 2013). If a company implements and properly uses an ERP system, the benefits are worthwhile (Kovács–Avornicului 2010).

Based on the HCSO (2013) data, the use of the ICT tools (e.g. ERP, CRM) was regionally balanced in 2013. The difference between regions

of the highest and lowest usage ratios is not significant. The use of the ERP and CRM systems increased among enterprises in Western Transdanubia region to the largest degree (between 3-7%) (HCSO 2013).

According to Serkan et al. (2012) larger companies are able to benefit more from the use of IT tools than smaller companies, and the size of an enterprise moderates the relationship between IT and corporate income. This means that the business value of IT has different impact on small and large enterprises.

Research methodology

The analysis focuses on the penetration of the Information and Communication Technologies (ICT) tools in small and medium-sized enterprises in Hungary. Our aim was to explore regional differences regarding the ICT tools penetration and the way these tools influence the revenue.

Before starting the examination, we should define our meaning of the ICT tools. Economic ICT is defined as IT and communication services, technologies and techniques associated with business and economic systems that support and serve the organizations to reach their targets (Gubán et al. 2012).

Database features

For our empirical analysis, we used the database[4] created within the "Complex examination and modelling of the company competitiveness, municipal, regional and macroeconomic effects of energy generation, energy use and waste management technologies" research project in 2013, collecting data from 818 Hungarian small and medium-sized enterprises via a questionnaire survey. The composition of the sample according to the companies' headcount is the same as the composition of the operating Hungarian companies (Szerb et al. 2014).

[4] Downloaded from http://old.energia.pii.pte.hu/menu/19.html, referred in the following as SME database.

We examined the degree to which the companies in the available database reflect the ratio of regions and headcount categories of the current enterprises operating in Hungary. We examined the representativeness in two dimensions, based on regions and headcount categories collectively. In the distribution of enterprises based on regions and headcount categories (Table 1), we can see that 36% of all operating enterprises are based in Central Hungary and are employing 1 to 4 persons.

Before establishing a representative sample, companies that were missing some values in the variables relevant for the examination were excluded. Exclusion conditions were the incomplete information related to the ICT tools, headcount and revenue.

Table 1. The composition of the enterprises by headcount categories [Npopulation=579 579, Nsample=122]

Region		1–4 persons	5–9 persons	10–19 persons	20–49 persons	50–249 persons	250+ persons	Total
Central Hungary	Population	36.3%	2.7%	1.3%	0.7%	0.3%	0.1%	41.4%
	Sample	36.9%	2.5%	1.6%	0.8%	0.0%	0.0%	41.8%
Central Transdanubia	Population	8.6%	0.6%	0.3%	0.1%	0.1%	0.0%	9.7%
	Sample	9.0%	0.8%	0.0%	0.0%	0.0%	0.0%	9.8%
Western Transdanubia	Population	8.4%	0.6%	0.3%	0.1%	0.1%	0.0%	9.6%
	Sample	9.0%	0.8%	0.0%	0.0%	0.0%	0.0%	9.8%
Southern Transdanubia	Population	7.2%	0.5%	0.2%	0.1%	0.1%	0.0%	8.1%
	Sample	7.4%	0.8%	0.0%	0.0%	0.0%	0.0%	8.2%
Northern Hungary	Population	7.5%	0.5%	0.2%	0.1%	0.1%	0.0%	8.4%
	Sample	7.4%	0.8%	0.0%	0.0%	0.0%	0.0%	8.2%
North Great Plain	Population	10.3%	0.7%	0.3%	0.2%	0.1%	0.0%	11.6%
	Sample	10.7%	0.8%	0.0%	0.0%	0.0%	0.0%	11.5%
South Great Plain	Population	9.9%	0.8%	0.3%	0.2%	0.1%	0.0%	11.3%
	Sample	9.8%	0.8%	0.0%	0.0%	0.0%	0.0%	10.7%
Total	Population	88.3%	6.4%	2.9%	1.5%	0.8%	0.2%	100.0%
	Sample	90.2%	7.4%	1.6%	0.8%	0.0%	0.0%	100.0%

Source: SME database, HCSO (2013)

After performing the exclusions under these conditions, 660 companies remained in the database, which were used to establish a representative sample on a regional and headcount level. As a consequence of the bottlenecks, it was only possible to establish a representative sample of 122 elements.

Looking at Table 1, we can see that the established sample accurately reflects the population ratios at regional and headcount-category level.

Description of the variables

Table 2 shows the variables related to the ICT tools relevant for the research. Variables related to the ICT tool penetration are dichotomous, i.e. 0 indicates the lack of an attribution, and 1 indicates its presence. The dependent variable is the average revenue.

Table 2. Variables of the ICT tools in the database of SME

Variable code	Name
B09Q01_1	One or more computers, laptops without network
B09Q01_2	Computers connected to the internal network
B09Q01_3	Not broadband Internet access (e.g. ISDN)
B09Q01_4	Broadband internet connection
B09Q01_5	Mobile Internet connection
B09Q01_6	Usage of email for internal or external business purposes
B09Q01_7	Own website in Hungarian
B09Q01_8	Own website in foreign language
B09Q01_9	Own interactive website
B09Q01_10	Active e-commerce to enable online presence
B09Q01_11	Special software applications (e.g. Accounting, CAD, CRM)
B09Q01_12	Billing, warehouse registry software related to sales
B09Q01_13	Usage of the enterprise resource planning (e.g. KulcsSoft, Armada, Libra, SAP)
B09Q01_14	Interactive banking
B09Q01_15	Online advertising
B09Q01_16	Others (e.g. Intranet, servers, etc.)

Source: SME database

We examined the relationship between the information flow and the average revenue, as well. The variables related to the information flow are presented in Table 3.

Hypotheses derived from test history

· H1: The penetration of the ICT tools is the highest in the Central Hungary region and shows a significant difference when compared to other regions.

· H2: There is an (are) ICT tool(s) which increase(s) revenue significantly.

Table 3. Variables related to the information flow

Variable code	Name
B04Q16_1	Consult with stakeholders, seek their opinion
B04Q16_2	Consult with participants in the Board of Management
B04Q16_3	Consult with owners
B04Q16_4	Extensive consultation with employees
B04Q16_5	Consult with external people as well
B04Q17_1	Everyone knows the required information, there is no need for other methods
B04Q17_2	There is no evolved method. If necessary, they announce the necessary information with stakeholders.
B04Q17_3	Hold irregular meetings
B04Q17_4	Regular meetings
B04Q17_5	Sending necessary information in writing and by email
B04Q17_6	Exchange information with internal mailing
B04Q17_7	IT platform application for internal information exchange (e.g. Intranet, teamwork supporting)
B04Q17_8	Usage of mobile application

Source: SME database

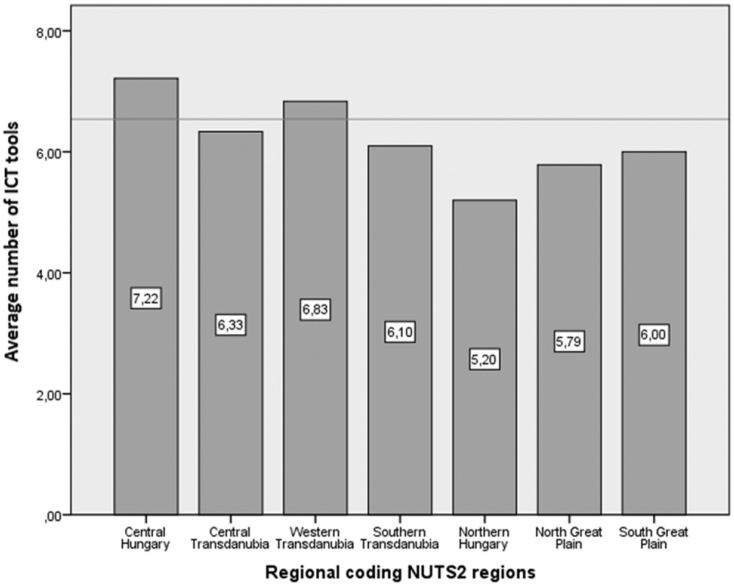
We applied the variance analysis for testing the first hypothesis, during which we examined whether there is a significant difference between regions in the ICT penetration, and if there is one, which regions have an outstanding value.

For the second hypothesis, we used the regression analysis, during which we wanted to know what effect the ICT tool penetration has on the revenue.

Testing the hypotheses

In the first hypothesis, we assumed that, since Central Hungary has the biggest ratio of operating enterprises, it seems inevitable that the penetration of the ICT tools should be also the highest in this region. We tested this assumption in the frame of the variance analysis, based on the number of the ICT tools (as the indicator for the ICT tool penetration).

Figure 1 shows the average ICT tool penetration, and we can clearly see that as assumed, the average ICT tool penetration in Central Hungary stands out from the other regions. In this region, an average of



Source: authors' own design based on SME database

Figure 1. Average ICT tool penetration by regions

7.2 ICT tools is used by the enterprises. The line represents the national average, namely 6.5. Based on this, the Central Hungary and Western Transdanubia regions are above average, while Southern Transdanubia, Northern Hungary, North and South Great Plain show below average values when compared to the national average.

Based on the Levene Statistic variance the ICT penetration of each region cannot be considered identical, because the significance level of the test is lower than 5% (Levene Statistic=2.710, df1=6, df2=115, sig.=0.017).

As the condition of variance identity has not been met, the Tamhane test (see Appendix 1) can provide some relevant information, which reduces the correlation to partial tests. Based on that we can say there is no significant difference between the regions regarding the ICT tool penetration.

We can only accept the assumption of the first hypothesis partially, because while the enterprises of Central Hungary did indeed have the highest value in the ICT tool penetration, these values did not differ significantly from the penetration in other regions. This hypothesis examined whether there is a difference in the ICT tool penetration overall, so it considered all combinations identical. However, the degree to which each region uses various ICT tools was also examined (see Table 4).

Table 4. Usage ratio of the ICT tools within companies in the Hungarian regions [N=122]

	Central Hungary	Central Trans-danubia	Western Trans-danubia	Southern Trans-danubia	Northern Hungary	North Great Plain	South Great Plain	Total
One or more computers, laptops without network	65%	75%	75%	70%	40%	79%	62%	66%
Computers connected to the internal network.	65%	58%	83%	20%	80%	50%	69%	62%
Not broadband Internet access (e.g. ISDN)	16%	25%	8%	0%	0%	29%	8%	14%
Broadband internet connection	82%	83%	100%	100%	100%	57%	85%	84%
Mobile Internet connection	45%	50%	50%	80%	30%	57%	31%	48%
Usage of email for internal or external business purposes	78%	67%	92%	80%	40%	79%	54%	73%
Own website in Hungarian	67%	50%	50%	70%	70%	64%	69%	64%
Own website in foreign language	29%	25%	0%	10%	10%	14%	8%	19%
Own interactive website	33%	8%	17%	0%	0%	7%	0%	17%
Active e-commerce to enable online presence	29%	8%	17%	40%	0%	7%	8%	20%
Special software applications (e.g. Accounting, CAD, CRM)	39%	42%	50%	30%	40%	7%	38%	36%
Billing, warehouse registry software related to sales	51%	42%	17%	30%	50%	36%	62%	44%
Usage of enterprise resource planning (e.g. KulcsSoft, Armada, Libra, SAP)	24%	8%	8%	0%	0%	0%	23%	14%
Interactive banking	55%	75%	83%	70%	60%	71%	62%	64%
Online advertising	43%	17%	33%	10%	0%	21%	23%	29%

Source: authors' own design based on SME database

Although there was no significant difference overall, on the level of each ICT tool enterprises operating in each region rely on each ICT tool to various degrees. Western Transdanubia was ranked first among the regions according to the usage ratio for the highest number of ICT tools in question (five), but the ICT tools are applied to the highest extent on average by enterprises from Central Hungary. This further strengthened the result that the enterprises from the Central Hungary region stand out mostly on a national level in application of the ICT tools.

An ICT tool can be considered the primary tool in process improvement. As it could be seen in the previous test, the application ratio of each ICT tool is very different between the regions. So, when applying a BPI or BPR or any other improvement method due to the differences between the ICT tools a mutation of each method must be used regionally.

In the second hypothesis, we examined whether there is (are) an ICT tool(s) that significantly increase(s) revenue.

When establishing the regression models, we applied the STEPWISE method. As a result, the only variables that remained in the model are those that have a significant influence on sales trends.

Based on the ANOVA table (Appendix 2), the null hypothesis stating that the regression equation can be considered a coincidence can be rejected, because the significance level of the regression test is lower than 5%. That is why the model exists.

The optimal regression model was reached in three steps. The significant explanatory variables that were included in the test were only able to explain 12.6% of the total variance of sales, the rest can be explained by other factors.

Three ICT tools that affect sales trends significantly were included in the optimal regression function. First was the use of the enterprise management software (ERP), second was an interactive banking option, and third was the application of computers connected to an internal network.

$$\hat{y} = 72865.780 + 106287.717x_1 - 59206.990x_2 + 57819.781x_3 \quad (1)$$

x_1 = Enterprise Resource Planning (e.g. KulcsSoft, Armada, Libra, SAP) usage;

x_2 = Interactive banking;

x_3 = Computers connected to the internal network.

Based on the priority coefficients by PRATT, the importance of each significant variable can be determined compared to each other. In this case, we can determine that the degree to which an enterprise management software contributes to sales trends is almost as high as the other two tools together (Appendix 3).

Furthermore, based on the parameters of the optimal regression line it can be claimed that if an enterprise is using an enterprise management software, or operates computers that are connected to a common internal network, then that will in average result in higher sales. Among others, these two factors help different departments communicate with each other efficiently.

Based on the regression analysis, we accept the second hypothesis, i.e. the use of an enterprise management software or computers connected to an internal network have an increasing effect on sales.

In addition to the above hypothesis, a variable related to the information flow[5] was involved to the regression model, which indirectly assumes a degree of ICT penetration. We examined the relationship between the information flow and the average revenue as a dependent variable.

The optimal regression model was reached in one step, the explanatory power of the model is 0.06. The significant explanatory variables that were included in the test were only able to explain 6% of the total variance of sales (Appendix 4).

One ICT tool was included in the optimal regression function: if the company uses an internal IT platform for internal information exchange, in any case it has a positive impact on revenue. The internal mailing list has an administrative part, where it is documented, who, when and what to read. This could be the reason that it has effect on average revenue in the regression model.

[5] The variables related to the information flow are mentioned in Table 3.

The traditional, standard information flow tools might distort the information, so these should be given special attention. Furthermore, the undocumented flow may also distort the information flow. Information flow is precise in the document management system, and it is recorded, so any changes can be followed. Beside the ICT tools, the flutter of the information is less.

Conclusions

In recent years, the importance of improving business processes has become evident. We aim to correct errors found in business processes. However, the first step towards doing this must be to take into account available IT devices, information systems and IT solutions for the economic organization, as these factors are crucial to the success of an enterprise.

Our study focused on the ICT tool penetration in the Hungarian SMEs. By examining the ICT tools tightly connected to the processes of an enterprise – those that help process mapping by being connected to internal information sharing – we reached the conclusion that enterprises operating in different regions rely on the ICT tool base to a different degree in average, but a significant difference could not be found. There was no significant difference between enterprises operating in different regions in total (neither in average, nor in the number of applied ICT tools), but when looking at the degree to which enterprises actually use each ICT tool regionally, a difference was found between different regions, meaning that enterprises from different regions do not rely on a particular tool to the same extent.

Furthermore, there are ICT tools that directly or indirectly have an impact on sales trends. An enterprise management system such as SAP is a tool that increases revenue.

Among various ICT tools – although it did not appear as a significant parameter – teamwork and project supporting software can be considered as best examples, because the information will be built in the system and it cannot be modified or ignored.

Besides the above, we should also highlight consumerization which changed the IT approach and has a huge role in revenue trends,

because communication with an own device is more convenient and cheaper, which can be an important aspect. Moreover, enterprises that use the services of some software service company that ensures consumerization with a cloud service do not need to invest in significant hardware equipment. From these results, we can conclude that the level of IT penetration has an effect on the quality of business processes, too.

As a further step, we should expand the data collection to involve more variables such as cloud computing, business process systems, data warehousing and data mining tools to get an overview of the Hungarian SMEs. From these examinations, we may get information on the innovativeness of the Hungarian enterprises. The companies need to develop and to understand their business processes in order to reduce costs and be more effective.

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Appendices
Appendix 1. Testing of expected value – Tamhane

Regional coding NUTS2 regions		Mean difference (I-J)	Std. error	Sig.	Confidence	
					Lower Bound	Upper Bound
Central Hungary	Central Transdanubia	.88235	.87232	1.000	-2.1336	3.8983
	Western Transdanubia	.38235	.78550	1.000	-2.2784	3.0431
	Southern Transdanubia	1.11569	.66533	.902	-1.0967	3.3281
	Northern Hungary	2.01569	.79260	.340	-.7423	4.7736
	North Great Plain	1.42997	.64900	.508	-.6656	3.5256
	South Great Plain	1.21569	.77967	.947	-1.3978	3.8292
Central Trans-danubia	Central Hungary	-.88235	.87232	1.000	-3.8983	2.1336
	Western Transdanubia	-.50000	.97830	1.000	-3.8574	2.8574
	Southern Transdanubia	.23333	.88472	1.000	-2.8747	3.3414
	Northern Hungary	1.13333	.98401	.998	-2.2780	4.5446
	North Great Plain	.54762	.87250	1.000	-2.5061	3.6013
	South Great Plain	.33333	.97362	1.000	-2.9971	3.6637
Western Trans-danubia	Central Hungary	-.38235	.78550	1.000	-3.0431	2.2784
	Central Transdanubia	.50000	.97830	1.000	-2.8574	3.8574
	Southern Transdanubia	.73333	.79924	1.000	-2.0487	3.5154
	Northern Hungary	1.63333	.90793	.853	-1.5194	4.7861
	North Great Plain	1.04762	.78570	.990	-1.6634	3.7586
	South Great Plain	.83333	.89666	1.000	-2.2193	3.8860
Southern Trans-danubia	Central Hungary	-1.11569	.66533	.902	-3.3281	1.0967
	Central Transdanubia	-.23333	.88472	1.000	-3.3414	2.8747
	Western Transdanubia	-.73333	.79924	1.000	-3.5154	2.0487
	Northern Hungary	.90000	.80623	.999	-1.9759	3.7759
	North Great Plain	.31429	.66556	1.000	-1.9793	2.6078
	South Great Plain	.10000	.79351	1.000	-2.6373	2.8373
Northern Hungary	Central Hungary	-2.01569	.79260	.340	-4.7736	.7423
	Central Transdanubia	-1.13333	.98401	.998	-4.5446	2.2780
	Western Transdanubia	-1.63333	.90793	.853	-4.7861	1.5194
	Southern Transdanubia	-.90000	.80263	.999	-3.7759	1.9759
	North Great Plain	-.58571	.79280	1.000	-3.3947	2.2233
	South Great Plain	-.80000	.90289	1.000	-3.9205	2.3205
North Great Plain	Central Hungary	-1.42997	.64900	.508	-3.5256	.6656
	Central Transdanubia	-.54762	.87250	1.000	-3.6013	2.5061
	Western Transdanubia	-1.04762	.78570	.990	-3.7586	1.6634
	Southern Transdanubia	-.31429	.66556	1.000	-2.6578	1.9793
	Northern Hungary	.58571	.79280	1.000	-2.2233	3.3947
	South Great Plain	-.21429	.77987	1.000	-2.8783	2.4497
South Great Plain	Central Hungary	-1.21569	.77967	.947	-3.8292	1.3978
	Central Transdanubia	-.33333	.97362	1.000	-3.6637	2.9971
	Western Transdanubia	-.83333	.89666	1.000	-3.8860	2.2193
	Southern Transdanubia	-.10000	.79351	1.000	-2.8373	2.6373
	Northern Hungary	.80000	.90289	1.000	-2.3205	3.9205
	North Great Plain	.21429	.77987	1.000	-2.4497	2.8783

Source: authors' own design based on SME database

Appendix 2. Testing the existence of regression
ANOVA (a)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	143671471640.076	1	143671471640.076	7.324	.008(b)
	Residual	2354035725894.590	120	19616964382.455		
	Total	2497707197534.670	121			
2	Regression	220431617227.785	2	110215808613.893	5.759	.004(c)
	Residual	2277275580306.880	119	19136769582.411		
	Total	2497707197534.670	121			
3	Regression	313980832651.216	3	104660277550.405	5.655	.001(d)
	Residual	2183726364883.450	118	18506155634.606		
	Total	2497707197534.670	121			

a. Dependent Variable: Average revenue

b. Predictors: (Constant), Enterprise Resource Planning (e.g. KulcsSoft, Armada, Libra, SAP) usage.

c. Predictors: (Constant), Enterprise Resource Planning (e.g. KulcsSoft, Armada, Libra, SAP) usage, Interactive banking.

d. Predictors: (Constant), Enterprise Resource Planning (e.g. KulcsSoft, Armada, Libra, SAP) usage, Interactive banking, Computers connected to the internal network.

Source: authors' own design based on SME database

Appendix 3. Model matching
Model Summary (d)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Confidence					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.240(a)	.058	.050	140060.57398	.058	7.324	1	120	.008	
2	.297(b)	.088	.073	138335.71333	.031	4.011	1	119	.047	
3	.355(c)	.126	.103	136037.33177	.037	5.055	1	118	.026	1.932

a. Predictors: (Constant), Enterprise Resource Planning (e.g.KulcsSoft, Armada, Libra, SAP) usage.

b. Predictors: (Constant), Enterprise Resource Planning (e.g. KulcsSoft, Armada, Libra, SAP) usage, Interactive banking.

c. Predictors: (Constant), Enterprise Resource Planning (e.g.KulcsSoft, Armada, Libra, SAP) usage, Interactive banking., Computers connected to the internal network.

d. Dependent Variable: Average revenue

Source: authors' own design based on SME database

Appendix 4. Parameters of the final model

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Correlations			Collineary statistics	
	B	Std. error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	72033.455	13668.512	.240	5.270	.000					
ERP (e.g. Armada, Libra, SAP) using	99093.707	36616.490		2.706	.008	.240	.240	.240	1.000	1.000
2 (Constant)	104046.081	20922.377		.4973	.000					
ERP (e.g. Armada,	114158.472	36939.499	.276	3.090	.002	.240	.273	.271	.959	1.043
Libra, SAP) using,	-53554.377	26640.138	-.179	-2.003	.047	-.123	-.181	-.175	.959	1.043
interactive banking										
3 (Constant)	72865.780	24812.219		2.937	.004					
ERP (e.g. Armada,	106287.717	36494.057	.257	2.912	.004	.240	.259	.251	.950	1.053
Libra, SAP) using,	-59206.990	26326.533	-.199	-2.249	.026	-.123	-.203	-.194	.949	1.054
interactive	57819.781	25716.655	.196	2.248	0.26	.202	.203	.194	.977	1.024
banking, computers connected to internal network										

Source: own edition

Testing the existence of regression - ANOVA(a)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	146472430490.019	1	146472430490.019	7.476	.007(b)
	Residual	2351234767044.650	120	19593623058.705		
	Total	2497707197534.670				

a. Dependent Variable: Average revenue

b. Predictors: (Constant), IT platform application for internal information exchange (eg. Intranet, teamwork supporting)

Source: own edition

Parameters of the final model

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Correlations			Collineary statistics	
	B	Std. error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	77292.933	13052.943		5.291	.000					
IT platform application for internal information exchange (e.g. Intranet, teamwork's supporting)	148990.960	54492.828	.242	2.734	.007	.242	.242	.242	1.000	1.000

Source: own edition

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A new way to finance sports: Corporate income tax allowance for sports

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Abstract

The Hungarian sports financing system has fundamentally changed in recent years. A new, unique element has been introduced: the corporate income tax allowance for prominent team sports. This type of sponsorship has a wide range of aims: to give more resources to the well-known and popular sports; to increase private donations to sporting organizations; to create jobs; and last but not least to reduce the black market in this area of the economy. The new tax allowance for spectacular sports started on July 1 2011 and the regulations were changed in 2013. In this paper I would like to give a detailed insight into the mechanism of the sports sponsoring system and, with the usage of empirical data, I will show the development of the Hungarian sporting organizations as a result of the new financial structure. Moreover, I want to show how it is possible to save from these benefits for the future.

Keywords: non-profit, sports financing, donation, corporate income tax.
JEL codes: K34, L30.

Introduction

A new, unique element has been introduced in 2011 to the Hungarian sports financing: the donation for certain sports objectives by corporate tax benefit (TAO[2] system). The aim of this type of sponsorship was complex: to give more resources to the well-known and popular sports, to modernize the sports infrastructure, to increase private donations to sporting organizations, to create jobs and last but not least to whiten this area of the economy. Only certain sports receive the tax benefit and these are chosen by the government: football, handball, ice-hockey, basketball and water polo. The five national

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[2] TAO (társasági adó) – corporate profit tax.

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sports' federations have many new tasks as a result of this: to control and give permissions, to help organizations, and to draft new directives. The position of auditors has also become more complex as they require more time and staff to cope with this new element. The scheme appears to work, as it can be seen in the increasing numbers of young athletes, the building of new sports halls, the increasing funds for trainers, and the cost for the government is minimal.

It should be mentioned that this tax allowance is not planned to last forever. The government gave just five years for these organizations to develop a better environment for sports activities and to make these branches of sports more popular.

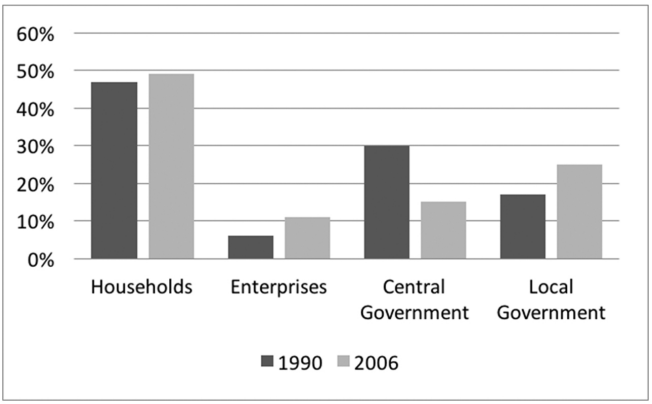
My aim is to show the intricacies of the sponsoring system, the way sporting organisations have developed following this change, and that the positive effects could be long-term, with the help of strategic planning.

Theoretical background

According to Andreff (2006. 271) "sports and money enjoy a long-lasting and necessary mutual relationship, where sport is competitive, it offers a sports spectacle that requires finance for its organization, but can bring in substantial income". He also claims that amateur sports are increasingly subject to a purely financial rationale, although almost all sporting organizations from Hungary are non-profit organisations.

The financing system of sports differs across countries. In the USA professionals and college sports take the spotlight, while in Europe the stress is on public sports. The level of financing is also different: in Europe around 0.5–3.5% of GDP is spent on sports; in Hungary it was 0.6% in 1990 and this increased to 0.7% by 2006 (Keserű–Dénes 2007).

The main contributors to sports are households, and local governments provide more money to sports than the central government (Andreff 2006). The central government's support was stronger in 1990, but it decreased in 2006 and the share of other types of financing increased (Figure 1).



Source: author's own design based on Andreff (2006) and Keserű–Dénes (2007).

Figure 1. Resources of sports financing in Hungary

According to Török (2009) the contribution of households is low in Hungary and although sponsorship capital is present to an ever-increasing extent, it does not yet satisfy the demands.

Giving allowances to support sports is not a unique Hungarian initiative; in the UK amateur sporting associations could receive an 80% to 100% corporate tax discount, and for specific donations, a 28% tax refund is also possible. Furthermore, in the UK 30 sports are supported under the sports development program (Váczi 2010. 45), while in Hungary only five sports are supported.

Földesi (2006) mentioned that organizational restructuring occurred several times between 1994 and 2004, but they were not accompanied with relevant changes in the approach to sports at top and middle managerial levels. Neither a modernized sports model, nor a Hungarian national sports strategy on which a new model could be built have been developed in that period.

Research methodology

The aim of the research is to show the effects and consequences of a newly introduced tax allowance system for football, basketball,

handball, ice hockey and water polo. The empirical data on the transmitted resources shows the size and importance of donations, whereas the data on the number of licensed athletes indicates the number of people affected and the support per capita as a comparative measurement among the previously mentioned five team sports.

The information for the analysis was gained by various methods, such as collection of secondary data, in-depth interviews, and participant observation.

Most empirical data related to the corporate income tax (CIT) allowance of sporting organizations has been received from the reports of the National Sports Institute and the Ministry of Human Capacities.

Following a review of the literature and current trends, interviews were made with a tax expert and with the head of the water polo team of Ferencvárosi Torna Club. Both have encountered the procedural difficulties of the new sponsorship system. The interviews were made in 2013, two years after the introduction of this new way of sponsorship. The questions were centred around the changes of sponsorship and their personal and professional experiences in the previous and present support systems. Their answers helped a lot in revealing the mechanism of the new structure with its benefits and drawbacks.

Overview of the Hungarian sports financing system between 1990 and 2011

The Hungarian recreational sports can receive normative state support through tenders of public foundations and particular state decisions (András 2006).

Support from public foundations like the Gerevich foundation and the former Wesselényi Miklós foundation[3] played a fundamental role in sports' financing because they had a stable income from lottery tax.

[4] The Gerevich sports grant is given by the Hungarian Olympic Committee. The Wesselényi Miklós Sport Közalapítvány was ceased and its tasks and assets were given to the Hungarian Olympic Committee.

Later, as Kelemen (2004) pointed out, such sources ceased and therefore sources of finance became harder to find. Between 2007 and 2011 local governments sponsored both recreational and professional sports. This consisted of values between 0.66% and 2.19% of the local budget for bigger cities, including the costs of sports establishments (Gyömörei 2012. 18).

Before 2011 private firms could also support the Hungarian sports life from their revenues, since it was deductible from the profit as a marketing or PR cost. Another form of sponsorship was through foundations – where the conditions were the same as for other types of foundations and almost all sports clubs had at least one. Around 100–150% of donations were deductible from the tax base (Simon 2004), depending on whether it was a public benefit or a prominently public benefit organization and on the length of sponsorship. From 2012 the varying amounts of deduction came to an end and the tax base could be reduced by 20% – or in the case of permanent donations by 40%, while 100% of the donated amount is considered an eligible cost (Fülöp 2015). In some cities local governments granted a local tax allowance to companies sponsoring a sports club. Sporting non-profits got between 4% and 6% of the total third sector support yearly between 2005 and 2012, whereas in 2015 support amounted to about 12% (KSH 2016). Finally, sports clubs and organizations could also have their own sources of finance from business activities or from selling tickets, etc.

The new way of financing sports in Hungary

On July 1 2011 the Act LXXXII of 2011 on the Amendment of Certain Acts on Sports Support made it possible for businesses to finance prominent sporting organizations from their corporate income tax commitments under given conditions. For the professional sporting organizations another Act (CLXXVIII) was introduced with effect from December 17 2011 (after its approval by the European Commission). The prominent sports mentioned in this paper are: handball, football, basketball, water polo and ice hockey, because these five sports account for more than 75% of all licensed sportsmen (more than 175 000 people)

and they are the most popular. These funds could be used for training of the young generation, personal costs and investments to create or modernize sports infrastructure.

The aims of the new sports financing system are complex (Hadas 2012):

- to reduce the government's direct involvement in the sponsorship of these sports and take the first steps toward a privately financed sporting arrangement;
- to increase the range of possible supporters of sports;
- to 'whiten' the monetary transactions in this field and create a transparent system;
- to create the possibility for everybody to do sports under better conditions or in new establishments;
- to increase the participation of the citizens in sporting activities;
- to create jobs in the field of sports e.g. staff in new establishments, trainers, managers.

Under these laws companies could sponsor sporting organizations from their corporate tax and get a tax allowance on their sponsorship. The conditions were profitable for those companies who were subject to corporate tax, as a saving of up to 70% could also be achieved in the sponsor's CIT liability. The sporting organizations are satisfied with the initiatives, but the preparations and the operations are difficult for the supported organizations, the sports federations and the National Sports Institute as well. The administrative and managerial tasks increased, demanded a degree of professionalism and were more time consuming.

Companies also benefit from the tax allowance for sponsors, because they can gain 7% or 23% on their donations. Companies can register the sponsorship as expenditure in their balances and at the same time they can lower their corporate income tax liability by 70% of the value of the sponsorship provided. Table 1 presents an example for the net result of the financial savings from the CIT allowance.

Furthermore, the donor company earns the right to pay a lower CIT advance for the next financial year, which is calculated from their present CIT base (decreased by the amount of the support given).

Additionally, donor companies cannot have registered public debt according to the Hungarian Tax Authority.

Table 1. Example of financial savings from CIT allowance (in HUF)

	10% CIT		19% CIT	
Profit before tax without sports sponsorship	1000	1000	1000	1000
Sports sponsorship provided		65		117
Profit before tax = CIT base	1000	935	1000	883
Calculated CIT	100	94	190	168
CIT sports allowance (70%)		65		117
Payable CIT	100	28	190	50
Financial savings (CIT without sponsorship – CIT with sponsorship – provided sponsorship)		100–(65+28)=**7**		190–(117+50) =**23**

Source: Hadas 2012

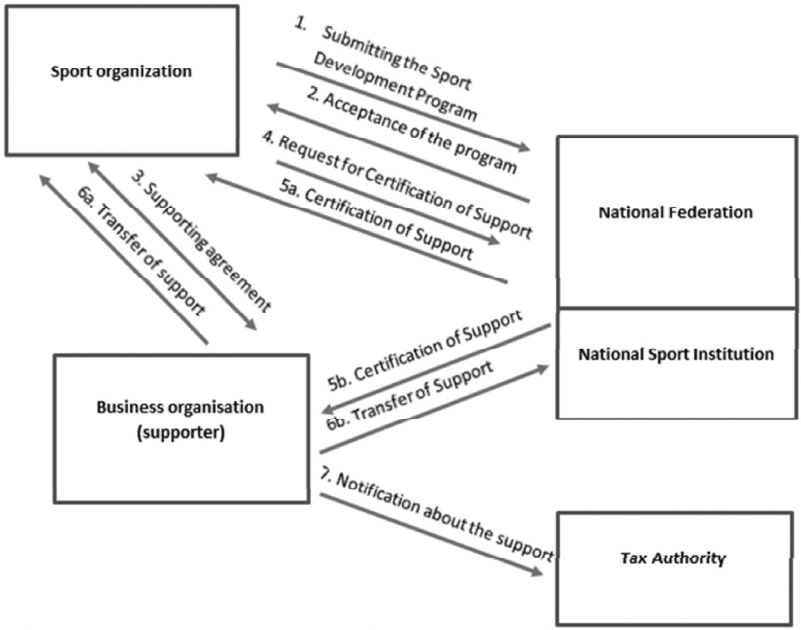
The sponsoring companies' tasks are not complicated. After choosing the sports program to support, they have to sign the support contract, then transfer the money to the sports organization's account(s) and notify the tax authority about the transfer within eight days. The sponsors take no risk in supporting an organization in this way, because they don't have to control the utilization of the money. Therefore, many companies, provided they expect positive financial results, are potential supporters.

However, the task of finding sponsors is not as simple as it seems. According to Hadas (2012) companies who are using the US GAAP[4] and publicly quoted companies cannot benefit from this support. Moreover, in the first year state-owned companies were also excluded from sponsorship. It was also a problem that managers were interested in the earnings before tax or EBIDTA (earnings before interest, depreciation, taxes and amortization), because they receive their bonuses as a percentage of the company's profit, as a solution to the principal-agent conflict. Family-owned businesses are not interested in it either for similar reasons.

On the other hand, the tasks are more complicated for the supported organizations, and they also have to find the supporters for their accepted

[4] Generally accepted accounting principles of the U.S. Securities and Exchange Commission.

sports development program. To be successful in this program the sports organization has to be able to create a good sports development program, which could be supported by the national federation of the given sports according to their rules. In fact, only experts of the sports financing system know what the expectations of a given federation are, because these directives are not mentioned in the law. Consequently, a program with the same share of costs could be accepted for developing a handball team and could be rejected when it is submitted to a basketball federation.



Source: authors' own design

Figure 2. Sports financing system with CIT allowance

Figure 2 shows how the system was working in the case of a successful sponsorship (before the end of 2013[5]). It can be seen that the

[5] From 1 January 2014 the tasks of the National Sports Institute are performed by the National Federations and the Ministry of Human Capacities.

manager of the given project has to control all steps through the process. Moreover, the sporting organization has to report the money received. The controller of the project is not the tax authority who has the resources, but the National Federations, who had no expert at the beginning. In 2014 the National Sports Institute ceased to exist, and since then its tasks are performed by the Ministry of Human Capacities and the National Federations.

The distribution of different tasks is not specified but, it should follow the unwritten rules of the national federations, and it could be modified to a given extent during the final accounting. In the first year almost all programs with reasonable goals and costs were approved. In the following year, the approval system became stricter because of the high number of applications, therefore they gave less support to the questionable organizations.

To benefit from the new financing system, sporting organizations have to be familiar with its rules and they have to find supporters to finance their development plans. Previously the leaders of these clubs needed different skills, therefore they need consultants to become successful. These special advisors could get 3% (from 2012/2013 only 2%) of the funding. At the beginning many advisors had no appropriate professional financial and accounting knowledge, thus the sports organizations did not receive proper assistance. They could ask for more money, but that shouldn't be financed from the funding.

The tax allowance for the support of sports has been reduced since the sports year 2013/2014: 75% of the allowance has to be transferred to the national federation or to the public association of the given sports organization, therefore the after-tax gain decreased to 25%, as shown in Table 2.

The National Sports Institute (NSI) received support from the state as well. After the first year of the new financing system (2011/2012), when it came out that this organization would have a lot of administrative tasks, the government decided that the supporters have to pay 1% of their support to the NSI. From 2014 this 1% is distributed between the National Federations (66.7%) and the Ministry of Human

Table 2. Example of sports financing from CIT after 2013 (in HUF)

Tax base without support	500 000 000
Tax without allowance (10%)	50 000 000
Maximal support	32 710 000
New tax base	467 290 000
New tax	14 019 000
Supplementary support	2 453 250
Savings	817 750
Savings as a percentage of support without supplementary support	**10.00%**
Savings as a percentage of support with supplementary support	**2.50%**
The change of support	**75.00%**

Source: author's own design based on Fajcsák (2013)

Capacities (33.3%). This decreased the gain of the supporters from the system, but the measure was so low, that the donor welfare hasn't been reduced.

Although donors could gain by giving money, they need a sports club with an accepted project that should contain a resource-utilization plan. Different expenses could be covered from the CIT allowance, but the share of resources are different according to the aim and the type of sports organization:

- Youth development and education (10%);
- Costs connected to competitions (10%);
- Personnel expenses (50%);
- Training related tasks (for general training 50%, but it could be reduced to 30%, for professional education 25%);
- Modernization and investment of fixed assets. If the investment could be used for given sports events in 20% of its operating hours and for a minimum of 10 days the share is 30%, in case of 16% of operations and 8 days: 50%, in case of 12% and 6 days, the share of own resources advances to 70% except in case when the object of the investment is for sports purposes where a possible 100% ex post financing is used on a yearly basis.

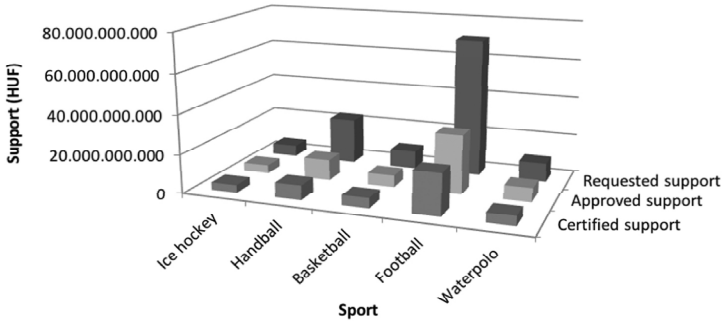
The proportions are declared in the law and more resources are needed within professional sports organizations than organisations involved in youth development and education. Therefore, many sports clubs prefer to develop the fixed assets or training facilities under the

name of a non-profit company whose aim is connected to youth development and give the right to the professional sportsmen to use these assets.

The private support for the five prominent sports is presented in Figure 3. For football the level of support is the highest, but the share of the projects approved by the National Federation is the lowest. Some money remained unused, because not every accepted program was able to find supporters. Therefore, the amount of money on the certifications to the Tax Authority is lower than the maximum possible. The share of approved and certified support is similar for handball, just the amount is lower than for football. Ice hockey has the highest certified proportion (67%), but the lowest level of requested support. Basketball and water polo teams applied for almost the same amounts of money, but in the end, basketball received more than 5 billion HUF certified support, while polo teams a little less at 4.8 billion HUF.

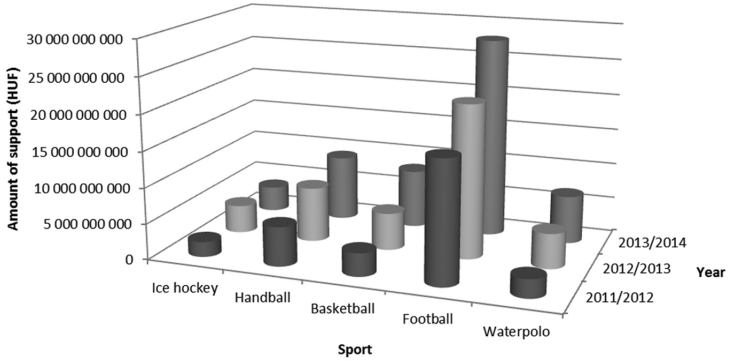
The share of certified support from the approved support hasn't changed a lot in the first three years. In the year 2011/2012 it was 75%, in 2012/2013 it decreased to 74.5% and in 2013/2014 to 73.41%, which means that sporting organizations faced problems in finding sponsors or collecting their own resources. The certified support's share increased significantly in football from 30% in 2011/2012 to almost 40% in 2013/2014. Meanwhile the nominal support increased for each spectacular sports in 2012/2013 and just ice hockey received less in 2013/2014 than in the previous year according to the data provided by the National Sports Institute.

The distribution of the money is deceptive, because the number of athletes is different. Football, the most popular sport, received the highest amount of support (between 17 and 28 billion HUF every year), but the support calculated for one licensed athlete was the lowest in the last two seasons (see Table 3). The reasons are complex. First of all, the cost of playing football is the lowest. All other prominent sports need at least a hall, but soccer can be played in the open air, and this is why many poor children play it all over the world. On the other hand, football alone got more money than the four other sports together, so



Source: author's own design based on Bardóczy (2013)

Figure 3. Support from CIT allowance in 2012/2013



Source: author's own design based on Jánosi (2015)

Figure 4. The change of certified support in the first three years (2011/2012–2013/2014)

this amount of money contributed to building and reconstructing football grounds and stadiums.

Ice hockey is becoming popular in Hungary, and many young people play it with enthusiasm. On the other hand, it is one of the most expensive sports: an ice arena and expensive protectors and equipment are needed to play it in a safe environment.

Table 3. Support per capita for different sports

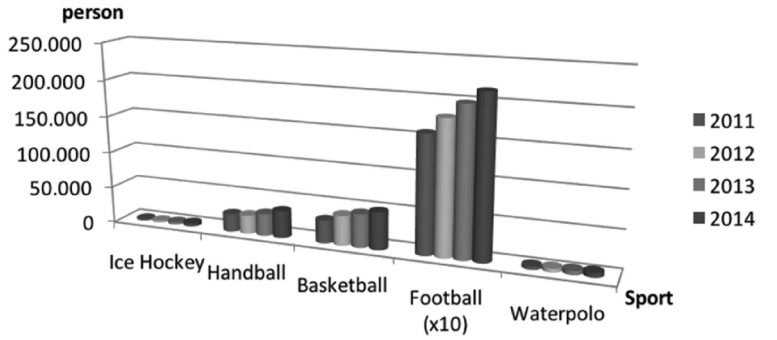
Support per capita	2011/2012	2012/2013	2013/2014
Ice hockey	892 160	1 450 313	949 271
Handball	222 995	278 089	277 010
Basketball	90 644	121 395	171 511
Football	178 735	112 689	134 421
Water polo	573 119	974 580	1 199 718
Average	233 086	150 764	180 486

Source: author's own design based on Jánosi (2015)

As a result of this supporting program the number of athletes increased in these branches of sports between 2011 and 2014 (Figure 5). The biggest increase was registered with the ice hockey teams where the number of licensed athletes increased by 93% and the lowest (36%) at football clubs.

Experiences of the water polo section of Ferencvárosi Torna Club

Ferencvárosi Torna Club (FTC) is one of the oldest, most successful and most well-known sports organizations in Hungary. The FTC has at least one section from all of the five prominent sports. They have separate men and women sections and have established different sections for youth to be able to receive more support.



Source: author's own design based on Jánosi (2015)

Figure 5. Changes in the number of athletes (2011–2014)

The water polo section of FTC received support in every sports year between 2011 and 2013, and they managed to collect around

100 000 000 HUF support from CIT allowances altogether. They had high staff costs: they managed to increase the number of trainers from six to nine and to increase the number of young players by almost 50%.

From the introduction of the new financing system the trainers have received administrative tasks, since they have to collect the required documents (invoices, certificates, list of attendants) at the competitions. To be able to cover the club's own share, the water polo section collects monthly payments from its members.

The club employed an advisor, to be able to exploit all possibilities and to help the process from writing tenders and requiring the support to confirm the costs and investments.

The main problem is that the financing system doesn't allow putting money aside for the future, as the club has to report the whole amount of support in the given sports year. In the second year (2012/2013) the number of athletes achieved the maximum: the club can't increase the number of the athletes without decreasing the level of training because they have only one pool. The only way of expansion is the construction of a new pool, but under the TAO system they are not able to invest in it because of property-issues.

Conclusions

The current sports supporting system from Hungary is working well: the number of athletes is growing, the number of employed trainers has increased and a new sports infrastructure was developed thanks to the increased financial support. This interim period has helped handball, basketball, football, ice hockey and water polo clubs to become independent from direct central governmental support. In this period (2011-2016) the clubs for the five sports could form their sponsor basis with the help of the tax allowance system, and later, when the connections between the clubs and companies become closer, the indirect state support can also be decreased step by step. The aim to increase the number of people involved in prominent sports was fulfilled. From one year to another the number of athletes practicing these sports has increased and it is expected to continue to grow in the

near future. The question is how the increase in the number of registered athletes can be kept on the long run, given that the number of births is decreasing.

The TAO sports financing system is foreseen to be in place until 30 June 2017. As there is no possibility for saving the money received from sponsors, those clubs which invest in sporting facilities will gain the most from the present financing system, as these will continue to operate after the financing system changes.

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Employers' perceived competency gaps for entrants in accounting

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Abstract

In the field of accounting education the need for change has existed for a long time. The aim of our research is to map competencies of accounting professionals in order to explore missing competencies and thereby improve the content and methodology of accounting training in Hungary. Our empirical research is based on an international comparative research carried out in the United States and Hong Kong. In the case of entry-level chartered accountants, accounting professionals found the following competencies to be missing: foreign language communication, management, management advisory services, and tax research. Education has to focus more on these missing competencies.

Keywords: competency, accounting, education.
JEL codes: A22, A23, M40, M54.

Introduction

The need for change is not new in the field of accounting education. The topic emerged more than fifty years ago (Gordon–Howell 1959). However, there was no consensus concerning the content of the change and there remains none at the beginning of the 21st century (Bolt-Lee–Foster 2003). In many countries, including Hungary, it has been claimed that, due to the construction of a market economy combined with the effects of globalization and information technology development, there is a need for highly qualified financial and accounting professionals. The question is whether today's accounting education can satisfy these requirements (Sztanó 2008). According to Sztanó's more recent findings (2015) there is basically no quantitative deficit in the field of accounting training nowadays.

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However, it cannot be stated clearly that accounting education is in compliance with all the high quality requirements of the financial and accounting profession. Because of environmental changes, the content of the accounting activity as a service has expanded and changed, and this should be seen in the changing content of education (Bélyácz 2008). The supportive, information-providing role of an accounting specialist has been transformed into a managing partner/decision-maker role (becoming a part of the management). According to Brewer et al. (2014) today's accountants are integrated thinkers, who are able to take part in the decision-making process and create strategies. However, accounting education did not follow this change, education is not currently focusing on an integrated competency-based training. The results of an Australian research show in an examination of job adverts for accounting professionals over a four-year period (2006–2009) that employers placed the emphasis more on soft skills than professional ones. According to Dunbar et al. (2016), although personal and social competencies are included in the curriculum, current curricula only meet the needs of employers regarding professional requirements. The employers' need for soft skills should be emphasized to a greater extent in future curricula and education.

The same conclusion was reached by the Australian researchers Kavanagh and Drennan (2008) while examining the students' ideas and employers' expectations. They found that education is not focused on personal and social competencies. Furthermore, the biggest gap between education and employers' expectations was depicted by self-motivation, professional attitude, verbal communication and continuous learning abilities. Professional accounting knowledge was not found to have a gap, but research skills were considered deficient by employers.

According to Vas (2009) "vocational training and training in higher education institutes can be successful and effective, if it continuously follows, examines and pays attention to expectations of the labour market and converts them to the language of education". Studies evaluating the performance of the Hungarian education system (Csermely 2009; Csehné 2012; Tóthné–Hlédik 2014) indicate that it can

only partially adapt to the labour market requirements. According to Klein (2012) the education system would be required to promote independent thinking, responsible behaviour, efficient work and decision-making ability for important situations in everyday life. If during training we already emphasize the development of those skills required by employers and entrants after graduating and being qualified, then they could start their career with better chances of employment and the potential for greater success at work.

However, as a first step, the competencies required by employers have to be collected, bearing in mind that they are constantly evolving in response to environmental changes. A part of the expected competencies involves those that employees learn during their training, and the others are learnt after starting work, in practice (Szabóné 2006). It could be important for employers to know what kind of competencies entrants have when entering the labour market, as employers could count on these competencies already at the beginning of professional employment in accounting.

The aim of our research is to map competencies of accounting professionals in order to explore missing competencies and thereby improve the content and methodology of accounting training in Hungary. This study will also be of interest to companies employing professionals by informing them about the general picture of entrants, based upon which specialised training courses could be organised.

Literature review, theoretical framework

The concept of competency

Requirements defined by employers form the basis of the competency evaluation for entrants. Real suitability is guaranteed by those behaviours, qualities, skills, abilities and personality traits, which can distinguish excellent performance from average, and can be improved on the long-run with training. These are called collective competencies (Bíró et al. 2007).

Competency is defined as a personality characteristic of excellent performers and a quality of a person that is necessary for effective

performance in a role or in a job (Klemp–McClelland 1986). Any personal feature could be considered a competency that is measurable or reliably assessable, and significantly distinguishes between workers with effective performance and ineffective performance (Spencer–Spencer 1993). Competencies are basic skills and abilities which are necessary for high quality work (Furnham 1990, cited by Armstrong 1999) and behavioural dimensions that influence work performance (Woodruffe 1993).

Definitions stress on the word competency in connection to the behaviours and attitudes of employees during work and their effect on performance (Karoliny–Poór 2010). In Hungarian the words 'competency' and 'competence' are often used synonymously. Competency is an expression connected to a person, which relates to behavioural dimensions and supports outstanding performance, while competence is connected to a profession/work and relates to those work activities, which can be performed by a person (Bíró et al. 2007).

Most of the competency lists used by organizations contain either person-based, behavioural competencies or professional competences, connected to work or a profession. Generally, both features are uniformly called competencies. Competencies are indicated in the content of the Core Competencies required for entrant accounting professionals and defined by the American Institute of Certified Public Accountants (AICPA), where functional competencies mean technical (professional) competencies (Bolt-Lee–Foster 2003).

Research results regarding the competencies of entrant accounting professionals

In this section we will present the research results regarding the (existing or missing) competencies required by the labour market from entrant accounting professionals.

Many studies from the USA are focused on the employer's expectations from accounting entrants. According to Richards (1992), the largest factor in promotion is technical knowledge. Professional knowledge can help build a career. However, in the event that someone becomes a partner instead of a manager, the importance of technical

knowledge falls to the third or fourth place (e.g. the communication competency overtakes it).

Public accountancy in American universities is focused on memorizing technical (professional) information and not on broader business knowledge or analytical abilities. Communication is seen as an important and missing competency which previously had not been a part of the accounting education, but should be introduced as part of a new curriculum (Stowers–White 1999; Myers 2005).

In their study, Bolt-Lee and Foster (2003) summarized the requirements for the American accounting professionals. As a starting point, the authors considered the required competencies (Core Competencies) of accounting entrants as defined by the American Association of Accounting Professionals (Appendix 1). The report by the Bedford Committee of the American Accounting Association (AAA), as presented by Bolt-Lee and Foster (2003), underlines that future professional accountants require skills for lifelong learning, critical thinking, interpersonal skills and knowledge of the Accounting Information Systems. The Big Eight accounting and audit firms also dealt with this topic and produced The Big 8 White Paper (AAA 1989), which discussed the ability to succeed in the accounting profession and the professional expectations of accounting graduates. Besides accounting and auditing skills, less traditional features like communication, intellectual and interpersonal skills, as well as general business, historical, political and ethical knowledge, were also mentioned.

The results of the research conducted by Kennedy and Dull (2008) showed that companies in the USA require accounting employees with good interpersonal skills (cooperation, team spirit, flexibility, adaptation skill, motivating others) and an ability to work in a collaborative environment. Thus, it became increasingly clear for teachers engaged in accounting education that students' cooperation skills must be developed during education in order to succeed in business.

Brewer et al. (2014) report competency crises related to accounting personnel training. They claim there is a gap between those

competencies which are necessary to succeed in the profession and those competencies for which development is provided during education.

Accounting professionals must constantly train themselves and future generations of accounting professionals in order to uniformly increase the number of required competencies, which are demanded by today's dynamically changing organizational environment. According to Brewer at al. (2014) there is a need for integrated thinkers, who are able to take part in decision-making and strategy development and go beyond only having accounting knowledge. The joint working group of the AAA and the Institute of Management Accounting (IMA) in 2010 worked out curriculum recommendations for accounting education. The working group's first report included an integrated competency-based framework according to which accounting education should focus on long term career expectations; the values of accounting should be widened, should contain creating strategy, analysis, planning and implementation (corporate performance management), i.e. accounting competencies should be taught using an integrated educational pedagogy.

Siegel and Sorensen (1994) published the result of a research project that measured the required skills of entrants in the field within American companies. The survey mentioned 15 Accounting Knowledge and Skills Areas (AKSA) selected from the taught university courses and primary topics found in professional exams. Using the results of their survey, they set up the hierarchy of the most important AKSAs for the profession – areas which are not handled by the accounting programs. The study found a gap between company requirements and the knowledge and skills of the accountant graduates. For example, the results highlighted a lack of knowledge in planning, product pricing and cost calculation, and an excess of focus on individual income tax, governmental and nonprofit accounting.

The Accounting Education Change Commission (AECC) was founded by the AAA and existed between 1989 and 1996. The AECC emphasized the role of professors and instructors in this change. In the

Committee's ability profile, there were eight skills and fields of knowledge presented which prepare the students to become professional accountants, but, nevertheless, are not making them professionals when starting a job (Bolt-Lee–Foster 2003).

In their study, Simmons and Williams (1996) reported on how the state and industry experts evaluate the professionals' performance and which of their skills are considered important. They summarize that entrants in the accounting field lack the appropriate knowledge to understand new technologies, are under-qualified in communication skills, business ethics, business globalization and lack a qualification for business decisions and multi-pronged approaches. Students are under-qualified in the following areas: written communication skills; oral communication skills (language communication), knowledge of accounting programs (using accounting softwares), general tax knowledge, the ability to answer the specific tax issues knowledge of the business environment, management and management consultancy skills (decision-making, management consulting services) and IT skills (computer skills). The priority of the gaps here being: 1. communication skills (oral, written); 2. management consulting services; and 3. knowledge of accounting programs.

Using the research results of Simmons and Williams (1996), Chen (2013) examined the differences between the accounting professionals' competencies and competency expectations in America and Hong Kong.

Chen used a three-way approach in the Hong Kong survey: he asked about entrants and curriculum the Big-4 consulting firms, nine universities in Hong Kong and professionals at the Hong Kong Association of Accounting Professionals. He prepared a short Likert-scale questionnaire regarding the nine fields required for entrants in accountancy determined by Simmons and Williams (1996). Overall, Chen (2013) identified very similar expectations of entrants and similar gaps to the US studies. In both countries, all of the nine examined competencies were diagnosed to be necessary but missing amongst entrants in accounting. The three most important expectations – and

also deficiencies – were identified in oral and written communication and management consultancy skills (decision-making).

Research hypothesis

Firstly, we wanted to find out whether there was any difference in the assessment of competencies for accounting professionals with different educational levels from Hungary. The accounting professional training of different (secondary, tertiary) levels in Hungary have almost the same professional content, but the curriculum content to be acquired in depth is significantly different. This is also shown by the differences in entry requirements related to the various levels of accounting training, in length of training and the different expectations outlined in output requirements. Our hypothesis stipulates that young (tertiary level) graduate accounting professionals have more complex knowledge than entrant accountants with lower (secondary level) qualifications and entrants who have finished administrator-level training have the least competencies. In higher education, there are more opportunities to improve the necessary skills; universities are better at preparing accounting professionals to meet the expectations of the labour market. According to this, we formulated our first hypothesis as follows:

H1: The more qualified the entrants are, the less they lack the relevant skills.

The respondents from our sample were – according to their professional qualification – administrators (the lowest level of qualification), accountants, tax advisors and auditors (the highest level of qualification). They work in different fields of the economy and have to meet different expectations as accounting professionals. Based on our assumption, professionals with a tax consultancy qualification work at medium-sized or big companies, and expect more complex and in-depth knowledge from entrant accounting professionals. Accountants typically work at small enterprises, doing less complex accounting activities, therefore, we assume the competency expectations of entrants to be different. Our second hypothesis comes from the above assumption:

H2: The respondents with various qualifications have different opinions regarding missing competencies.

The accounting expert training, like other specialist trainings in the field of economics, has changed continuously over the past 20 years due to environmental, technological and economic changes, as it has been adapted to the labour market needs. We assume that the opinions of the respondents are influenced by the length of their work experience. Also, the time when the respondent finished his/her education influenced the assessment of required and missing competencies related to entrants to the accounting profession. According to this, we formulated our third hypothesis:

H3: The opinions of respondents with differing length of working experience differ with respect to the missing competencies.

Research methodology

Nowadays, due to business globalization, entrants in the field of accounting do not necessarily work in their home country. Therefore, collecting the employers' expectations from different geographical areas can help vocational training institutions to prepare a curriculum which supports entrants' professional careers regardless of where they wish to begin working (Chen 2013). The study involving a comparative analysis of different market participants and cultural environments in the USA and Hong Kong (Chen 2013) presented in our literature review seems to be an appropriate basis for conducting a similar empirical research in Hungary.

The competency list used in our research contains 16 competencies and was prepared based on the results of the Hong Kong and American empirical research examining nine competencies (see Table 1, competencies 1-9), expanded with seven other (Table 1, competencies 10-16). Our reasoning behind this expansion is as follows: we wanted to know to what extent entrants to accountancy have the professional competencies discussed (accounting knowledge, analytical thinking), to what extent their education prepares them for such technical skills and how satisfied employers are with the quality of accounting

education. Provided that foreign language knowledge remains a missing skill amongst a significant proportion of the Hungarian population (according to Eurostat (2011) 63.2% of the Hungarian population does not speak any foreign language), we wanted to determine whether this was a missing competency among entrants to the accounting field as well, and thus required development. We think the effects of globalization and the expansion of the accounting services' content has caused the profession to require language skills for workers in the accounting field as well. The question is whether foreign language knowledge is a competency that is equally necessary on all three levels of accounting training.

We think that a lifelong learning skill is a particularly important competency for workers in the accounting field, considering the ever-changing regulatory environment of the accounting profession, technological changes and the expansion of services.

Ethical behaviour skills were given greater emphasis after the domestic and foreign broker scandals. Among the causes for thousands of companies failing is that of accounting irregularities – intentional inaccuracies – such as distorted reports, false profit statements, revenue tampering, hiding corporate debt and misleading accounting (called creative accounting).

Accounting gives a picture of the companies' income, property and financial situation. These accounting statements, as per Kane (2004) play a key role in creating and maintaining investor confidence. Creative accounting involves accountanting professionals bowing to pressure from management and results in false reporting, a variant of false informing. Such actions may be compliant with the law, but do not respect the rule of law (Szász 2007). According to Trotman (1993) the aim of such practices that are on the verge of legitimacy is the embellishment by the accountant of the corporate financial position with economic and financial information. In Naser's (1993) phrasing this activity refers to taking advantage of gaps in the rules to manipulate information, and structuring transactions in a way to obtain a desired accounting result.

Szász (2008) says that the global economy, the rapid technical and technological changes all provide unique economic opportunities in the accounting profession, however at the same time from a professional and ethical point of view, accounting practitioners have a huge responsibility towards the general public, as individuals' savings and the value of the retirement plans depend on the value of the company stock.

Table 1. Competency list used in the empirical research from Hungary

Competencies examined in the international empirical research		Expanded competencies in the Hungarian research	
1.	Written communication skills	10.	Foreign language communication skills
2.	General tax knowledge		
3.	Oral communication skills (language communication)	11.	Analytical thinking
		12.	Accounting skills
4.	Ability to answer the specific tax issues	13.	Ethical behavior, professional skepticism
5.	Knowledge of the business environment		
6.	Knowledge of accounting programs (using accounting software)	14.	Teamwork, cooperation
		15.	People related skills
7.	Management consultancy skills (decision-making)	16.	Ability for continuous learning
8.	IT skills (computer skills)		
9.	Management skills		

Source: author's own design based on Chen (2013)

The research in the USA and Hong Kong focused on entrants to accounting who possessed a high level of qualifications. Therefore, we considered it important to conduct the study separately for all three levels of Hungarian accounting expert education: the financial and accountancy administrators (or NTR training participants), chartered accountants and graduate accounting professionals. People may qualify as accounting administrators at secondary level trainings lasting for two semesters. With this qualification they can fulfil simple tasks under the control of a chief accountant. Another two semesters long training forms chartered accountants, who, after three years of practice may prepare financial statements on their own. The third level of qualification is achievable through higher education.

University or business school students of finance and accounting specializations can become graduate accounting professionals and, based on law, after three years of practice they can become chartered accountants as well.

While smaller companies employ mainly accountants, medium-sized or larger companies require graduate accounting professionals with more complex knowledge. Accounting and finance professionals are employed by enterprises regardless of the company size.

According to our assumption, competency requirements of the labour market for professionals within the three different levels of qualification are not equal in content or priority, and the missing competencies should differ, as well.

The Hungarian labour market is typically dominated by small and medium-sized enterprises (SMEs). According to the Central Statistics Office's data, 99.9% of the enterprises are small and medium-sized and only 0.1% are large undertakings. Accordingly, our research is focused on mapping the SME sector in Hungary. In order to achieve our research goal, we were looking for a platform, which is commonly known and appropriately represents this sector and where an adequate number of responses is likely.

The questionnaire mapping the lack of competencies for entrant accounting professionals was completed by 525 participants (out of 1000), on 25 November 2015, at the Tax Navigator "Tax 2016" Conference. Since the purpose of the operation of Tax Navigator Ltd. is the professional training for accountants working at small and medium-sized enterprises and accounting professionals at accounting firms serving SMEs, the respondents fully represent the SME sector and their responses are considered relevant. Among the respondents there were auditors, tax consultants, chartered accountants and financial-accounting administrators.

The respondents were expected to give an opinion regarding the missing competencies of entrants matching their own education level, but also of entrants with higher and lower education level. The expression of opinion is subjective in all cases; the opinion related to the same educational level could be less self-critical than the opinion

related to other education levels, so this was under particular scrutiny when processing the data.

The territorial jurisdiction of the respondents was not investigated. Although the conference took place in Budapest, this was a nationwide professional event and many of the participants came from different cities of Hungary. As there are national professional and examination requirements for both professional training and higher education, we did not see any examination of regional differences as justified. In accordance with the above we came to the conclusion that our data is sufficiently representative for carrying out a quantitative analysis.

The first part of the questionnaire contains statistical characteristics of the respondents, and the second part contains an evaluation of the competencies broken down by professional qualification (entrant administrators, accountants and graduate entrant accounting professionals).

Using a five-point Likert scale, the respondents evaluated the relevance and fulfilment of 16 competencies for accounting professionals based on their own point of view. Following the logic applied by Chen (2013) we marked relevant competencies with number one and missing competencies of entrants in accounting with number five (1. has the competency 2. rather has the competency 3. middle level competency 4. rather missing competency 5. completely missing competency). The competencies considered unnecessary were marked separately. We used the SPSS statistical program for processing the received responses.

Research data and results

Demographic profile of the sample

The first part of the questionnaire contains statistical characteristics of the sample. The breakdown of respondents by jobs shows that 73.23%, of the interviewed professionals were employed as internal accounting staff (chief accountant, accountant) and only 26.77% worked as external accountants (employee and manager of an accounting office). Almost two-thirds of the respondents (65%) are accounting professionals in management positions, regardless of

whether they work as managers in a business organization or external accountant office.

Regarding the respondents' professional qualification, 8% of all the respondents had the lowest professional accountancy degree (administrator), while 76% had an accountant qualification and 17% had a tax consultancy qualification as well. Only 7% of the respondents worked as auditors.

Based on the results of the cross examination between jobs and professional qualifications, it can be said that 11% of the internal accountants posessed an administrator qualification, 72% had an accountant qualification (4% out of them are tax advisors at the same time), 11% were only tax advisors, and 6% were auditors. Among the respondents working for accounting offices, 26% had an administrator degree, 3% had an auditor degree, and 71% had an accounting degree.

Among managers working for an accounting office or as a self-employed, 10% were trained as auditors, 78% were accountants (out of them 25% were qualified as tax advisors, too), and 2% got administrator qualifications. Considering the internal accounting staff (chief accountants), 89% posessed accountant qualification (out of them 14% were tax advisors, too), 5% were only tax advisors, 6% auditors, and none of them had an administrator degree.

Administrator degrees are connected to subordinate employee positions, while auditor qualifications are connected to chief accountants, accounting office managers, and so-called leader positions.

The composition of the sample according to the respondents' professional experience, shows that the majority of the respondents (77%) has over ten years of work experience. Surprisingly, entrants (having less then three years of work experience) attended the conference at a rate of nearly 10%.

The gender composition of the sample reflects the composition of the Hungarian accounting professionals by gender, as only 10% of the sample was represented by males, leaving an overwhelming proportion of female respondents.

Competencies considered unnecessary for accounting professionals

We examined whether the competencies considered necessary in the international research, are also considered necessary in Hungary. Generally, it can be said that the identified 16 competencies were considered necessary by 93% of the respondents. Different competencies were considered unnecessary for entrant professionals with different qualifications. The respondents' opinions about the scope of unnecessary competencies by qualification level are summarized in Table 2.

Table 2. Hierarchy of unnecessary competencies by qualification level

Administrator		Accountant		Graduate	
Management consultancy skills (decision making)	7%	Management consultancy skills (decision making)	2%	Management consultancy skills (decision making)	<1%
Management skills	7%	Management skills	3%	Management skills	<1%
Foreign language communication skills	3%	Foreign language communication skills	4%	Foreign language communication skills	<1%

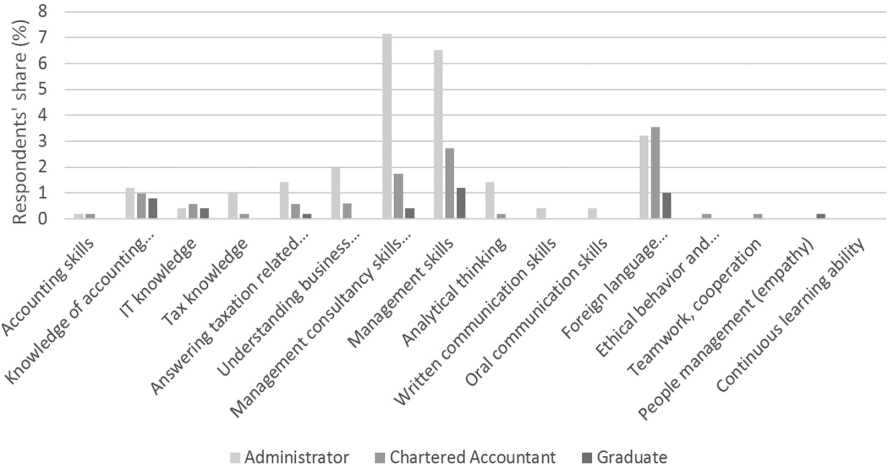
Source: author's own design

For administrators, 7% of the respondents considered management consultancy skills (decision making) and management skills as unnecessary competencies, but only 3% considered as unnecessary the foreign language communication skills. Related to accountants, a much smaller proportion (2-4%) of the respondents considered these three competencies unnecessary. In the case of graduate entrants, there were no unnecessary competencies identified (Table 2).

Respondents' with different educational level rated differently unnecessary competencies (see Figure 1).

Necessary and missing competencies

In order to identify the missing skills, the respondents were asked to value the missing competencies of entrant accounting professionals on a five-point Likert scale (1. has the competency 2. rather has the competency 3. middle level competency 4. rather missing competency 5. completely missing competency). Administrators, accountants and graduate accounting professionals were rated separately.



Source: author's own design

Figure 1. Unnecessary competencies according to the respondents' education

The results verify H1, according to which the more qualified the entrants are, the less they lack the relevant skills. The skills average in the case of administrators was 2.80, 2.42 in the case of accountants, and 2.04 in the case of graduate accounting professionals.

There are significant differences between the averages relating to each competency of a different level for entrance professionals. Competencies are missing the most in the case of administrators, the only exception being the foreign language communication skills, a competency the accountants lack more. This difference could be explained by the fact that markets require less foreign language knowledge from administrators.

The reviewed competencies lack the least amongst graduates (Figure 2), except for the knowledge of accounting programs, for which accountants perform slightly better (2.43) than the graduate accounting professionals (2.44).

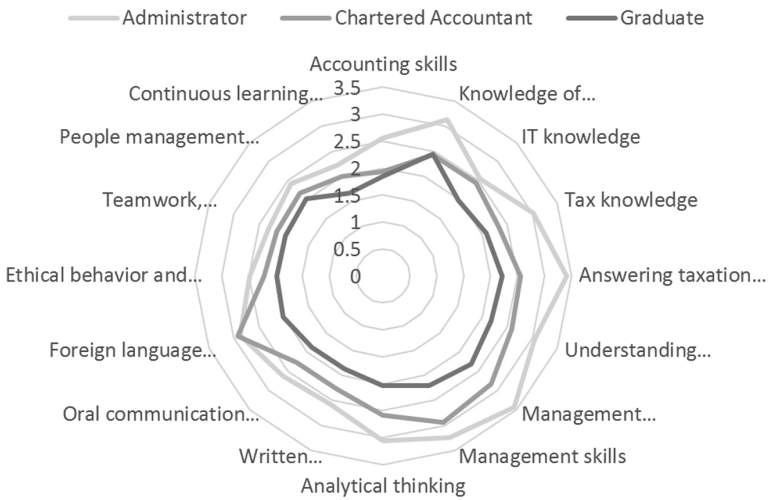
Table 3. Evaluation of necessary and missing competencies on the examined three levels of education based on averages

Competencies	*Administrator*	*Accountant*	*Graduate*	F	Sig.	Significant differences between the averages
Accounting skills	2.55	1.94	1.84	70.047	0.000	yes
Knowledge of accounting programs	3.13	2.43	2.44	57.025	0.000	yes
IT knowledge	2.54	2.45	1.99	43.209	0.000	yes
Tax knowledge	3.03	2.34	2.07	109.263	0.000	yes
Answering taxation related questions	3.42	2.55	2.21	153.406	0.000	yes
Understanding business environment	3.05	2.59	2.18	90.604	0.000	yes
Management consultancy skills (decision making)	3.44	2.83	2.31	121.208	0.000	yes
Management skills	3.25	2.94	2.21	132.825	0.000	yes
Analytical thinking	3.06	2.59	2.03	110.544	0.000	yes
Written communication skills	2.57	2.26	1.87	61.415	0.000	yes
Oral communication skills	2.63	2.28	1.88	68.032	0.000	yes
Foreign language communication skills	2.88	2.93	2.01	110.841	0.000	yes
Ethical behavior and professional skepticism	2.48	2.21	1.97	31.464	0.000	yes
Teamwork, cooperation	2.3	2.14	1.97	13.747	0.000	yes
People management (empathy)	2.42	2.18	2.02	19.833	0.000	yes
Continuous learning ability	2.22	1.99	1.66	37.222	0.000	yes
Average	**2.80**	**2.42**	**2.04**			

Source: author's own design

One approach to analyzing the average values is that if the average of a competency is below 2.5, then it is considered as existing, if it is above, then the competency is considered rather as a missing competency (see Table 3).

In the case of administrators, 11 competencies out of the examined 16 competencies are rated above 2.5, so they are missing competencies. The knowledge of accounting software (3.13) is an area to be improved considering the content of the training, and it is a crucial competency for administrators, too. Although in the administrators' job profile the most important word is 'contributing', as it is guided work, the analytical thinking competency (3.06) should still be developed during training.



Source: author's own design

Figure 2. Evaluation of necessary and missing competencies on the examined three levels of education based on averages

Three out of the missing competencies (understanding business environment, management consultancy skills (decision making) and management skills) were considered unnecessary by respondents to a significant extent. These competencies can be gained by financial and accounting administrators as part of career building, through experience acquired during work and in further training courses. Entrant accounting professionals are involved only in some tasks of accounting activities and for that the average knowledge (for mechanical work) can be suitable. Oral (2.63) and written (2.57) communication skills can be improved with the help of training courses and schooling provided by employers. Special usage of IT equipment (2.54) can be also learnt through internal training. In accordance with the employer's specific needs, the knowledge acquired during education can be extended with further training courses.

Chartered accountants as accounting professionals engaged in self-service activities have 10 out of the listed 16 competencies, which shows the high quality of these trainings.

Management consultancy skills (2.83) and management skills (2.94) are considered as missing competencies, which according to experts' opinion can be acquired for chartered accountants with an accredited exam (NTS) during the years spent at work. However, the changed role is a concern also for chartered accountants, as becoming a partner requires integrated thinkers, who above accounting knowledge are capable of taking part in decision-making and strategy development. Professional training is expected to therefore give a stable foundation of competencies, which could be improved during work. Education is not focused on improving foreign language communication skills (2.93). Based on the research results we can conclude that international communication is less required in the SME sector, than in large enterprises with extensive international relations.

During the chartered accountant's training, teaching methods should be strengthened to assist the development of analytical thinking (2.59). Furthermore, it should be strived for understanding the operation of the business environment (2.59) during studies and deepening the knowledge of taxation (2.55) is also a problem to be solved by professionals responsible for the revision of the training content.

The graduate accounting professionals have an average below 2.5 considering all the examined competencies, so none is considered a missing competency. Results show an average below 2 in the case of seven competencies, among these the continuous learning ability (1.66), the technical accounting knowledge (1.84) and stable written (1.87) and oral communication skills (1.88) stand out. According to experts' opinion graduates have appropriate IT knowledge (1.99), are characterized by ethical behaviour (1.97) and are capable of team work (1.97).

In the case of accountants and administrators, the five missing competencies at the beginning of the hierarchy are, based on the averages (over 2.5), indeed missing competencies. In contrast, the competencies which received the highest values amongst graduate accounting professionals have averages below 2.5, so they are not considered missing competencies (Table 4).

Table 4. The ranking of missing competencies, by qualification level

Rank	Administrator		Accountant		Graduate	
1	Management consultancy skills (decision making)	3.44	Management skills	2.94	Knowledge of accounting programs	2.44
2	Answering taxation related questions	3.42	Foreign language communication skills	2.93	Management consultancy skills (decision making)	2.31
3	Management skills	3.25	Management consultancy skills (decision making)	2.83	Answering taxation related questions	2.21
4	Knowledge of accounting programs	3.13	Understanding business environment	2.59	Management skills	2.21
5	Analytical thinking	3.06	Analytical thinking	2.59	Understanding business environment	2.18

Source: author's own design

Management consultancy skills (decision making) and management skills are the competencies which appeared in the first part of the hierarchy for all three levels of qualification. In our opinion, this is an important and useful piece of information for accountants and graduate entrants in accounting and should be kept in mind for the content development of professional training courses.

Existing (least missing) competencies

Although our survey focuses on missing competencies, we think it is important to emphasize the least missing competencies, namely the five competencies with the lowest value at the appropriate educational level (Table 5).

Continuous learning ability and ethical behaviour are sufficiently acquired skills on all the three levels of qualification. In our opinion, the continuous learning ability is a very important competency as the profession is continuously changing in this legislative environment.

Learning the ethical behaviour to an appropriate level means safety for those enterprises requiring accounting services. In the case of accountants and graduate accounting professionals, the appropriate level of professional training is justified by the prominent place of accounting skills within the hierarchy.

Table 5. The ranking of existing (least missing) competencies by qualification level

Rank	Administrator		Accountant		Graduate	
1	Continuous learning ability	2.22	Accounting skills	1.94	Continuous learning ability	1.66
2	Teamwork, cooperation	2.30	Continuous learning ability	1.99	Accounting skills	1.84
3	People management (empathy)	2.42	Teamwork cooperation	2.14	Written communication skills	1.87
4	Ethical behavior and professional skepticism	2.48	People management (empathy)	2.18	Oral communication skills	1.88
5	IT knowledge	2.54	Ethical behavior and professional skepticism	2.21	Ethical behavior and professional skepticism	1.97

Source: author's own design

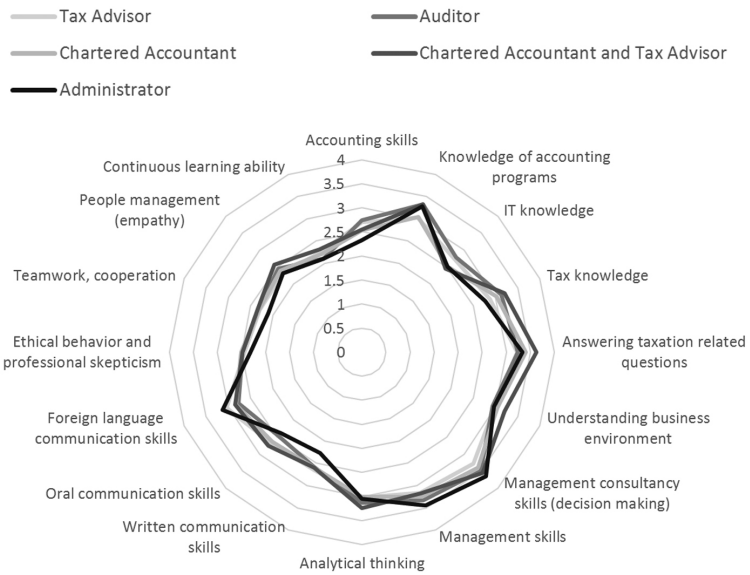
The assessments for entrant accounting professionals were examined in detail based on various characteristics of the respondents. As a first step, we investigated what role the respondents' educational level played in the assesment of the competencies required for entrant accounting professionals.

According to the respondents with chartered accountant and tax advisor qualifications, "tax knowledge" and "answering taxation related questions" are considered rather missing competencies at all levels. The biggest differences are between the opinion of graduates and respondents with other qualifications. The reason for this is that chartered accountants experienced in tax practice are often less educated, yet graduates with their theoretical knowledge of taxation are not competitive. Therefore, the content of the training related to tax knowledge should be reviewed for all levels. In addition, this group of respondents evaluated the most negatively the analytical thinking and people management competencies, for all the three levels.

Auditors do not differ from respondents with other qualifications when evaluating administrators (see Figure 3). However, in the case of chartered accountants, auditors rated management skills, understanding the business environment, IT knowledge and management consultancy skills the most negatively (Figure 4). When

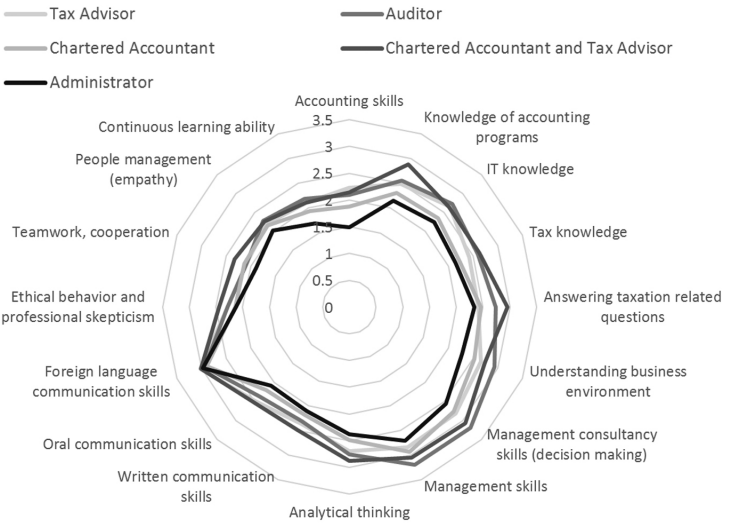
evaluating graduates, management skills, understanding the business environment and IT knowledge competencies were rated the most negatively (Figure 5). The reason for this negative evaluation could be that auditors have the most complex knowledge from an accounting professional's point of view. They rated accounting professionals with chartered accountant training and with higher education degree negatively compared to their own abilities.

Respondents with administrator education are critical when considering administrator entrants' management consultancy skills and management skills. They self-critically and objectively evaluate the two competencies required on higher level of education. They consider the foreign language skills as a missing competency for both administrators and chartered accountant entrants. Administrators rated graduates the most positively from the examined competencies' point of view, which perhaps illustrates the distance between qualifications (Figure 5).



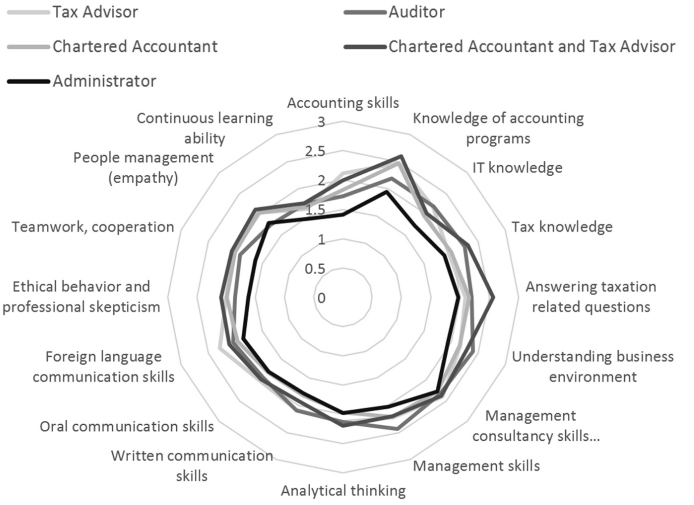
Source: author's own design

Figure 3. Administrator's necessary competencies by the respondents' qualifications



Source: author's own design

Figure 4. Chartered accountant's necessary competencies by the respondents' qualifications



Source: author's own design

Figure 5. Graduate's necessary competencies by the respondents' qualifications

Discussion

The evaluation of entrant administrators based on the respondents' qualification

We examined the difference between the responses of the respondents with different professional qualifications and we found that professional qualifications did not influence the evaluation of competencies when rating competencies of entrant administrators. Results show minimal deviation for respondents with different qualifications (respondents with administrator qualification are the most critical when rating entrant administrators' foreign language knowledge, management consultancy skills and management skills), however differences between averages do not show a significant deviation for any competency (see Appendix 3).

The evaluation of chartered accountants based on the respondents' qualifications

The difference in the respondents' professional qualification indicates significant deviation for nine competencies. The respondents with an administrator degree rated generally more positively (existing or missing to a lesser extent) the examined competencies for entrant chartered accountants. The respondents with an auditor qualification are the least satisfied with the existence of accounting skills ($p<0.001$) and IT knowledge ($p<0.01$). Those respondents having chartered accountant qualification see the biggest deficiency in the knowledge of accounting programs competency ($p<0.001$) for entrant chartered accountants.

The respondents with auditor and chartered accountant qualification consider a lower existing competency in tax knowledge, answering taxation related questions, analytical thinking and oral communication skills ($p<0.05$). According to the respondents with an auditor qualification the two competencies of understanding business environment and management consultancy skills (decision making) ($p<0.05$) are the least existing competencies for entrant chartered accountants (see Appendix 4).

The evaluation of graduates based on the respondents' qualifications

Examining the differences in responses according to various professional qualifications, it could be stated that as per administrator

respondents, the graduates have the most suitable knowledge in the examined areas, i.e. administrator respondents gave the lowest average value. The reason could be the difference in the content of the two levels of education, i.e. between the administrator and graduate education.

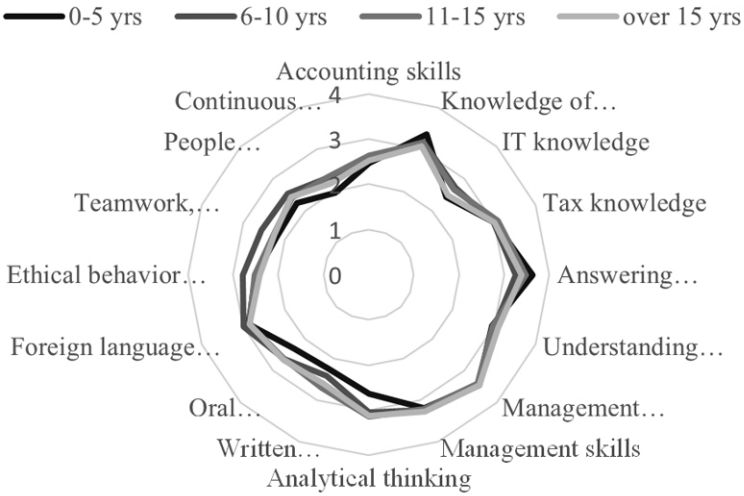
In case of accounting skills ($p<0.01$), the knowledge of accounting programs ($p<0.05$), tax knowledge ($p<0.05$) and answering taxation related questions ($p<0.01$) competencies, the deviations of the respondents' averages by qualification are significant. The most critical respondents were the auditors (in case of the accounting skills competency) and those having chartered accountant and auditor qualification when rating the graduates' existing competencies. In our view, the area of taxation and the practical knowledge of accounting programs are indeed areas for improvement in current accounting graduate education (see Appendix 5).

Based on the above results it can be stated that our second hypothesis (H2) can be accepted, so there are competencies, the judgment of which depends on the respondents' professional qualification.

The evaluation of entrant accounting professionals based on the respondents' work experience

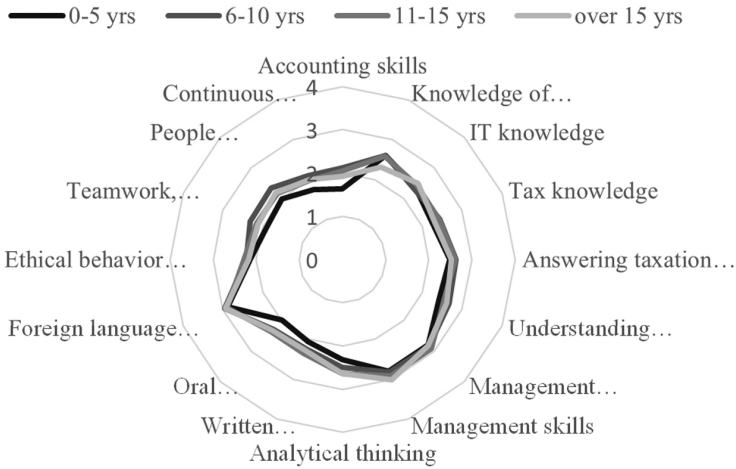
We analyzed in detail, what role the differences in the respondents' professional experience played in the assessment of competencies required for entrant accounting professionals.

Respondents having relatively short work experience rated more positively the existence of a competency at almost all levels and for all competencies, than the respondents having more work experience. The reason is that the respondents closer to entrants in age answered with some apparent bias when assessing the competencies. The only exception in case of entrant administrators are the competencies of knowledge of accounting programs and answering taxation related questions, where the most negative was the rating of respondents with no more than five years of working experience. Respondents with more working experience assessed the existence of competencies almost the same way for all categories of entrants (Figures 6-8).



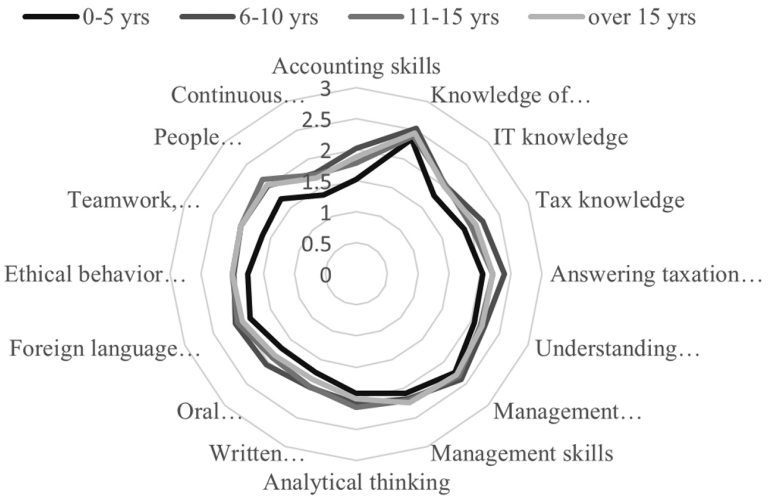
Source: author's own design

Figure 6. Administrator's necessary competencies according to the respondents' work experience



Source: author's own design

Figure 7. Chartered accountant's necessary competencies according to the respondents' work experience



Source: author's own design

Figure 8. Graduate's necessary competencies according to the respondents' work experience

The evaluation of entrant administrators based on the respondents' work experience

In case of the analytical thinking and written communication skills, work experience affects perception of the administrators' competencies. Average differences are significant in the case of both competencies ($p<0.05$). In both cases, according to the least experienced respondents (0-5 yrs) entrant administrators have most of the mentioned competencies (see Appendix 6).

The evaluation of entrant chartered accountants based on the respondents' work experience

The assessment by the respondents' professional experience was examined separately, to see if the averages show any significant digression. The least experienced respondents rated most positively the entrant chartered accountants for almost all competencies. However, only for one competency (accounting skills) there is significant digression between averages ($p<0.05$), the least experienced

respondents consider that chartered accountants generally have this competency (see Appendix 7).

The evaluation of graduates based on the respondents' work experience

For all competencies, the least experienced respondents rated the most positively the graduate accounting professionals. However, only for one competency (accounting skills) there is significant digression between the averages ($p<0.05$), the least experienced respondents consider that the graduate accounting professionals have that competency on the whole (see Appendix 8).

Based on the above results we can accept our hypothesis that for some competencies the aproppriate performance judgement depends on the respondents' professional experience.

Taking into account the different characteristics of the respondents, we can say that the assessment of entrant accounting professionnals' competencies is influenced by the respondents' qualities. Managers are more critical when assessing the administrators' existing competencies; the least experienced and younger respondents rated more positively some of the examined competencies. The chartered accountants' competencies are rated more positively by administrators with lower qualifications, younger respondents and those having less work experience. Auditors, tax advisers, and chartered accountants were more critical when assessing existing competencies. The entrants' knowledge of accounting programs was the only competency rated more positively by respondents above 50 years (thus assuming their own deficiencies) than by younger respondents. The accounting graduates' existing competencies were rated most positively by respondents with the lowest qualifications, respondents below 30 years and by the least experienced, who themselves could be considered entrants.

Accounting office managers rated ethical behaviour, teamwork and cooperation competencies as least existing.

Conclusions

We conducted a survey for identifying missing competencies amongst entrant accounting professionals, taking into consideration the

characteristics of the Hungarian accounting training. Therefore, we separated the three most typical training levels: administrators, accountants and entrant graduate accounting professionals.

Our first hypothesis, that "the more qualified the entrants are, the less they lack the relevant skills," was accepted. Based on the competency averages, it was ascertained that with the increase of qualification, competencies are perceived as increasingly possessed by entrants. The examined competencies were missing the most for the administrators' education level.

The averages show a better result for chartered accountants, while the examined competencies are missing least in case of the graduates, except for the knowledge of accounting programs, which is explained by the fact that bookkeeping is part of the chartered accountants' professional exam, while in the case of graduates it has less importance.

In case of the examined professional, communicational and social competencies, a higher degree indicates a higher competency level.

We consider our second and third hypothesis to be accepted based on the completed analysis. The opinions of the respondents with different qualifications and work experience differ in relation to some of the missing competencies.

The respondents in management positions expect professionals with higher competencies for administrator jobs. The respondents with lower degrees assessed more positively competencies of entrants with higher degrees. Young and less experienced respondents assessed more positively entrants' knowledge. Highly educated practitioners were the most critical, they expect practical knowledge immediately from entrants. Professional training should react with more practical curriculum development.

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Appendices

Appendix 1. Core Competency Framework

Functional competencies

Functional competencies refer to technical skills which are the closest to the accounting profession.

- Decision making
- Risk analysis
- Assessment
- Reporting
- Research and analysis
- Using technology, develop and strengthen the technological competencies

Personal competencies

Personal competencies refer to behaviors and practices. Developing these personal competencies improves the ways professional relationships are handled and helps individual learning and personal development process.

- Professional behavior
- Problem solving and decision making
- Cooperation
- Management
- Communication
- Project management
- Using technology, develop and strengthen the personal competencies

Extensive business competencies

Extensive business competencies relate to the environment where accounting professionals provide their services. Those professionals willing to enter the profession must take into account both internal and external business environments and the fact that their contributions determine their success or downfall. They must be fully aware of the business environment.

- Strategic and critical thinking
- Industry, sector prospects
- International, global prospects
- Resource management
- Legal, regulatory prospects
- Marketing, customer focus
- Using technology, develop and strengthen the extensive business competencies

Source: Bolt-Lee and Foster (2003)

Appendix 2. Explanation of competencies

1.	Written communication skills	The correct and comprehensive writing ability, knowledge of spelling
2.	General tax knowledge	Knowledge of tax laws, the appropriate use of standards
3.	Oral communication skills (language communication)	The spontaneous use of language, the grammar and spelling rules, linguistic intensity. Ability to choose appropriate form of statement, adequate to the speech situation. Verbal communication includes listening to different opinions and the establishment of discussion skills.
4.	Ability to answer the specific tax issues	Answering general and specific questions arising during professional work.
5.	Knowledge of the business environment	Basic knowledge of economics, forms of business, basic knowledge of rules.
6.	Knowledge of accounting programs (using accounting softwares)	Familiar with the possibility of computer-aided accounting, understand different software interfaces.
7.	Management consultancy skills (decision-making)	The ability to prepare the necessary information for management decisions.
8.	IT skills (computer skills)	Applies text editor and spreadsheet at user level
9.	Management skills	Knows how to make a success of the target, how to achieve the intended result.
10.	Foreign language communication skills	Spontaneous use of language in a foreign language, the use of grammar and spelling rules, linguistic intensity.
11.	Analytical thinking	Thinks over specific task independently, possibly quickly, using own professional knowledge performs flawlessly.
12.	Accounting skills	Accounting professional skills, knowledge of accounting principles, knowledge of the double entry bookkeeping system and regulations of the Accounting Act
13.	Ethical behaviour, professional skepticism	Moral, social, behaviour according to appropriate behaviour standards, professional skepticism
14.	Teamwork, cooperation	Able to cooperate, work with others
15.	People related skills	Assistance, empathy, sensitivity, care, concern
16.	Ability for continuous learning	The ability to adapt to environmental changes

Source: author's own design

Appendix 3. Evaluation of competencies related to administrators according to the respondents' education

Competencies	Respondents' education					F	Sig.
	Tax Advisor	Auditor	Chartered Accountant	Chartered Accountant and Tax Advisor	Administrator		
Accounting skills	2.705	2.742	2.538	2.549	2.333	0.85	0.494
Knowledge of accounting programs	3.023	3.323	3.045	3.319	3.282	1.313	0.264
IT knowledge	2.733	2.774	2.514	2.457	2.513	0.84	0.5
Tax knowledge	2.886	3.129	3.021	3.207	2.769	1.35	0.25
Answering taxation related questions	3.222	3.241	3.406	3.63	3.333	1.387	0.237
Understanding business environment	2.977	2.935	3.038	3.211	2.974	0.761	0.551
Management consultancy skills (decision making)	3.275	3.483	3.401	3.543	3.639	0.69	0.599
Management skills	3.171	3.333	3.249	3.172	3.444	0.552	0.698
Analytical thinking	3.023	3.129	3	3.239	3.051	0.836	0.503
Written communication skills	2.636	2.581	2.592	2.598	2.275	0.954	0.432
Oral communication skills	2.667	2.452	2.634	2.742	2.375	1.099	0.356
Foreign language communication skills	3.048	2.767	2.834	2.851	3.125	0.906	0.46
Ethical behavior and professional skepticism	2.444	2.484	2.512	2.484	2.316	0.297	0.88
Teamwork, cooperation	2.289	2.323	2.314	2.348	2.103	0.421	0.794
People management (empathy)	2.311	2.452	2.395	2.571	2.325	0.747	0.56
Continuous learning ability	2.244	2.097	2.211	2.304	2.1	0.356	0.84

Source: author's own design

Appendix 4. Evaluation of competencies related to chartered accountants according to the respondents' education

Competencies	Respondents' education					F	Sig.
	Tax Advisor	Auditor	Chartered Accountant	Chartered Accountant and Tax Advisor	Administrator		
Accounting skills	2.234	2.094	1.877	2.149	1.487	4.798	**0.001**
Knowledge of accounting programs	2.489	2.563	2.304	2.882	2.154	5.196	**0**
IT knowledge	2.66	2.719	2.347	2.645	2.25	3.429	**0.009**
Tax knowledge	2.426	2.594	2.228	2.634	2.154	3.524	**0.008**
Answering taxation related questions	2.413	2.742	2.46	2.957	2.333	4.436	**0.002**
Understanding business environment	2.66	2.935	2.537	2.742	2.282	2.626	**0.034**
Management consultancy skills (decision making)	2.814	3.2	2.759	3.075	2.553	3.223	**0.013**
Management skills	2.837	3.194	2.928	3.043	2.711	1.366	0.245
Analytical thinking	2.696	2.75	2.49	2.872	2.385	2.812	**0.025**
Written communication skills	2.362	2.312	2.182	2.5	2.103	2.034	0.088
Oral communication skills	2.489	2.375	2.193	2.521	2.077	2.818	**0.025**
Foreign language communication skills	3.022	2.933	2.892	3.011	2.975	0.302	0.876
Ethical behavior and professional skepticism	2.277	2.281	2.132	2.436	2.125	1.701	0.148
Teamwork, cooperation	2.085	2.094	2.123	2.326	1.895	1.533	0.191
People management (empathy)	2.191	2.281	2.163	2.253	2.026	0.429	0.788
Continuous learning ability	2.106	2.188	1.944	2.116	1.692	1.664	0.157

Source: author's own design

Appendix 5. Evaluation of competencies related to graduate entrants according to the respondents' education

Competencies	Respondents' education					F	Sig.
	Tax Advisor	Auditor	Chartered Accountant	Chartered Accountant and Tax Advisor	Administrator		
Accounting skills	2.109	1.719	1.826	1.989	1.41	3.435	**0.009**
Knowledge of accounting programs	2.478	2.188	2.481	2.604	1.95	2.811	**0.025**
IT knowledge	2.174	2.188	1.958	2.022	1.725	1.813	0.125
Tax knowledge	1.957	2.25	2.01	2.315	1.875	2.484	**0.043**
Answering taxation related questions	2.087	2.194	2.159	2.565	1.975	3.365	**0.01**
Understanding business environment	2.174	2.406	2.152	2.293	1.95	1.244	0.291
Management consultancy skills (decision making)	2.4	2.344	2.274	2.38	2.275	0.25	0.91
Management skills	2.222	2.438	2.21	2.198	2.026	0.723	0.577
Analytical thinking	2.13	2.125	1.965	2.196	1.975	1.075	0.368
Written communication skills	2.087	2.094	1.81	1.924	1.775	1.546	0.188
Oral communication skills	2.022	1.937	1.82	1.989	1.8	0.898	0.465
Foreign language communication skills	2.283	2.032	1.955	2.112	1.846	1.463	0.212
Ethical behavior and professional skepticism	2	1.844	1.99	2.087	1.625	1.847	0.119
Teamwork, cooperation	2.022	1.906	1.997	2.055	1.625	1.644	0.162
People management (empathy)	2.043	1.75	2.042	2.121	1.795	1.476	0.208
Continuous learning ability		1.719	1.666	1.736	1.45	0.79	0.532

Source: author's own design

Appendix 6. Evaluation of competencies related to administrators according to the respondents' work experience

Competencies	Respondents' work experience				F	Sig.
	0-5 yrs	6-10 yrs	11-15 yrs	over 15 yrs		
Accounting skills	2.469	2.594	2.639	2.525	0.39	0.761
Knowledge of accounting programs	3.354	3.174	3.151	3.073	0.771	0.511
IT knowledge	2.429	2.721	2.66	2.474	1.445	0.229
Tax knowledge	3.02	3	3.093	3.018	0.129	0.943
Answering taxation related questions	3.633	3.25	3.485	3.391	1.219	0.302
Understanding business environment	2.959	3.015	2.979	3.104	0.553	0.646
Management consultancy skills (decision making)	3.426	3.458	3.404	3.45	0.04	0.989
Management skills	3.196	3.23	3.211	3.275	0.143	0.934
Analytical thinking	2.625	3.045	3.135	3.111	2.796	**0.04**
Written communication skills	2.265	2.42	2.716	2.612	2.845	**0.037**
Oral communication skills	2.327	2.638	2.646	2.667	1.501	0.213
Foreign language communication skills	2.878	2.985	2.857	2.856	0.237	0.87
Ethical behavior and professional skepticism	2.5	2.776	2.515	2.401	2.265	0.08
Teamwork, cooperation	2.204	2.559	2.292	2.261	1.704	0.165
People management (empathy)	2.245	2.536	2.412	2.42	0.76	0.517
Continuous learning ability	1.959	2.333	2.34	2.188	1.625	0.183

Source: author's own design

Appendix 7. Evaluation of competencies related to chartered accountants according to the respondents' work experience

Competencies	Respondents' work experience				F	Sig.
	0-5 yrs	6-10 yrs	11-15 yrs	over 15 yrs		
Accounting skills	1.633	2.114	2.04	1.922	2.721	**0.044**
Knowledge of accounting programs	2.612	2.614	2.577	2.31	2.563	0.054
IT knowledge	2.388	2.329	2.434	2.486	0.572	0.634
Tax knowledge	2.245	2.443	2.43	2.296	0.757	0.519
Answering taxation related questions	2.49	2.629	2.61	2.529	0.285	0.836
Understanding business environment	2.429	2.667	2.535	2.619	0.729	0.535
Management consultancy skills (decision making)	2.796	2.836	2.908	2.813	0.219	0.883
Management skills	2.796	2.821	2.919	3.004	1.046	0.372
Analytical thinking	2.306	2.5	2.64	2.636	1.48	0.219
Written communication skills	2.061	2.229	2.347	2.269	0.851	0.466
Oral communication skills	1.98	2.271	2.356	2.311	1.678	0.171
Foreign language communication skills	2.878	2.969	2.896	2.95	0.125	0.945
Ethical behavior and professional skepticism	2.143	2.239	2.287	2.187	0.32	0.811
Teamwork, cooperation	1.917	2.314	2.168	2.122	1.629	0.182
People management (empathy)	1.98	2.348	2.149	2.184	1.267	0.285
Continuous learning ability	1.755	2.1	1.98	2	1.057	0.367

Source: author's own design

Appendix 8. Evaluation of competencies related to graduate entrants according to the respondents' work experience

Competencies	Respondents' work experience				F	Sig.
	0-5 yrs	6-10 yrs	11-15 yrs	over 15 yrs		
Accounting skills	1.521	2.015	1.784	1.877	2.653	**0.048**
Knowledge of accounting programs	2.347	2.536	2.394	2.451	0.326	0.807
IT knowledge	1.776	2.029	2.031	1.996	1.014	0.386
Tax knowledge	1.878	2.206	2.01	2.085	1.174	0.319
Answering taxation related questions	2.041	2.391	2.204	2.205	1.058	0.366
Understanding business environment	2.061	2.232	2.173	2.19	0.29	0.833
Management consultancy skills (decision making)	2.245	2.397	2.33	2.293	0.22	0.882
Management skills	2.082	2.179	2.196	2.243	0.382	0.766
Analytical thinking	1.918	2.087	2.143	2.004	0.707	0.548
Written communication skills	1.714	1.971	1.959	1.845	1.077	0.358
Oral communication skills	1.694	2.058	1.908	1.852	1.473	0.221
Foreign language communication skills	1.857	2.106	2.074	1.993	0.685	0.562
Ethical behavior and professional skepticism	1.755	1.971	2	1.996	0.933	0.425
Teamwork, cooperation	1.633	2.014	2.01	2.011	2.373	0.07
People management (empathy)	1.714	2.014	2.143	2.028	2.226	0.084
Continuous learning ability	1.367	1.754	1.724	1.668	2.266	0.08

Source: author's own design

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The use of Monte Carlo simulation in the assessment of an agricultural investment

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Abstract

The research aims to present an investment analysis model and its risk management methods, which can be commonly used to prepare the realization of any agricultural investment. Using the case study method, we guide the reader through the examination of the economic viability of an investment in cultivating per Western European standards a momentarily neglected piece of land in Harghita County, Romania, that would be suitable for agricultural purposes. We explore the risks associated with the investment and provide a detailed description of the related method.

Keywords: Monte Carlo simulation, agriculture, investment decision, business planning.

JEL code: G30.

Introduction

One of the consequences of intensified globalization is that, besides producing outstanding quality products, farms must constantly adapt to the changing environmental conditions in order to remain competitive. The continuous investment activity is a prerequisite for this adaptation, as these investments are the main drivers of innovation and production growth. In Romania, as in Central-Eastern Europe, the productivity and competitiveness of agriculture is far below the Western European level (Schimmelfennig–Sedelmeier 2005). It is essential to continue supporting, developing and reforming agriculture, as 1.3 million persons are employed in this sector in Romania (INSSE 2015) and it also plays an important role in maintaining the rural population, mitigating the disparities between urban and rural areas (Prishchepov

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et al. 2017), preserving the environment, as well as protecting nature (Schimmelfennig–Sedelmeier 2005). Thus, increasing the productivity and competitiveness of the sector is of paramount importance.

To achieve this improvement, it is not sufficient to use modern agricultural technologies, but also the various calculation methods of cost effectiveness, and making financially justified decisions, instead of the "everybody here grows potatoes, so that's what I'm doing, too" method. The Capital's (2016) survey shows that a significant part of the Romanian farmers are already familiar with the new agricultural technologies, but their financial literacy is far behind the Western European level.

In the first part of our paper, we review the literature, then we present the research methodology and the data sources of the research. Afterwards we examine if it is possible to run a cost-effective agricultural business given the soil and weather conditions typical for the area. Finally, we describe our results and the conclusions that can be drawn.

Literature review

The literature provides two different approaches for the concept of investment, one is from the general economics' and the other is from the business economics' point of view.

Macroeconomists define investments as the increase in the fixed assets of a given economy (country). Hall and Taylor (2003. 56) define investments as "the expenses incurred by companies for their offices, equipment and stocks, as well as the expenditures incurred by households for residential purposes." In contrast, Samuelson and Nordhaus (2005) define investments as the increase in the capital stock of a national economy by purchasing/producing buildings, machines, equipment and supplies, and sacrificing current consumption in order to increase future consumption.

By analyzing the concept of investment from the business economics point of view, we concluded that it consists of all the activities aimed at replacing and expanding the fixed assets. In the

definition provided by Mátrai–Németh (1986. 87), an investment is the sum of "all the activities aimed at the replacement and expansion of the fixed assets."

Classifying investments by multiple aspects

The literature classifies investments in several ways, but we emphasize only three of them. The first classification is in terms of national economy and business administration, the second one is by the financing form, where we distinguish between investments financed from own resources and investments financed from loans, and the third one is by intended purpose.

Bálint et al. (2001) argue that the investments' purpose may be to establish a new production facility or service provider business; to increase the existing production capacity; to rationalize modernization of outdated facilities; or to replace old, outdated production equipment. Accordingly, the investment types are the following: completely new or "greenfield" investment; expansion investments; rationalizing investments or replacement investments.

Investment pre-decisions process

There are several authors who discuss the investment pre-decisions process in their research. Fekete–Husti (2005) define the decision-making and pre-decision process in nine steps:

1. initialize the investment based on the business strategy,
2. prepare a preliminary feasibility study,
3. decide on the feasibility study,
4. carry out the feasibility study for the selected version,
5. decide on further steps,
6. define the elements of the project strategy,
7. decide on the project strategy,
8. ensure the necessary implementation resources,
9. determine the availability of the necessary resources.

In contrast, Butler et al. (1993) sets forth only four major decision-making steps:

1. identify the investment possibilities,
2. develop the initial idea into a business purpose,

3. assess and select the projects,

4. analyze the projects.

In conclusion, it can be stated that the pre-decision process comprises the initial idea and the steps of transforming it into a plan that is achievable and financially viable for the company. Business investments can be manifold; hence it is difficult to define a generally valid model that applies to all types of investments.

In our article, we focus on creating a greenfield agricultural investment model in Romania. One significant impediment of the Romanian agriculture is that even though there is available capital and knowledge, the agronomists cannot foresee and calculate the return on their investment.

The methodology of calculating the cost-effectiveness of an investment

Calculating the cost-effectiveness of an investment is an essential phase of the investment pre-decision process. The calculations have a well-established methodology, with considerable importance in both foreign and domestic literature. Initially, the literature suggested using static indicators to assess the cost-effectiveness of any investment, disregarding the time value of money. However, since the 1930's, the development of the net present value's calculation method has led to dynamic indicators, first appearing in books and articles of Anglo-Saxon authors (Markovics 2013).

Static calculation methods of investment cost-effectiveness

The static calculations of investment cost-effectiveness disregard the time factor. Because of this, they are able to compare investments with similar lifespan and fairly uniform yield distribution (Illés 1997).

Illés (2002) makes a distinction between the three types of static calculation methods:

1. Cross-sectional analysis: calculations are done for a given year.

2. Multi-annual analysis: the static calculation is done for every estimated year of the investment's lifespan. If every year the investment works with a considerably higher profitability than the interest rate, it is quite certainly cost-effective.

3. Lifespan analysis: a static profitability indicator is defined during the calculations, which is then compared to the interest rate. The investment project is classified based on the comparison result.

Static calculations of investment cost-effectiveness are relevant because they can be performed quite easily and quickly, which is why they are most likely to be used in business practice.

Dynamic calculation methods of investment cost-effectiveness

Today's relevant literature features both the static and the dynamic calculation methods of cost-effectiveness, however, most authors agree that the time factor must be taken into account, so most often the dynamic methods are recommended. This chapter presents the three most important dynamic methods: the net present value (NPV), the internal return rate (IRR) and the discounted payback period.

According to Markovics (2013), one of the most recommended methods among all the dynamic calculations of cost-effectiveness is to determine the net present value. The NPV is a difference indicator and its general formula shows how much surplus profit (converted to net present value) the investment yields over the standard profitability (or the measure of inefficiency as compared to the expectations).

$$NPV = \sum_{t=0}^{n-1} [P_t - (k_t + E_t)] \frac{1}{(1+i)^t}$$

P_t = cash flow during period t;

k_t = non-investment costs during period t (current cost without amortization);

E_t = investment related expenses during period t (investment costs);

i = interest rate.

The reason behind the net present value's relatively frequent usage could be that the interpretation of the result is very easy: if the net present value is positive, the investment is worthwhile. The method's drawback is the high complexity of the interest rate used for discounting.

The internal rate of return (IRR) generally refers to the return rate at which the value of the revenue and expenditure is equal.

$$\sum_{t=0}^{n-1} P_t \frac{1}{(1+r)^t} = \sum_{t=0}^{n-1} (k_t + E_t) \frac{1}{(1+r)^t}$$

P_t = cash flow during period t;

k_t = non-investment costs during period t (current cost without amortization);

E_t = investment related expenses during period t (investment costs);

r = internal rate of return.

According to this method, the investment can be considered cost-effective if the internal rate of return is not smaller than the interest rate used. The great advantage of this method over the other dynamic methods is that the results are easily interpreted by business professionals, and the information itself is not subject to the uncertainty surrounding the definition of the interest rate used (Markovics 2013).

The dynamic (or discounted) payback period indicates the number of years in which the discounted amounts of the incurred investment and non-investment expenditures return from the discounted amounts of the generated revenue, given the profitability expectations for the interest rate used. It is calculated as follows: equalizing the revenue and expenditure lines, we look for the year when we first got the return of the discounted amounts of investment and non-investment expenditures from the discounted revenues, i.e. the discounted payback period can also be determined by identifying the year which zeroes out the net present value formula (Markovics 2013).

Applying risk management procedures

In practice, there are many types of investment projects, depending on the size and type of risks involved. First, the main risk factors must be identified, and the best risk management procedure that suits the type of risk involved has to be chosen from the methodology base.

The financial literature mostly recommends increasing the interest rate used as a risk management approach, which essentially means that the interest rate is corrected (increased) by the risk factor. The higher the interest rate used, the higher the return the investment is required to

yield. The economic literature makes several other recommendations, such as increasing the expenditure line, decreasing the return line, calculating the payback period and making parallel calculations, such as sensitivity analyses, decision trees etc. (Markovics 2013).

This chapter discusses in more detail the three risk management methods used in the practical part of our paper, namely the sensitivity analysis, the scenario analysis and the Monte Carlo simulation.

During the sensitivity analysis, we apply several different magnitudes or a series of magnitudes and we carry out the cost-effectiveness analysis several times in such a way that different magnitudes of the given variable are used during the calculations, while the other variables remain unchanged. Thus, we get a whole series of evaluations of the applied economic criteria, a set of cost-effectiveness indicators as a result, which will show us how and to what extent the cost-effectiveness indicator reacts to the changes of the variable used in the given sensitivity analysis (Vargha 1997).

The purpose of the scenario analysis is to investigate the effects of the joint change in the parameters of the calculation model of investment cost-effectiveness on the NPV's evolution. Its possible techniques are the various statistical models (e.g. VAR, CFAT), the simulations (e.g. Monte-Carlo) and the intuitive methods. Its tacit presumption is that whatever happens in the first period is independent from what happens in further periods, and that the variables are independent for every period. During the scenario analysis, it is important to make the context as simple as possible and to not get emotionally attached to the investment (Brealey–Myers 1993).

Using the sensitivity and scenario analyses presented above, we can examine different situations, but it is obvious that we can study only a limited number of variable combinations, so we assumed a discrete probability distribution in our analyses.

The Monte Carlo simulation is an instrument that allows us to examine not only a few, but all the possible combinations, thus being able to analyze the entire distribution of the project's outcomes; therefore, we can also analyze continuous distributions, not only discrete ones (Bozsik–Fellegi 2011). Stochastic models can be used to

describe randomness-influenced processes as the outcome is also randomness-influenced. In this case, the random phenomenon's simulation can be carried out using random numbers. In this context, the most prevalent method is the Monte Carlo simulation (Komlósi 2002). By modeling a problem with the Monte Carlo method, a much more complex and intricate system can be analyzed than with other methods. In present-day's interpretation, the Monte-Carlo method comprises all the techniques where statistical samples are used to approximate quantitative problems. The method's elaboration is associated with Stanislaw Ulam's name, but its computer application is the merit of John von Neumann and Nicholas Metropolis. The Monte Carlo name was given by Metropolis (Metropolis–Ulam 1949). According to Szobol (1981), the Monte Carlo method is a numerical method used for random quantity modeling of mathematical problems. From a mathematical point of view, the reason behind creating the Monte Carlo method is to set up a problem where an expected value (*M)* has to be calculated.

In order to approximate any a scalar quantity, an ε probability variable must be found such that $M\varepsilon = a$; then, after carrying out N independent observations on ε, it can be affirmed that

$$a \approx \frac{\varepsilon_1 + \varepsilon_2 + \ldots + \varepsilon_N}{N}$$

As the law of large numbers is applicable to a series of independent, equally distributed probability variables with an expected value, the ε_i values' arithmetic mean will converge to the expected value in probability: if $N \to \infty$, then $\varepsilon_N \xrightarrow{P} a$. The series of probability variables ε_1, ε_2, ..., ε_N, converges to an a constant if it is true for arbitrary h that $P(|\varepsilon_N - a|) \geq h) \to 0$, when $N \to \infty$ (Szobol 1981).

Research methodology

Our article aims to offer practical guidelines for drawing up an easy-to-create model for greenfield agricultural investments.

The first research question analyzes whether a modern agricultural investment can generate added value, given the current prices and yields in Romania:

RQ1: Can a greenfield agricultural investment be profitable, given the current prices and yields in Romania?

The second research question addresses the investment's risks:

RQ2: How can the financial effects of the volatility risks (e.g. weather conditions) specific to agriculture be effectively managed in an agricultural greenfield investment model?

In order to answer the research questions, an exploratory research is needed, so we chose the case study method that draws general conclusions from exploring past or even current events (Leonard–Barton 1990).

In our research, we use the case study companies as benchmarks in order to establish which input factors lead to which output factors in the investment model. The analyzed data was collected from two sources:

• the companies involved in the case study collected via semi-structured interviews (by processing over 50 hours of interview material conducted with 15 interviewees), from company documents (secondary business-related data), as well as from direct observation (spending three months on the analyzed sample farms);

• public statistical sources.

During our research, we collected data from the most relevant sources, because in case of an agricultural investment, not only the cost of the company's own and foreign capital and the procurement cost of various equipment, machinery and raw materials has to be determined, but the geological peculiarities of the area (soil type, average temperature, precipitation), the amount of potential subsidies and the area's crop insurance possibilities should also be taken into account.

Hereinafter we present the databases, the research and the analyses, and using the respective data, we present the financial assessment of a sample agricultural investment.

Companies subject to the case study

Due to the uniqueness of our research, we needed a lot of information that cannot be found in annual financial statements. The aforementioned data refer to fuel, fertilizer and spray consumption per

hectare, the area that an employee can treat, the hourly performance of the various machinery or the damages caused by wild animals and the methods of protection against these damages.

These data can be inferred from the agricultural literature's estimations, as well as from relying on the vast experience of the field's specialists. In our article, most of the data was determined based on the specialists' (in our case farmers') experience and estimations, since there is no common method to determine these values and, in fact, we obtained different results from observing parcels located at even just a few kilometers distance.

For the above reasons, we rely on the average of three different companies' data. One of the farms' owner has agreed to provide the required information, provided that the company's name is not mentioned anywhere in the analysis; for this reason, hereinafter we call them Farm1, Farm2 and Farm3. The main features of the three companies are:

• Farm1's main activity is winter wheat, barley and oat cultivation on a 291-hectare cropland; 80-100 hectares of fallow land; permanent employees: 4;

• Farm2's main activity is wheat and barley cultivation on a 425-hectare cropland; no fallow land; permanent employees: 3;

• Farm3's main activity is wheat, barley and rape cultivation on a 700-hectare cropland; no fallow land, since they use crop rotation and they grow alfalfa on the "resting" plots; permanent employees: 6.

We can state about the three farms that the coverage of the debt stock fluctuates around 140-150%, and the share of equity within the total resources is of 50-65%. Despite the very low wages in agriculture, the employees' wages are 1.5-1.8 times the minimal wage on all three farms, because the employees often work up to 14 hours a day during summer harvest. In addition, all three farms hire seasonal workers during spring, autumn and harvesting.

Statistical data sources

The Farm Accountancy Data Network (FADN) is a database operated by the EU member states since 1965, which mainly offers

information on the profitability of various agricultural business categories. The relevance of the information collected from the database is shown by the fact that the system only registers farms that perform their activity at least above 2 EUME[3]. Moreover, the database only takes into account the wider agricultural activities of the farms (basic agricultural activity, produce processing, forestry, fishing, agricultural services, rural tourism) and does not include industrial, commercial and non-agricultural activities.

The National Institute of Statistics, hereinafter referred to as INSSE, publishes the data of the country's regions, including the average yield of crops in recent years, the cereal prices or even the average wages in the agricultural sector, among others. Data is also provided on county level, which is essential for the realistic determination of the agricultural yield.

The data regarding the soil types, weather conditions (average temperature, annual precipitation) and the crops typical for Harghita County were collected from the Harghita County's Agricultural Development Strategy for 2010–2020 (Harghita Consulting 2009).

We determined the soil types using the methodology presented by Vágvölgyi and Varga (2011) to determine average temperature and precipitation quantity required for cultivating certain plants, in order to select the most suitable crops for the region's weather conditions and soil type.

We became acquainted with the types of subsidies in agriculture, their extent and the eligibility conditions, the application deadlines and the expected payments from the newsletters published by the Payments Agency for Interventions in Agriculture (APIA).

The loan granted at the beginning of the investment has been determined based on the loan offer published by the Commercial Bank of Romania (BCR) for starting small and medium businesses, taking into account the maturity, grace period, normal interest rate, commission and administration fees.

[3] An EU attribute that expresses the economic size of the farm.

We determined the insurance fees based on an inquiry, since insurance companies mostly offer customized packages based on the geographical and weather conditions, the insured risks (late spring frost, early autumn frost, hail, hurricane-like rains and drought) and the size of the land to be insured.

Data analysis methods

For calculating the investment's cost-effectiveness, we use the dynamic calculation method of investment cost-effectiveness, i.e. the net present value (NPV), which was previously presented in the literature review. We decided to use this method because a quite large fixed asset investment is required in agriculture, and what is more important, the "production" can be started only in the second year of the investment (the croplands have to be prepared in order to achieve a satisfactory yield, which can last several months), so the payback period is long, therefore it is essential to take into account the time factor and the time value of money.

We reveal the investment's risks and their effects with the help of three different risk-analysis methods. First, by using the sensitivity-analysis, we determine the factors that influence the most the cost-effectiveness of the investment, then we analyze the effects of the combined changes of these factors in different scenarios. Third, we run a Monte Carlo simulation to determine the probability of certain outcomes (the net present value of the investment), thus analyzing the investment's riskiness.

The practical calculations of our research are divided into three parts. In the first part, we present the necessary investments in real estate, building and fixed assets, and justify these choices. In the second part, we discuss the project's financing, the changes in the revenues and expenditures, and present the steps of calculating the expected net present value. In the third and last part, we present the risk-analysis methods used, and the conclusions drawn from these.

Investments in land, buildings and agricultural machinery

Our research aims to analyze the cost-effectiveness of a greenfield agricultural investment. The first step of the investment is to determine

the required fixed assets and their value, so this chapter deals with the investments in land, buildings and agricultural machinery.

Land and buildings

The investment is carried out in Harghita County, and aims to improve and cultivate a 100-hectare land. The land is rented from the common land of Capalnita, Satu Mare, Badeni or Martinis, with a contract for at least eight years, so we don't have to buy it.

The agricultural work will require machinery, seeds, pesticides and fertilizers, which will have to be stored somewhere, and silos must be built for grain storage. First, a site is needed, which will also pose as the company's headquarters. Given the current market prices, the price of an 8-10 000 sqm land in the area amounts to EUR 20 000.

We build a warehouse where the seeds, pesticides, fertilizers and the machinery's spare parts can be stored. After analyzing the constructions built by the reference companies for similar purposes, we came to the conclusion that a 500 sqm warehouse would suffice. Given the current market prices, building one sqm of a warehouse costs 50 euros, so the total building cost is EUR 25 000.

The agriculture in Harghita County suffers considerable damages caused by wild animals, therefore the land has to be enclosed with electric fence. The fencing costs are presented in Table 1.

Table 1. The costs of electric fences and enclosures

Description	Unit price (euro)	Quantity	Total amount (euro)
Electric fence	230.00	1	230
Wiring (m)	0.35	15 000	5 250
Posts (pcs.)	1.75	1 000	1 750
Gate	163	4	652
Total (euro)			**7 882**

Source: authors' own design based on market prices

The total price of the fence is EUR 7 882, including the necessary wiring, the posts, four entrance gates and the electric fence itself. We did not include the costs associated with setting up the fence, since the company has three permanent staff members who can install the fence during the first winter.

Another key investment item is the construction of the grain silos, essential for maintaining the grain quality (and its market value) during long-term storage. In our research, we decided to build mobile silos. Consequently, the capacity of a silo does not exceed 25 000 kg of grain, but the distribution company undertakes the silos' installing, sparing us additional costs. Given the foreseeable yields, 10 such silos will be needed. With a unit price of EUR 2600, this means a total investment of EUR 26 000.

We will also need a mobile petrol station. Agricultural machinery has a hard time traveling on highways, and it would be a waste of time to spend several hours daily with refueling. Taking into account the machinery's consumption, a 2-3000 liters' petrol station would suffice. This would cost EUR 2500.

Summing up the required amounts for land and buildings (warehouse, grain silos, mobile petrol station and fence), the total investment is EUR 81 328 (see Table 2).

Table 2. The total cost of land and buildings

Land and buildings	Unit price (euro)	Quantity	Total amount (euro)
Land			
Land (ha)	20 000	1	20 000
Total land			**20 000**
Buildings			
Silos 25t	2 600	10	26 000
Warehouse m^2	50	500	25 000
Fence	7 882	1	7 882
Mobile petrol station	2 500	1	2 500
Total buildings			**61 382**
Total land and building costs			**81 382**

Source: authors' own design based on market prices

Agricultural machinery and equipment

Another key aspect of this investment project is the machinery pool. After determining the type of machinery needed during the production processes, by assessing their performance and taking into account the experience of those working at the case study companies, we decided to purchase the machinery listed in Table 3.

Table 3. Agricultural machinery

Machinery	Price (euro)
Steyr 9086 tractor with shovel loader	11 500
Fendt 306 tractor with shovel loader	24 000
John Deere 1055 combine harvester	25 000
Rabe Star 120 D III plough	3 600
Claas markant 41 bailing machine	4 500
Deutz-Fahr twisting machine	2 200
Pöttinger Landsberg Lion round ring harrow	4 000
Fella SM 320 scythe	3 500
Krone disc	2 500
Amazone ZA-U 1001 fertilizer spreader	1 300
Amazone UF 1000 sprayer	10 500
Amazone D7 Super S seed drill	2 850
Sonstige 8t trailer	3 900
Krone 8t trailer	3 800
Kögel 18t bail truck	2 450
Ferroni wash pump	500
Karcher high pressure washer	1 250
Jaguar grain auger	2 000
Güde GSE 2700 generator	325
Volkswagen Transporter T5	8 800
Tools	1 345
Total machinery costs	**119 820**

Source: authors' own design based on market prices and case study companies' data

While determining the required machinery's cost, we sized up the current market prices by analyzing various dealers' offers. We assume that in the case of a greenfield investment, it would not be economical to purchase new machinery as their price would increase the investment costs and would extend the payback period to at least 15-20 years. Our hypothesis is based on the following: the price of a used, 6-7-year-old tractor or combine harvester is EUR 20 000, while the price of a new tractor or combine harvester with similar performance is EUR 100 000.

We must take into account that the annual repair costs of used machinery go well beyond the costs of new machinery, and the insurance fees are also higher. Shipment fees could also apply, while in the case of new machinery, these are normally covered by the dealer. After a quick overview of the offers, we estimated the shipment fees to

RON 13 400, which covers 3000 km of transport with a 24-ton truck (4-5 shipments between Harghita County and Cluj County or Harghita County and Bucharest).

Besides the agricultural machinery, the farm also needs a car. We chose a Volkswagen Transporter minibus due to its suitability to transport both merchandise and people.

To sum up, we came to the conclusion that the total investment in agricultural machinery is EUR 119 820 and the shipment cost is RON 13 400.

Expenditures, revenues and financing

In this chapter we present the annual foreseeable revenues and expenditures determined in the article, arguing the relevance of every item. Due to the fact that the agricultural activity has been planned to be carried out on an uncultivated agricultural land, the machinery-, the building- and the soil-preparation is going to be a two-year-long process, therefore the agricultural production will begin only in 2018. Thus, the revenues and expenditures that will be presented below, will apply starting 2018. We also present the cost of external capital and equity of the investment.

Expenditures

Because of the small number of annual invoices and accounting documents, it is better to hire an accounting firm than to have an in-house accountant. However, a small office will be needed anyway. Its cost was estimated to RON 10 000, including the furniture, a computer, a printer and a restroom.

In addition to the already mentioned one-time expenditures, there are annually recurring expenditures also, as follows: wages, rent, raw materials and consumable expenditures, repair costs, insurance fees, interest and installments.

When calculating the wages, we took into account the wages at the reference companies. Although the wages in agriculture are generally lower than in other sectors, we noticed that the wages of all three companies' permanent employees are 1.4-1.5 times higher than the minimum wage. This can be explained by the fact that these employees

often work up to 12-14 hours a day during the spring and autumn works and harvesting. In addition, they may also have to work on weekends during these periods. In the light of the above, we used corresponding values when calculating labour costs (see Table 4).

Table 4. Estimated labour costs for 2018

Employees	Gross wage (RON)	Worked hours	Annual gross wage (RON)
Employee 1	2 000	-	24 000
Employee 2	2 000	-	24 000
Employee 3	2 400		28 800
Seasonal workers	**Hourly wage (RON/hour)**	**Worked hours**	**Annual gross wage (RON)**
Worker 1	12	84	1 008
Worker 2	12	84	1 008
Worker 3	12	84	1 008
Worker 4	12	84	1 008
Worker 5	12	84	1 008
Employer's contribution (RON)			**22 387**
Total labour costs (RON)			**104 227**

Source: authors' own design based on case study companies' data

The company also hires seasonal workers to help the permanent staff during harvesting. The seasonal workers' hourly wage was set to RON 12, based on the information provided by the reference companies. According to our calculations, the total annual wage costs, including the employer's contributions payable for each employee, are RON 104 227.

The rent costs were determined based on the values stated in the lease agreements of agricultural areas lent by the common land of Capalnita, Satu Mare, Badeni and Martinis during the past years. We found that the annual rent per hectare is EUR 180, but it must be borne in mind that this land has been fallow for a long time, and bringing it to an agriculturally suitable state is quite expensive. The demand for agricultural land is also very low in the area, so no significant change can be expected in future rental rates. Another important aspect is that the plot is large, ensuring a more favorable bargaining position. To sum up all of the above, the cropland's annual rental fee is estimated to EUR 18 000.

We present below the annual expenditures incurred for raw materials and consumables necessary for the agricultural works, including the costs of seeds, pesticides, fertilizers and fuel.

Seed, pesticide and fertilizer prices will be rendered in euros, because, in most cases, they are purchased on pre-order, as most of them are not produced in Romania, and the importers set the prices in euro. Table 5 presents the required seeds, the required quantity per hectare and the purchase price.

Table 5. Estimated costs of seeds for 2018

Seeds	Quantity (bag/ha)	Unit price (euro)	Sown surface (ha)	Total (euro)
Hisseo winter wheat seed (50 kg)	3.25	19	40	2 470.00
Canberra barley seed (40 kg)	4.83	25	30	3 622.50
Legendary alfalfa (25 kg)	1.17	103	30	3 615.30
Total (euro)				**9 707.80**

Source: authors' own design based on case study companies' data

Although the seed-related costs recur every year, it should be noted that these costs will not incur in the first year, when the soil is restored to a suitable state by ploughing and fertilizing.

Table 6 summarizes the various fertilizers needed and the relevant costs. The data shown were calculated based on the interviews with the reference companies' managers, while the methodology was adapted from Vágvölgyi and Varga (2011).

Table 6. Estimated costs of fertilizers for 2018

Fertilizer	Unit price (euro/100 kg)	Quantity/ha (kg)	Worked land (ha)	Total (euro)
Kalkmononsolpeter	23.00	5.00	70.00	8 050.00
Prantkalk	9.10	1.50	70.00	955.50
Ammonsulfatsolpeter	34.55	1.00	70.00	2 418.50
BayWa Power	43.00	0.16	100.00	688.00
Total (euro)				**12 112.00**

Source: authors' own design based on case study companies' data

We summarized the pesticide-related costs in Table 7.

Table 7. Estimated costs of pesticides for 2018

Sprays	Unit price (euro)	Quantity/ha (kg)	Worked land (ha)	Total (euro)
Pacara Forte WG (l/ha)	27.00	1.00	70.00	1 890.00
Stomp Aqua WW (l/ha)	11.60	3.00	70.00	2 436.00
Lexus WW (g/ha)	1.10	15.00	70.00	1 155.00
Juwel Tap WG (l/ha)	54.70	1.00	70.00	3 829.00
Trebon 30 EC (l/ha)	107.00	0.15	70.00	1 112.50
Deeis Flüssig (l/ha)	23.80	0.15	70.00	249.90
Total (euro)				**10 683.40**

Source: authors' own design based on case study companies' data

The fuel cost is also an annual repetitive cost, since agricultural works (ploughing, sowing, harvesting) are cyclic. We presented the fuel consumption per hectare of each agricultural process type in Table 8.

Table 8. Estimated cost of fuel for 2018

Fuel	Quantity (l/ha)	Price (RON)	Worked land (ha)	Used quantity (l)	Total (RON)
Spring ploughing	25.00	5.88	100.00	2 500.00	14 691.05
Disking + harrowing	20.00	5.88	100.00	2 000.00	11 752.84
Sowing	8.00	5.88	100.00	800.00	4 701.14
Harvesting	25.00	5.88	70.00	1 750.00	10 283.73
Twisting + bailing	20.00	5.88	30.00	600.00	3 525.85
Autumn ploughing	25.00	5.88	100.00	2 500.00	14 691.05
Mowing + turning	20.00	5.88	30.00	600.00	3 525.85
Spraying + fertilizing	30.00	5.88	70.00	2 100.00	12 340.48
Transporter (l)	-	5.88	-	500.00	2 938.21
Generator	-	5.88	-	1 000.00	5 876.42
Total				**13 350.00**	**84 326.61**

Source: Authors' own design based on case study companies' data

The amount of fuel needed for every work phase was determined based on the data provided by the case companies. Based on our calculations, the annual fuel cost is RON 84 326.61.

To sum up, raw materials and consumables include seeds, fertilizers, sprays and fuel, and while determining future prices, we took into account the expected increase.

The next type of annual cost that we discuss in detail is the repair and maintenance cost. Since the company has a quite large machinery

pool of second-hand machines, the repair and maintenance costs have to be taken into account when calculating the investment's net present value. Agricultural studies such as Holló (2015) suggest that the annual repair costs are 3-5% of the purchase price when acquiring new equipment, but for used machinery this value is somewhat higher. Based on the interviews conducted at the case study companies, we came to the conclusion that the annual repair costs of used agricultural machinery are up to 8-10% of its original price. Thus, we determined the annual repair costs as 10% of the machinery's purchase price. This is RON 53 919 per year.

In this following section, we present the annual costs related to machinery and crops insurance. These costs are harder to determine because the insurance companies tend to come up with new, customized offers every time, so we determined the insurance fees based on an inquiry. We can choose from several insurance companies' offers for agricultural machinery insurance, but these offers are quite alike, they set the insurance premium to 2.4-2.5% of the machinery's market price. Determining the crop insurance fees is not so simple, though. The region's characteristics (average temperature and precipitation), the crop type and the land's size to be insured are also taken into account. We decided to work with the offer sent by one of Romania's leading insurance companies. The insurance covers damages caused by late spring frost, early autumn frost, drought, hail and hurricane-like rainfalls. The premium is 5% of the insured amount for wheat and barley and 1% for alfalfa.

In addition to the above-mentioned expenditures, there are other annual administrative and energy-related costs. As stated earlier, the company does not have an in-house accountant due to their seasonal activity, so the administrative fees consist of amounts paid for the accounting firm's services. We determined its value to RON 5000 per year, based on the currently available market offer. We determined the annual energy costs (water, electricity and telecommunications) as RON 9000, with an 8% annual increase (INSSE 2015).

To sum up all the expenditures, we prepared a table (see Table 9) for

every single year, summarizing all the cost types, and showing the respective year's expenditures in RON. In order to determine the following years' costs, we used the inflation-adjusted value of the costs calculated for 2018. We averaged the annual inflation to 2.5% for the following 8 years, in accordance with the forecast of the National Bank of Romania (NBR 2015).

Revenues

This section deals with the expected annual revenues determined by our calculations, explaining the aspects considered for each revenue. The revenues can be divided into two categories: revenues from crop sales and revenues from subsidies.

In order to determine the revenues from crop sales, the annual yield and the sales price should be determined simultaneously, because in agriculture when the yield is high, the price is low, and vice versa. Table 10 presents the National Statistics Institute's data concerning the wheat, barley and alfalfa yields for the 2007-2013 period.

Table 9. Estimated expenditures for 2018

Expenditures	Euro	RON
Materials + rent		
Land rental fee	18 000.00	
Wages		116 280.77
Seeds	10 199.26	
Fertilizers	12 725.17	
Sprays	11 224.25	
Fuel		87 467.52
Repair + Energy		70 155.29
Total materials + rent	52 148.67	273 903.58
Insurance + loan		
Insured crops		14 506.78
Insured machinery	3 147.15	
Interest	25 523.21	
Installments	40 080.40	
Total insurance + loan	68 750.76	14 506.78
Total expenditures for 2018	120 899.43	288 410.36
Total expenditures for 2018 in RON		**832 457.80**
Total expenditures for 2018 in EUR		**184 990.62**

Source: authors' own design

Table 10. Average annual wheat, barley, alfalfa and straw yields from 2007 to 2013

		2007	2008	2009	2010	2011	2012	2013
Wheat	kg/ha	1 542	3 403	2 423	2 690	3 664	2 653	3 469
Barley	kg/ha	1 772	3 564	2 858	3 003	3 628	2 613	3 451
Alfalfa	kg/ha	13 817	17 109	17 280	16 945	17 474	14 309	16 062
Straw	kg/ha	3 855	8 508	6 058	6 725	9 160	6 633	8 673

Source: authors' own design, based on INSSE (2015)

In order to get a more realistic picture of our 8-year investment's expected revenues, we presume that similar yields can be expected between 2018 and 2023, i.e. there will be some years with high yield and some with low yield, distributed randomly, as yield is influenced by the weather that cannot be forecasted for a 6-year period. Table 11 presents the cereal price evolution for the above-mentioned period.

Table 11. The evolution of cereal prices between 2007–2013 (at current prices)

Cereal	Unit	2007	2008	2009	2010	2011	2012	2013
Wheat	RON/kg	0.87	0.87	0.59	0.69	0.98	0.98	0.88
Barley	RON/kg	1.04	1.17	0.76	0.75	1.02	1.09	1.12
Alfalfa	RON/kg	0.66	0.65	0.61	0.62	0.69	0.64	0.60
Straw	RON/kg	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Source: authors' own design based on INSSE (2015)

Table 12 shows how we built up each year's revenue, including the possible compensation granted by the insurance company.

Table 12. Estimated revenues from the sale of cereals in 2018

Cereal	Unit price (t)	Yield (t/ha)	Insurance	Land (ha)	Quantity (t)	Total value (RON)
Wheat	889.54	4.25	2.90	40.00	170.16	151 361.64
Barley	1 064.54	4.45	3.10	30.00	133.62	142 240.49
Alfalfa	675.55	20.51	17.00	30.00	615.23	415 623.09
Straw	102.50	8.71		70.00	609.55	62 478.68
Total						**771 703.90**

Source: authors' own design

Column 6 of Table 12 holds the higher value between the insured quantity (the product of columns 4 and 5) and the real (grown) quantity

(the product of columns 3 and 5), while column 7 holds the revenue from the crop sales (the product of columns 2 and 6). In other words, the quantity shown in column 6 is the annual wheat, barley and alfalfa production or the minimum quantity determined by the insurance contract for low-yield years, when the difference between the harvested quantity and the minimum contractual quantity is paid by the insurance company as compensation. I.e. when determining revenues, we calculate with selling the minimum quantity set forth by the insurance contract or the harvested quantity (if the latter is bigger), and then we multiply this value at the cereal price set for the given year.

The other revenue category is agricultural subsidies. The subsidies for crop production, granted by APIA in 2015, are shown in Table 13.

Table 13. Agricultural subsidies in 2015

Type	Unit price
Direct payment (RON/ha)	1 930.00
Fuel subsidy (RON/l)	1.80

Source: authors' own design based on APIA (2015)

When determining the value of direct payments, we considered the agricultural facility's location and the crops grown, as there are several types of available subsidies, determined on the crop type and the altitude.

In the case of fuel subsidies, the law sets forth that all agricultural companies may claim the reimbursement of 31% of the fuel costs incurred during agricultural works, in form of subsidies, amounting to approximately RON 1.8 per liter. Based on the estimated fuel consumption, we can determine easily the annual value of the respective subsidy.

Financing the investment

Given the capital structure of the case study companies, as well as the capital structure of the sector based on the FADN (2015) database, it can be stated that agricultural companies obtain loans easily, provided that the loan's amount does not exceed their own equity. Based on our previous calculations the total investment cost will be approximately EUR 500 000. Therefore, the investment is financed partially by the company's own

contribution (EUR 300 000) and partially by a loan (EUR 200 000). Banks offer loan packages of up to EUR 2.5 million for starting small and medium businesses, and there is a possibility for up to four years' grace period. By taking advantage of these benefits, the company contracts a 6-year loan with a 2-year grace period. Table 14 summarizes all the loan-related charges and costs, as well as the loan costs determined.

Table 14. The company's capital structure and the cost of the external capital

Equity (euro)		300 000.00
Loan (euro)		200 000.00
Charges and commissions	**Costs in %**	**Monthly costs (euro)**
Lending rate	1.00%	27.78
Credit administration charge	1.50%	41.67
Monthly account charges	0.30%	600.00
Annual loan interest	10.00%	1 666.67
Total		**2 336.11**
Loan cost	**14.02%**	

Source: authors' own design based on BCR (2015)

In conclusion, the annual cost of the EUR 200 000 loan is EUR 28 000. The grace period is indispensable for the company as in the first year the land is restored to a proper condition, and the company has no revenues during this period.

The calculation of the net present value

In this chapter we summarize the annual expenditures and revenues presented so far, calculate the investment's expected cash flow and NPV based on the annual cash flows. To calculate the cash flow we used the indirect method, and the annual data are presented in Table 15. The higher values of the last years can be explained by the fact that the company will have no loans in those years.

Table 15. Investment cash flow

2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
17 040.51	4 745.00	-108 235.79	-79 679.23	34 489.26	451 249.18	489 854.34	408 299.85	170 340.51

Source: authors' own design

To determine the net present value, we also need the value of the discount rate applicable for each year. First we calculated the expected return of the equity with the help of the CAPM (Capital Assets Pricing Model) (see Table 16).

$$r_e = r_f + \beta(r_m - r_f)$$

r_e – cost of equity,
r_f – risk free return,
$(r_m - r_f)$ – market risk premium,
β – volatility or the extent of systematic risk inherent to the market.

Table 16. The cost of equity

CAPM	2016
r_f	3.87%
ß	1.11509
$(r_m - r_f)$	9.05%
r_E	**13.96%**

Source: Damodaran (2014)

The risk-free interest rate required during the model's application is determined by the 10-year return of the Romanian government securities. The market risk premium, the r_m-r_f value, was calculated based on the data estimated by Damodaran (2014), as well as the model's other component, the beta. Table 17 summarizes the steps of calculating the beta. First, the sector beta (0.58) is corrected by the company's financial leverage, i.e. the ratio of equity and external capital. The resulted beta must also be corrected by the operation leverage, i.e. the ratio of fixed and variable costs, thus obtaining the beta used in the CAPM.

Table 17. Calculating the company specific beta

Unlevered beta	0.58
Financial leverage	0.6667
Beta corrected by financial leverage	0.9048
Operation leverage	0.2324
Fixed costs	112 300.80
Variable costs	483 179.03
Beta corrected by operation leverage	1.1150

Source: authors' own design

After calculating the cost of equity, we calculated the Weighted Average Cost of Capital, hereinafter referred to as WACC, used as a discount rate when calculating the net present value.

$$WACC = r_D \left(\frac{D}{V}\right) + r_E \left(\frac{E}{V}\right),$$

where D is the value of the external capital, E is the equity, V is the value of the company (V=D+E), r_D is the cost of the external capital and r_E is the cost of equity. The annual weighted average cost of capital is summarized in Table 18.

Table 18. The annual weighted average cost of capital (2016-2024)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
r_D (%)	14.01	14.01	14.01	14.01	14.01	14.01	0.00	0.00	0.00
r_E (%)	13.96	13.96	13.96	13.96	13.97	13.98	13.98	13.98	13.98
D/V (%)	0.400	0.400	0.373	0.311	0.222	0.087	0.00	0.00	0.00
E/V (%)	0.600	0.600	0.627	0.689	0.778	0.913	1.000	1.000	1.000
D/E (%)	0.667	0.667	0.596	0.452	0.286	0.095	0.00	0.00	0.00
WACC (%)	13.98	13.98	13.98	13.98	13.98	13.98	13.98	13.98	13.98

Source: authors' own design

The company's annual weighted average cost of capital, as shown in Table 18, has the same value year after year because the cost of equity (13.96%) is almost the same as the cost of external capital (14.02%).

Finally, we calculated the investment's expected NPV, knowing the annual cash flows presented so far and the weighted average cost of capital. According to our calculations, the NPV is RON 636 764, meaning that the investment is worthwhile. The answer to the first research question, therefore, is that it is worth investing in the Romanian agriculture because it will be profitable, despite the Romanian yields and prices.

Risk analysis

This chapter presents the risk-analysis methods applied during the investment's risk assessment, as well as the conclusions drawn from these. We used three methods to analyze the effects of the possibly

occurring risks, namely the sensitivity analysis, the scenario analysis and the Monte Carlo simulation.

The sensitivity analysis determined the degree of risk inherent in each factor (Table 19).

Table 19. The NPV after the factors' value change

Case	NPV (RON)
Base scenario	636 764
Case 1a	367 998
Case 1b	890 365
Case 2a	489 754
Case 2b	803 951
Case 3	591 429
Case 4	584 457
Case 5	773 542

Source: authors' own design

1st case: we analyzed the effect of a 10% decrease (1a) and increase (1b) in the forecast cereal price on the net present value, with the constancy of the other factors.

2nd case: we analyzed the effect of a 10% decrease (2a) and increase (2b) in the forecast yields on the net present value. We noticed that if the yields increase, the net present value increases more than it decreases when the yields decrease. This can be explained by the insurance, because it eliminates some of the losses.

3rd case: we presumed a 10% increase in fuel prices. It obviously impacts the net present value, however, this effect is relatively small.

4th case: we analyzed the effect of a 10% wage growth, and the results are quite similar as in the third case.

5th case: we analyzed the case where agricultural subsidies grow 10% faster than the forecasted pace and we concluded that the agricultural subsidies influence the expected NPV quite significantly.

To sum up the results of the sensitivity analysis, we found that the investment's cost-effectiveness is mainly influenced by the cereal price fluctuations, the annual cereal yields and the agricultural subsidies.

The next risk-analysis method used is the scenario analysis. Similar to the sensitivity analysis, we drafted six different scenarios, summarized in Table 20. As the sensitivity analysis pointed out that the

investment's cost-effectiveness is mainly influenced by the cereal prices and the yields, we created the scenarios with these in mind.

Table 20. The NPV for each scenario

Case	NPV (RON)
1	79 288
2	173 853
3	367 998
4	423 107
5	890 360
6	1 070 266

Source: authors' own design

1st case (pessimistic scenario): the national cereal yield is high, so the prices are low, but our company's cereal yield is low (e.g. because of the hail). In such cases, the insurance company covers the difference between the produced quantity and the secured quantity, but only at the current market price, so we analyze the revenue collected in the case of the secured quantity and low market prices, and how this influences the net present value. We also presumed that fuel prices and wage costs are going to be 10% higher than the forecast value.

2nd case: the national cereal yield is high, so the prices are low, but our company's cereal yield is low (e.g. because of the hail). It is similar to the previous case, with the difference that we presumed the stability of fuel prices and wages.

3rd case: the national cereal yield is high, so the prices are low, but our company's yield is merely average.

4th case: the national cereal yield is average, but our company's yield is low (e.g. because of the hail).

5th case: the national cereal yield is low, so the prices are high, and our company's cereal yield is average.

6th case (optimistic scenario): the national cereal yield is low, so the cereal prices are high, and our company's cereal yield is also high.

It can be seen that, although we modeled several cases, the expected net present value varies on a large scale, i.e. this method cannot provide a reliable risk analysis due to the investment's complexity and the correlations between the various factors.

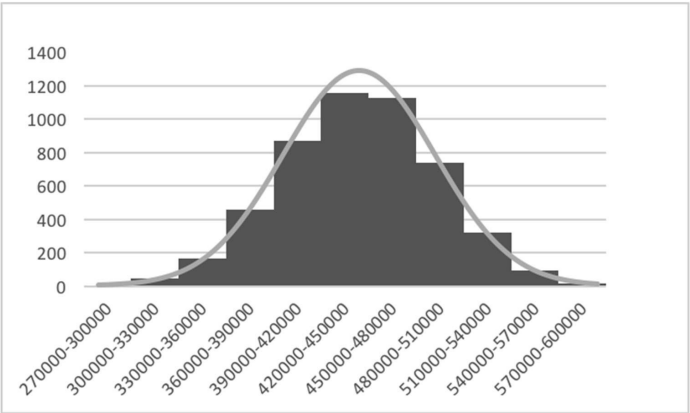
Finally, we created a Monte Carlo simulation to determine 5 000 possible net present values, and examined their distribution (Table 21), thus determining the probability of occurrence of each NPV.

Table 21. The Pivot table of NPVs

NPV (in RON)	Pcs.	Percentage
270 000-300 000	4	0.08%
300 000-330 000	46	0.92%
330 000-360 000	165	3.30%
360 000-390 000	455	9.10%
390 000-420 000	873	17.46%
420 000-450 000	1 159	23.18%
450 000-480 000	1 130	22.60%
480 000-510 000	740	14.80%
510 000-540 000	319	6.38%
540 000-570 000	95	1.90%
570 000-600 000	14	0.28%
Total amount	5 000	100.00%

Source: authors' own design

We drafted a histogram based on the Pivot table (Figure 1) and displayed the normal distribution function, assuming that the net present value has standard normal distribution.



Source: authors' own design based on the Pivot table

Figure 1. The histogram and normal distribution of the NPVs generated by the Monte Carlo simulation

The chart clearly shows that in approx. 2200 of the 5000 test cases the NPV ranges between 420 000 and 480 000, i.e. the probability of the NPV falling into this range is of almost 50%.

The correlations taken into account for the Monte Carlo simulation:

1. Wheat yield = 3.5*Rnd()[4] + 1 ton (assuming that any cropland can produce 1 ton of wheat per hectare, under any circumstances, and the maximum yield does not exceed 4.5 tons);

2. Barley yield = wheat yield + 0.2 (i.e. barley yield is similar to wheat yield, but it is always 0.2 tons more per hectare);

3. Straw quantity = wheat yield + barley yield (i.e. the quantity of straw is determined by the wheat and barley yield);

4. Alfalfa yield = 12 + 2*wheat yield (i.e. the alfalfa yield is 12 tons under any circumstances, up to 21 tons in good years);

5. Wheat prices:

- if the yield is less than 1.8 tons, the wheat price is RON 1/kg;
- if the yield ranges between 1.8 and 2.5 tons, the wheat price is RON 0.95/kg;
- if the yield ranges between 2.5 and 3.4 tons, the wheat price is RON 0.88/kg;
- if the yield is above 3.4 tons, the price of wheat is RON 0.75/kg.

6. Barley prices:

- if the yield is less than 1.8 tons, the barley price is RON 1.1/kg;
- if the yield ranges between 1.8 and 2.5 tons, the barley price is RON 1/kg;
- if the yield ranges between 2.5 and 3.4 tons, the barley price is RON 0.92/kg;
- if the yield is above 3.4 tons, the barley price is RON 0.8/kg.

7. Alfalfa prices:

- if the yield is less than 1.8 tons, the alfalfa price is RON 0.7/kg;
- if the yield ranges between 1.8 and 2.5 tons, the alfalfa price is RON 0.65/kg;
- if the yield ranges between 2.5 and 3.4 tons, the alfalfa price is RON 0.6/kg;
- if the yield is above 3.4 tons, the alfalfa price is RON 0.55/kg.

[4] Microsoft Excel's random number generator, its return value varies from 0 to 1.

8. Straw prices:

• if the yield is less than 1.8 tons, the straw price is RON 0.2/kg;

• if the yield ranges between 1.8 and 2.5 tons, the straw price is RON 0.15/kg;

• if the yield ranges between 2.5 and 3.4 tons, the straw price is RON 0.1/kg;

• if the yield is above 3.4 tons, the straw price is RON 0.08/kg.

The assumptions used while constructing the model were based on the correlations between cereal prices and yields, published by the National Statistics Institute since year 2000 (INSSE 2015).

To sum up the risk-analysis procedures, we can state that the investment's greatest risk lies in the fluctuations of cereal prices and yields, but these can be partially avoided by concluding appropriate insurance contracts. If this is met, the investment's net present value is 100% positive in all 5000 simulated cases, meaning that the investment is worthwhile. Thus, the answer to the second research question is that the risk-analysis models detailed above are essential under any circumstances, especially the Monte Carlo simulation.

Conclusions

In line with the EU policies (EP 2013), we believe that improving agricultural production and competitiveness is one of the main tasks of the coming decades, being a potential solution to unemployment, environmental and energy problems, as well as decreasing the social inequalities. For this reason, solving the agricultural problems in Central and Eastern Europe and Romania becomes increasingly imperative.

The presented methodology offers a solution to the aforementioned problems, allowing us to give answers to questions regarding the cost-effectiveness of agricultural businesses, and thus making this sector more efficient.

In this paper, we were looking for the answer to whether it is possible to operate an agricultural facility economically in the given environmental and economic conditions. Based on our calculations, we

can affirm that this type of agricultural activity can be carried out economically. Moreover, by taking into account the information provided by the risk analysis, we can also affirm that, although no huge profit can be expected in this sector, it is a rather reliable industry where proper decisions can lead to financial success in the long run.

It is important to stress that we planned to purchase used machinery at the beginning of the investment, otherwise a two- or threefold capital investment would be needed, prolonging the payback time and increasing the investment risk.

We would also like to emphasize that crop insurance is indispensable for such investments, as our paper's risk analysis chapter also points out, otherwise the investment would be entirely vulnerable to weather conditions. So, one of the first steps is to find the best insurance company.

Further research may be based on the analysis of the investment's cost-effectiveness when including EU funds in the investment's financing, but relevant regulations must be taken into account in this case. In addition, it would be worth examining in a further research the relationship between the variables used in the Monte Carlo simulation, such as the cereal prices and annual yields, and modeling them in order to develop a more accurate risk prediction/analysis method.

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