ISSN 2278-3091
Volume 8, No.1.1, 2019
International Journal of Advanced Trends in Computer Science and Engineering
Available Online at http://www.warse.org/IJATCSE/static/pdf/file/ijatcse1181.12019.pdf
https://doi.org/10.30534/ijatcse/2019/1181.12019

Integration of Case Study Approach, Project Design and Computer Modeling in Managerial Accounting Education with a Diploma Thesis Development as an Example

Arkadiusz Januszewski
Department of Management Information Systems and Controlling
UTP University of Science and Technology
Bydgoszcz, Poland
arekj@utp.edu.pl

ABSTRACT

The article presents a case study, project design and computer modeling used as a research method applied in the process of diploma thesis development in managerial accounting education. The main purpose of this work is to present the scope of scientific studies performed by students as part of the diploma thesis development and the education effects which come as a result of the integration of the methods. The paper presents it with an example of the master's dissertation developed in the Laboratory of Management Accounting and Controlling Systems at the Faculty of Management, UTP University of Science and Technology in Bydgoszcz. The thesis concerns the Activity-Based Costing model application for the airport in Bydgoszcz. The conclusions discuss the benefits for students who analyzed the enterprise, developed an Activity-Based Costing model and implemented it in SAS Activity-based Management environment

Keywords Managerial Accounting Education, Methods, Case Study, Project Design, Computer Modelling, Diploma Thesis, Educational Effects, Sas Activity-Based Management

1. INTRODUCTION

The case study approach [1] in education produces significant advantages to learners. According to Healy and McCutcheon "*The case method has the potential to engage and motivate students, to encourage self-learning and to develop skills in critical thinking and elaborative learning*" [2]. Also Cheng points out that in the educational syllabi greater stress should be put on the case study approach [3].

The case study approach is particularly important in applied sciences and management education. The important role of empirical study in management accounting was stressed by Kaplan already in 1986 [4]. Today many authors and lecturers still appreciate the use of the case study method for accounting education [5, 6, 7, 8, 9]. This is also proved by Rebele and St.Pierre research who analysed scientific accounting education journals and gauged that approximately 25% of all the papers published since 2001 are cases [10]. Similarly the results of the latest research by Apostolou, Dorminey, Hassell and Rebele indicate a continuing trend away from publishing results of empirical studies and toward publishing descriptive articles, instructional resources and educational cases [11].

According to the author's experience, the analysis of the enterprise in terms of implementing controlling instruments is an important, however, not the only one, part of educating future managers, controlling systems designers and managerial accounting specialists. All those specialists should take an active part in designing and introducing the controlling or managerial accounting system. For that reason in the managerial accounting education process the case study method should not be limited to the analysis of the organization, however be connected with the project design method and computer modeling [12] (figure. 1).

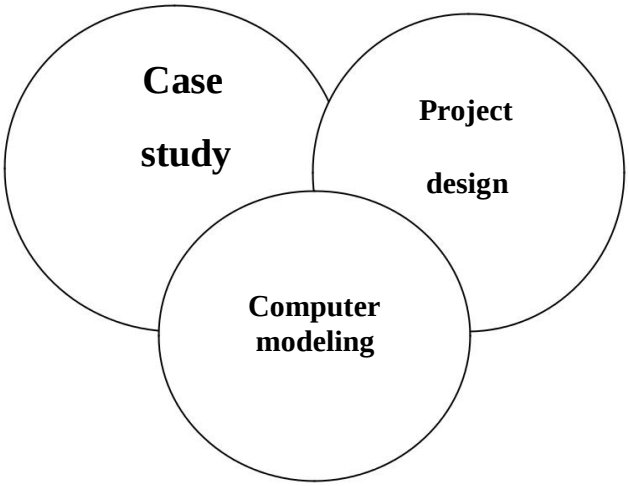

Figure 1: Integration of case study, project design and computer modeling in managerial accounting education

An application of the project design method to managerial accounting reckons on a development of the specific controlling model, such as a budgeting model, costing model or profitability assessing model. The model should be implemented in the IT environment with the use of state-of-the-art IT tools. This implementation is referred to as computer modeling. The effectiveness of combining the three methods;

case study approach, project design and computer modeling, in the education of managers and managerial accounting specialists has been proved by the author's experience by revising a few dozen of diploma theses developed in the last few years in the Laboratory of Management Accounting and Controlling Systems (MAACS laboratory), at the Faculty of Management, UTP University of Science in Bydgoszcz.

The main goal of the paper is to present the scope of scientific studies performed by students as part of the diploma thesis development and to point out the education effects which come as a result of the integration of the three education methods.

An example will be provided by master's dissertation and Activity Based Costing model developed for the airport in Bydgoszcz and implemented in the IT environment with the use of SAS Activity-based Management software package throughout the diploma thesis development process.

2. SCOPE OF STUDIES PERFORMED BY STUDENTS IN THE MAACS LABORATORY

The Laboratory of Management Accounting and Controlling Systems (MAACS) is one of the four computer business laboratories founded in 2009 and co-financed from the European Regional Development Fund within the Regional Operational Program at the Faculty of Management, the UTP University of Science and Technology (UTP) in Bydgoszcz, as a part of project 'Stage 2 of the Regional Centre of Innovativeness'.

The MAACS laboratory has been equipped with state-of-the-art IT applications of Activity Based Costing, Balanced Scorecard and the operational budgeting method:

- two applications for cost and profitability management according to ABC methodology: Profit Management Systems developed by ABC Akademia (Poland) and SAS Activity Based Management developed by SAS Institute (USA);
- three applications for budgeting and multidimensional analysis: Optico – by BMM (Poland) and Prophix developed by Prophix Software (Canada) and SAS Financial Management (SAS Institute);
- two applications for Balanced Scorecard: Result Scorecard developed by OTTIMA plus (Poland) and SAS Strategy Management (SAS Institute).

The scientific studies in the MAACS laboratory are mostly performed with the students participating, who prepare their diploma thesis. The number of papers developed in the MAACS laboratory has been increasing successively since 2012 [13, 14]. Over 2012-2017, 5 BSc and 10 MSc papers have been developed with the use of the software installed in the MAACS laboratory.

The scope of work performed by the students whose task is to develop the ABC model for a specific enterprise usually covers [15]:

- audit of the enterprise in terms of the needs and the potential of the ABC method application;
- defining the ABC model,
- implementing the model in the IT environment,
- gathering and preparation of the input data required for costing procedures,
- inputting data and testing the ABC model,
- analyzing the results.

A. Use of case study analysis

The airport in Bydgoszcz is 1 of the 12 biggest airports in Poland certified by the Civil Aviation Authority. The company employs over 130 people. The airport operation is based on three major market segments. The first, and the most essential one, is the service rendered to regular domestic and international connections and then to seasonal charter flights and, finally, to the smallest segment, the service provided to irregular flights, namely General Aviation; mostly commercial flights by private carriers.

The audit of the airport in Bydgoszcz was a very important stage of the ABC system development and covered the following tasks:

- getting to know the business activity of the enterprise, including the processes (take-off, landing, exploitation and safety, sale, financial services, administration) and the actions performed;
- getting to know the organizational structure and identification of the employee groups and the number of employees in each group (management level employees, operational level employees, safety level employees, technical level employees, financial level employees);
- recognizing the other resources of the enterprise (buildings and offices, airport maintenance equipment, protective equipment, office equipment etc.)'
- getting to know the activities performed as part of operating processes in detail and determining the resources used for the execution;
- making interviews to identify the locations of equipment and the locations where processes and activities are performed;
- analysis of book-keeping, especially the costs and revenues records;
- analysis of fixed-assets record-keeping;
- analysis of the other record-keeping systems to help supplying valuable and quantitative data for the ABC model.

B. Use of project design method

The main research objective required the development of the ABC model which facilitates answering two questions:

- How much is the service of a specific route (arrivals and departures of the aircraft on a specific route) in a given period?

- How much is the service of all the routes of a given carrier?

Defining the ABC model involves determining:

- groups of resources and resource cost accounts within each group,
- processes and activity cost accounts within each process,
- groups of cost objects and cost object cost accounts within each group,
- connections (cost flow paths) between resource cost accounts and activity cost accounts,
- connections (cost flow paths) between activity cost accounts and cost objects accounts,
- resource cost drivers, namely the ways of the resource cost allocation for activities,
- activity cost drivers, namely the ways of the activity cost allocation for cost objects,
- components of costs by nature for each of the resources.

The ABC model developed for the airport in Bydgoszcz includes 211 cost accounts grouped in three modules [16]:

- the module of resources in which 107 various resources were defined in 10 groups (Table 1);
- the module of activities in which 6 processes and their 42 various activities were differentiated (Table 2);
- the module of cost objects in which 61 cost objects broken down into 13 groups were defined (12 groups are the ones referred to as 'Carrier').

Table 1:. GROUPS OF RESOURCES IN THE ABC MODEL ELABORATED FOR THE AIRPORT IN BYDGOSZCZ

Group of resources	No. of resource cost accounts
Employees	5
Buildings and structures	21
Means of transport	8
Equipment	7
Airport maintenance equipment	8
Airport equipment	17
Protective equipment	10
Office equipment	11
Intangible assets	8
Outsourced services	12
Total	107

Source: own elaboration

In order to show the scope of student's work and the complexity of the ABC model elaborated for the airport, some examples of the resources of "Ground service equipment" the student had to identify are presented in Table 3. For each resource the student had to assign cost by nature, which required a very detailed analysis of the general-ledger record- and fixed-assets record-keeping.

Table 2: PROCESSES IN THE ABC MODEL ELABORATED FOR THE AIRPORT IN BYDGOSZCZ

Processes	No. of activities cost accounts
Exploitation and safety	7
Take-off	13
Landing	11
Sales	3
Financial service	5
Other activities	4
Total	43

Source: own elaboration

Table 3:. EXAMPLES OF RESOURCES AND COST OF RESOURCE IN THE "GROUND SERVICE EQUIPMENT" IN THE ABC MODEL ELABORATED FOR THE AIRPORT IN BYDGOSZCZ

Resources in the "Ground service equipment"	Resource cost driver
Heaters	Depreciation, consumables
Baggage carts	Depreciation, consumables
Electric carts	Depreciation, consumables
Conveyors	Depreciation
Elephant de-icing unit	Depreciation, fuel, de-icing liquid, consumables, outsourced services
Lublin dirt removal car	Depreciation, fuel, consumables ,water and sewerage, outsourced services
Personal safety equipment	Depreciation, fuel, consumables
Passenger steps	Depreciation
Wheelchair	Depreciation
Melex	Depreciation, electric energy
Weight	Depreciation, consumables
Air start unit	Depreciation, electricity, reconditional services

Source: own elaboration

For the same reason the next table (Table 4) presents detailed characteristics of some activities in the "Take-off" process and activity cost drivers used to distribute activities cost between cost objects ("carriers" in the airport case study).

As computer modelling software SAS Activity Based Management (SAS ABM), which is a Business Intelligence solution and a part of Corporate Performance Management suite by SAS Institute, was selected [17].

ABC model implementation in the SAS ABM environment begins with the definition of dimensions. After that, using

dimensions, costs centers and costs accounts in each of the module are created.

Next, cost flow paths from the resource accounts to activity accounts and cost flow paths from activity accounts to cost object accounts had to be defined. On one hand, cost flow paths from resources to activities indicate which resources are consumed during the execution of each of the activities (the so-called "cost contribution"). On the other hand, they show how costs of specific resource are distributed between different activities (the so-called "cost distribution"). The example shows how the cost of "Operational level employees", distributed between ten different activities, is presented in Figure. 2. Figure. 3 shows the resources used in the "Passenger service" and "Check-in" activities execution in the "Take-off" process.

Table 4:. ACTIVITIES IN THE PROCESS OF "TAKE-OFF" IN THE ABC MODEL ELABORATED FOR THE AIRPORT IN BYDGOSZCZ

Activities in the "take-off" process	Activity characteristics	Activity cost driver
Passenger services	Providing passenger information on arrivals and departures, providing travel safety information to passengers	# of FTE
Check-in	Check-in before departure; handing over the boarding cards and baggage drop off	# of departures
Boarding	Verifying the accuracy of data on boarding cards and passenger documents, bringing passengers to buses	# of departures
Passenger transport to aircraft	Transporting the passengers by bus from the gate to the aircraft	# of departures
Ground rescue and fire protection	Providing aircraft runaway guidance	# of departures
Follow me	Fire engines leaving the Airport Rescue and Fire Fighting Services facility and securing the flight operation at adequate distance from the aircraft	# of departures
Heating system use	Preparing and connecting the equipment to be ready upon the decision of the crew to use the aircraft heating system	# of usage
De-icing	Preparation of de-icing forms together with the crew, providing proportions of de-icing liquid and the area to be de-iced, SPVR supervision over the activity performance	# of de-icings
Steps departure	Steps release and departure	# of departures

Source: own elaboration

It is similar when one considers the connections between activities and cost objects. Cost flow paths from activities to cost object indicate which activities are performed for defined cost objects (for the destinations services), as well as how the costs of specific activity are distributed between different cost objects.

The example demonstrating which activities are executed for the service of "BZG-STN" destination in the "Take-off" process has been given in Figure 4. The next figure shows the distribution of "Boarding" cost between various destinations (Figure. 5).

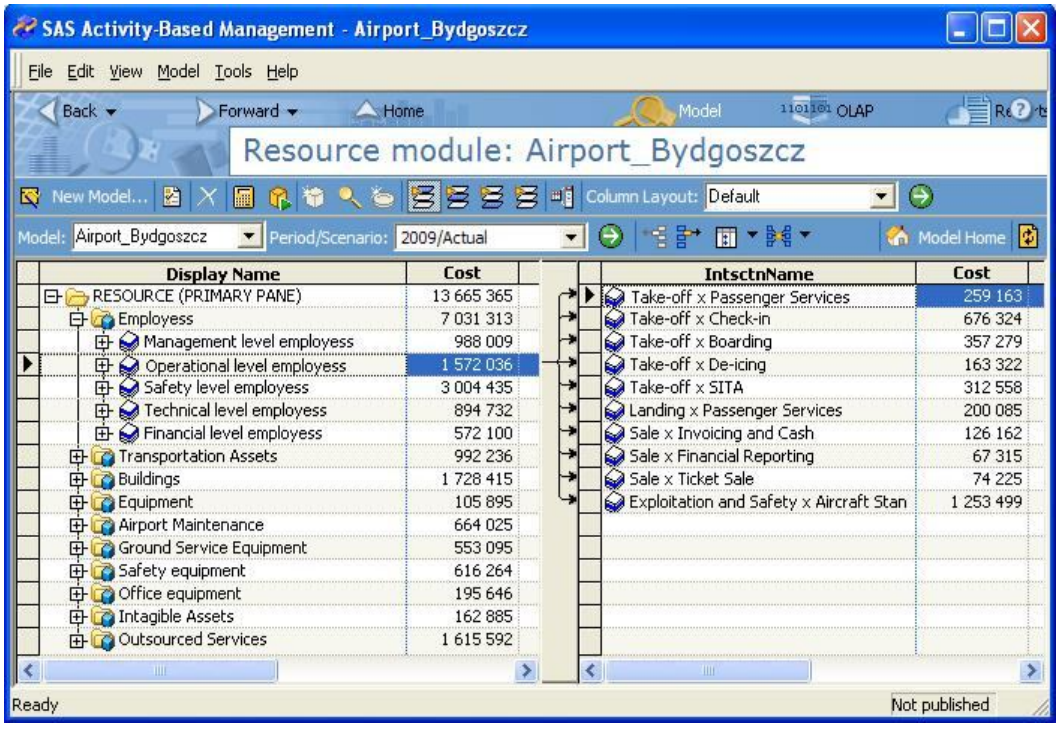

Figure 2. Distribution of "Operational level employees" cost between activities in the SAS ABM model for the Bydgoszcz airport

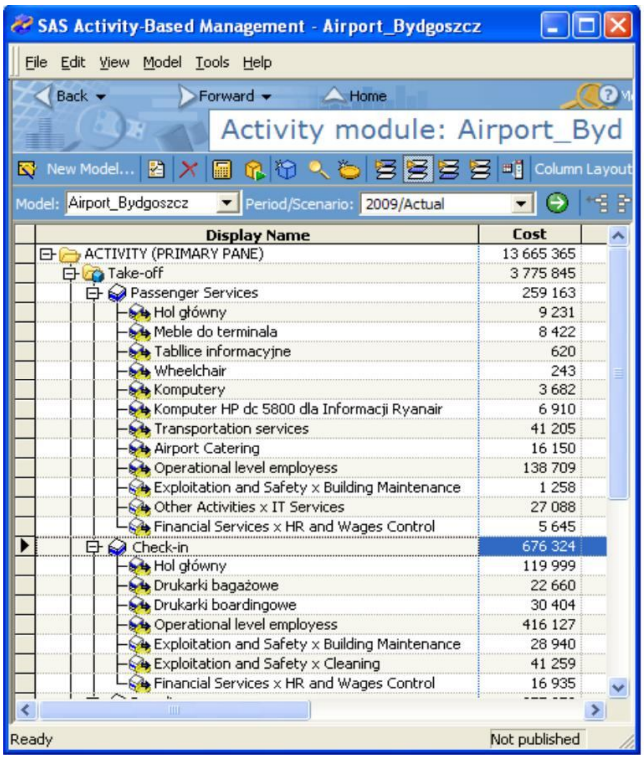

Figure 3: Contribution of resources cost in "Passenger services" and :Check-in" activities in the SAS ABM model for the Bydgoszcz airport

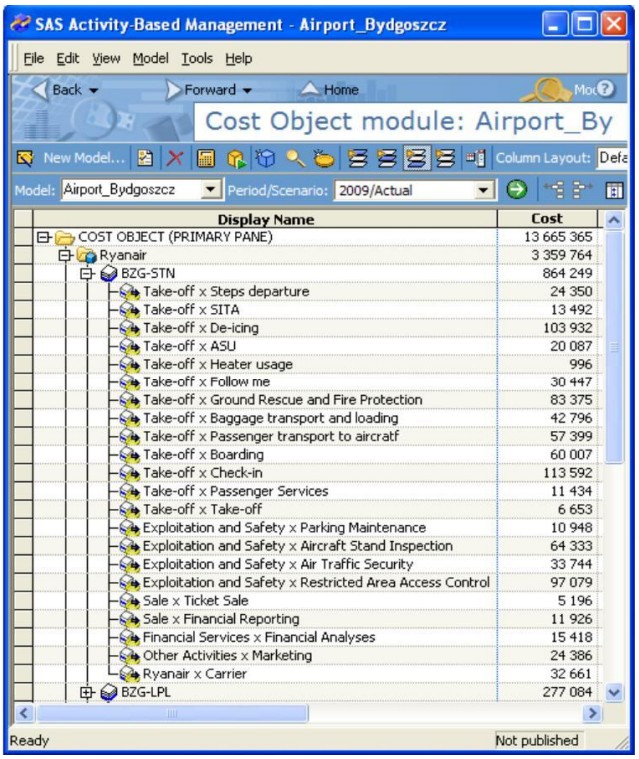

Figure 4: Contribution of activities cost in "BZG-STN" destination in the SAS ABM model for the Bydgoszcz airport

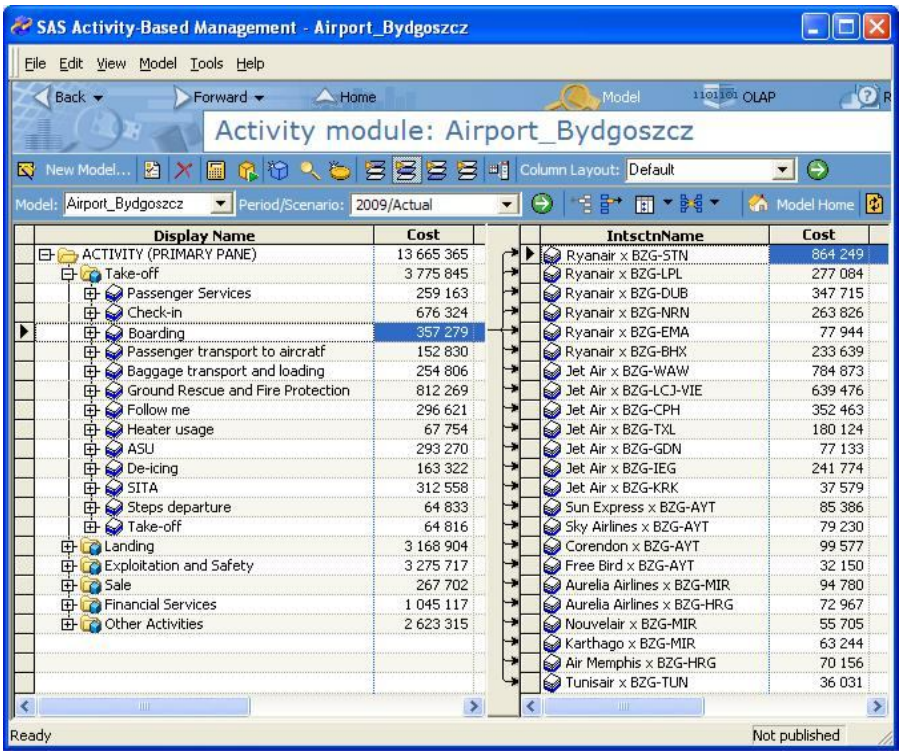

Figure 5: Distribution of "Boarding" cost between destinations in the SAS ABM model for Bydgoszcz airport

3. CONCLUSION

The case study method allows students for confronting their knowledge of theory acquired during university lectures and from literature readings with practical problems. On the one hand, such grasp of theory and practice opens the students' eyes to the nature of a specific management accounting method, however, on the other hand it provides them with an insight into various threats and obstacles which impede its successful implementation in a company.

In the MAACS laboratory the students were given a chance to perform a full cycle of developing controlling systems, starting from the organization analysis, through the ABC model developing and computer modelling, collection of the data required to perform calculations and, finally, the profitability of customer services analysis with the use of contribution margin statement.

Both the extent of analytical, design and implementation work as wells as the complexity of designed solutions proposed by students justify the conclusion that combining the case study method, project design and computer modelling is an effective way of managerial accounting education. Considering the positive effects for the students from the education process by solving practical problems of managerial accounting, it seems that this methods integration offers teaching advantages as it triggers students' creativity, enhances their IT skills and makes it easier to understand the nature of advanced managerial accounting methods.

Designing is very important and very rarely applied in diploma thesis. It is concept-oriented and it triggers creativity and facilitates understanding essential managerial accounting. The use of advanced IT tools results in learning the possibilities and appreciating IT technologies as more and more important for organization management. IT competence, combined with the existing competences and professional experience, is very attractive for employers [18].

To recapitulate, the advantages of Activity Based Costing software application in the learning process are also claimed by other researchers [19].

REFERENCES

[1] R.K. Yin, *Case Study Research. Design and Methods.* SAGE Publications, 2009.

[2] M. Healy, M. McCutcheon, "Teaching with Case Studies: An Empirical Investigation of Accounting Lecturers' Experiences". Accounting education: an international journal. Vol. 19. No. 6, pp.555-567, December 2010.

[3] K.W. Cheng, "The curriculum design in universities from the perspective of providers of accounting education". Education, Vol.127. No.4, pp.581-590, Summer 2007.

[4] R.S. Kaplan, "The role for empirical research in management accounting", Accounting, Organizations and Society, Vol. 11, no. 4–5, 1986.

[5] D. Cooper, W. Morgan, "Case study Research in Accounting". Accounting horizons. No. 22 (2), 2008, pp. 159-178.

[6] A. Januszewski, J. Kujawski, "Case Study as a Research Method Used in Controlling and Managerial Accounting Education", in Proceedings of INTED2016, Valencia, Spain, 2016, pp. 8543-8552.

[7] I. Knyviene, "A new approach: the case study method in accounting". Economics & Management, Vol. 6 Issue 4, 2014, p.158-168.

[8] R.A. Lawson, et., "Thoughts on Competency Integration in Accounting Education", Issues in Accounting Education. Vol. 30, No.3, 2015, pp.149-171.

[9] M. Norwani, R. Yusof, R.A. Halim, "The effectiveness of case study method towards competency development of students in introductory accounting subject", in Proceedings of ICERI2011 Conference, Madrid, Spain, 2011, pp.5756-5766.

[10] J.E. Rebele, E.K. St. Pierre, "Stagnation in accounting education research". Journal of Accounting Education, Vol.33, 2015, pp.128-137.

[11] B. Apostolou, R.W. Dorminey, J.M. Hassell, J.E Rebele, "Accounting education literature review (2013-2014)". Journal of Accounting Education, Vol.33, 2015, pp.69-127.

[12] S.T. March, V.C. Storey, "Design science in the information systems discipline: An introduction to the special issue on design science research". MIS Quarterly, Special Issue, pp.725–730, December 2008.

[13] A. Januszewski, J. Śpiewak, "IT for Controlling and Management Accounting Courses", in Proceedings of ICERI2014, Seville, Spain, 2014, pp. 4896- 4905.

[14] A. Januszewski, "Results of Scientific Studies Performed by Students in the Computer Laboratory of Managerial Accounting and Controlling Systems", in Proceedings INTED2016, Valencia, Spain, 2016, pp. 4220-4226.

[15] A. Januszewski, J. Śpiewak, "Students' Scientific Studies of Controlling as an Essential Part of Educating Managers". In Proceedings of EDULEARN15, Barcelona, Spain, 2015, pp.4172-4178.

[16] A. Januszewski, "Evaluation of costs and profitability of services applying the SAS Activity-Based Management system with the Airport as an example", Journal of Management and Finance, University of Gdańsk, 2013, pp.18-28.

[17] A. Januszewski, "Overview of the Business Performance Solutions". Studies & Proceedings of Polish Association for Knowledge Management, Volume 20, 2009, pp.39-45.

[18] A. Januszewski, "Evaluation of Educational Outcomes – Results of the Pilot Employers Survey, in Proceedings of EDULEARN16, Barcelona, Spain, 2016, pp. 8296-8303.

[19] A. Tan, A. Ferreira, "The Effects on the Use of Activity-based Costing Software in the learning process: an Empirical Analysis", Accounting education: an international journal. Vol. 21. No. 4, pp.407-429, August 2012.