

Modelling of the costs of decision support for small and medium-sized enterprises

Viera Tomišová, Ján Hudec

Matej Bel University, Faculty of Economics,
Department of Quantitative Methods and Information Systems,
Tajovského 10, 97590 Banská Bystrica, Slovakia
vieratomisova@pobox.sk, jan.hudec@umb.sk

DOI: 10.20470/jsi.v8i1.280

Abstract: *The support of decision-making activities in small and medium-sized enterprises (SME) has its specific features. When suggesting steps for the implementation of decision-support tools in the enterprise, we identified two main ways of decision-making support based on the data analysis: ERP (Enterprise Resource Planning) without BI (Business Intelligence) and ERP with BI. In our contribution, we present costs models of both mentioned decision support systems and their practical interpretation.*

Keywords: ERP (Enterprise Resource Planning), BI (Business Intelligence), key elements of the functionality of ERP systems, decision support.

1. Introduction

While conducting our research activities aimed at the management decision support in small and medium-sized enterprises (SME) we learnt that in spite of the wide availability of different decision support tools and solutions, these are insufficiently utilized in SMEs at present. There are more reasons for that.

We agree with the models of key success factors for the Business Intelligence (BI) implementation as described by Mesaros (Mesaros P. et al. 2016) but we assert that one of the key factors that are missing in this model is the analysis of cost decision support before and after the implementation of BI. This analysis is particularly important in the SME segment.

Within our research we focused on one of those reasons, namely on the economic aspect of the total costs of the implementation and utilization of decision support tools in SMEs. Similar studies (Horakova, M., Skalska H. 2013) also ascertained that SMEs are sensitive to the cost of implementation and BI operation.

2. Information support of decision making in enterprises

We chose SMEs as our research subject because of their importance for country's economy as well as an unused potential of decision support tools in this type of enterprises. Similarly, to other countries of the EU, in the Slovak Republic SMEs represent almost 99% of the total number of enterprises and their share in the total employment is nearly 70%.

Under the valid legal definition of the European Commission (2003) enterprises can be classified in different categories according to the number of employees, annual turnover and balance sheet total as follows:

- Micro enterprise: fewer than 10 employees and annual turnover or asset value lower than € 2 million,
- Small enterprise: fewer than 50 employees and annual turnover or asset value lower than € 10 million,
- Medium enterprise: fewer than 250 employees and annual turnover or asset value lower than € 43 million.

SME managers can, within the scope of their responsibilities, take decisions intuitively, on the basis of data or using the combination of these ways. We studied mainly the ways of decision-making based on data and we identified two main approaches:

- a) Decision-making based on data stored in the ERP database, i.e. using the functionality of the ERP system implemented in the enterprise. We will refer to this type of decision support as to „ERP without BI“ reflecting the fact that the enterprise management can utilize only standard

ERP functionality and people with this type of employee functionality. Managers do not have specialized Business Intelligence (BI) systems at their disposal.

- b) Decision-making based on data from BI. We presume that the enterprise implemented one of BI tools and its management uses these tools. As ERP systems are the main data sources for BI, it is logically expected that BI tools are implemented in enterprises which use ERP systems as well. We will refer to this type of decision support as to „ERP with BI“.

In order to clearly explain the fundamental difference between decision support in the case of ERP without BI and ERP with BI, we use a simplified methodology for the implementation of decision support in SMEs.

Table 1 Implementation procedure for ERP without BI (Source: Devised by authors)

Step	Description
1.	To identify enterprise managers who need support for their decision-making activities (e.g. as we did at the beginning of Chapter 3).
2.	To define what they make decisions on.
3.	To define key indicators that a particular manager influences through their decisions, e.g. sales manager – customers segmentation (geographical, seasonal, interests).
4.	To define what data is used to calculate key indicators (e.g. geographical segmentation of customers is calculated based on enterprise sales data for different geographical locations).
5.	To find out where, i.e. in which databases, data necessary for the calculation of key indicators can be obtained (e.g. sales data for different locations can be found in ERP system, Sales Module, Part: Shop).
6.	To make summary reports and data exports from ERP in a required format, e.g. for MS Excel, which is used as a reporting tool for managers.
7.	To propose such a combination of reports and exports from ERP that provides the manager with understandable information enabling them to take a decision.
8.	To get feedback from the manager if they received all necessary data and information to be able to take a correct decision. If yes, steps 3 – 7 were carried out properly. If not, it is necessary to reassess steps 3 -7.

The similar methodology is provided in Table 2 for ERP with BI. We can see that the procedure is the same as for ERP without BI except for steps 6. and 7. This is a result of the BI principle in relation to ERP.

Table 2 Implementation procedure for ERP with BI (Source: Devised by authors)

Step	Description
1.	To identify enterprise managers.
2.	To define what they make decisions on.
3.	To define key indicators.
4.	To define what data is used to calculate key indicators.
5.	To find out where data necessary for the calculation of key indicators can be obtained.
6.	To analyze and formulate a task for BI data model.
7.	To program, test and fill the database with BI data.
8.	To get feedback from the manager if they received all necessary data and information from BI to be able to take a correct decision. If yes, steps 3 – 7 were carried out properly. If not, it is necessary to reassess steps 3 -7.

From the mentioned procedures it is obvious that data preparation for manager’s decision-making by means of ERP without BI and ERP with BI differs mainly in steps 6. and 7. in our simplified methodology. It thus follows from this that the implementation of ERP with BI is usually more cost-intensive than ERP without BI solutions due to the costs related to the implementation of BI tools in the enterprise. However, we would like to point out here that decision support by means of ERP with BI does not always have to be more cost-intensive for an enterprise than ERP without BI. We are going to explain the reasons for this statement in the following chapter.

3. Costs of decision support in the case of “ERP without BI” compared to “ERP with BI”

In order to clearly present our approach to the creation of the cost model of decision support we will focus on the key functionality elements of ERP and BI systems aimed at supporting decision-making of managers. We will define 4 types/roles of enterprise managers:

- General Manager (G),
- Production Manager (V),
- Sales Manager (O),
- Financial Manager (E).

We have chosen these roles because they are standard managerial roles in SMEs. Not all of them are present in every enterprise and they can also be combined, however, this will be taken into account in our model.

The next step is to define the examples of responsibilities of individual managers within which they can take decisions.

Sales manager thus decides:

- who is the target customer of the enterprise,
- which marketing activities the enterprise shall carry out so that marketing is successful and effective,
- on creation and fulfillment of a product sales plan (trends, seasonality, subcontracts for production).

Production manager takes decisions on:

- fulfillment of orders obtained by the Sales Manager,
- key indicators in the production process: delivery time in comparison to the plan, extent and volume of production in progress, length of a production cycle, production line capacity, delivery accuracy, inventory turnover, profitability, quality. Everything is checked within individual parts of the production process: plants, production line, workshops, warehouses, product batches, material and semi-finished products.

Financial Manager takes decisions on:

- company finance,
- system developments in the company and
- fulfillment of enterprise duties towards the state which are specified by the legislation.

General Manager decides on:

- the enterprise development and focus in relation to competitors,
- meeting the main goals in the departments led by three subordinate managers (Sales, Production, Finance),
- fulfillment of the main enterprise indicators checked by the enterprise owners (shareholders).

Our task is to design a cost model for two types of decision support. When designing the model we will proceed from a simple one to more complex one, i.e. on the example of a specific managerial decision we will demonstrate differences in costs related to the preparation of data necessary for this decision. On the basis of this example we will, using the method of synthesis, devise a methodology for the evaluation of effectiveness and also design a practical tool to help decide whether to use ERP without BI or ERP with BI in the enterprise.

The example of a management problem: The enterprise often carries out marketing campaigns and the Sales Manager needs to decide:

- which regions the campaign should focus on,
- which customers to target (existing, potential or both) and
- which company products shall be covered by the campaign so that it will be economically effective.

In the enterprise with ERP without BI, in accordance with the steps provided in Table 1, the data preparation for the decision of the Sales Manager should involve the following roles:

- The role of ERP administrator: their task is, on the basis of the ERP data model, identify data sources in the ERP relational database model to be able to, through SQL queries, obtain data and information from ERP which is needed by the enterprise analyst and which cannot be supplied by the roles of key model users (marketing, sales, and finance).
- The role of the key user of Marketing Module: their task is, on the basis of their knowledge on Marketing Module functionality and knowledge of reports from ERP, to provide the enterprise analyst with reports which are relevant for the preparation of potential answers for the Sales Manager,
- The role of the key user of Sales Module: their task is, on the basis of their knowledge on Sales Module functionality and knowledge of reports from ERP, to provide the enterprise analyst with reports which are relevant for the preparation of potential answers for the Sales Manager,
- The role of the key user of Finance Module: their task is, on the basis of their knowledge on Finance Module functionality and knowledge of reports from ERP, to provide the enterprise analyst with reports which are relevant for the preparation of potential answers for the Sales Manager,
- The role of the enterprise analyst: their task is to process data supplied by the mentioned roles and design variants of possible decisions of the Sales Manager as well as prepare the justification for these variants.
- If data preparation for the decision of the Sales Manager involves all mentioned roles, the cost related to the preparation of different decision variants for the Sales Manager will be calculated according to formula [1].

$$O_{ERP} = \sum_{i=1}^n t_i * o_{ERP_i} + \sum_{j=1}^m r_{ERP_j} \quad [1]$$

Where: O is Sales Manager

O_{ERP} - are costs of the potential decision variants for the Sales Manager in the enterprise with ERP without BI

O_{ERP_i} - are hourly wage costs per an employee in the role i ,

t_i time usage per an employee in the role i ,

r_{ERP_j} - are overhead costs in the enterprise with ERP without BI,

n - is the number of roles,

m - is the number of types of overhead costs.

As for the enterprise with ERP with BI, the preparation of data necessary for the decision of the Sales Manager according to the steps provided in Table 2 includes only a role of the company analyst because the data they need to elaborate potential decisions variants for the Sales Manager is available in BI. In other words, the activities carried out by other roles in the case of ERP without BI were done by BI implementers. This is why all information necessary for decision support is ready in BI. We take the role of the enterprise analyst in the case of ERP with BI into consideration because we presume that the manager who needs information for their decision will not be able or willing to work with BI outputs. This assumption might not be correct in practice as the manager can work directly with BI tools and thus the analyst is not needed.

The costs related to the preparation of potential decision variants of the Sales Manager (O) in the case of ERP with BI are calculated according to formula [2].

$$O_{ERP_{BI}} = O_{ERP_{BI}} + r_{ERP_{BI}} \quad [2]$$

where $O_{ERP_{BI}}$ are costs related to the preparation of potential decision variants for the Sales Manager in the enterprise with ERP with BI,

$O_{ERP_{BI}}$ - are wage costs of the enterprise analyst,

$r_{ERP_{BI}}$ - are overhead costs in the enterprise with ERP with BI.

Let us assume that the Sales Manager needs to have information for their decision 3 times a month. Let us also assume that the information is prepared by the mentioned roles and the preparation takes as much time as the information preparation for the decision of the manager that is defined by us.

As we mentioned at the beginning of Chapter 3, the enterprise has 4 managers who also need information for their decisions. We will calculate the costs related to the preparation of potential decision variants for the Production Manager, Financial Manager and General Manager in a similar

way as we calculated the costs related to the preparation of potential decision variants for the Sales Manager.

The costs related to the preparation of potential decision variants of the Production Manager (V) in the case of ERP without BI are calculated according to formula [3].

$$V_{ERP} = \sum_{i=1}^n t_i * v_{ERP_i} + \sum_{j=1}^m r_{ERP_j} \quad [3]$$

V_{ERP} – costs of the potential decision variants for the Production Manager in the enterprise with ERP without BI

v_{ERP_i} – hourly wage costs per an employee in the role i ,

t_i time usage per an employee in the role i ,

r_{ERP_j} – overhead costs in the enterprise with ERP without BI,

n – the number of roles,

m – the number of types of overhead costs.

The costs related to the preparation of potential decision variants of the Production Manager (V) in the case of ERP with BI are calculated according to formula [4].

$$V_{ERPBI} = v_{ERPBI} + r_{ERPBI} \quad [4]$$

V_{ERPBI} – costs of the potential decision variants for the Production Manager in the enterprise with ERP with BI

v_{ERPBI} – wage costs of the enterprise analyst,

r_{ERPBI} - overhead costs in the enterprise with ERP with BI.

The costs related to the preparation of potential decision variants of the Financial Manager (E) in the case of ERP without BI are calculated according to formula [5].

$$E_{ERP} = \sum_{i=1}^n t_i * e_{ERP_i} + \sum_{j=1}^m r_{ERP_j} \quad [5]$$

E_{ERP} – costs of the potential decision variants for the Financial Manager in the enterprise with ERP without BI

e_{ERP_i} – hourly wage costs per an employee in the role i ,

t_i time usage per an employee in the role i ,

r_{ERP_j} – overhead costs in the enterprise with ERP without BI,

n – the number of roles,

m – the number of types of overhead costs.

The costs related to the preparation of potential decision variants of the Financial Manager (E) in the case of ERP with BI are calculated according to formula [6].

$$E_{ERPBI} = e_{ERPBI} + r_{ERPBI} \quad [6]$$

E_{ERPBI} – costs of the potential decision variants for the Financial Manager in the enterprise with ERP with BI

e_{ERPBI} - wage costs of the enterprise analyst,

r_{ERPBI} - overhead costs in the enterprise with ERP with BI.

The costs related to the preparation of potential decision variants of the General Manager (G) in the case of ERP without BI are calculated according to formula [7].

$$G_{ERP} = \sum_{i=1}^n t_i * g_{ERP_i} + \sum_{j=1}^m r_{ERP_j} \quad [7]$$

G_{ERP} – costs related to the preparation of potential decision variants of the General Manager (G) in the case of ERP without BI,

g_{ERP_i} – hourly wage costs per an employee in the role i ,

t_i time usage per an employee in the role i ,

r_{ERP_j} – overhead costs in the enterprise with ERP without BI,

n – the number of roles,

m – the number of types of overhead costs.

The costs related to the preparation of potential decision variants of the General Manager (G) in the case of ERP with BI are calculated according to formula [8].

$$G_{ERPBI} = g_{ERPBI} + r_{ERPBI} \quad [8]$$

G_{ERPBI} – costs related to the preparation of potential decision variants of the General Manager (G) in the case of ERP with BI,

g_{ERPBI} – wage costs of the enterprise analyst,

r_{ERPBI} – overhead costs in the enterprise with ERP with BI.

In order to calculate the costs of the decision support for managers in the enterprise (in the case of ERP without BI and ERP with BI) using the model designed by us, let us presume that

- General Manager needs information for the preparation of potential decision variants a-times per month (e.g. 3 times),
- Sales Manager needs information for the preparation of potential decision variants b-times per month (e.g. 4 times),
- Production Manager needs information for the preparation of potential decision variants c-times per month (e.g. once),
- Financial Manager needs information for the preparation of potential decision variants d-times per month (e.g. 5 times).

The monthly costs of the decisions support for all four managers, according to formulas [1] to [8] in the case of ERP without BI represent:

$$P_{ERP} = a * G_{ERP} + b * O_{ERP} + c * V_{ERP} + d * E_{ERP} \quad [9]$$

P_{ERP} – monthly costs of the enterprise related to the information preparation for the decisions support of managers in the case of ERP without BI

In our example the monthly costs of the enterprise related to the information preparation for the decision support of managers in the case of ERP without BI are:

$$P_{ERP} = 3 * G_{ERP} + 4 * O_{ERP} + 1 * V_{ERP} + 5 * E_{ERP} \quad [10]$$

Similarly, the monthly costs of decision support for managers in the case of ERP with BI are:

$$P_{ERPBI} = a * G_{ERPBI} + b * O_{ERPBI} + c * V_{ERPBI} + d * E_{ERPBI} \quad [11]$$

In our example the monthly costs of the enterprise related to the information preparation for decision support for managers in the case of ERP with BI are:

$$P_{ERPBI} = 3 * G_{ERPBI} + 4 * O_{ERPBI} + 1 * V_{ERPBI} + 5 * E_{ERPBI} \quad [12]$$

Using the formulas, it is possible to calculate yearly costs of the information preparation for the management decision support in the case of ERP without BI and ERP with BI; it is possible to calculate the return on investment for ERP with BI or to calculate what costs are acceptable for the implementation of BI in a specific enterprise.

$$P_{ERP_r} = 12 * P_{ERP} \quad [13]$$

P_{ERP_r} – yearly costs of the enterprise in the case of ERP without BI

P_{ERP} – monthly costs of the enterprise in the case of ERP without BI

$$P_{ERPBI_r} = 12 * P_{ERPBI} \quad [14]$$

P_{ERPBI_r} – yearly costs of the enterprise in the case of ERP with BI

P_{ERPBI} – monthly costs of the enterprise in the case of ERP with BI

The monthly costs of the decisions support for all four managers, according to formulas [1] to [8] in the case of ERP without BI represent:

The calculations according to formulas [1] to [14] can be done by e.g. MS Excel. Figure 1 shows a part of an Excel table as an example of calculations done according to formulas [1] to [14]. We can see that the calculations are not complicated. Recording the data used as inputs for the model might pose a problem. However, this is a standard problem concerning the availability of relevant and correct data. We believe that all input data necessary for the model can be obtained in the enterprise.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1																		
2																		
3		role	hour cost	overhead/hour	number of hours		for O		for V		for E		for G			Monthly costs	Yearly costs	
4		admin	1	5	10	=C4*E4+D4*E4	1	=F4*G4	1	=F4*I4	1	=K4*F4	1	=M4*F4		=H4+J4+L4+N4	=P4*12	
5		key 1	2	2	20	=C5*E5+D5*E5	1	=F5*G5		=F5*I5		=K5*F5	1	=M5*F5		=H5+J5+L5+N5	=P5*12	
6		key 2	3	8	30	=C6*E6+D6*E6	1	=F6*G6	1	=F6*I6		=K6*F6		=M6*F6		=H6+J6+L6+N6	=P6*12	
7		key 3	4	2	12	=C7*E7+D7*E7	1	=F7*G7		=F7*I7	1	=K7*F7	1	=M7*F7		=H7+J7+L7+N7	=P7*12	
8		key 4	5	2	14	=C8*E8+D8*E8		=F8*G8	1	=F8*I8		=K8*F8		=M8*F8		=H8+J8+L8+N8	=P8*12	
9		key 5	6	2	18	=C9*E9+D9*E9		=F9*G9		=F9*I9	1	=K9*F9	1	=M9*F9		=H9+J9+L9+N9	=P9*12	
10		key 6	7	2	12	=C10*E10+D10*E10		=F10*G10	1	=F10*I10		=K10*F10		=M10*F10		=H10+J10+L10+N10	=P10*12	
11		key 7	8	2	20	=C11*E11+D11*E11		=F11*G11		=F11*I11		=K11*F11		=M11*F11		=H11+J11+L11+N11	=P11*12	
12		analyst	9	2	22	=C12*E12+D12*E12	1	=F12*G12	1	=F12*I12	1	=K12*F12	1	=M12*F12		=H12+J12+L12+N12	=P12*12	
13																		
14		Average costs for 1 decision of manager							=SUM(H4:H13)		=SUM(J4:J13)		=SUM(L4:L13)		=SUM(N4:N13)		=H14+J14+L14+N14	=P14*12
15		Count of decisions of manager per month							4		1		5		3			
16		Monthly costs for prepare decisions of managers							=H14*H15		=J15*J14		=L15*L14		=N15*N14		=SUM(H16:N16)	=P16*12

Figure 1 Calculation of the company costs in the case of ERP without BI (Source: Devised by authors)

4. Discussion on possible model interpretations

We would like to start the discussion by analyzing the relationship of P_{ERPBI} (i.e. monthly costs of management decision support in the case of ERP with BI) and P_{ERP} (i.e. monthly costs of management decision support in the case of ERP without BI). The aim is to show that these costs have different starting values and they rise differently over time. This situation is described schematically in Figure 2. The intersection point of P_{ERP} and P_{ERPBI} costs shows when the costs related to the information preparation for the decisions support in the case of ERP without BI and ERP with BI become the same. Based on this intersection point it is possible to infer the time when the investment into BI becomes profitable because at that time P_{ERPBI} costs get lower than P_{ERP} costs.

Costs

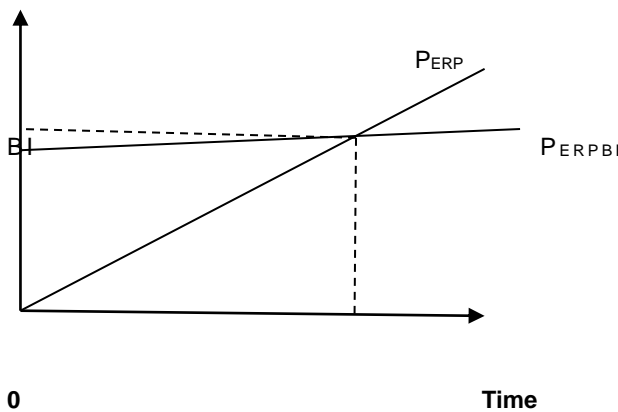


Figure 2 Company costs in the case of ERP with BI and ERP without BI (Source: Devised by authors)

P_{ERPBI} – monthly costs of the decision support for managers in the case of ERP with BI

P_{ERP} – monthly costs of the decision support for managers in the case of ERP without BI.

Intersection point: $P_{ERPBI} = P_{ERP}$

Figure 2 can be also interpreted as follows: decision support costs in the case of ERP without BI start at zero because no investment into the implementation of BI tools was needed. However, the preparation of data for the decisions support of each manager involves costs related to the work of different roles. This is why the costs of this method of the decision support increase faster over time

than the costs related to ERP with BI. The decisions support in the case of ERP with BI has defined costs in the zero point of time which are related to the implementation of BI. However, unlike the costs in the case of ERP without BI, the costs of decision support in the case of ERP with BI increase slower over time as human labor is not needed (roles listed in the case of ERP without BI). The activities carried out by people in the case of ERP without BI are, in the case of ERP with BI, replaced by BI tools implemented in the enterprise.

We continue the discussion by explaining the influence of the implementation costs of BI on the costs of decisions support. Figure 3 shows curves calculated by means of our model where, in the case of ERP with BI, we consider 4 different prices of BI implementation (€50 thousand, 100 thousand, 150 thousand and 200 thousand).

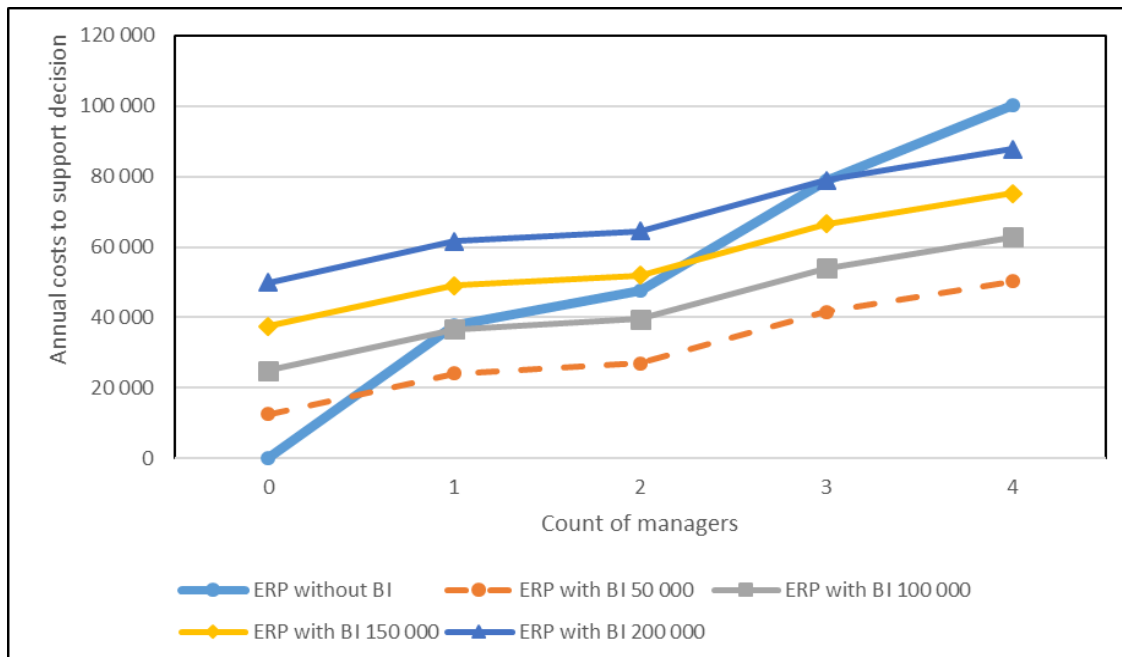


Figure 3 The influence of the number of managers on the enterprise costs with a parameter
(Source: Devised by authors)

We can see that the yearly costs of decision support depend on the number of managers who need information for their decision-making, also on the way managers get their support (ERP without BI or ERP with BI) and on the costs related to the implementation of BI. The graph shows the relations between decision support costs in the cases of ERP without BI, ERP with BI and different implementation costs related to BI. It should be pointed out that in the case where the number of managers is zero, i.e. the number of decisions is zero, it is not possible to calculate BI depreciation per number of decisions as there would be division by zero. This is why, in this specific case, we calculate BI depreciation on the yearly basis (depreciation period is 4 years), which means if its price was € 50,000, the yearly depreciation (=costs) would be $\text{€ } 50\,000 / 4 = 12\,500 \text{ €}$.

It seems the decision support costs should be directly proportional to the number of managers and the number of their decisions. We intentionally used different managers in our model. Each of them takes decisions with different frequency and each of them needs to process different sources of input data using different key users of ERP. We take all of this into consideration in our model. The fact is that the graphs in Figure 3 show there is an increasing trend in dependence of decisions support costs on the number of managers, however, it is not represented by lines.

We want to conclude the discussion with the graph which was calculated based on the model and shows another example of the use of our model. Figure 4 shows a graph representing the relations between decision support costs and the number of decisions. Using this graph, we want to show how effective it is to implement BI in relationship to the type of the manager and number of their decisions. We calculated data for the Sales Manager in both cases, i.e. ERP without BI and ERP with BI (the implementation costs of which were €50 thousand).

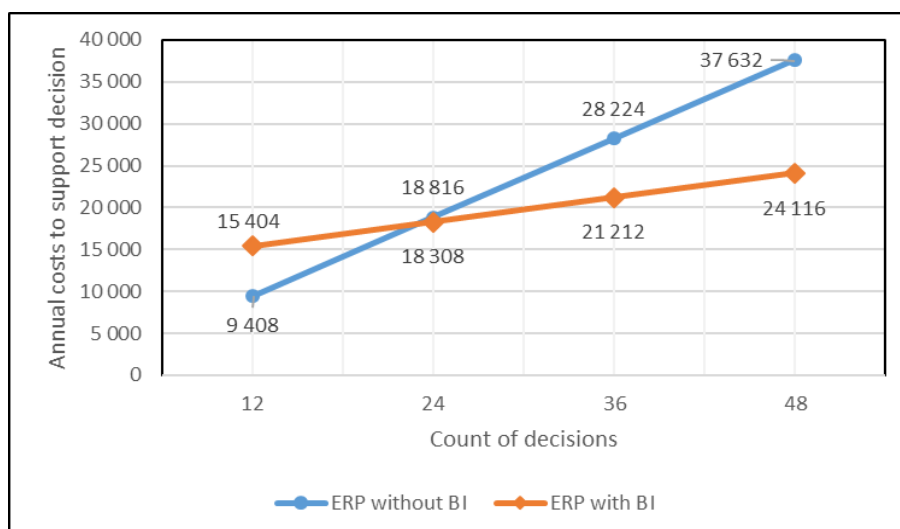


Figure 4 The influence of the number of decisions on the decision support costs
(Source: Devised by authors)

We can see from the graph in Figure 4 that the yearly costs of the decisions support are lower in the case of ERP without BI only if there are about two decisions of the Sales Manager per month, i.e. 24 decisions per year. If there is a higher number of decisions, the decision support costs are lower in the case of ERP with BI. In other words, if there was only Sales Manager in the enterprise that would require decision support and they would take more than 24 decisions per year for which data processing is needed, it would be more profitable for the company to implement BI for €50,000.

It can be seen in the discussion that our model offers more possibilities. The availability and accuracy of input data for the model influences its use in practice. The Excel table is an outcome of work which, after providing specific data, enables to calculate values according to formulas [1] to [14]. It is possible to model various combinations of input costs (e.g. wage, overheads, etc.) within this tool.

References

- Čarnický, S., 2013: Three phases of successful implementation and use of Business Intelligence in the management of small and medium sized enterprises. *Enterprise revue*, No.30. ISSN 1335-9746
- Horakova, M., Skalska, H., 2013: Business Intelligence and Implementation in a Small Enterprise. *Journal of Systems Integration*. Vol 4 No 2. ISSN: 1804-2724
- Mesaros, P., Čarnický, S., Mandicak, T., Habinakova, M., Mackova, D., Spisakova, M., 2016: Business Intelligence impact on corporate performance in Slovak enterprises – a case study. *Journal of Systems Integration*. Vol 7 No 4. ISSN: 1804-2724
- Novotny, O., Pour, J., Slansky, D., 2005: *Business Intelligence*. Prague: Grada Publishing, ISBN 80-247-1094-3
- Pour, J., Gala, L., Šedivá, Z., 2009: *Establishment information science*. Prague: Grada Publishing, ISBN 978-80-247-2615-1
- Pour, J., Maryska, M., Novotny, O., 2012: *Business Intelligence in establishment experience*. Prague: Professional Publishing, 2012. ISBN 978-80-7431-065-2
- Tomišová, V., 2012: Software support of management decision making. *Young scientists revue*, Žilina: University of Žilina, Faculty of Management Science and Informatics, ISBN 978-80-554-0560-5
- Tomišová, V., 2012: Use of enterprise information systems for decision support process in Slovakia *Statystyka i ryzyko* Rusnak, Zofia -- Wrocław: University of Economics, ISBN 978-83-7695-292-5

JEL Classification: D24, M15