Mgr inż. Justyna Patalas
Uniwersytet Zielonogórski
e-mail:j.patalas@iizp.uz.zgora.pl

MODEL OF ERP SELECTION FOR SME

*Abstrakt: An authorized method for the ERP in SME implementation effi-
ciency assessment (EWE) has been developed. It consists of 5 elements
that is: (1) ERP system parameters, (2) SME company parameters, (3)
SME experience which proceeded ERP project, (4) functionality indica-
tors values, (5) algorithm that enables ERP and SME characteristics
binding – GMDH algorithm. The application of this method allows for the
prediction of the economical effects as far as the implementation of ERP
is concerned, taking into consideration the efficiency indicators in the
analyzed company. On the basis of the EWE method the decision model
for the ERP efficiency implementation has been developed.*

MODEL DOBORU ERP DLA MSP

*Streszczenie. Opracowano autorską metodę oceny efektywności wdrożeń
systemów ERP w SME (EWE). Składa się z 5 elementów, tj.: (1) parame-
try systemu ERP, (2) parametry przedsiębiorstwa MSP, (3) doświadczenia
MSP, które zrealizowały projekt wdrożenia systemów ERP, (4) wartości
wskaźników funkcjonowania przedsiębiorstwa, (5) algorytmu, który umoż-
liwi powiązanie charakterystyk MSP i ERP – algorytmu GMDH. Zastoso-
wanie metody EWE pozwala na prognozę efektów ekonomicznych wdro-
żenia rozważanego systemu ERP (pod kątem wybranych wskaźników efek-
tywności) w analizowanym przedsiębiorstwie. W oparciu o elementy me-
tody EWE został opracowany model doboru ERP dla MSP.*

1.INTRODUCTION

ERP systems dynamic development in recent decade with their growing sale increase
make the best evidence to prove that the systems are in demand as a supporting tool in
management [1]. Bearing in mind the needs of the market the IT developers customize
ERP functionality to the SME demands.

SMEs that are about to make decision concerning the introduction of ERP system tend
to make a pre-evaluation of the efficiency of the very implementation (for example
taking into consideration the level of the user's objectives realization) [3]. However the
process of the efficiency evaluation is very expensive, time consuming and followed by
complicated analyzes, which means that companies tend to opt for any products that are
not really adjusted to their needs. Bearing this in mind, there is a demand for developing
the method that would diminish the risk of an inadequate implementation and at the
same time would allow to solve the problems which otherwise could be missed. A
relevant framework to this issue is based on a database referring to:

The SME, with defined the selected functionality indicators and ERP systems (*SAP Business One* or *Comarch CDN XL*) ascribed to SME as well as to a company module of SME. Allowing responding to the following question: Whether a existed (given) the ERP implementation efficiency method in the small and medium enterprises (SME)?

It can be concluded that there is a need to define the criteria of the ERP system efficiency in the SME that should be carried out on the basis of the functionality area definition. Consequently an appropriate reference model of the company should be developed to enable both defining the needs in the areas of functionality and the success evaluation of ERP implementation. Such a model should provide a kind of guideline for the future ERP implementation framework.

The decision as far as the selection of the proper ERP system should be preceded by the management profitability assessment and the prospect advantage of the system implementation [4]. In order to view the prediction of the selected functionality indicators the authorized consulting ERP implementation prediction (software *Consulting IT system for the ERP implementation effects in small and medium size companies*) can be used [6].

In this paper is presented the method of assessment of efficiency ERP implementation in the small and medium enterprises (SME) and model of ERP selection for SME.

2. THE ERP IMPLEMENTATION EFFICIENCY METHOD - EWE

The author's method was developed on the basis of the defined method for the IT project profitability assessment, including ERP systems characteristics. It combines the knowledge database with SME experience in which the project has already been implemented. It consists of 5 elements that is:
(1) ERP system parameters,
(2) SME company parameters,
(3) SME experience which proceeded ERP project,
(4) Functionality indicators values,
(5) Algorithm that enables ERP and SME characteristics binding – GMDH algorithm.
The name of the method is an acronym that enhances the main operating methods, namely: Efficiency – Implementation – ERP.

In order to define a ERP in SME method for the system implementation efficiency assessment it is necessary to find the answer for the following questions:
(1) What kid of SME is to be discussed?
The reference model has been developed (SME according to the regulation dated from November 12th 1999, Commercial Law – Dz .U .Nr 101,poz 1178), which enhances the following [5]: legal aspect of SME operation, SME business areas, basic and supporting activity areas description, company efficiency assessment indicators.

(2) What parameters of SME are to be considered?

(3) In which way the information concerning ERP in SME implementations are to be accessed?

The development of the ERP decision model as far as the purchase of the system is concerned should be started with collecting as much information as possible in relation to the structure and the dynamics of the object in question. It can be a subjective knowledge which involves the empirical data obtained as a result of the observation on the object functionality. This approach consists of the complete knowledge data because it has been obtained in real situation. The elements in decision model (*ERP parameters - parameters of SAP Business One or Comarch CDN XL*, value selected functionality indicators of SME) were obtained as a result of the research which was carried out on the area of Lubuskie region, Poland. The date which was used in this assessment come from January – September 2005. The data was collected from the companies operating within SME sector where ERP system was applied and these companies belonged to reference model of SME.

(4) What kind of algorithm can be used to combine SME and ERP characteristics?

For defined object – the pair: ERP and SME - (parameters of *SAP Business One* or *Comarch CDN XL*, and value selected indicators of efficiency SME) was making two empirical date of indicators of efficiency SME and parameters of ERP systems. The data contains the value indicators of efficiency SME is based on experience SME where ERP system was applied. The algorithm that enables the SME and ERP to be combined was defined as GMDH (Group Method Data Handling), that involves the following assumptions[2]: a precise description of the interdependence between the output and input data (selected SME efficiency indicators with the characteristics of a given ERP system as well as the characteristic of the company in which the system was implemented) and minimum modeling error. As a result of the algorithm GMDH implementation the best possible polynomial was obtained which was characterized by the lowest value criteria for regularity assigned to the pair object (respectively - SME and SAP Business One system or Comarch CDN XL). The algorithm evolution process was completed on the second iteration. It is worth pointing out that the second degree of the polynomial was obtained as a result of the implementation of SME and effective operation indicators database with ERP system parameters for the SAP Business One and Comarch CDN XL. Thus, it can be different from the new ERP database for effective operation indicators.

(5) What kind of decision supporting structure should be used in relation to the ERP purchase, being at the same time the implementation of the ERP method?

Decision model is contracted on the basis of the knowledge data base. It includes a complex information about all the processes which could be observed while the date base was created, so both examples of successful and unsuccessful ERP system implementation are included. The application of empirical knowledge enabled the application of GMDH as a modeling tool. In conclusion the decision model, which was under examination, binds the selected indicators of effectiveness of SME implementation with the parameters of a given ERP system and the parameters of the company as such, which introduced this system. This restriction makes the decision making process sim-

ple and brings it to some kind of pattern of the restriction propagation (chosen decision making indicators of implementation for the ERP system under examination). It means that, for some companies, the assessment of the effects which ERP would bring can be done on the basis of previously defined indicators and the experience of those companies which have already applied ERP integrated information system.

In accordance with the date included in the SME functionality indicators database, including ERP parameters all the variations of the GMDH algorithms [2] were investigated in the computer software *Consulting IT system for the ERP implementation effects in small and medium size companies.*

3. THE PREDICTION VALUE FOR THE DEFINED INDICATORS IN SME

The main problem in responding to the question whether a given ERP will guarantee to obtain the assumed level of a SME performance index for assumed costs and existing limitations or not – is the presented like the decision problem. In order to illustrate the possibility of answer let us consider the situation: the problem considered regards of chosen the ERP system objective and of assessment of effects of the system implementation for enterprise A.

The stage of the ERP system variations and prediction testing of certain SME functionality indicators allows for the introduction of the conclusions concerning the ways in which the prediction is proceeded using EWE implementation method. The main aim for the experts was to determine prediction value for the functionality indicators that is: turn over profitability indicator, work profitability indicator, storage rotation indicator II in relation to the Sap Business One or Comarch CDN XL. The object on which efficiency examination is carried out in relation to the ERP is a pair: a SME company, which considers the ERP selection and a properly defined ERP system (Sap Business One, Comarch CDN XL). The author's software *Consulting IT system for the ERP implementation effects in small and medium size companies* facilitates the proceeding of previously described experiments.

So, the best possible polynomial (decision model) in relation to the Comarch CDN XL binding the selected indicators like: W1 - *turn over profitability indicator*, W2 - *work profitability indicator* (using the author's software *Consulting IT system for the ERP implementation effects in small and medium size companies)* is defined:

$$W (W1, W2) = W2, \qquad (3.1.)$$

where: W1 = turn over profitability indicator, W2 - labor profitability indicator
This model is a synthetic indicator of effectiveness that consist of certain particle indicators (in indicators database: W1- 30, W2-47) is the polynomial Nr. 10, with criteria value $r = 0,0353$ (Fig. 1.)
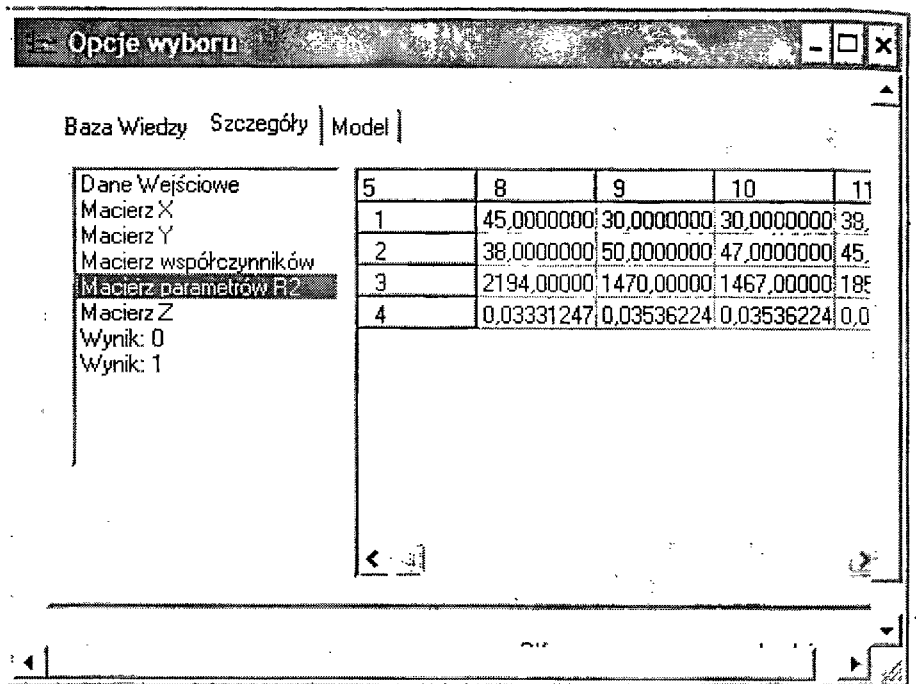
Fig. 1. The best possible polynomial (decision model) in relation to the Comarch CDN XL binding the selected indicators like W1 = turn over profitability indicator, W2 = labor profitability indicator

The prediction value of the such defined polynomial (decision model) in relation to the Comarch CDN XL is constants value and is such the present labor profitability indicator value (in accordance with the defined decision model).

Consequently, in order to illustrate the comparison both decision models in relation to the Comarch CDN XL and SAP Business One let us consider a decision model in relation to the SAP Business One binding the selected indicators like W1, W2.

The best possible polynomial (decision model) in relation to the SAP Business One binding the selected indicators (includes in decision model in relation to the Comarch CDN XL) like: W1 = storage rotation indicator II, W2 = labor profitability indicator:

$$W(W1, W2) = -0,002W1 + 0,1117W2 + 0,1001W2^2 + 0,0026W1W2 \qquad (3.2.)$$

where: W1 = storage rotation indicator II, W2 = labor profitability indicator

This model is a synthetic indicator of effectiveness that consist of certain particle indicators (in indicators database: W1- 40, W2-47) is the polynomial Nr. 88, with criteria value r = 0,5286 (Fig. 2.)

Bazą Wiedzy   Szczegóły | Model |

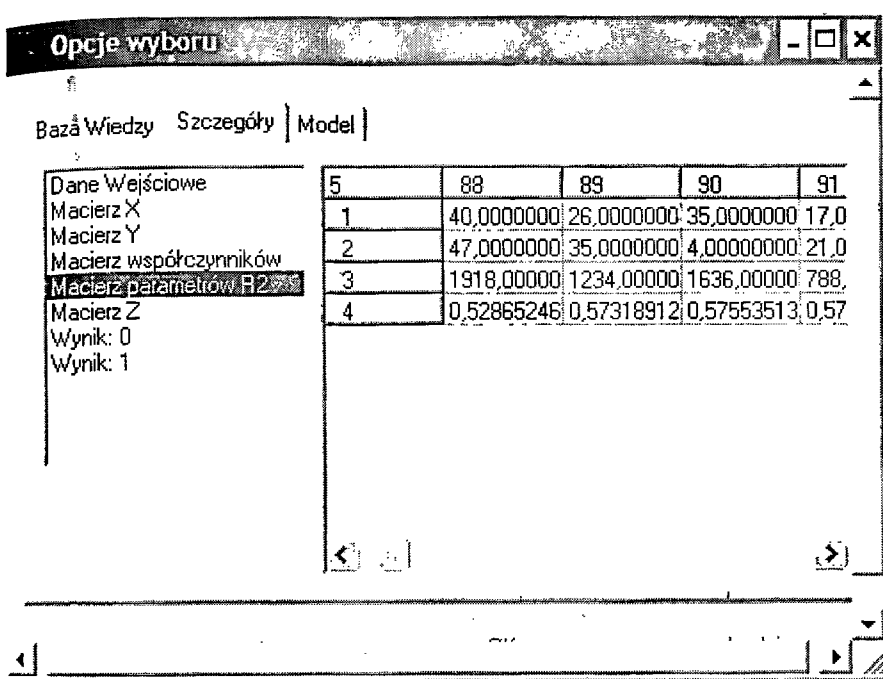| Dane Wejściowe	5	88	89	90	91
Macierz X	1	40,0000000	26,0000000	35,0000000	17,0
Macierz Y	2	47,0000000	35,0000000	4,00000000	21,0
Macierz współczynników	3	1918,00000	1234,00000	1636,00000	788,
Macierz parametrów R2	4	0,52865246	0,57318912	0,57553513	0,57
Macierz Z					
Wynik: 0					
Wynik: 1					

Fig. 2.. The best possible polynomial (decision model) in relation to the SAP Business One binding the selected indicators like W1 = storage rotation indicator II, W2 = labor profitability indicator

It is worth pointing out that in accordance to the database all the variants were investigated and the procedures accessible in the computer software *Consulting IT system for the ERP implementation effects in small and medium size companies,* which links pre defined indicators of the ERP implementation efficacy. In this way the smallest modeling error was obtained , and at the same time, connecting given indicators, which was described as decision models - polynomial. The selection that was made confirms the assumption that for different ERP systems which even connects similar efficacy indicators for the ERP implementations the decision model can be different. It is understandable, taking into consideration that they were developed in accordance with different operating efficacy database and ERP system parameters.

So, on the basis of the decision making model a forecast of a defined indicators value is introduced to the company . As a result, the company must make a decision as far as the purchase of the ERP system is concerned. This system is defined as Sap Bussines One, Comarch CDN XL, based on value forecasting.

4. MODEL OF ERP SELECTION FOR SME

The ERP implementation efficiency method, which has been suggested, enables us to build a decision model which involves all the elements of the method structure for the ERP in SME (EWE) implementation efficiency. The modeling object consists of the pair: ERP system and the SME company which condition is described as a numerical set of values – selected indicators for SME operation functionality, ERP characteristics and the parameters of the company that implemented the system. The procedure will be developed for the ERP system variations in small and medium size companies. The ERP purchase decision support system will be based on the empirical database, being the implementation of the EWE method and it would include the values of the defined efficiency indicators after and before ERP implementation as well as the GMDH algorithm. The solution defined as an obtainable ERP implementation efficiency indicators prediction will be shown with the assistance of the consulting IT software. Consequently, a recommended ERP system for SME company will be shown.

Allowing responding to the following question: whether a given ERP will guarantee to obtain the assumed level of selected functionality indicators of SME or not, for assumed costs and existing limitations

Using the decision model in the process of ERP selection for SME (in accordance with the author's software *Consulting IT system for the ERP implementation effects in small and medium size companies* – the application of method EWE (assessment of efficiency ERP implementation)

The prediction value for the defined indicators in SME *(using the author's software Consulting IT system for the ERP implementation effects in small and medium size companies)*

Reference of ERP system (by the prediction of the better values for the selected indicators assigned to the SME operating efficiency)

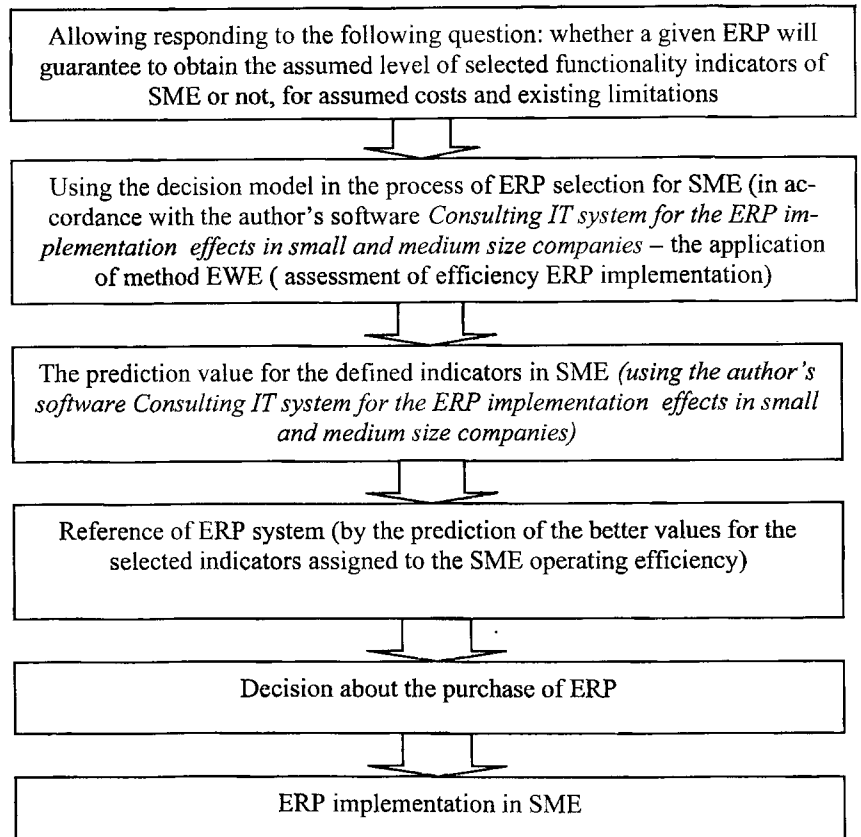Decision about the purchase of ERP

ERP implementation in SME

Fig. 3. Model of ERP selection for SME

The model of ERP selection for SME which has been defined enables us to carry out a assessment of the ERP implementation. The precisely defined indicators are ascribed to

decision model, which allows us to define potential values of these parameters after the system has been implemented. In accordance to the A company database the decision model is presented to the company in a form of the value prediction of the defined indicators (W1 or W2), which was obtained after the ERP implementation. As a result, on the basis of the obtainable prediction values, it was recommended for the company to use system ERP, which was conditioned by the prediction of the better values for the selected indicators assigned to the SME operating efficiency.

5. CONCLUDING REMARKS

On the basis of the ERP implementation efficiency method – EWE the decision model for the ERP efficiency implementation has been developed . It was concluded that on the basis of the decision model the company of SME sector will obtain the prediction of the defined SME functionality indicators value after and before ERP implementation, defined as SAP Business One and Comarch CDN XL.

The method proposed shows just a concept associated with the assessment of the ERPs in order to find their SME's effective implementation. It means that, for some companies, the assessment of the effects which ERP would bring can be done on the basis of previously defined indicators and the experience of those companies which have already applied ERP integrated information system.

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