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SOFT COMPUTING & INCREASING EFFICIENCY OF EXTRACTING DATA FROM SAP ERP

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Abstract

The purpose of this work is to draw attention to the importance of data entered into SAP and out of SAP ERP system. Through our work, we will use different and brand new scientific method of system dynamics in order to present results of on innovative way of graphic presentation. Common issue in companies across the globe, which use ERP system, is that one percent of highly valuable data never ends up in a centralized solution like SAP ERP. Instead of that, same data ends up in different kinds of so called external databases like Microsoft access, Excel spreadsheets, all kinds of paper notes etc. This causes many issues in SAP ERP business intelligence because management of the company doesn't see the "full picture" when it comes to achieving the company's mission and vision. The goal is to present empirically the volume of savings both in the time of realizing the activities and in the financial context if the presented business activity is made by integration using SAP ERP system. Savings in time are shown with the use of system dynamics, and based on data acquired from measuring of certain activities. Savings in financial context are shown by the quantification of the state after including the business activity in information system contrary to the condition before it was included. If the management of company recognizes benefits on entering most of the crucial data into SAP ERP system and decides to exclude different types of external databases, model of system dynamics will clearly show how the same company can gain brand new benefits. This creates a whole new dimension for company which will be also ready for making quality decisions based on exact data from the system with very small percent of deviations.

1. INTRODUCTION

Information and data which are gathered and received in company business processes are of great strategic importance for one company. Every information or data can be of high importance for one company. Prerequisite for best use of information and data is standard organization and saving of that information and data. Based on input information and data, company is able to make decisions, analysis, create business history, make research etc. and

based on these activities boost its business effects as well as decrease exposure to business risks on every-day basis. In business processes, importance of this category is already known, unfortunately, attention to input data and information is less then significant, which is common issue.

We are all witnessing a great deal of popular Enterprise Resource Planning (ERP) solutions today. ERP systems such as SAP, Microsoft Dynamics NAV and Oracle E-Business Suite enable integration of business processes in whole company and greatly improve business management

and business tracking which makes their role of great importance (Willinger, 2008). Companies that choose to implement one of these solutions in their business structure are mostly overloaded with new possibilities and options and at the same time they are not in the position to estimate all the potential which these solutions offer (Stefani, 2002). In this case ERP system is used for basis processes, and after some time of use there are additional possibilities offered by the system. Usual practice is that part of these possibilities become standard business practice, but there are parts of some very important possibilities that are neglected (Knapp, 2008). Reasons for overseeing possibilities are various. Most common reasons lie in constant resistance of employees, resistance of management, poor preparation for implementation etc. (Hodzic, 2013). The fact is that little or no attention is focused on new improvements, unfortunately (Group of authors, 2009).

The aim of this work is to show true meaning of SAP ERP system for one company and to show how to use SAP ERP in its best light through correlation of adequate training of employees and final output at the end. New methodology of system dynamics (System Dynamics¹) is used for visualization of this correlation methodology. With the help of POWERSIM² software, structural flow diagram will be shown. Considering the fact that this work was started as answer to real problems and situations in companies in which authors of this text are employed, in that manner, scientific importance of work is inasmuch greater.

Through this work, authors also want to show how much quantitatively the training of employees adds to productivity of a company. Problem of providing the education basically lies in the fact that company management does not see the real value in training beyond mere basic business processes, unfortunately. In this work, influence of employee training to final outcome of business will be quantified with the help of mentally-verb model and system dynamics.

2. METHODOLOGY

Relevant data for this paper came from surveys done in three medium to large sized companies from BiH whose businesses are supported by SAP ERP system. All three surveys were conducted in 4Q13 using online survey tool (Google Forms). These surveys were supplemented by two focus groups. One group consisted of experts in IT departments, and the other consisted of employees covering administrative operations of business. Respondents were asked about their methods of data storing and retrieving.

Additionally, authors personally interviewed two IT experts from surveyed companies and three more experts

in the field of implementation of ERP, ERP programming and ERP consulting.

Collected data was used to describe and measure the current procedure of adding data in SAP system.

3. SYSTEM DYNAMIC QUALITATIVE MODELS OF SAVING DATA PROCEDURE IN SAP ERP

In this part, process of adding data in company will be shown schematically as an introduction to mentally-verb model, system dynamics and structural model view.

3.1. System of saving data in company

Input data which are saved using various transactions in company are modified by certain number of employees. Part of the data is saved in SAP system, but many data is stored outside of SAP ERP. Outside of SAP system usually represents external databases or in negative case scenario, data is not stored at all, unfortunately. External database includes different, for SAP system, databases from Microsoft Excel tables, Microsoft Access, Microsoft Outlook and similar tools and applications, personal notepad, writings etc.

3.2. Model of saving data in company

Before describing any model, it is necessary to define category of data which is very important. Input data which can be relevant for company are present in every exchange of information between company and environment which is of great importance. For example, for purchase department data on invoices or similar documentation is important, like bank guarantee, slips etc.

Company which will be shown in example below, implemented SAP ERP system seven years ago. Considering the fact that the beginning of work in SAP system was a significant change for company business, only basic transactions were included with regard to goods movement and other similar process.

In time, user expertise regarding SAP system had grown which had led to many new transactions stored by using SAP ERP.

At the moment, it is important to note that SAP usability is on an acceptable level. Many modules are used to connect all businesses in a unity. Every major business transaction is stored and monitored by using SAP system. However, further training of employees in this field stagnated and is on the low level. Every new employee goes through training which lasts from 9 to 12 days. On this training, employee learns about transactions which are relevant to position he works on and, if necessary, receives an additional training just for him/her.

The fact that full SAP potential is not used points to three problems:

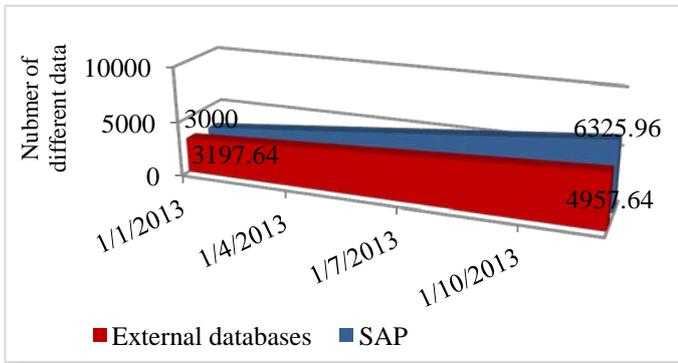
1. One substantial part of data is not saved in SAP system (Figure 3.1). This problem leads to separated databases in different shapes and variations. In time, these databases become

¹ http://en.wikipedia.org/wiki/System_dynamics (20.05.2012)

² <http://www.powersim.comansactions>

larger, immense and hard to search when certain data is needed. The next figure shows this growth linearly, if we assume that the way of collecting data in SAP system is intact, and data input is constant, respective volume of work is unchanged, most important. It is evident that data in external databases are constantly increasing through time, with note that there is no tendency to slow down or decrease. Constant growth is certain. In certain moment these databases will be extremely problematic, with huge amount of data and complicated for use.

Figure 3.1: View of accumulating data out of SAP system



- The rate of internal data processing is not on a satisfying level because employees are not familiar with additional possibilities or they do not want to change procedures, simply because of their obtained habit.
- ERP system like SAP offers extraordinary solution for recording data and its use and it is very important software for administration. Main reason why SAP potential is not used enough is human factor. Unfortunately, managers do not give enough attention to ERP system and employees thus do not have enough knowledge or do not want to use additional software possibilities, simply because they do not have to.

Solution to these problems is in training. Advanced training and education of employees will raise awareness about importance of software and increase productivity because employees will gain more expertise and skills.

3.3. Dynamic modelling by use of system dynamics methodology

System dynamics represents perception and set of conceptual tools that allow us to understand the structure and dynamics of complex systems. Methodological

approach contains several phases. The aim of the initial phase is to recognize and define system and its limits, which is described by mentally-verb model. In this phase, it is very important to recognize time-changeable sizes and their causally- consequential relation effects.

Considering the fact that system dynamics is based first of all on mental model, it is very important that the model is of good quality. That means that any useful information, influence or change with respect to the system, should be taken into consideration. Based on verbal model, structural model and flow diagram are used to represent second phase of dynamic modelling. Using this model, building of many simulation scenarios for certain problem is possible, which basically helps to consider the problem as well as enable quality problem solving.

Below, model of one simulation scenario will be built, based on previous model based on surveyed companies.

3.4. Verbal model of adding data

If, for this example, we look at transactions as incoming invoices, then we will describe their recording more easily. After processing, incoming invoices are added in SAP system or external databases, outside of SAP. Expertise of employees has direct influence on quantity of added data in SAP (positive causally-consequential relation). This expertise also indirectly influences the quantity of all added data outside of SAP (negative causally- consequential relation).

3.4.1. Classical data archive outside of SAP ERP

Classical data archive represents all the data stored in external databases. External databases can be different types of software as Microsoft Office or some other software that do not have direct relation with SAP system. Another way of recording data is through the using personal notes. Considering the fact that in this company SAP ERP is implemented nearly 5 years ago, poor use of the SAP system at the present level led to accumulation of data in external databases. This means that the initial count in classical data archive is 3.000 records. Mathematically speaking, correlation between quantity of input data and classical data archive can be shown below:

$$\begin{aligned}
 & \text{Classical data archive} \\
 &= \text{Input data quantity} - \text{Expertise} \\
 &+ \text{Initial data quantity added outside of SAP}
 \end{aligned}$$

Expertise represents total quantity of processed data. This value will be explained in the next chapter.

Currently, four employees manage to record 39.52% of incoming invoices in SAP (based on 500 input monthly transactions). This represents length of the process. On the other side, this also means that 60.48% of data represents surplus which requires additional employees or it ends up in one of the external databases.

3.4.2. Expertise and employees

Expertise is variable which is proportional to education of employees and inversely proportional to number of input transactions. Expertise usually influences not only the speed of working in SAP, but also the whole spectre of data which are stored in SAP. Correlation between expertise and employees is shown below:

$$Expertise = 4 \text{ employees in process} * 197.6470$$

- where number 197.6470 represents amount of processed invoices in one month (derived by measuring of the stored processes).

By influencing to the increase of expertise, we also influence the increase of stored data in SAP system. Level of expertise has direct impact on expertise of employees.

3.4.3. Efficient method for employees- Training

Most of the authors are convinced that training is the efficient way to present the employees importance and role of ERP system and its full potential (Birchall, 2012). In accordance to this thesis, employees receive additional training for new transaction. Time of the training is one month. In that period of time, employees attend advanced training. After attending the training, results about storing data are visible in SAP system.

The aim of the training is not only improvement of the technical skills of employees, but also their view on SAP system.

After training employees will store data in much less time and beside that, data that was not stored in SAP system earlier (instead of that it was stored in external databases), will be stored in one place.

Training has its influence on expertise of employees which have coefficient with value 4.64. In accordance with the above text, we can form an equation for employees' expertise:

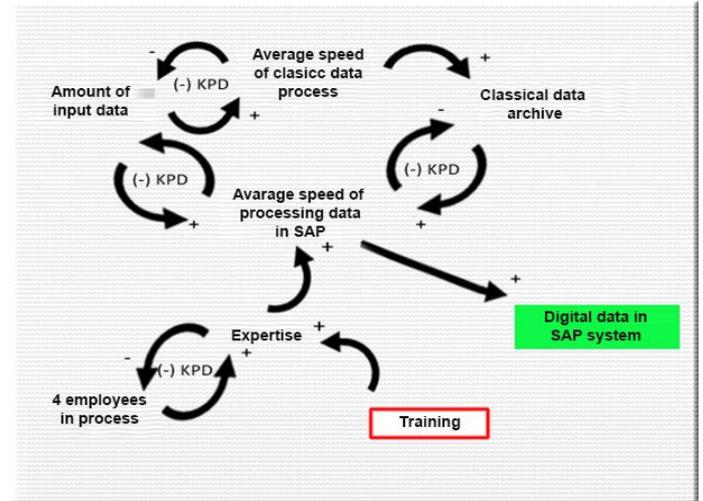
$$Expertise = DELAYPPL (4 \text{ employees in process} * 197.6470 * Training; 1; 4 \text{ employees in process} * 197.6470)$$

- where coefficient of 4.64 represents the ratio between processed invoices before and after training.

3.5. Storing data with structural model

Within the verbal model in previous section, structural model of storing invoices in company is created. Time needed for storing information about invoices in SAP system, and it depends on a training of employees that directly affects their expertise, speed and volume of processing input data. The expertise of employees directly influences at the ratio between input data and data in SAP system. Indirectly, it influences the data in external databases and classical data archives. Structural model is presented in a figure 3.2.

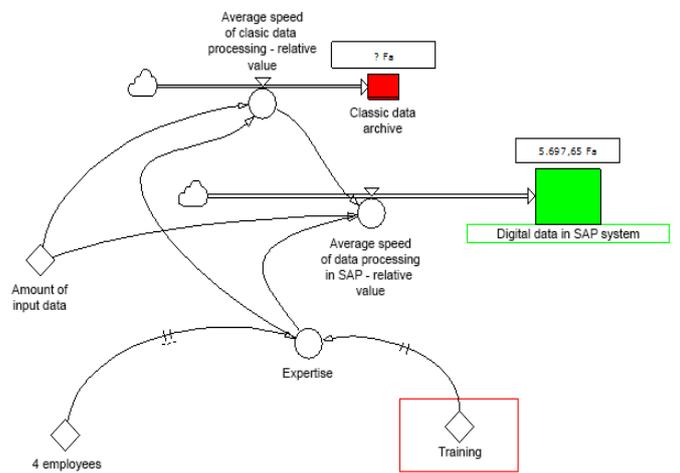
Figure 3.2: Structural diagram of storing the data process in SAP system



3.7.1. Use of the software POWERSIM (presentation of the storing the data model)

The Figure 3.3 presented below and the system dynamic flowchart is shown through the use of POWERSIM tool.³ POWERSIM is object-oriented and each of the symbols in this model of flowchart is defined by the exact equation, which means that this model also represents mathematical simulation model.

Figure 3.3: System dynamic model flowchart of processing data in SAP system



4. BUSINESS BEFORE AND AFTER THE INTENSIVE TRAINING

This section in the article describes mathematical and computing model in accordance with object - oriented POWERISM structure flowchart. The short comparison shall be made between current and improved procedure of

³ Powersim Studio 2003, User's guide, 1997-2003, Powersim Software AS

adding data in SAP system, and quantification of savings after the completed training. Quantification shall withal contribute to the significance of the thesis of this work.

4.1. Computing model of adding the data-mathematical approach

This approach represents the depiction of mathematical – computing model of adding data in SAP system. Initial values are set by estimation of the employees who work with SAP system in the company.

Table 4.1: Flowchart equations

| TYPE | VALUE | No. |
|-------|--|-----|
| init | Digitized data in SAP = 0 | (1) |
| flow | average data processing rate in SAP = $+dt*IF$ (average rate of classical data processing - relative value >0; expertise; MIN (expertise; amount of input data) | (2) |
| init | Classical data record = 3000 | (3) |
| flow | Average rate of classical data processing = $+dt*$ amount of input data - expertise | (4) |
| aux | Expertise = DELAYPPL (4 employees in the process*197.6470* training; 1; 4 employees in the process *197.6470) | (5) |
| const | Transaction input = 500 | (6) |
| const | 4 employees in the process = 1 | (7) |
| const | Training = 4.64 | (8) |

Equations (2) and (4) describe input material flows of *data in SAP* and *data outside SAP*, while equations (1) and (3) define initial conditions of their state. Equation (5) represents the amount of data input in SAP with respect to *the number of input data*, which directly influences the state of *classical data record*. Equations (6), (7) and (8) represent the defined constants; *4 employees in the process* represents a group of employees who are involved in the process of invoice registration. Coefficient 4.64 was obtained by quantifying and comparing the period of time before and after the training.

New process frame

New process means usage of new transactions within SAP system that will quite simply enable automatization of certain steps in the process of reception of invoice. It will therefore contribute to more efficient and faster proceeding of this process. On another hand, electronic signature will be used within the SAP system, with the aim to improve safety criterion, accelerate the signing process, especially through signing from far locations in the case of the director or his/her assistant being absent and so on. This

automated and electronically processed process will significantly made a savings and in time, where on contrary to the former way of receiving invoice, that lasted three days in average, the new calculation enables the accounting within one day even for the worst case.

The key step process of invoice registration:

1. *Supplier delivers the goods and with it the invoice which is submitted to protocol;*
2. *The protocol verifies the invoice, scans it, then joins it in SAP shared folder;*
3. *The original of the invoice is directly sent in the finance department;*
4. *A clerk in the IT department receives a message about the attached invoice through SAP;*
5. *IT clerk affirms the compatibility of the parcel and invoice by “clicking” the “OK” square;*
6. *The procurement clerk receives a message about compatibility through SAP and verifies the invoice;*
7. *The director of the department receives a message about invoice verification through SAP and confirms it by “clicking” the certain square;*
8. *Message about the completed invoice input in SAP system comes through SAP to the clerk in the finance department.*

The improved process excluded mostly physical transmission of the document that was the most time taking in the process and hence shortened the period for 78.43% with respect to the initial period.

Apart from the mentioned acceleration of the process, it is of great importance to mention that a bigger amount of data is saved in SAP. This enables the new possibility of tracking all transactions using SAP ERP system, which shall ease their overview, analysing and reporting.

Figure 4.1: Graphical view of the amount of data within SAP and outside of it

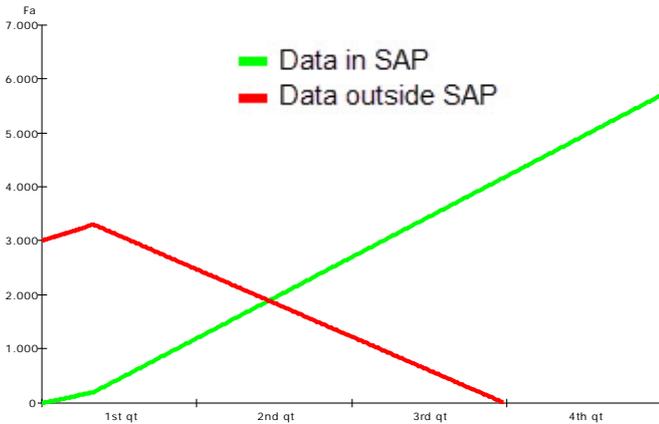


Figure 4.1 shows the chart of data in SAP and out of it. With appropriate training, after a some period of time all the data out of SAP shall be saved in SAP system.

4.2. Savings quantification model

The efficiency of training is easy to be shown monetarily in the way that the gained time is compared with average salary of the employee who works on SAP ERP system. The equation for computing the savings is formed:

On average there are 21 working days in a month, which is = 168 working hours

$$Working\ hour\ value = \frac{average\ salary}{168\ working\ hours}$$

- Savings measured in money shall also be determined with the help of the above equation:

$$Savings = working\ hours\ value * working\ hours\ for\ which\ the\ process\ is\ shortened$$

5. CONCLUSION

The suggested model is used by the authors to emphasize the significance, primarily, of detailed usage of the possibilities that SAP ERP system has, and then the importance of training in accordance with it. The value of this model is insofar higher since it can serve any company using ERP system, for anticipation of administrative output that is influenced by the above mentioned variables which are very important. Coefficients and degrees of influence between the variables can be presented with quite precise, by former research.

It is a fact that software solutions in companies are not used as nearly as their abilities allow them to. In practice, software implementation is not fully made because of various internal factors. The most frequent reason are insufficiently trained employees, or managers who do not know enough about how much the ERP solution can improve the business, which is also a common case.

People need education and constant training in order to achieve the necessary critical level of knowledge (Ridderstrale and Nordstrom, 2006). The quality of the training that prepares employees to work with ERP system significantly affects the usage of this system in practice. Clearly, benefits of thorough data management are enhanced control, better decision making support, improved traceability, standardization of processes which sum in increasing productivity and eventually cost savings.

Bottom line is, no matter how good processes are regulated and organized in a company, if employees do not have a trained and thorough approach to their operating tasks the whole organization will fail to deliver satisfying results.

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