

«USE OF THE INFORMATION SYSTEM IN EVALUATION OF THE PERFORMANCE OF EMPLOYEES»

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Summary

Modern enterprises that function as business systems with a developed information system (IS), make efforts to develop internal models that would directly monitor business activities of all employees, aiming at evaluating their contribution to the realization of particular business processes and to the overall achievements of the enterprise.

The monitoring system within the framework of the IS, can be divided into the security-related level (the level of transactions within the database), the quantitative level (the level of documents, items, amounts and masses), and the qualitative level (the level of financial contribution).

The primary objective of this study is to reveal the importance of monitoring and evaluation of employees' performance [4, 5] within the framework of the IS on the levels of security, quantity and quality. The second objective is to point at several possible criteria which, if incorporated in a business application, can be useful in automatized optimal multi-criteria evaluation and ranking of employees in an enterprise.

Key words: *monitoring of employees' activities, evaluation of performance, multi-criteria ranking, information system, business application.*

1. Introduction

Modern enterprises that operate as business systems with a developed information system (IS), have been trying to develop internal models capable of directly monitoring business activities of all employees, the aim of which is to evaluate their contribution to the realization of particular business processes and to the overall achievement of the enterprise [3].

The system for monitoring performance employees (S) within the framework IS can be divided into three basic levels (Fig. 1).

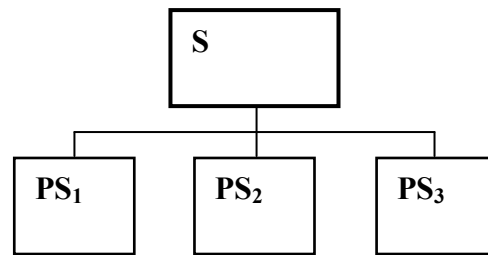


Fig. 1. System for monitoring performance of employees (S) within the framework of IS

The security level (PS1) includes attributing each transaction in the database to a person that has made this transaction. Apart from the security-related aspects of the business database, this level has also a great importance from the psychological point of view, as it makes all employees aware that their performance within the framework of IS, will be registered.

The quantitative level (PS2) comprises a synthesis of all documents and items through which the business processes have been realized per each employee. This level has an operative importance in terms of monitoring the daily dynamics of employees' activities within the framework of IS and in making correctional management decisions regarding improvement of the work process dynamics.

The qualitative level (PS3) includes synthetic textiles of financial contributions as results of business processes along the employee. This level has the exceptional importance for the management because enables periodically the tracking of realization of total function aims companies and functions aims single prominent employees indebted for the tracking of realization purchasing and product line.

By ranking employees on the quantitative and qualitative level and by employing appropriate stimulation as function of the achieved position within a particular rank, it is possible to monitor their progress within an enterprise, detect their affinity for certain business processes and additionally incite their motivation to and creativity in performing business assignments.

The primary objective of this study is to establish the importance of the problems relating to monitoring and evaluating performance of employees within the framework of the IS in an enterprise, on the levels of security, quantity and quality, by introducing business applications. Another objective is to outline several possible criteria which, if built in a business application [1], may serve in the automatized optimal multi-criteria evaluation and ranking of employees in an enterprise.

2. Security level of monitoring performance of employees within the framework of the IS

The participants in an information system usually have manifold roles and their activity is present in one or more modules of the business application.

The most often asked question in the process of investigation of transactions memorized in the database, is their origin, i.e. the identity of the participant in the IS who conducted the transaction.

Obviously, the identity of the executor of transaction can be established only if the database contains data on its executor in addition to the data on the transaction, which is not the case in many active business databases and which, accordingly, appears as a serious problem.

The above suggests that each relation within the relation data model must contain at least the name of executor of the transaction, and the date and time of the transaction.

Should the above described conclusion be accepted as recommendation for the buildup of a logical data model, then we can define the general and basic form of the relation applicable in every entity from the general ERA database model:

$$\mathbf{entity} = (\mathbf{primary_key}, \mathbf{user_name}, \mathbf{user_date}, \mathbf{user_time}, \dots), \quad (1)$$

where: $\mathbf{primary_key}$ is - primary key of the relation,
 $\mathbf{user_name}$ is - name of the user of the business network,
 $\mathbf{user_date}$ is - date of transaction realization,
 $\mathbf{user_time}$ is - exact time of transaction realization.

The above-outlined form of relation on the level of the physical data model, ensures memorizing of data about the last executor-owner of transaction within the scope of each record in the database, and this is the foundation of each model of evaluating the performance of employees through the business application.

The security-related level of monitoring performance of employees within the framework of the IS, as described above, may have a great positive psychological effect on the users of the IS, as they become aware of the fact that each of their activities within the IS remains registered in the database and is linked with his user name.

3. Quantitative level of monitoring performance of employees within the framework of the IS

The quantity-related level implies monitoring and evaluation of the daily dynamics of development of business processes and obtaining information on the overall size of the work performed by employees during work hours of just one day, or several days. The quantity-related level is based on establishment of the security-related level described in Item 2.

The application of this method enables ranking of employees per a number of criteria.

Performance of employees, with regard to particular departments, can be divided into two basic groups:

- administrative - commercial department (processing of various commercial documents through business application);
- physical - shipping department (physical manipulation of goods at the warehouse, loading, unloading).

Systematical memorization of data-based transactions linked with the above mentioned activities by employing the IS business application, enables mutual ranking of employees within particular departments by several criteria.

Some of available criteria for quantitative evaluation of the commercial department have been described in Table 1. As per those criteria, the contribution (**Dkomsek**) of the i^{th} employee in the commercial department ($i=1, M_1$), can be described by the following function of criteria (**f**):

$$D_{komsek_{i(i=1,M_1)}} = f(KIDOK_i, KRDOK_i, KBSIDOK_i, KBSRDOK_i, KKKOL_i) \quad (2)$$

Since the criteria in expression (2) have different relative significance in the multi-criteria evaluation of employee's overall contribution, it is necessary to weight them.

Approximate, empirical values of the weight are given in Table 1.

Table 1. Weights of quantitative criteria relating to the commercial department

Criterion	Weight of Relative Significance	Description
KRDOK	1	Number of commercially realized documents
KBSRDOK	2	Number of items in commercially realized documents
KKKOL	3	Commercially realized amounts of articles per unit of measure
KIDOK	4	Number of processed documents
KBSIDOK	5	Number of items in the processed documents

Some of available criteria for quantitative evaluation of the shipping department are described in Table 2. According to those criteria, the contribution (**Dsklsek**) of the j^{th} employee in the shipping department ($j=1,M_2$), can be described by the following function of criteria (**f**):

$$D_{sklsek_{j(j=1,M_2)}} = f(SRDOK_j, SBSRDOK_j, SRKOL_j, SRMASA_j) \quad (3)$$

As the criteria in expression (3) have different relative significance, it is necessary to weight them. Approximate empirical values of the weight are given in Table 2.

Table 2. Weights of quantitative criteria for the shipping department

Criterion	Weight of relative significance	Description
SRDOK	1	Number of outgoing documents prepared for the shipping of goods
SBSRDOK	2	Number of items in the documents prepared for the shipping of goods
SRKOL	3	Shipped amount of goods per unit of measure
SRMASA	4	Shipped mass of goods in kilograms (kgs)

The quantity-related level of evaluation of employees' performance within the framework of the IS, constitutes the basis for management of human resources included in the business processes, as they enable establishment of the rank of employees per distinctive criteria, as described in Table 1 and Table 2, depending of the department in question.

Accordingly, the multi-criteria ranking of employees as an important function of the IS, should be worked out in an optimal manner in terms of business application, i.e. by employing methods of dynamic programming and some of the methods of multi-criteria ranking [2].

4. Qualitative level of monitoring employees' activities within the framework of the IS

Unlike the quantitative level that quantifies dynamic effects of employees' performance in the scope of business processes in real time, the qualitative level is more directed towards periodic monitoring of financial effects and relates mainly to the commercial department. The basis of the quality level is also establishment of the security level, as described in Item 2.

For example, a sales officer makes several offers in a certain time period and none of them results in the sale of goods, whereas another sales clerk writes only a few offers and effectuates most of them.

Another example: a sales clerk commercially effectuates a number of documents of minor financial value with a number of customers, whereas the other clerk makes considerably better financial results with just one document and just one customer.

The question here is how to evaluate and rank employees with such results?

Quantitative indicators of employees' performance are important in terms of management of the overall business processes, whereas qualitative indicators are important on the level of management of overall financial results and measurement of individual contribution of employees to these results.

In enterprises with a developed commercial function, this level of monitoring and evaluation of employees' performance becomes extremely important and just as complex, and it entirely relies on the power of the business application.

Some of the possible criteria for a qualitative evaluation of the commercial department are given in Table 3. According to these criteria, the contribution (**Fkomsek**) of the k^{th} employee to the overall financial effects ($k=1, M_3$), can be described by the following function of criteria (**f**):

$$\mathbf{Fkomsek}_{k(k=1, M_3)} = \mathbf{f} (\text{PRDBRUTO}_k, \text{PRDRABAT}_k, \text{PRDFAKT}_k, \text{PRDRUC}_k, \text{DUGPVAL}_k) \quad (4)$$

Since the criteria in expression (4) have different relative value, it is necessary to weight them as well. Approximate empirical values of the weight are given in Table 3.

Table 3. Weights of financial criteria in the commercial department

Criterion	Weight of relative significance	Description
NPRDRUC	1	Collected price differential
NPRDFAKT	2	Collected invoiced value without tax
DUGPVAL	3	Uncollected overdue debt
FPRDFAKT	4	Net invoiced value without tax
FPRDBRUTO	5	Gross invoiced value without tax
FPRDRABAT	6	Value of approved rebate

The qualitative level of evaluation of employees in the commercial department within the framework of the IS is particularly dubious, due to certain factors in Table 3, which are completely in opposition with each other. E.g. a certain sales clerk may have a considerable invoiced realization, but poor collected receipts from sales. Another clerk may have a considerable collected receipts from sales, but at the same time great uncollected and overdue debts, etc. In practice, the NPRDRUC criterion is most frequently identified as the most important one, because it directly indicates the amount of the profit made.

The qualitative level of evaluation of the contribution of each employee is the foundation for the management of material and financial resources in enterprises, and it is extremely important for the management, which in that respect requires more power and support from the business application and the IS as a whole.

5. Conclusion

Today the information systems constitute the foundation for functioning of the business system in an enterprise, while the foundation of the information system lies in one or more integrated business applications, and without them the management of business processes is no longer possible.

One of the most important functions, which becomes more and prominent on the level of management and which should be supported by modern business applications, is monitoring and quantitative and qualitative evaluation and ranking of employees and they have direct effects on optimal management of a business system.

The realization of this function is based on the capabilities of the data model according to which the business application database is structured. This function depends on the business strategy of the management in relation to the employees. The more state-of-the-art this business strategy and the higher level it is on - the more weight has the function of monitoring and evaluation of employees' performance.

Accordingly, this study analyzes the issue of monitoring and evaluation of employees' performance at three different levels: security, quantity and quality of performance.

The proposal relating to the security level given in expression (1), Item 2, can be - if accepted as a general data model - extremely useful in the development of a system of evaluation of employees' performance within the scope of business applications, as it eliminates a whole range of problems that occur at the later stages of the IS's life cycle, precisely because of the flows in the data model.

The functions of contribution of employees (2, 3, 4), developed within the scope of the quantitative and qualitative levels, with the accompanying criteria and weights for multi-criteria evaluation and ranking, and which are based on good practical experience of the authors in designing successful business applications - can also serve as a starting point in solving complex problems of managing human resources and measuring their overall contribution to the business system in real time on the level of the business application.

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