HR Systems as a New Method for the Automatization of Business Processes in Organization

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Abstract. In this article, a comparative overview of business process optimization using HR systems is given. Key characteristics, prospects and significance of this innovation in organizations are considered. An example of integration of human resource management systems for automation in the enterprise is covered.

1. Introduction

One of the main trends in the development of the market for automated personnel management systems and WFM applications as a whole is to ensure the full functionality of the enterprise [1]. Synchronization of terms of employee’s contracts with the results of their work, the selection of trainings for further professional and career growth are priority tasks for automating business processes in the field of personnel management for the organization. It is likely that the new HR-systems will realize the possibility of managing personnel costs and mapping business processes for each department. Such an advantage will help automate the unified corporate system of the enterprise, bring it to a new level by reducing costs and increasing competitiveness [2].

2. Analysis of Data Processing Methods in HR Services

Data is created, stored, updated and used by employees and HR managers on a daily basis. Such business processes are quite common and often go unnoticed, although they can be optimized. For example, a human resources recruiter who looks at a job applicant’s resume and then registers it for follow-up, collects, uses and stores business data about potential hiring. Indeed, the efficient collection, storage and use of data is essential for any business, and the most successful organizations control these processes. Many people believe that effective data management and turning them into information using software is the competency needed to succeed in today's market.

The main task of modern automated personnel management systems is to optimize the work, first of all, of the management and personnel of the HR services of enterprises. Automated storage and processing of personnel information allows efficient selection and movement of employees. Moreover, with the help of HR-systems, it is possible to carry out payroll accounting regarding information on staffing positions, vacations, sick leave, business trips, benefits and penalties.
3. The Mathematical Model of the HR Systems Optimization

In mathematical modeling, many factors of production are replaced by fixed capital $K$ and living labor $L$, which are obtained by the aggregation operation. Due to this, the probabilistic optimization model is greatly simplified. Factor $K$ includes all external factors of production (in this case, the automation of business processes), while factor $L$ represents the live labor of workers in all types of activities performed during the business process.

The production factors $K$, $L$ and the final product $y_{out}$ at the output of the process system are subject to optimization. As a result, their optimal values, which will be best in a situation of priori uncertainty regarding favorable, likely, risky results and process conditions. To write a probabilistic optimization model with two variables, we express through $K$ and $L$ all the interval-stochastic values of the model: profit $[Pr_{Ch,R}(w)]$, selling prices of the final product manufactured $[p_{Ch}(w)]$, production factor prices $[p_{R}(w)]$, investment volumes $[I(w)]$, and full process costs $[C_{Ch,R}(w)]$, both under the odds $(Ch)$ and under the risky $(R)$ conditions:

$$\begin{align*}
[Pr_{Ch}(w)] &= [s_{Ch,y_{out}}(w)]_{Ch}*y_{out}-[p_{Ch}(w)]*K-[r_{Ch}(w)]*L, \\
[Pr_{R}(w)] &= [s_{R,y_{out}}(w)]_{R}*y_{out}-[p_{R}(w)]*K-[r_{R}(w)]*L, \\
[C_{Ch,R}^{\text{ext}}(w)] &= [p_{Ch}(w)]*K+[r_{R}(w)]*L, \\
[C_{Ch,R}^{\text{int}}(w)] &= [p_{R}(w)]*K+[r_{R}(w)]*L.
\end{align*}$$

A probabilistic optimization model expressed in terms of production factors $K$ and $L$ takes the following form ($\theta_{Ch} + \theta_{R} = 1$):

- optimization criterion:

$$P \left[ \max_{K,L} \left( \theta_{Ch} \left[ [s_{Ch,y_{out}}(w)]_{Ch}*y_{out}-[p_{Ch}(w)]*K \right] + \theta_{R} \left[ [s_{R,y_{out}}(w)]_{R}*y_{out}-[p_{R}(w)]*K \right] \right) \right] \geq \alpha. \tag{5}$$

- limitation on the profit of the process (condition):

$$\begin{align*}
P_{Ch}*P\left([s_{Ch,y_{out}}(w)]_{Ch}*y_{out}-[p_{Ch}(w)]*K-[r_{Ch}(w)]*L\right) \geq Pr_{Ch}^{\text{ext}}|Ch| + P_{R}*P\left([s_{R,y_{out}}(w)]_{R}*y_{out}-[p_{R}(w)]*K-[r_{R}(w)]*L\right) \geq Pr_{R}^{\text{ext}}|R| \geq \beta. \tag{6}
\end{align*}$$

- budget constraint:

$$\begin{align*}
P_{Ch}*P\left([p_{Ch}(w)]*K+[r_{Ch}(w)]*L\right) \leq [I(w)]_{Ch} + P_{R}*P\left([p_{R}(w)]*K+[r_{R}(w)]*L\right) \leq \gamma, \tag{7}
\end{align*}$$

where $K, L \geq 0$.

Interval-stochastic factors in a probabilistic optimization model being the sums of pairwise independent and uniformly distributed values (prices of production factors $[p_{i}(w)]$, selling prices of the final product produced $[s_{i,y_{out}}(w)]$, investment volumes $[I(w)]_{Ch/R}$) have symmetric probability densities and distribution functions that are convex or concave functions relative to the inflection point in parts interval of the domain of definition. When the number of terms in the sum is equal to one or two, the probability distribution functions are determined respectively by the interval-stochastic uniformly distributed value, and for three or more terms, they have the normal distribution law.
4. The Overview of the Modern Market for HR Process Automation Systems in Russia

In the Russian market there are a huge number of automated personnel management systems. The main advantages and advantages of Russian programs for optimizing business processes in personnel management over Western ones are the low price and adaptability to the Russian accounting system and HR administration, while the wider and more complete functionality of HR systems is an advantage of the Western ones.

Table 1. Classification of automated personnel management systems.

| Local | Medium, integrated | Large, integrated |
|-------|--------------------|-------------------|
| Human Resources Package by "INFIN" company; Automated workstation "Personnel Accounting" by the "Infosoft" company; Automated personnel management system "Pharaoh" | "E-Staff"; "BOSS-Personnel" by the "BOSS.Persoanel systems" company; Module "Personnel and Staffing" of the company "Corporation PARUS"; "1C: Salary and personnel management 8.3" | SAP R/3 "Personnel"; "Oracle Applications": "Human Resource Management"; "PeopleSoft"; "Baan HR & Payroll"; Microsoft Dynamics AX |

At small enterprises in Russia, the most popular were the E-Staff and 1C programs: Salary and HR 8.3. The cost of Russian personnel management systems varies from 300,000 rubles to 800,000 rubles per year. The price of Superjob's HR system for 2019 was approximately 600,000 rubles. Western automated personnel management systems are more expensive - from 1 million rubles per year. Most companies pay for work site packages to automate the maintenance of a database for a recruiter. This software simplifies the interview process by informing the recruiter about the candidate’s data and then forming the questionnaire in a decentralized way. E-Staff is primarily used by recruitment companies such as Superjob and HeadHunter.

HR-systems significantly save time and costs of the enterprise. To do this, we will conduct a comparative analysis of the cost of the "1C: Salary and HR Management 8.3" program for the corporate and professional versions and for the costs of the enterprise without introducing innovation.

The corporate version is used mainly in large and medium-sized Russian enterprises, while the professional version is used in smaller ones.

Table 2. Comparative cost analysis using the HR-system and without its implementation in the enterprise.

| Factor                      | "1C: Salary and personnel management 8.3 CORP" | "1C: Salary and HR Management 8.3 Prof" | Company (without innovation) |
|-----------------------------|-----------------------------------------------|----------------------------------------|-----------------------------|
| Price                       | 109 000 Rub                                  | 27 300 Rub                            | -                           |
| Additional license for 1 workplace | 6 300 Rub                                   | 6 300 Rub                             | -                           |
| Salary for the year (3 people) | -                                           | -                                      | 1 260 000 Rub              |
| Amount                      | 115 300 Rub                                  | 33 600 Rub                            | 1 260 000 Rub              |

The average salary of an employee is 35,000 rubles. The company usually employs three employees in the field of recruiting and personnel management. Annual salary costs will be:

\[35 000 \times 3 \times 12 = 1\ 260\ 000\ \text{rubles.}\]
Optimization with the help of an automated personnel management system reduces costs at the enterprise by about 11 times when using the corporate version of software, and for the professional version by 37.5.

5. Conclusion

HR-systems help to manage the structure of the organization, store data for each employee, carry out strategic planning of staff development (individually [3], in groups and teams, and in general) and strategic management of commercial organizations [4] and modern transnational corporations [5], taking into account the business goals of the enterprise. Structured and visual information helps to focus on human resources management tasks. Moreover, such systems significantly reduce the work with documentation, create a database in which all information will be stored.

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