Modeling and Optimization of Information Resources in Aerospace Systems

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For aerospace systems to function, it is required to comply with the guaranteed amount of information restrictions x_j^Y :

$$x_j \geq x_j^Y, i = \overline{1,n}. \tag{1}$$

Index j corresponds to the *j*-th solution.
Then we can form such an optimization model:

$$\sum_{j=1}^{n} C_j x_j \to max, \quad \sum_{j=1}^{n} \eta_{gj} x_j \leq x_g, g = \overline{1, G}, \quad \sum_{j=1} q_{gj} x_j \leq Q_g, g = \overline{1, G},$$

$$\sum_{j=1} q''_{gj} x_j \leq Q''_g, g = \overline{1, G}, \sum_{j=1}^{n} q_j x_j \leq Q, \sum_{j=1}^{n} \sum_{g=1}^{G} \beta_{gj}, \tag{2}$$

$$\eta_{gj} x_j \leq B, \quad \sum_{j=1}^{n} \beta''_j x_j \leq B'', \quad \sum_{j=1}^{n} \sum_{k=1}^{KP} \tau_{jk} x_j \leq \Phi, \quad x_j \geq x_j^Y, \quad j = \overline{1, n}.$$

When variational modeling approaches are applied to (2), then procedures for changing variables are implemented.

$$x_j = x_j - x_j^Y, j = \overline{1, n}, \quad \sum_{j=1}^{n} C_j X_j \to max,$$

$$\sum_{j=1}^{n} \eta_{gj} X'_j \leq X_g - \sum_{j=1}^{n} X_j^Y, \quad g = \overline{1, G}, \quad \sum_{j=1}^{n} q'_{gj} x'_j \leq Q'_g - \sum_{j=1}^{n} q'_{gj} x_j^Y, g = \overline{1, G},$$

$$\sum_{j=1}^{n} q''_{gj} x'_j \leq Q''_g - \sum_{j=1}^{n} q'_{gj} x_j^Y, g = \overline{1, G},$$

$$\sum_{j=1}^{n} q_j x'_j \leq Q - \sum_{j=1}^{n} q_j x_j^Y, \tag{3}$$

$$\sum_{j=1}^{n} \sum_{g=1}^{G} \beta'_{gj} \eta_{gi} x'_j \leq B' - \sum_{j=1}^{n} \sum_{g=1}^{G} \beta'_{gj} x_j^Y,$$

$$\sum_{j=1}^{n} \beta''_j x'_j \leq \sum_{j=1}^{n} \beta''_j x_j^Y, \quad \sum_{j=1}^{n} \sum_{k=1}^{KP} \tau_{jk} x'_j \leq \Phi - \sum_{j=1}^{n} \sum_{k=1}^{KP} \tau_{jk} x_j^Y, \quad x'_j \geq 0, \quad j = \overline{1, n}.$$

The aerospace system was considered, in which it was necessary to rely on appropriate mathematical methods.

A total of 105 objects were considered in the system. They included information resources. Among them are: servers, developer jobs, warehouse jobs, jobs of departments that are involved in providing services.

By using optimization approaches, the efficiency of the analyzed system can be increased.

In Fig. 1 we can see the illustration the dynamics of some key indicators.

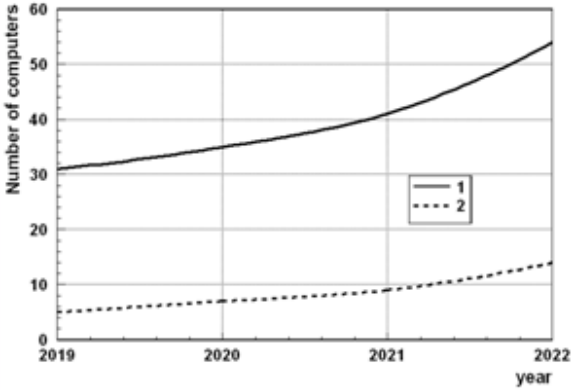

FIGURE 2. Illustration of prediction number of computers

In fig. 2, the values for the following indicators were predicted:

1- the number of developer computers, 2 - the number of computers in warehouses.

In order for the indicated values to be achieved, it is required to monitor and control the implementation of the developed algorithms. Also, corporate information resources are used optimally.

Taking into account the corresponding restrictions on the number of information sources - no more than 70, on the guaranteed amount of information - no more than 10 GB, a forecast was made in terms of processing time. It is shown in Fig. 2.

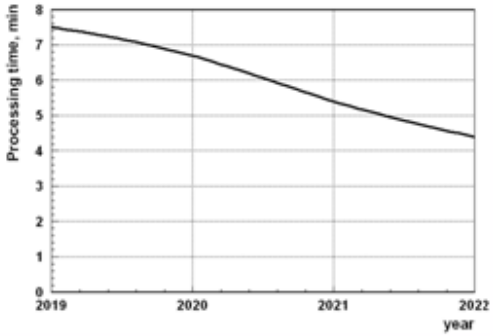

FIGURE 2. Illustration of prediction of processing time

CONCLUSION

The quality as well as the effectiveness of management decisions in the aerospace sector can be improved through the use of mathematical methods and optimization approaches. Studies have shown that such an increase will be at least 5-10%. In the course of the development of the aerospace system, the weight of this effect will be more significant. In the course of its control, it is necessary to adequately formalize the multi-alternative choice of parameters in order to optimize the selective collection and processing of information. It is necessary to collect primary data, carry out their processing and conceptual integration, carry out variational modeling taking into account solutions to linear programming problems in order to make management decisions. In order to form a rational system for the development of the aerospace sector, it is necessary to focus on the use of integrated approaches related to the transfer of information resources, which include standard components in the relevant areas of potential development.