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Calculation of priority requests to IT Helpdesk of the airline

A model of flexible management of priorities in requests for IT services of airline employees based on the use of set theory operations to build data processing algorithms [1]. The model is adapted for implementation in the Helpdesk system implemented in the airline's corporate network on the MS SQL Server database server platform.

Prioritization of IT services

When prioritizing IT service requests, various factors come into play. An object-oriented approach allows to assign a priority indicator to each system object. Depending on the object's origin, its priority can be either independent or dependent. Simple objects that do not rely on others have their own priority, while dependent objects have a priority that can be calculated based on the priorities of the objects they depend on.

To classify the IT service system's objects lets divide them into two classes: simple (independent) and complex (dependent on other objects). Let's simplify the cases where an object has both a calculated priority and an additional priority component.

The simplest way to calculate the dependent priority of an object is to multiply the priorities of its subordinate objects. If priorities are represented by natural numbers, the lowest value, such as 1, is considered the highest priority, with higher values following in reverse order.

Let's examine specific types of objects within the IT service system for airline employees. Starting by looking at independent objects, which can influence the priority of dependent objects. The order of defining independent objects does not affect their impact on the priorities of dependent objects, as their priorities serve as simple multipliers in the calculation process.

Airline departments. Different departments within an airline may have varying priorities for IT service requests. For instance, the smooth functioning of the flight crew and controllers in the flight department is crucial for flight safety. Therefore, requests from aircraft maintenance units should be prioritized over requests from the financial department. The specific priority values are determined through expert evaluations.

The ratio of subdivisions is defined based on their D_ID codes, D_NAME names, and D_R priority values:

$$D = \{d \mid d \in (D\_ID \times D\_NAME \times D\_R)\},$$

with corresponding elements:

$$d = (d\_id, d\_name, d\_r).$$

User roles. The priority of user requests depends on their role in ensuring the continuous and reliable operation of departments. For example, a technician maintaining an aircraft at an airfield during the interflight period will have a higher

priority than an engineer in the same division who is planning the aircraft maintenance program for the next month.

The relationship between positions, division codes (D_ID), position codes in the corresponding divisions (P_D_ID), their names (P_D_NAME), and priority values (P_D_R) is structured as follows:

$$P = \{p \mid p \in (D\_ID \times P\_D\_ID \times P\_D\_NAME \times P\_D\_R)\},$$

with corresponding elements:

$$p = (d\_id, p\_d\_id, p\_d\_name, p\_d\_r).$$

The presence of the "d_id" value in each "p" element indicates that the actual priority of the position depends on the priority of the department in which the position is located. When calculating the priority of an IT service request, let's consider the priority of the department by multiplication, which is also part of the request's complex object.

IT request location. The IT department's employees handle all requests received in the Helpdesk system. Processing conditions may vary. Some requests can be completed remotely, while others may require the presence of an IT employee at the airline's main office or at a location within the base airport. Fulfilling requests from employees in foreign offices sometimes requires a business trip. These circumstances affect request timing and can be adjusted by assigning different priority values.

The relationship between locations on sets of subdivision codes ("D_ID") and the location codes for corresponding subdivisions ("L_D_ID"), their names ("L_D_NAME"), and priority values ("L_D_R") is as follows:

$$L = \{l \mid l \in (D\_ID \times L\_D\_ID \times L\_D\_NAME \times L\_D\_R)\},$$

with corresponding elements:

$$l = (d\_id, l\_d\_id, l\_d\_name, l\_d\_r).$$

Services, jobs and plans for fulfilling requests. The IT service for employees of any enterprise is structured around a catalogue of IT services, and airlines are no exception to this. For instance, the catalogue of IT services of the airline company "International Airlines of Ukraine" is organized into three levels: services, works included in the services, and plans for the execution of these works.

The catalogue comprises over a hundred items relating to airline services. Some services are used by all employees, such as network support, while departments like flight operations, aircraft maintenance, and sales play crucial roles within the airline. Each IT department supports complex software and technical systems used by hundreds of users. There are also services that are required by a few or even just one employee. The priority for each service is determined through expert evaluations.

The priorities of service support work may vary. Routine tasks, like installing the system on a new user's computer or granting/changing access rights, are automated and completed remotely with minimal time requirements. On the other hand, tasks like developing a new report may take several days. A quick task might take precedence over a lengthier one.

Additionally, work plans and their priorities are influenced by various factors such as time, day of the week, and location. Assuming that additional information about services, works, and plans does not impact the determination of their priorities, will simplify the management of the priority model.

We can define the catalogue of services as a set of relations for service objects, work objects, and execution plan objects. Each of these objects can have its own priority:

$$S = \{s \mid s \in (S\_ID \times S\_NAME \times S\_R)\},$$
$$T = \{t \mid t \in (S\_ID \times T\_S\_ID \times T\_S\_NAME \times T\_S\_R)\},$$
$$E = \{e \mid e \in (T\_S\_ID \times E\_T\_S\_ID \times E\_T\_S\_NAME \times E\_T\_S\_R)\}$$

with corresponding elements:

$$s = (s\_id, s\_name, s\_r),$$
$$t = (s\_id, t\_s\_id, t\_s\_name, t\_s\_r),$$
$$e = (t\_s\_id, e\_t\_s\_id, e\_t\_s\_name, e\_t\_s\_r).$$

In cases where positions, locations, work codes (t_id), and service codes (s_id) are involved, the direct reliance of execution plans on work codes and works on service codes provides an opportunity to delay the calculation of actual work priorities and their execution plans until the calculation of request priorities.

Requests for IT services are interdependent. Hence, their priorities are not isolated but are contingent on the components and need to be calculated accordingly. The representation of these requests (denoted as Q) is constructed based on sets of airline divisions (D), positions (P), locations (L), services (S), works (T), execution plans (E), and other components, such as sets of company employees, IT service performers, and time standards for execution. It can be assumed that these other components do not influence the prioritization of requests and do not complicate the model:

$$Q = \{q \mid q \in (D \times P \times L \times S \times T \times E \times R)\},$$

The set R contains the calculated priorities of requests:

$$R = \{r \mid r = d\_r * p\_d\_r * l\_d\_r * s\_r * t\_s\_r * e\_t\_s\_r,$$
$$d\_r \in D\_R, d\_id \in D\_ID,$$
$$p\_d\_r \in P\_D\_R, p\_d\_id \in P\_D\_ID, p\_d\_id=d\_id,$$
$$l\_d\_r \in L\_D\_R, l\_d\_id \in L\_D\_ID, l\_d\_id=d\_id,$$
$$s\_r \in S\_R, s\_id \in S\_ID,$$
$$t\_s\_r \in T\_S\_R, t\_s\_id \in T\_S\_ID, t\_s\_id=s\_id,$$
$$e\_t\_s\_r \in E\_T\_S\_R,$$
$$e\_t\_s\_id \in E\_T\_S\_ID)$$
$$e\_t\_s\_id=t\_s\_id\}.$$

Calculating the priorities for user requests for IT services can be done by running the SQL procedure stored on the airline database server using the technologies available in the airline [2]. After identifying all the elements in the request that influence its priority, it is necessary to make changes in the structures of the relevant database tables and the software of the Helpdesk system site to save and edit expert assessments of the priorities of independent objects. This will allow the calculated priorities of requests to be used for sorting and display.

In conclusion, the proposed mathematical model for managing the priorities of IT service requests meets the intended goal. This model has been implemented in the

Helpdesk system at the airline "Ukraine International Airlines" and has been put into operation along with means of organizing user access [3].

References

1. Сураєв В.Ф., Мазур В.І., Фоміна Н.Б. Організація потоків даних в системі формування завдань на технічне обслуговування літаків. Комп'ютерні системи та мережні технології (CSNT-2024): XV міжнар. наук. – прак. конф., 25–26 квітня 2024 р.: тези доп. – К., 2024. – С. 158-159.
2. Suraiev V., Mazur V., Ivankevsch O. Effective approach to minimization of the cost of airline's intersystem interfaces creation. The Ninth World Congress "AVIATION IN THE XXI-st CENTURY". – Kyiv, September 22-24, 2020
3. Сураєв В.Ф., Мазур В.І. Оптимізація сукупної вартості міжсистемних інтерфейсів. - Проблеми інформатизації та управління. – К.: НАУ, 2019. – Вип. 1 (61). – С. 7-10.