SOFTWARE APPLICATION FOR POSTAL ITEMS ROUTING AS PART OF POSTAL SYSTEMS` CRITICAL INFRASTRUCTURE

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Abstract: *Postal network is the most developed and complex logistical infrastructure in the world. The complexity is determined by the number of participants, which either require or perform postal services and by manipulating with a large number of postal items handling billions of them on daily basis globally. A basic request is that the shipment is transferred safely and on time to the recipient. A mass production, many sorting points in the supply chain and variety and stochasticity of delivery addresses are aggravating circumstances for this goal fulfillment. Accordingly, postal operators need the most advanced technological systems for sorting and processing. This paper proposes the concept of addressing based on the three levels of postal units and the software application created for the routing of postal items in the system of this kind.*

Keywords: POSTAL TECHNOLOGY, SHIPMENT, ROUTE, SOFTWARE

1. Introduction

Postal network is the most developed logistics infrastructure in the world. The complexity is determined by the number of participants that demand and offer postal services.

The most developed postal or courier operators in the world (DHL, FedEx, UPS, USPS etc.) work with their innovative and modern infrastructure, covering the largest part of the market. All their systems are kept in step with modern method of business, from receiving to delivery points. In this way, modern and efficient processing centers are equipped with the most efficient technological systems for sorting. By the same principle, the transport resources of new generation are the part of modern postal systems that base operations on efficiency and principles of sustainable development. From the users' point of view, the most important parameter of the quality of postal service is the safety of postal shipments. [4]

The parameter of safety refers to the shipment loss or damage. In order to improve this part of service, the concept of sorting, routing and transportation of postal shipments has a vital role. In this paper, the concept of addressing which is based on three levels of postal network is suggested, and beside this the software application for routing of the postal shipments in that systems is created.

2. The Concept of Addressing

The suggested concept of addressing is based on the numerical addressing coding system where an address is presented by four digits. It is suitable for the internal use in certain postal systems or as the main concept of addressing in smaller postal systems, because of its simplicity and its impossibility to divide territory into the smallest units of delivery.

Addresses include three observed levels of postal units. With the appropriate modifications, it is possible to adjust the software to any of the existing ways of addressing (Postal Address Code, standard postal number....)

The structure of address is the following:

A B C D

where:

- A – is ID number, assigned from the software (system) and it is virtual warehouse of addresses' storing,
- B – refers to the postal units of the first level,
- C – refers to the postal units of the second level,
- D – refers to the postal units of the third level.

This structure shows that the concept of addressing is suitable for smaller systems or the internal use, as previously said. The implementation on larger systems is possible by using new or existing ways of addressing, but with the change of address part in the software and logic of routing. By adding another character behind A, the adjustment is carried out to the particular postal system where business operation is based on four levels. By adding one more character, the needs of the five-level system are met etc.

3. Software For Routing Of The Postal Shipment

The usefulness of software tools in modern business is very important. The time of business operations is reduced, as well as necessary efforts and costs for accomplishing certain operations. The software proposed in this paper represents the plan how the shipments routing should function in postal system, and where it should be located in business information systems and interfaces.

The model with functionality is created for postal system, and it is organized in three levels because it has been noticed that the most postal companies operate in this way. An example for this way of functioning could be found in the "Post of Serbia", where its infrastructure is divided into executive units (units for offering services), postal centers and main postal centers. [2]

3.1 The levels of postal units included in the software model

The current levels in the model of postal system are: Postal units of the first level, Postal units of the second level and Postal units of the third level. The supremacy of units is determined respectively. The communication operates between the third and the second level, as well as between the second and the first level.

The first level includes big processing centers, in which all shipments arrive from a certain larger area. In these units these shipments are processed, sorted and dispatched to other units of the first level. The examples in the system of "Post of Serbia" are the main postal centers.

The second level refers to the centers, in which all shipments arrive from certain smaller area, which are dispatched from them to the superior units of the first level. The examples in the system of „Post of Serbia" are the postal centers.

The third level are units in which the collection of mail is performed, as well as delivery on their territory, i.e. these units offer services to final users. The third level covers local areas where all shipments are dispatched to the superior unit of the second level. The examples in the system of „Post of Serbia" are the units where postal services are offered to users.

3.2 Structure of interfaces

When the software run, a registration of unlimited number of users is enabled, which can be on administrator level or a common user, i.e. employee in postal system (Fig.1, Fig. 2).

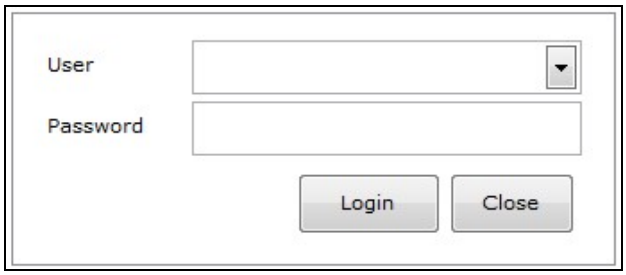

***Fig. 1** User login*

Beside primary operations (shipment reception), administrator has a possibility to use so-called advanced options (Fig4). These options represent possibility of defining:

- new users,
- locations in postal systems,
- hierarchy,
- new addresses,
- new routes.

These options are not allowed to a common user (to employee in postal system). Only access to the part of shipment reception is allowed.

This part (Fig. 3) enables filling in the primary data about sender and receiver, which are dispatched to the database and warehouse as following information. The fields that label identity numbers of the Post Office of sender and receiver have got a vital role, according to the explanations of the addressing concept. It is possible to add appropriate reference or comment with every shipment in the same field which is predicted for that purpose.

After filling in the addresses of sender and receiver's Post Office, it is possible to define the route where shipments should be sent to. In this part, unit of measure (package, bag and pallet) is defined, as well as its quantity and weight.

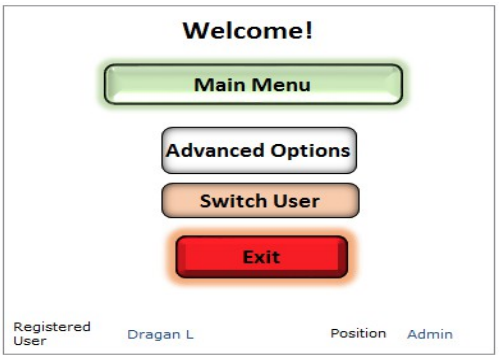

***Fig. 2** Menu*

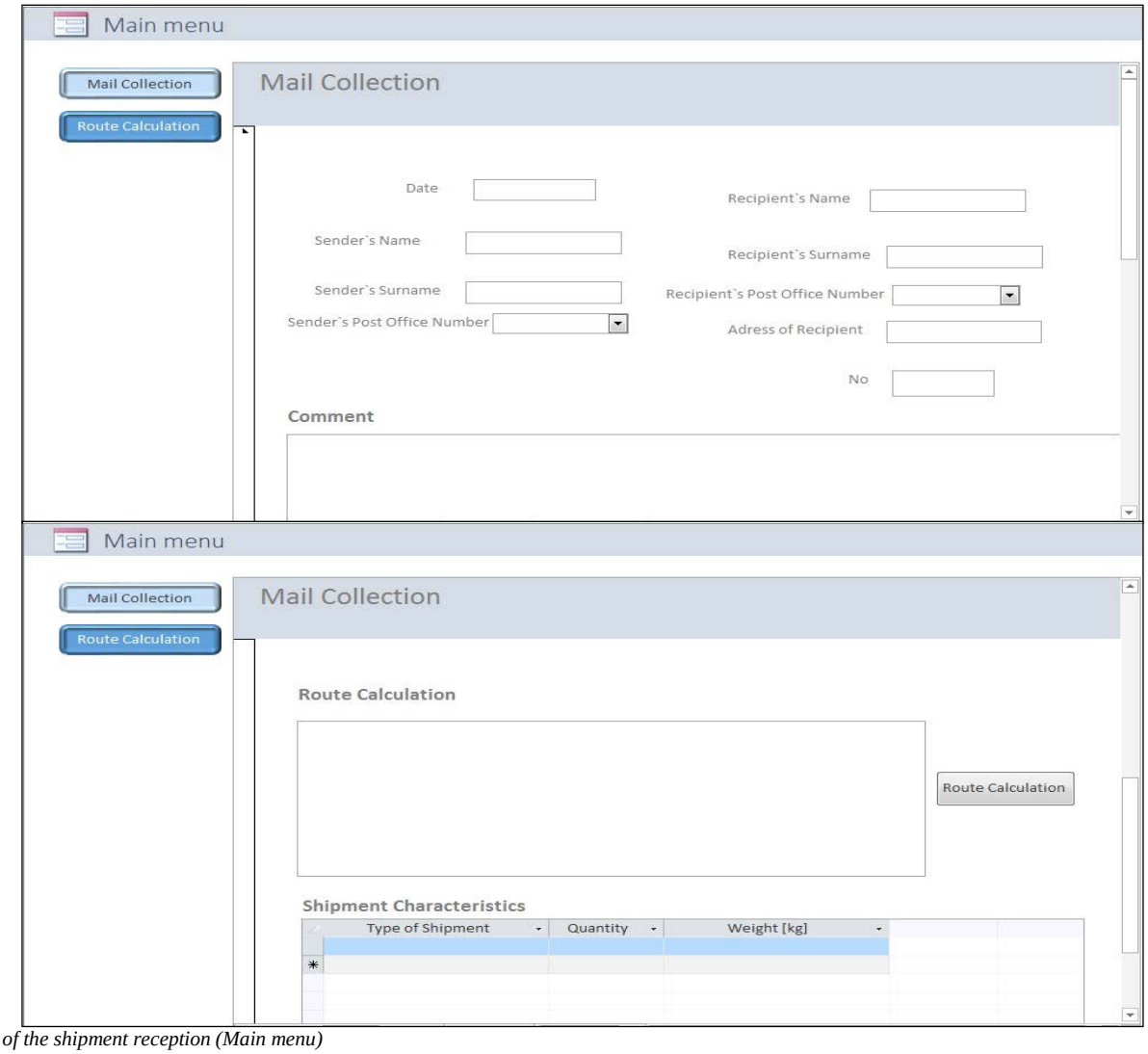

***Fig. 3** Part of the shipment reception (Main menu)*

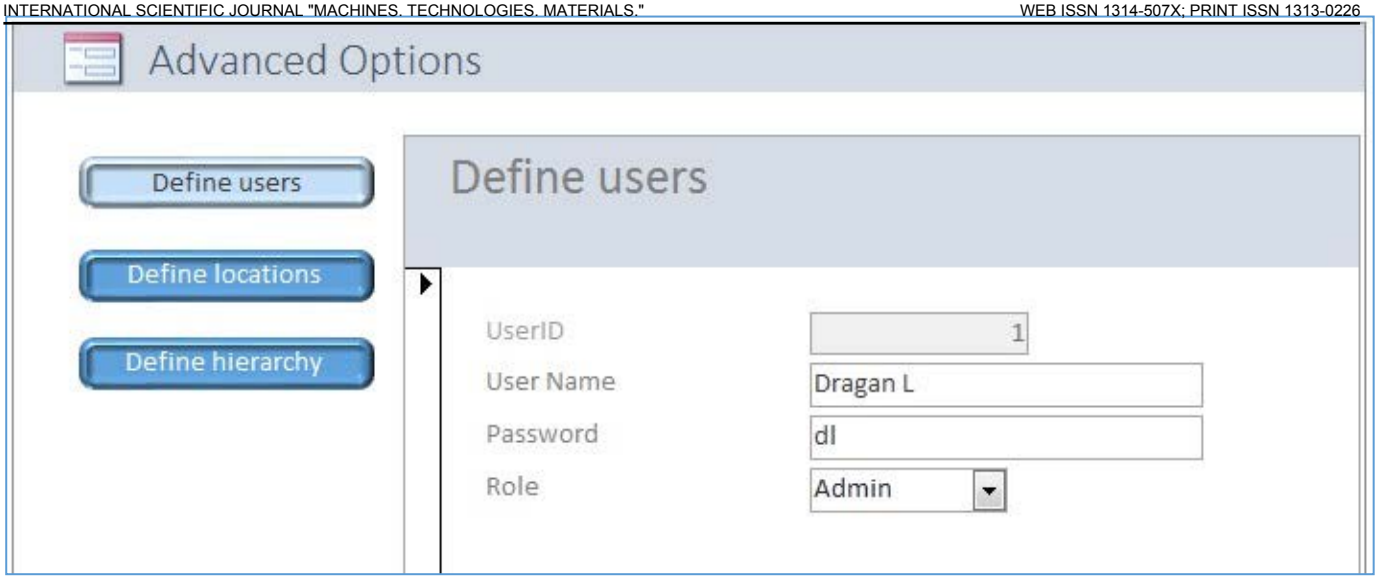

Fig. 4 *Advanced options-define users*

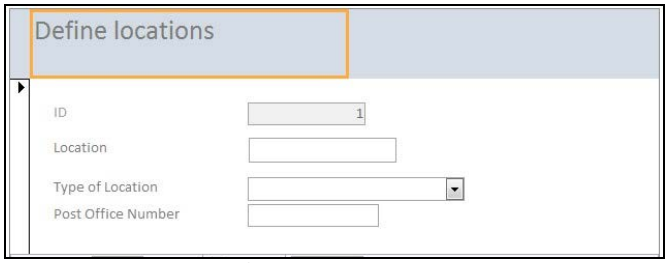

Fig. 5 *Advanced options-define locations*

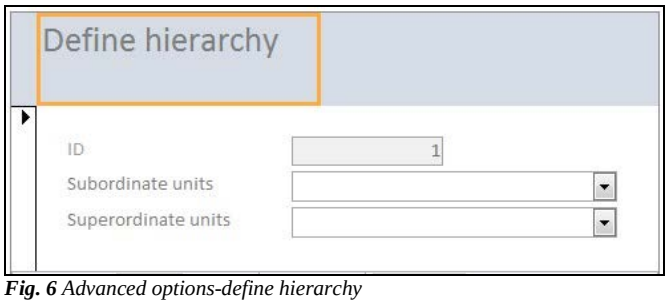

Fig. 6 *Advanced options-define hierarchy*

3.3 Numerical example

The package is dispatched from Novi Sad (1212) to Rudovci (1111). The numerical address code of these Post Offices are designed according to the concept proposed in this paper.

Analyzing the code starting from the last digit, we could say that Novo Selo (1212) is the second Postal unit of the third level, as the part of the first level Postal unit of the second level and the second Postal unit of the first level.

On the other hand Rudovci (1111) is the first Postal unit of the third level, the first Postal unit of the second level and the first Postal unit of the first level. The reception is carried out through the interface, which is shown in the Fig. 1. by filling in the appropriate information about the shipment. Beside the individual shipment, units of the enlargement, such as bags, pallets can be defined. After filling in the provided fields, the shipment reception is completed.

With the click on the option of defining route, we get required output of the software (Fig. 7).

The routing of postal shipment is important for the concept of traceability in the postal system. The definition of traceability concept according to the standard ISO 9001:2000 says that this is the ability to verify the history, location or application of an item by means of documented recorded identification. The possibility of identification of the previous and next location of the tracking unit is the result of the concept. [3] Beside traceability the concept application is accepted in the area of locating incorrect goods such as spoiled food and beverages, pharmacy products etc., in order to remove them all from distribution as soon as possible. [1] In order to achieve traceability through the business chain, internal and external traceability should be carried out in every chain. [2]

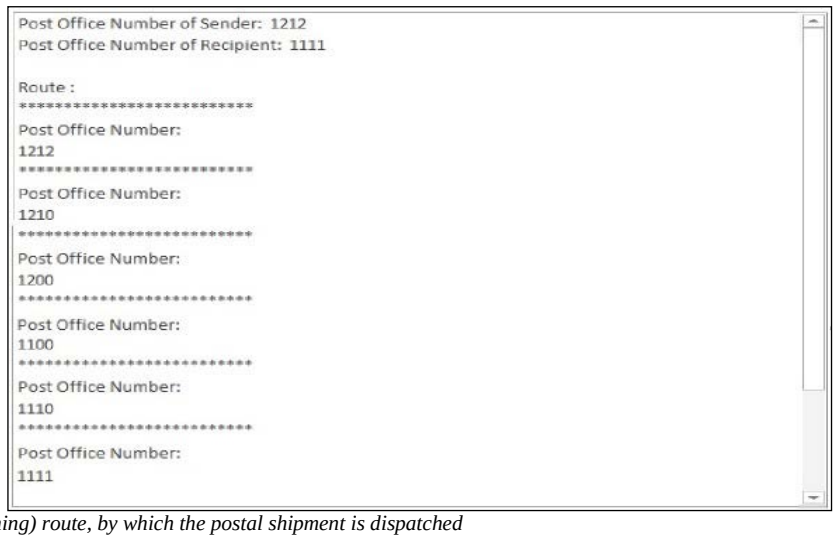

Fig.7 *Stetement (defining) route, by which the postal shipment is dispatched*

4. Conclusion

The modern business concept implies the orientation to the user as the main factor. In order to fulfill the needs and expectations of users the organizations should use modern concepts, information systems and adequate technology.

The concept of modern routing contributes to the improvement of total service quality. The main reason lies in the fact that this concept brings to higher safety in transfer of postal shipment, which is defined as one of the most important parameters for quality assessment by final users. Also, the use of critical postal infrastructure is optimized. One of the main problems and tasks of this concept is to determine the route, by which the shipment is transported.

The process of trace determination is the best to be done in the moment of receiving the shipment, i.e. when we create so-called source of information about shipment. This information is stored and if needed it is withdrawn from database.

The synergy of expectations that should be met in technology processes in postal companies and new available technologies results in the necessity for software that define and present the route. It is necessary that this software should be the component part of business information systems and interfaces. The proposed model of software, which is designed for collection of shipment and route definition, including the suggested way of addressing satisfies the internal needs of bigger or middle postal systems or overall needs of smaller systems. It is possible to adjust the suggested model to the new concepts of addressing applying the minimal changes in this software.

5. Literature

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