SUPUT: SOFTWARE SOLUTION FOR TRAVEL ORDER MANAGEMENT

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SAŽETAK

Učinkovito upravljanje putnim nalozima za službena vozila sastavni je dio optimizacije resursa i osiguravanja besprijekornog poslovanja unutar organizacije. Ključni značaj programskih rješenja u pojednostavljivanju i poboljšanju procesa upravljanja putnim nalozima jest osiguravanje i olakšavanje automatizacije procesa putovanja, što dovodi do minimiziranja vremena zastoja i povećanja produktivnosti. Integracija podataka u stvarnom vremenu administratorima omogućuje praćenje raspodjele automobila, potrošnju goriva i održavanje promičući isplativost i održivost. Dodatno, programska rješenja pružaju sveobuhvatno izvješćivanje i analitiku, omogućujući informirano donošenje odluka i prilagodbe politika kako bi se zadovoljile sve veće poslovne potrebe. U tu svrhu, u ovom članku predstavljeno je novo programsko rješenje SUPUT (Sustav za Upravljanje PUTnim nalozima) koje dodatno olakšava upravljanje putnim nalozima, ali za razliku od već postojećih rješenja nudi i mnoge druge značajke, kako pri obradi podataka, tako i pri samim sigurnosnim aspektima rada. Među ostalim, njegovom uporabom proces upravljanja putnim nalozima dodatno se poboljšava ciljanim statističkim pokazateljima koje organizacijama mogu pomoću u predviđanju budućih troškova.

ABSTRACT

Effective management of travel orders for official vehicles is an integral part of optimizing resources and ensuring flawless operations within the organization. The key importance of software solutions in simplifying and improving the process of managing travel orders is that they ensure and facilitate the automation of the travel process, which leads to the minimization of downtime and increased productivity. Real-time data integration allows administrators to monitor car allocations, fuel consumption and maintenance, promoting cost effectiveness and sustainability. Additionally, software solutions provide comprehensive reporting and analytics, enabling informed decision-making and policy adjustments to meet growing business needs. For this purpose, this article presents a new software solution SUPUT (Croatian: Sustav za Upravljanje PUTnim nalozima) that further facilitates the management of travel orders, but unlike already existing solutions, it also provides many other features both in data processing and indeed in the security aspects of work. Moreover, its use further improves the process of managing travel orders with targeted statistical indicators, which can help organizations forecast future costs.

Keywords: travel order, system, trip, vehicle, employee

1. UVOD
1. INTRODUCTION

In the dynamic contemporary business environment, where global connection and intercontinental co-operation have become the norm, efficient travel order management has become one of the key points of view for the organisations that strive to maintain the competitive advantage. The complexities linked to the travel order processing and co-ordination demand system solutions which not only optimise resources' allocation, but also support the employees' satisfaction and the alignment with

the company's policies. In order to solve these challenges, this paper describes a comprehensive system designed to simplify and automatise the employees' travel requests, which consequently increases the organisational productivity and cost, and overall efficiency. By integrating innovative technologies and enabling data-based insights, this system offers novelties in the way companies process travel approvals, solving bottle necks, decreasing manual interventions and empowering the decision makers with timely data-supported information for strategic planning.

There are several commercial travel organisation systems, such as TravelPerk [1], Egencia [2], Amadeus [3], Travelport [4], Sabre [5] and Rydoo [6]. TravelPerk is a travel management platform that offers a wide choice of flights, hotels and other travel services, simultaneously offering policies', approvals and cost reports tools. It is a fast-growing corporate travel management platform with the aim of simplifying the business travelling experience for both companies and their employees. Egencia, on the other hand, is a corporate travel platform that combines innovative technology with a personalised service in order to offer custom travelling experience. It is focused on cost optimisation and alignment, while simultaneously offering a wide scope of travelling options what correspond to individual preferences. Amadeus is the leading global distribution system used by travel agencies and companies dealing with accessing and booking of the services linked with travelling, such as flights, hotels, rent-a-car, etc. Its comprehensive data base and advanced searching capabilities enable travel experts to efficiently find the best offers and options for their clients. Travelport, much like Amadeus, is another outstanding global distribution system that links travel agencies and suppliers from across the world, facilitating flawless travel arrangements booking and management. Sabre represents one of the most prominent global distribution systems fitting in equal measure to travel agencies, corporations and individual passengers. It allows access to a large number of travel contents, including flights, accommodations, cruises and other travel services, with focus on flexibility and choice. Rydoo je a software platform focused on cost management and travel solutions for companies. It

offers tools that help companies simplify cost and management reporting processes. This platform includes functionalities such as invoices scanning, cost categorisation, approval work flow, travel booking and reporting integration.

Numerous studies have emphasised the importance of efficient travel request processing within the organisational efficiency and employee satisfaction optimisation. In [7] the authors analyse the travel booking information system. [8] describes travel control system for government officials with the purpose of the prevention of spending tax money on unauthorised travels. [9] describes the travel request processing computer system which is designed in such a way as to support the whole process from submitting the request, issuing order and reporting. The business travel computer system described in [10] simplifies the order preparation, confirmation issuing, reporting and business travel expenses reporting, and overall easier business travel management.

This paper describes the specialised system for business travel order processing. This system, among other things, permits data import and export allowing the exchange thereof with other systems, input data validation through network services as well as multilingualism which makes it accessible to a wider range of users. Furthermore, this system features a centralised database which renders all users' data available for analysis and reporting. Such a system is especially beneficial for companies whose operation's viability leans on the employees travelling frequently such as IT consultants. Even though the above-described systems cover a wide spectrum of functionalities in travel organisation and travel expenses, we deem the market lacking highly specialised systems which focus exclusively on travel order processing and analysis. Therefore, this paper describes a completely new (original) program solution, i.e., constitutes another expert contribution in the area.

Here below the system architecture, key components, functionalities and expected benefits have been described. Further, the system usability analysis has been set out in order to show its efficiency and to highlight its potential in travel order management.
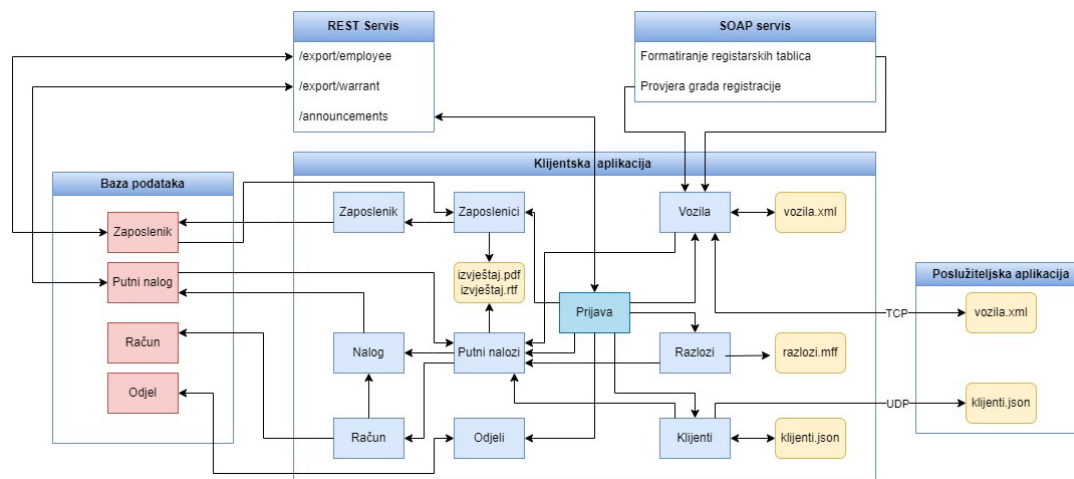
Slika 1
Arhitektura sustava

Figure 1
System architecture

2. ARHITEKTURA SUSTAVA
2. *SYSTEM ARCHITECTURE*

The system has been split into five key components that intercommunicate in order to perform the envisaged functionalities (Figure 1). The data is being stored in different format files (XML, JSON and own format), depending on the using manner and circumstances in order to reach the maximum efficiency (see chapter 3) while extracting and processing data before the input in the database.

The database is at the same time the most important system component because it is where the validated data on departments, employees, travel orders and associated invoices are being stored in alignment with the rules of the referential integrity and other existing limitations and rules of data handling. Through the client application the records can be read, written, deleted and updated by using the parameterised SQL queries, which at the same time prevents the SQL injection attacks. The database has been implemented in the SQL Server software solution for the integrated support in the process performance optimising and speed, centralised handling, safety and parallel multiple clients' access. Along with the clients' application, the database can also be accessed from the outside through the REST service which enables fetching employees' records and orders based on the forwarded record identification number. During the REST request processing, the attached user's data are being verified by the Basic Authentication method in order to ensure the appropriate clearance level before fetching the resources.

The clients and company cars data are stored in JSON and XML files for the purpose of possible data processing need in case when connecting to the database is not possible. Also, records from the XML and JSON files can be partially or completely exchanged between the employees without the intermediation of the system. They are located on the server for the purpose of multiple client access and for safeguarding. They are accessed by sending the appropriate TCP request from the client's side of the application and by performing the appropriate TCP response on the server's side of the application which sends the file through the network, ensuring that all the users in the system have access to the most recent data.

Primjer 1 *Sadržaj XML datoteke*
Example 1 *The content of the XML file*

```xml
<?xml version="1.0" encoding="UTF-8"?>
<companycars>
  <car>
    <licenseplate>ZG-3297-MI</licenseplate>
    <internalmark>Toyota-Corolla-08</internalmark>
    <assigned>Kresimir Dabcevic</assigned>
    <currentuser>Kresimir Dabcevic</currentuser>
    <location>Zagreb</location>
  </car>
  <car>
    <licenseplate>SB-8619-YZ</licenseplate>
    <internalmark>Peugeot-508-22</internalmark>
    <assigned>Nika Kocurek</assigned>
    <currentuser>Nika Kocurek</currentuser>
    <location>Slavonski Brod</location>
  </car>
</companycars>
```
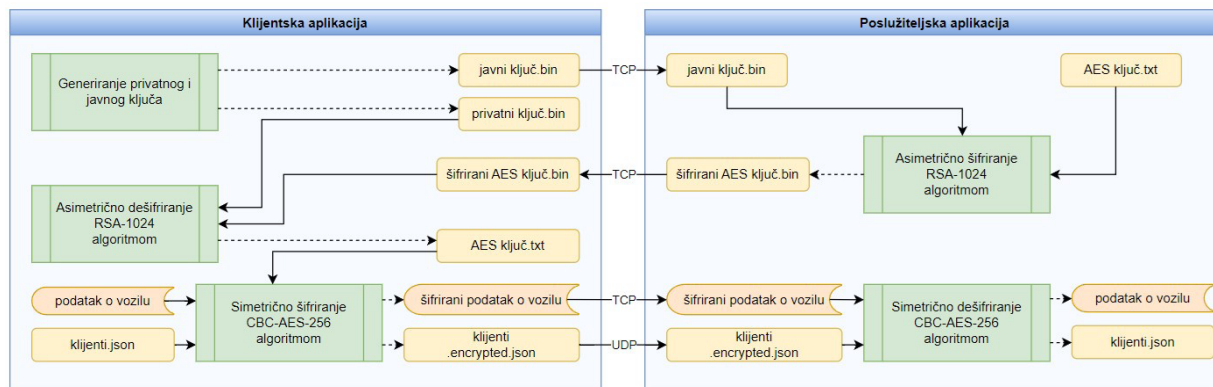
Slika 2 *Komunikacija klijent-poslužitelj*

Figure 2 *Client-server communication*

XML file (Example 1) contains company cars data and represents a comprehensive document with all the data that are at the disposal of the authorised employees (system users). To prevent the data loss and corruption during simultaneous modification attempts in the document, all the modifications are being sent through the TCP protocol where they are being performed one by one directly in the server version of the file. With multiple users having access to the file, it is imperative to ensure correct data structuring during input and modification. For this purpose, a specially designed SOAP service is being used which has been designed to check the validity and formatting of the vehicles' registration plate prior to the permanent modification in the file, and it is available exclusively for the system's internal use within the company.

Within the application, users have access to their own JSON file only with the clients data which is edited locally inside the client's application. After each modification, the file gets sent to the server for safeguarding and can be extracted again in case of the file loss or corruption. The XML file has a bigger total file size due to the possible data validation and more formatting characters compared to an equivalent JSON document. In order to reduce the possible network load due to frequent document sending, the JSON format combined with the UDP protocol is being used because it does not require connecting the sender and the receiver via a socket.

The company cars and clients data are sensitive and must be encoded before sending them through the network so they remain protected in case of unauthorised access. The encoding takes place by

combining the asymmetric RSA algorithm with the key size of 1024 and the symmetric algorithm CBC AES-256. Before sending the data, the client's side sends the public key to the server's side where, with the help of the received public key, the symmetric key gets encoded and sent to the client's application where it gets decoded through the private key. All the following data participating in the communication between the client and the server are being encoded through the symmetric key. This way of encoding ensures better security compared to the application of the symmetric encoding only, and quicker performance compared to the application of asymmetric encoding only. Figure 2 illustrates the entire client-server communication that takes place in this part of the process.

For additional security, the keys get deleted and re-created in the beginning of every session. The generation takes place in a separate thread to enable smooth use of the application during the process.

3. ISTAKNUTE FUNKCIONALNOSTI NOVOG SUSTAVA
3. PROMINENT FUNCTIONALITIES OF THE NEW SYSTEM

The client's side of the system offers customised overview and simple processing of all the data being used in the system, while the system itself provides security and accuracy of the data. Apart from the main objectives of the system, additional possibilities are available such as generating reports on employees and orders in several formats, numerous statistical extracts on employees with
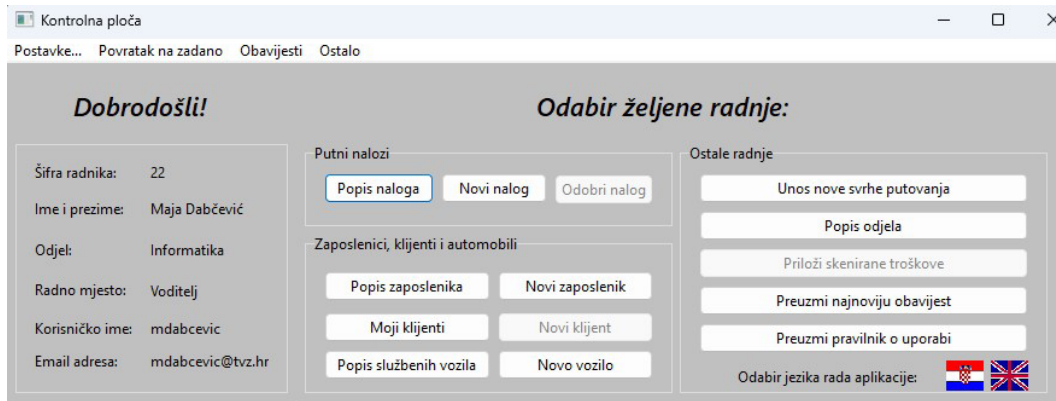
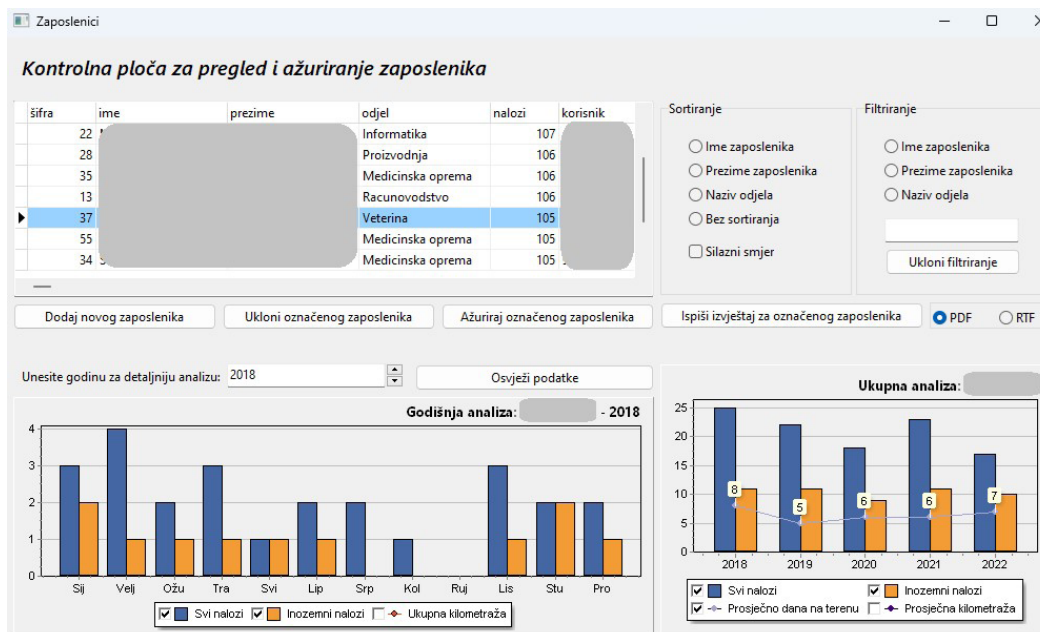selectable granularity and many others (Figure 3).

The data presentation takes place in separate windows containing also numerous possibilities dedicated to the display customisation. Inside the window there is a table containing all the relevant data for the selected data source, with the possibility of filtering the data according to the entered value and selecting sorting by the desired column and order.

By selecting the desired record from the table and by pressing the wanted action, a pop-up window opens up containing field to input all the information needed for the record processing. Before the processing, the system performs all the necessary checks and data validation, and at the end informs the user of the process result through the appropriate message, such as: "Before creating the travel order, planned expenses must

be marked!" if the user wishes to end creating the order before selecting the expenses for it.

Handling the records of travel orders is the main purpose of the system. For this reason, it is important to ensure the data consistency and accuracy. For this purpose, the data needed for the creation of the order are downloaded from the original files which prevents erroneous values or disallowed formats. If the desired value does not appear on the list, the user can add it via a pop-up window, which does not interrupt the travel order creation. After adding the value, the list gets automatically updated and the user can use it during the order processing without additional interaction.

If the order has been successfully created, it is immediately visible in the order list. Along with the input data, other relevant information is shown, such as the department, name and

IZVJEŠĆE O PUTNIM NALOZIMA ZA ZAPOSLENIKA

Šifra	Trajanje	Poslovni partneri	Svrha putovanja	Kilometraža
44	25.01.2018 06.02.2018	KBC Dubrava, KBC Rebro,	Promocija proizvoda, Inventura,	418 km
51	10.01.2018 22.01.2018	Ljekarna Slavonski Brod,	Potpisivanje ugovora,	302 km
56	24.01.2018 03.02.2018	Belupo,	Teambuilding, Edukacija,	778 km

Slika 5 *Izvješće o putnim nalozima*

Figure 5 *Travel orders report*

surname of the employee pertaining to the order. At the same time, the displayed data allow for the prior check during the report creation for an individual order. If there is an error in the data, it can be corrected before creating the report, which contributes to time saving. Since the list of orders gets updated automatically with successful modifications, statistical data shown on the diagrams for an individual employee get updated automatically as well (Figure 4).

4. REZULTATI
4. RESULTS

SUPUT is a free and completely automatised solution for travel order management within a company that efficiently eliminates the need for the physical presence of the submitter and the approver during the process. Using SUPUT software solution contributes to the digitalisation, acceleration and standardisation of business processes, and to cutting costs within the company, which enables the employees to better allocate resources that have previously been used for manual management.

Compared to the existing solutions, it stands out in the Croatian market specifically due to the built-in support for the data validation and formatting within the system. SUPUT is focused exclusively on processing, approval, archiving and fetching travel orders and associated data without the superfluous advanced functionalities and dependency on other systems, which makes it extremely simple to use.

The solution is entirely autonomous and all the system's components are the exclusive property

Tablica 1 *Usporedba postojećih rješenja*

Table 1 *Comparison with existing solutions*

	Functionality	System						
		SUPUT	TravelPerk	Egencia	Amadeus	Travelport	Sabre	Rydoo
1	Data validation and formatting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Data location	Locally	Cloud	Cloud	Cloud	Cloud	Cloud	Cloud
3	Report generator	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Dependency on other systems	No	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
5	Croatian localisation	Yes	No	No	No	No	No	No
6	Possibility of digital travel approval	Yes	Yes	No	Yes	No	No	Yes
7	Free-of-charge system	Yes	No	No	No	No	No	No

of the company, with no need for the outside warehouses and similar services. Despite of SUPUT being a stand-alone solution, accessing the data through other systems within the company is facilitated by using the REST service which fetches the desired employees and orders records.

As one of the outputs, SUPUT also offers the possibility of using different report generators. For instance, Figure 5 shows the report for a chosen employee, i.e., the details of their past travels. However, the database model enables creation and execution of many other arbitrary queries which can be useful in different statistical analyses. So, statistics for a travel can be obtained, by certain time intervals, travel purpose, destination, etc. Depending on the system user type, those with the highest clearance have the possibility of creating and executing such queries, as well as the possibility of saving them directly into the database in the form of stored procedures and functions. [11]

Table 1 features the key functionalities in comparison with six commercial systems: TravelPerk, Egencia, Amadeus, TravelPort, Sabre, and Rydoo.

The results show SUPUT to be competent from several standpoints, especially from the price standpoint (the system is free of charge), localisation to the Croatian language and the possibility of digital travel approvals. On the other hand, the abovementioned commercial systems offer better integration possibilities with other systems.

5. ZAKLJUČAK
5. CONCLUSION

The SUPUT software solution is another alternative in facing the challenges that companies and organisations come across in handling travel orders. From the initial submitting a request to the final approval and expenses monitoring, each step of the journey of travel order is precisely automatised, saving precious time and resources to the employees and the administrators. Furthermore, the described software solution promotes increased transparency and responsibility, ensuring a

higher level of alignment and employees' adherence to travel policies. By travel data processing and analysis, organisations can make informed decisions and improve their travel procedures to achieve maximum profitability. Even though it is only the first version of the application, in our future work we intend to expand the list of available platforms and devices, focusing mostly on the clients on mobile platforms. Also, we are going to investigate the possibility of expanding already existing statistical indicators by using artificial intelligence and predictive analytics based on historical data and statistical algorithms.

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6. REFERENCES

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