

Innovative ICT model of E-business in urban railway transport

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Abstract –The paper presents the basic directions for the implementation of activities for the procurement of digital maps and transportation of service users. The activity includes the integration of the internet service of urban traffic in Belgrade (metro as a part of the railway and the city transport company). The model shows the architecture and infrastructure based on advanced internet technologies. The aim of this paper is to present the application of ICT in future businesses.

Keywords –internet service integration, urban service, service provider, service user

I. INTRODUCTION

The application of innovative ICT business models is increasingly common. In accordance with the vision and mission of transport companies, the application and development of innovative services is reflected primarily in customer satisfaction [1], [2], [3]. Very current application of the new paradigm of the business unit in the development of innovative ICT model, are interactive components of human resources, technology, organizational processes, environment and service / product, where research in the field of transport services in urban areas.

As a rule, transport is a multimodular structure and services are predominantly organized in the integration of several modules. Transport service is determined by technological and behavioral components. The technological component is determined by the capacities of transport organizations as service providers, mechanisms for access and delivery of services, security requirements and business-process technological resources.

The behavioral component is determined by the roles of responsible operators for service delivery with management of security factors and user-people factors, input data they provide, needs-desires, requirements and expectations as well

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as contextual information important for synchronizing activities in service process structure [4], [5]. The basic idea is to satisfy the needs, requirements and wishes of users through an innovative ICT e-business service in order to increase the quality of service. This paper presents the possibility of integration of several modules and internet services at the level the city of Belgrade.

II. MODELING OF INNOVATIVE ICT MODEL

A. Infrastructure components

Basically, modeling an innovative e-business model based on advanced Internet technologies includes: human resources, applied technology, organizational processes, environment (place or space) for the implementation of e-processes and service or product [1].

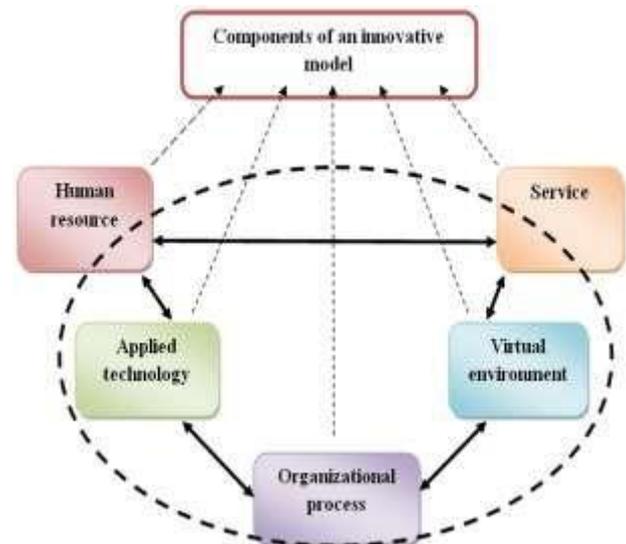


Fig. 1.Components of an innovative model

The components "human resources" and "services" have a dual purpose, which can be viewed as part of the structure of an innovative model in the process of realizing service transactions, and then can be independent until the use of a digital map or planning the next trip. Human resources can be analyzed by service users as well as employees in transport organizations in the structure of the innovative model.

For the development and use of the model, the user of the service plays a key role as the initiator of the electronic process for the procurement of the transport ticket. Employees

in transport organizations, IT administrators have a special role in arranging the accessibility of innovative model services, availability at any time of the day during the week as well as for the security requirements of all interested participants during the interaction activities.

The service, the transport ticket in digital form that the user receives on the smartphone represents the final result of the electronic process.

Applied technology and organizational processes determine the ability and implementation of electronic process services in order to procure a map in a virtual environment based on the Internet platform.

Based on the above, it is necessary to develop a model of an innovative transactional model of electronic business based on advanced Internet technologies in the transport of users. The model should include the infrastructure consisting of hardware and software that have the role of connecting the computer and the user and to connect devices and communication channels for data transmission via the Internet. The service components applied in the innovative model are shown in the table 1.

TABLE I
SERVICE COMPONENTS

Component	Technology
Physical Infrastructure Architecture	Passive Equipment, Servers, Routers
Software infrastructure	Mobile technologies, Wireless technologies, Wireless standards
E-business infrastructure management	Business results analysis, Technical performance analysis, Infrastructure monitoring, User interface
E-business services	Content creation, Process management, Transaction realization, Data analytics
Infrastructure of quantitative components	Security, Availability, Efficiency

Basically, the infrastructure of an innovative model should enable on the basis of technology (applied for model development), virtual environment (space for process realization), organizational processes (predetermined business rules) and human resources (in the transport organization in charge of safety, security and availability of resources service) that the service or product (in our case e-card in digital record) continuous management of business digital processes.

In addition to designing the infrastructure of the innovative model, it is necessary to perform functional modeling of business processes for service provision [6].

The popularity of e-business and the development of modern IT infrastructure implies more investment, costs for the organization to provide permanent and stable services to new services [7], [8].

Based on the above, the services of the railway and road carrier as well as the services of the bank must ensure uninterrupted communication at any time of the day for the necessary service that is in line with available transport capacity, choice, payment and cancellation of travel in the e-procurement process. maps.

The presentation of the railway e-business service in an innovative contactless transaction model implies an overview of the content as well as the choice of service that can be realized in the interaction of service users via the Internet with the service provider's service, ie. with the railway and road organization for the transport of passengers. Infrastructure e-services are the basis for the functioning and use of all other services, including e-learning, e-health, e-banking, e-procurement, e-business, e-justice [9].

DNS (*Domain Name System*) is a basic Internet service for the implementation of an innovative model that also translates the Internet domain and IP address [10], an e-mail exchange service for obtaining maps in digital format, services for remote access to network resources are the basic services that are an integral part of every computer on the network. E-business services basically have the task of supporting and realizing the selection process required by the service user and the realization of online money transactions with the bank's services via mobile technologies. Mobile services must provide the functionality of e-business services through mobile technologies. Big data services include data management services that arise in the exchange of e-mails in the communication of users with the service provider (railway and road carrier). Messaging in the Data Center is a data that serves for detailed analysis and review of quantitative and qualitative indicators that are directly related to service users.

Content creation services enable the IT administrator to set up and present a service that includes the possibility of choosing the route of the road and railway carrier. The created content must be available to the users of the service anytime and anywhere. Process management services include monitoring of available railway resources that are foreseen as well as the resources of the road carrier and at the same time the real needs of service users.

Realization of transactions is a service that should provide a safe and secure payment process when the user of the service has selected and confirmed the requested service and the service is automatically booked. The service of realization of contactless money transactions of the bank must function as an intermediary.

The data analytics service should provide the possibility of analyzing all activities in the process of reviewing, exchanging e-mails regarding the selection and implementation of the contactless process of purchasing a map in digital form, which they realize in the interaction between service users and railways via Internet service.

B. Model realization process

The innovative model of electronic business in urban transport basically includes the user of the service as a client and the railway and road transport organization as a service provider. The user of the service selects, pays for and receives

an e-ticket in digital format via an application on a smartphone.

The process of realization of e-business models based on advanced Internet technologies functions between the service user (client) and the railway (service provider).

The user of the service uses a mobile device application to realize an innovative contactless model in order to purchase a transport ticket. By opening the application installed on the smartphone, the service user has the option of choosing the travel route. After selecting the route, it reviews and selects the travel date. For a certain date, it selects the number of trains where the possibility of choosing the type of place (sitting, bed, bed) is opened. The selected request is sent to the service provider's service via a wireless connection.

TABLE II
VIEW INDIVIDUAL SERVICE STEPS

Email-request (client)	Email-response (server)
Railway route selection	Confirmation of the railway route
Selecting the number of service users	Confirm the number of service users
Privilege selection	Confirmation of privilege
Travel date selection	Confirm the travel date
Choice of road transport service or payment	Confirmation of road transport or payment
Road carrier route selection	Confirmation of the road carrier route
Selecting the number of service users	Confirm the number of service users
Privilege selection	Confirmation of privilege
Travel date selection	Confirm the travel date
Payment selection	Payment confirmation
User registration	Confirmation of user registration
Payment for the requested service	Confirmation of payment for the requested service and sending a digital card
Viewing a paid service and storing a digital card on a smartphone	Booking a paid service and sending data to the DATA center

When the service receives the request of the service user, the requested service is conditionally reserved and a new page is opened that refers to the road carrier. The user of the service has the option to select an offer in road transport or to skip and focus on registration in order to pay for the selected service online. In case of major disturbances in train traffic or extraordinary events, there is a possibility that the request of the service user will not be accepted when the carrier's application is not in function.

If the payment process is successfully completed, the carrier reserves the requested service resource and sends the user a digital record representing the transport ticket containing:

Date and time of payment for the service; Ordinal number of Internet payments in the service for contactless ticket issuance; Number of seats; Travel route; Date of travel; Number of service users; Total price of the service; Bar code for validation and control in the vehicle.

C. Activity flow algorithm

The innovative Contactless IT transaction model presents an algorithm (Figure 2) for activities related to the exchange of messages in the e-process of communication between service users and providers [1].

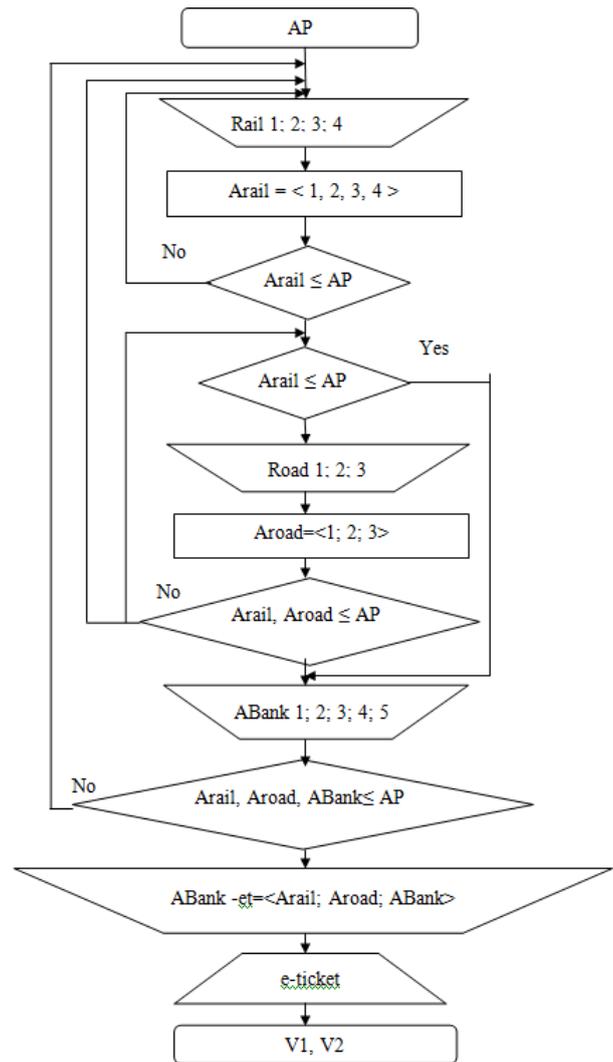


Fig. 2. Activity algorithm in an innovative ICT model

In order for the user to satisfy his need in order to procure a transport ticket in digital form, the request for an electronic ticket "ek" must be less than or equal to the operational capability of the application "AP" to obtain the required service in accordance with the capacity of railway and road transport organization.

The electronic card "ek" in the e-process is generated by the transaction activities of the application "AP" where the choice is enabled in the railway TO "Arail", in the road TO "Aroad"

and payment for the service contactlessly through the bank "ABank". The subset "Arail" includes the following steps: selection of route "1", date "2", number of passengers "3" and type of seat "4". While in the road TO "Aroad" the user of the service chooses the route "1", the date of travel "2" and the number of passengers "3". The service user pays for the service contactlessly through the bank "ABank" in the following steps: user login "1", account entry "2", payment "3", confirmation of payment for service "4" and rejection of the requested service "5". The user with the e-card on his smartphone performs validation in the vehicle "V1" and for control by an authorized employee "V2".

III. CONCLUSION

The e-business model based on advanced Internet technologies of transport services consistently incorporates wishes, requirements and needs of service users in the interactive dimension of messages and business transactions with transport organizations for railway transport. The e-business infrastructure of railway transport trains hardware and software components of the system, human resources, internet technologies, mobile technologies, arranges for security and digital protection of service users. The availability of web services in Internet communication users from any mobile device positioned at any physical location and at any time, recommends interaction with add-on models that are tested in real conditions presented in test scenarios. Ultimately, this will affect the improvement of the image of railway organizations in the business environment and the creation of a positive ambient climate for connecting the total quality of services and maintaining the stated level of connecting customer services.

In future research based on the implementation and application of the innovative model, special attention should be paid to the number of passengers carried and the use of the model over time is extremely important for service providers. In this way, service providers can successfully align the service with the real requirements of service users. In addition to the above, the service model presented can be quickly adapted through strategies in line with the goal of improving the performance of the entire system.

The presented innovative model approaches new trends through the application of e-business and integration of services of several transport organizations, which should be expanded according to the needs of service users in order to improve service quality in order to achieve higher revenues

and reduce costs. The development and improvement of the business of transport organizations as well as other interested organizations in society and the economy with the application of innovative business models enables new trends provided by Internet technology.

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