Models of e-business in Transportation

Dejan D. Marković[1], Bojan V. Stanivuković[2] and Momčilo J. Dobrodolac[3]

Abstract – **In this paper, modern concepts of e-business and their usage in transportation are presented. The application of mobile business in association with actual problems in postal, road and railway transportation is specially described.**

Keywords – **Models of e-business, Mobile e-business, E-business in transportation**

I. INTRODUCTION

Electronic technology, as combination of information and telecommunication technologies, is more and more in usage in modern business, i.e. the number of companies that have taken the concept of e-business is bigger every day in the world. Basic trend in development of e-business, especially in segment of business relations between the companies, is that Internet has become dominant channel for business relations. Main reason for that is about low costs that this way of business affects with combination of high efficient performance of business operations.

One of the trends in new e-business technology development is usage of mobile phones in e-business because they make an opportunity to implement entirely new services. That phenomenon brings us a new concept of modern business – Mobile Business. Because of its advantages and high spectrum of possibilities, there is belief that mobile phone, i.e. mobile technologies, will be significant channel for development of e-business in the future and there is a thinking that it will surpass Internet and take its position of dominant business channel away.

Modern concepts of e-business and their usage in transportation are presented in this paper. The application of mobile business in association with actual problems in postal, road and railway transportation is specially described.

II. MODELS OF E-BUSINESS

There is a question what business people, including small firms, corporation groups and managers on every level, should know in order to become a part of huge world of "e-business". First of all, it is necessary that one should have a good knowledge about models of business on Internet. Making

business on the new markets defines a type of e-business and also its model. Based on relations between parties, there are two basic models of e-business:

- Business to Business models – B2B models and
- Business to Consumer models– B2C models,

and also some derived models:
- Business to Employee – B2E;
- Consumer to Consumer – C2C;
- Consumer to Business – C2B;
- Business to Business to Consumer – B2B2C;
- Consumer to Business to Consumer – C2B2C;
- People to People – P2P;
- Intrabusiness;
- Exchange to exchange – E2E;
- M – commerce;
- Government to citizens – G2C;
- Government to government – G2G;
- Government to Employee – G2E.

Two main e-business models are B2B and B2C. B2B market occupies the biggest part of on-line transactions. Transactions on that market bring between 80 and 85% of total e-commerce income.

A. Classification of Models Based on Basic Aim

There is no unique, universal and accepted classification of e-business models. Having in mind that problem, Centers for IBM e-business Innovations carried out the research analyzing 700 companies that were active on the Internet. On that basis, they determinate examples of on-line business models [1].

According to Centers for IBM e-business Innovations the following e-business classification models definition is given:

Offline facilitator – Those companies promotes their brands on-line, but they do not accept any form of orders by internet. They are trying to avoid any type of potential conflict (channel conflict).

Content provider – Those companies are known like related groups or content aggregators. Making business is special in experts way for certain fields and those companies are directed on specific value propositions. Their activity is based on subscriptions, advertisement or transaction fees.

Business destination – Their business is based first of all on direct sale channels. Their main activity is based on sale of good and services.

Online exchange – Their appearance, whether like auctioneers, finance transactions or market designers, brings customers and seller in connection and they help them to make business. The income is accomplished mostly by

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[1] Dejan D. Markovic is with The Faculty of Transport and Traffic Engineering University of Belgrade, Vojvode Stepe 305, 11 000 Belgrade, Serbia, E-mail: mdejan@sf.bg.ac.yu
[2] Bojan V. Stanivukovic is with The Faculty of Transport and Traffic Engineering University of Belgrade, Vojvode Stepe 305, 11 000 Belgrade, Serbia, E-mail: stanivukovic@yahoo.com
[3] Momcilo J. Dobrodolac is with The Faculty of Transport and Traffic Engineering University of Belgrade, Vojvode Stepe 305, 11000 Belgrade, Serbia, E-mail: m.dobrodolac@sf.bg.ac.yu

transaction fees, but it may be supplemented by advertisement and subscribe taxes.

Gateway – There are several different tools: search engines, Internet service providers (ISP) and shopping agent. Those companies provide an easy way for users to find what they want on the Internet. As there is a case with the ones that appears the first time on the Internet, this on-line business brings the biggest income through advertisement.

Although many of companies can be ranked in these classes, anyway there are some hybrid models. The dynamic nature of digital economy demands permanent reevaluations and adoptions. For some companies it is enough to make a little progress in their own business model through new accomplishments.

III. EXAMPLES OF E-BUSINESS IN TRANSPORTATION

A. Postal Traffic

Today's postal operators make business in environment that differs a lot from the period of postal originate. Postal customers have more and more specific demands, they have wide range of possible services to choose and they are much more demanding in respect to recent times. That forced postal operators to become aware of the fact that they must adjust their business in order to hold or make bigger their share in world communication market [2].
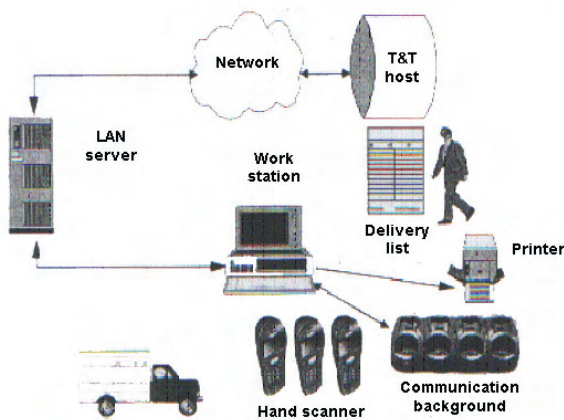

Fig.1. Track & Trace system with off-line PDT terminals

Question that is usually asked by postal service customers all over the world is position of their mail during the transportation. Customers want to know where is their mail in specific moment, why it is not yet consigned or who consigned it. System for track and trace of postal items is based on following elements: portable PDT terminal, T&T work station and T&T host computer. Architecture of Track & Trace system with off-line PDT terminals is shown on Figure 1.

Classic postal services – sending of all sort of mail, in the future will be digitally done. That means that kind of postal services will be under a new kind of measures that prevents

lost or migration of mail. These measures will be effected by adding identification to mail in digitally form. Based on that identification, it will be known where would be some specific postal item in every moment. That kind of data will be accessible to the person that sends the mail, postal workers that manipulate with that mail and also to recipient. A small RFID dice is incorporated in postal stamp sized like one business card. It includes all data about a person that sends

mail, about a person that receives a mail, about mail itself, its content and destination. As soon as that stamp is affixed, all data mentioned above is transferred in postal computer in form of identification tag. After that, moving of postal item can be tracked and traced over the Internet. Example of one postal stamp is shown on figure 2.

Fig.2. Postal stamp

B. Road Transportation

The most seen usage of e-business in road transportation is for track and trace of vehicles, for parking and toll rate payment. As tracking and tracing system for vehicles is concerned, it is implemented through information system that allows satellite observation of mobile objects under GPS and GSM/GPRS technology. Tracking the object is possible in every moment and data about status and vehicle position can be received by using SMS messages or Internet.

That kind of service provides:

- Tracking and displaying of vehicle status using SMS messages

- Signalizing the alarm to mobile phone

- Vehicle tracing in real time using Internet

- Vehicle tracing history using Internet

- Technical support 24 hours

System for tracking and tracing is specially useful in monitoring of business for big transportation companies and other systems that are in dispose of a huge rolling stock.

Besides tracking of vehicles in real-time and review of history of drives, this group of users finds particularly important to have route management feature: option to define various routes and perform off-line comparison between defined routes and real tracks. With a single click, user can get map with defined route and real tracks in different colors, so that any differences can be easily noticed.

Also, additional information could be very useful, such as mileage, total time vehicle usage time, maximal and average speed, etc.

Certus Autotrack information system, system that is developed in Serbia for tracking and tracing, fulfills a series of functions in fleet management:

Supervision:
- Exact positioning and status of vehicle in real time

- Control of drivers
- Coordination of vehicle usage

Operative:
- Improving of efficiency through vehicle usage coordination

Analytic:
- Statistic analyses can be made for specific vehicle in specific time period

Financial:
- Rationalization of costs is effectuated by better work discipline and better vehicle coordination

Demonstration of Certus Autotrack information system is given of Figure 3.

Fig.3. Elements of Certus Autotrack system

Advantages of Certus Autotrack information system are:
- Satellite monitoring through GPRS enables tracing huge number of vehicles in real time because all vehicles send data to IP address of server using Internet, while in standard GSM mode, number of vehicles that can be monitored in a moment is limited by number of GSM modems that are used by vehicles for connection.
- In case of GPRS, amount of transferred data is charged, but not period of line occupation (like it is case with GSM). This kind of system is much more cost effective.
- Calculation shows that for a price of one SMS message with position of vehicle, it can be transmitted 1000 messages using GPRS – if we assume that data are send every 30 seconds from vehicle and that there is 15 hours of vehicle usage on daily basis. This means that a price for GPRS monitoring do not overcome the price of two SMS messages.

One of the solutions of the problem with the lack of parking places in cities is division of city center into zones that characterize limited time of parking and tariff system for parking payment. System is totally automated and designed in way that driver can pay parking place in the least time period without any contact with some employee that make collection. Parking payment is doing in most modern way – by parking

tickets, parking machines, SMS messages of mobile phone network and using electronic dice cards.

Toll rate payment systems are based on "vehicle – road" communication technology, traditional microwave or infrared waves or recently used satellite technology (Global Positioning System – GPS), including Automatic Vehicle Identification – AVI and Automatic Vehicle Classification – AVC in order to enable electronic transfer of money between vehicle that passing toll rate gate and agency that organize system of payment.

Modern equipment for toll rate payment, in fact, takes job to workers that make payment in classic cabins. It allows the transactions be made at vehicle speed that is close to normal traveling speed. Some sorts of devices are designed in the way they can communicate with any reader. Agencies that organize system of payment are very interested in their further development and also in development of readers in order to improve the system.

C. Railway Transportation

Railway system has passed all technology and other changes and has found solutions for imposed mission of new age. The solution really is in following and implementation of modern scientific and competent knowledge and experience and that is the only way for it to subsist.

High speed trains, multimodal transport and synchronized railway time scheduling in international range demands new solutions in railway transportation. Having in mind that railway system has big competition in road and air transport, efficient communication is basic for unobstructed railway transportation flow with high level of safety.

Today, trains are equipped with up to six different navigational systems. Each is extremely costly and takes up space on-board. A train crossing from one European country to another must switch the operating standards as it crosses the border. All this adds to travel time and operational and maintenance costs. The solution of the problem is found in new system developed under the initiative of European Union authorities called ERTMS.

The European Rail Traffic Management System – ERTMS has been developed in recent ten years and its implementation is in process. GSM-R (Global System for Mobile Communication – Railways) is communication platform for ERTMS and it is developed on ETSI. GSR-R is an integral part of GSM. But GSR-R is much more that multifunctional wireless communication system – it actually provides general communication platform for control systems of trains in the future. ERTMS is digital system. It offers integrated services, has standardized open interfaces and it is made on modulus platform. Main components are ETCS and GSM-R. ETCS is the new control-command system and GSM-R is the new radio system for voice and data communication. Together, they form ERTMS, the new signaling and management system for Europe, enabling interoperability throughout the European Rail Network.

General ERTMS architecture consists of trackside equipment, trainborne equipment and GSM-R radio communications.
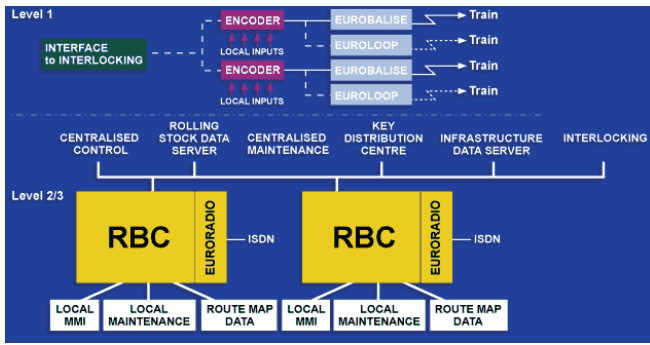
Fig. 4. Trackside equipment, RBC, Eurobalise

On Figure 4. Trackside equipment, RBC, Eurobalise is shown. On Figure 5. Trainborne equipment, Eurocab is shown. On Figure 6. GSM-R radio communications, Euroradio is shown.
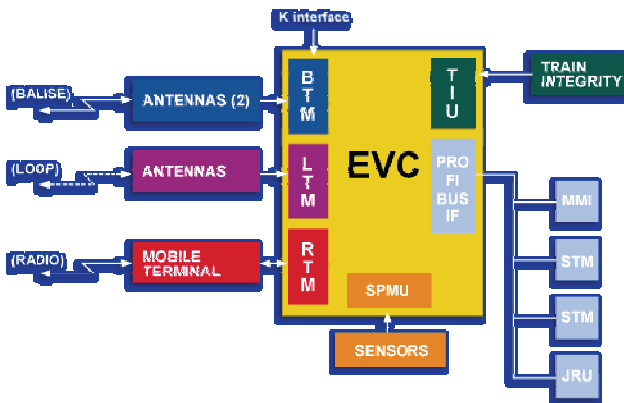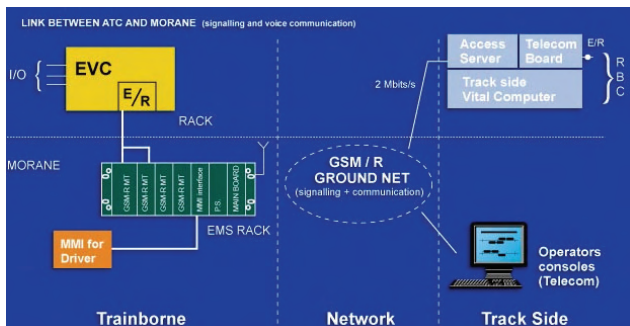

Fig.5. Trainborne equipment, Eurocab

Fig.6. GSM-R radio communications, Euroradio

ERTMS offers many advantages for railway operators, their employees and customers.

Lower telecommunication infrastructure costs:

- There is a need for less number of transmitter-receivers, regardless bigger transmission capacity. In one project, 2800 GSM-R transmitter-receivers (TRX) replaced 10300 convencional transmitter-receivers, although number of customers was increased from 90000 to 150000.
- Number of broken parts is decreased, there are less spare parts.
- Huge manufacture of GSM infrastructure caused low equipment price.

Savings in railway equipment and rolling-stock:

- Railway network could be better utilized due to ERTMS
- Special signaling infrastructure is not necessary any more

Savings in number of conservation employees and training employees:

- Less conservation employees is necessary because there is just one system to support
- There is training just for one system

Better technical characteristics:

- More trains on the same railway
- Bigger radio traffic capacity
- Bigger number of serviced trains with one system

Interoperability:

- Trains can cross the border without changing personnel, locomotive, radio equipment or frequencies
- Less time to cross the border
- Better usage of pulling machines and rolling stock

IV. CONCLUSION

Vision of the future is definitely on m-commerce side. Concept of modern people, that business should do prompt, where ever he/she is and what ever period of day or night is, is quite complementary with m-commerce. This is the reason why it will become, if no dominant, than very frequent way of making transactions between seller and customer (B2C), but also between more companies (B2B).

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