

Smart Public Transport

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ABSTRACT

This research paper presents a project developed in the subject “Work in a learning enterprise”, where we are presenting an idea for improving the urban transport of the Bulgarian city Ruse. The self-made authors applications developed for this purpose are: reusable electronic cards in the transports, mobile application and website.

Keywords: urban transport, Ruse, reusable electronic cards.

INTRODUCTION

We are a group of 11th grade students, majoring Economic Informatics. In the school subject “Work in a Learning Enterprise” we presented an idea related to the operation of public transport in our hometown (Ruse).

For this purpose, we created a learning enterprise, “Transport Support Canetti” Ltd., with a mission to support the urban travel system of the city. The proposed solution supports urban mobility. Our idea is inspired by the past attempts of the municipality to improve the system of using electronic cards, and due to the massive technology lag in our urban transport compared to other major cities in the country. Our target is to eliminate the massive use of non-recyclable paper in the form of tickets, which, in addition to

being obsolete as a method of use, is also one of the polluters of the environment. This reduces the so notorious lately carbon footprint in the sector. The project was presented at an internal school circle for learning enterprises, as shown in Fig. 1.

EXPERIMENTAL

Our team developed a system of proposals consisting of a mobile application, a website, a reusable card with a chip, and a machine reader for it [1 - 3]. Later in the report you can see a small part of our programming code of the mobile app and how it looks visually. You will see the different types of cards our company offers and where they can be purchased from. You can also view our merch, the result of our survey about the interest of our business.

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RESULTS AND DISCUSSION

Following a survey of the target group of passengers using the municipal public transport services daily, it was found that 99 % of the researched users would benefit from the improvement being proposed.

Our available cards (Fig. 2)

- Children's - which are free up to 14 years of age, with the latest change in regulation on the terms and conditions of travel on public transport in the territory of the country.

- Student - from 14 to 19 years
- Student - over 19

- For elderly people - over 55 or disabled people with reduced working capacity

- Basic

The prices are in accordance with the regulatory requirements and changes in the legislation of the country and the Municipality of Ruse [4].

After purchasing the card chosen by you from Fig. 2, it can be used immediately by inserting it into the readers installed in public transport vehicles [5].

Anyone who wants to use our public transport cards can purchase them from the ticket center



Fig. 1. Representatives of the company Transport Sport Canetti Ltd.



Fig. 2. App Cards.

of Ruse Municipality. We use the same address for selling the cards because the residents of the city have known it for many years.

For the users who do not like to carry physical cards in them but always have a phone, we suggest they use our mobile application.

The mobile application, developed by us, carries basic functionalities depending on the needs of the user. When the customer opens the mobile application “*Avtobusirusi*”, the client is redirected to their own profile, where they have the possibility to fill out and edit personal data. The tab is positioned at the bottom of the screen, serving for navigation in the application. There are 5 different sections:

- Your profile (Fig. 3);
- Public transport cards;
- The city map with all bus and trolley stops (Fig. 4);

- Information about our company;
- The card purchased by the user (Fig. 5);

Section “Public transport” cards from programming point of view look like this (Fig. 6). “PublicTransportCard” in function that is used as a template. The code contains the picture of the card, its title and 3 descriptions which are used to visualize the card prices. When the feature is created and ready to go, it can be replenished with the necessary information (Fig. 7). In Fig. 8 you can visually perceive the finished programming code.

Behind every mobile app and website, there is a database that stores user’s information and establishes the connection between clients and the server. Our database contains 3 tables “user” “user-info” “cards” (Fig. 9). Each of them is unique itself. “User” and “cards” represent the main two tables, and “user-info” is an additional

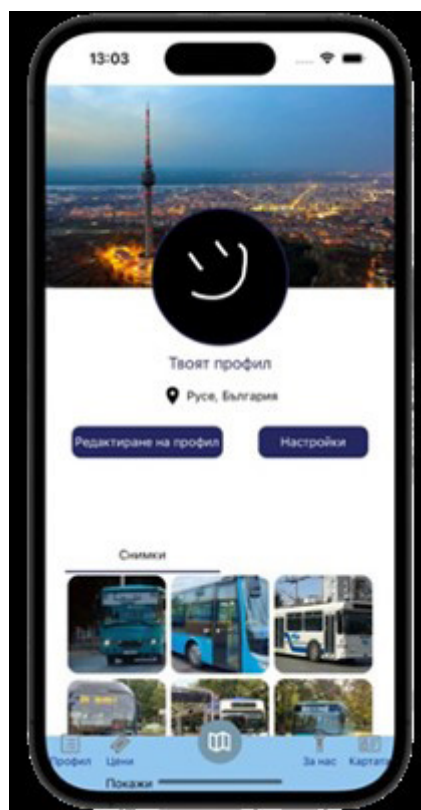


Fig. 3. Mobile app section “Your profile”.



Fig. 4. Mobile app section “City Map”.



Fig. 5. Mobile app section “Your Card”.

```
const PublicTransportCard = ({ title, description1, description2, description3, imageSource }) => {
  return (
    <View style={styles.card}>
      <Image source={imageSource} style={styles.cardImage} />
      <Text style={styles.cardTitle}>{title}</Text>
      <Text style={styles.cardDescription}>{description1}</Text>
      <Text style={styles.cardDescription}>{description2}</Text>
      <Text style={styles.cardDescription}>{description3}</Text>
    </View>
  );
};
```

Fig. 6. Part of the programming code used for public transport.

```
15 <PublicTransportCard
16   title="Детска карта за един месец 0 - 14г."
17   description1="тролеи- безплатна"
18   description2="автобуси - безплатна"
19   description3="тролеи и автобуси - безплатна "
20   imageSource={require('./karti/dete.png')}
21
22 />
23
24 <PublicTransportCard
25   title="Ученическа карта за един месец"
26   description1="тролеи - 4лв"
27   description2="автобуси - 10лв"
28   description3="тролеи и автобуси - 12 лв "
29   imageSource={require('./karti/uchenik.png')}
30 />
```

Fig. 7. The completed programming code used for public transport cards.

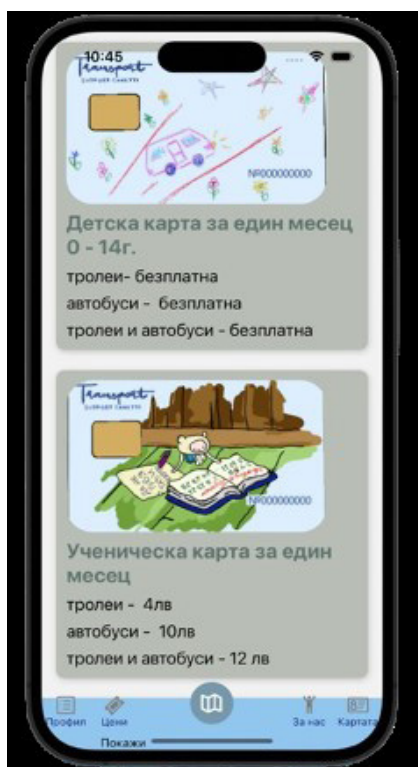


Fig. 8. Mobile app section “Public”.

table. To initiate the relationship between the tables „user” id (primary key) is associated with id(foreign key) in the other two tables (Fig. 10 and Fig. 11).

We use our login system to query the database. We create a profile by entering the necessary information (Figs. 12, 13) or logging into our profile. The information is accepted or rejected by the database according to whether it is correct, incorrect or already existing. Fig. 14 shows the new record, and Fig. 15 shows the code behind the login system connected to the database.

For the convenience of travellers, we offer a website developed by ourselves. In its development the following programmers were used: HTML, CSS, and JavaScript. For more specific functions, we used the help of w3schools [6].

Our completed website offers more detailed information compared to the app. It can be navigated from the menus (Fig. 17):

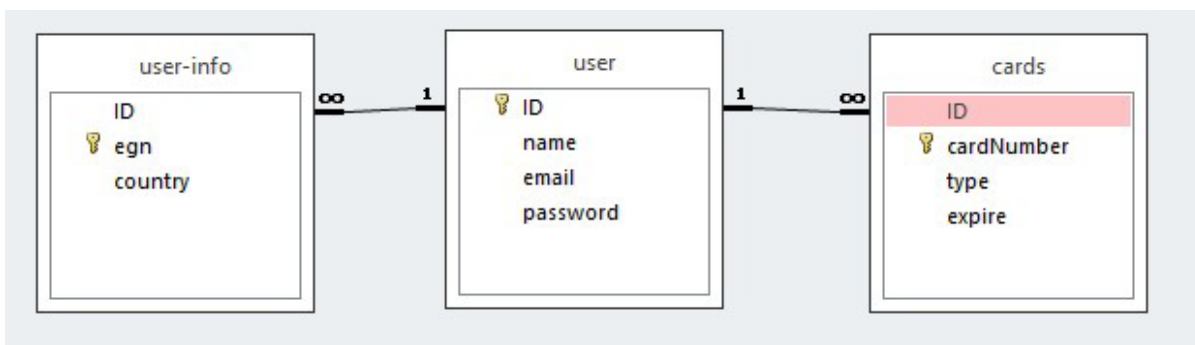


Fig. 9. Database with relationships.

```

CREATE TABLE "cards" ( "id" INTEGER, "cardNumber" NUMERIC NOT NULL, "type" TEXT, "expire" INTEGER, PRIMARY KEY("cardNumber"), FOREIGN KEY("id") REFERENCES "user"("id") )
CREATE TABLE sqlite_sequence(name,seq)
CREATE TABLE "user" ( "id" INTEGER, "name" TEXT, "email" TEXT, "password" TEXT, PRIMARY KEY("id" AUTOINCREMENT) )
CREATE TABLE "user-info" ( "id" INTEGER, "contry" TEXT, "egn" INTEGER NOT NULL, PRIMARY KEY("egn"), FOREIGN KEY("id") REFERENCES "user"("id") )
    
```

Fig. 10. Code from the database.

	id	name	email	password
...	Filter	Filter	Filter	Filter
1	1	naden	Ne.zmam84@gmail.com	123456789
2	2	test	Test@test.bg	123456789
3	3	Monika	M.aleksandrova@gmail.com	123456789
4	4	petranka	Email@email.com	123456789
5	6	Mitko	Tovasilal@ilel.co	0987654321

Fig. 11. Table "user" from the database.



Fig. 12. Login system with information.

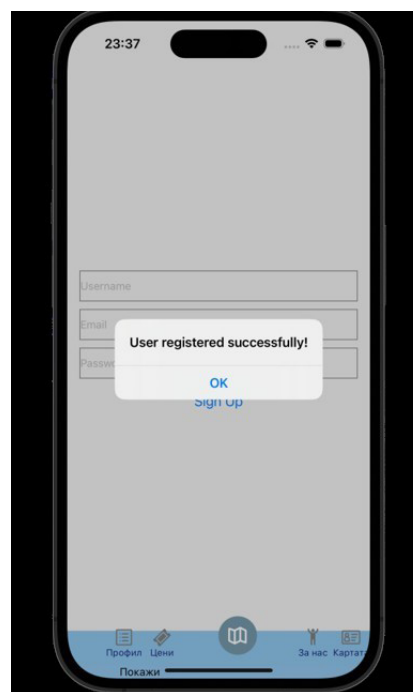


Fig. 13. Successfully registered user.

Table: user

	id	name	email	password
...	Filter	Filter	Filter	Filter
1	1	naden	Ne.zmam84@gmail.com	123456789
2	2	test	Test@test.bg	123456789
3	3	Monika	M.aleksandrova@gmail.com	123456789
4	4	petranka	Email@email.com	123456789
5	5	Mitko	Tovaemail@lel.co	0987654321
6	6	Pavlina_23	P.petrova@gmail.com	tovaeparola23.0?

Fig. 14. User table after the new.

```

ns > test > js signup.js > SignupScreenV2Test

const SignupScreenV2Test = () => {
  const [name, setUsername] = useState('');
  const [email, setEmail] = useState('');
  const [password, setPassword] = useState('');

  const handleSignUp = async () => {
    try {
      const response = await fetch('http://localhost:3006/signup', {
        method: 'POST',
        headers: {
          'Content-Type': 'application/json',
        },
        body: JSON.stringify({ name, email, password }),
      });

      if (response.ok) {
        Alert.alert('User registered successfully!');
        setUsername('');
        setEmail('');
        setPassword('');
      } else {
        Alert.alert('Failed to register user');
      }
    } catch (error) {
      console.error('Error signing up: ', error);
      Alert.alert('Failed to register user');
    }
  };
};

```

LEMS OUTPUT TERMINAL PORTS SEARCH ERROR

Fig. 15. Code for the login system connected to the database.

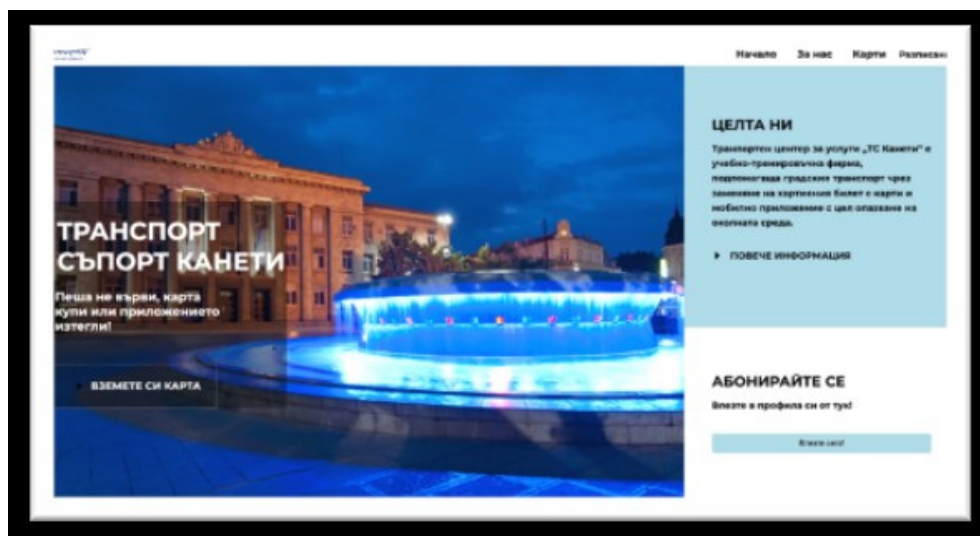


Fig. 16. The website.



a)



b)

Fig. 17. Handmade logos.

- About us;
- Trolleybus and bus schedule;
- Our cards;
- Register for a profile.

For the implementation of the project, all the documents for company registration [7], employment contracts, data protection policy, and a registration card were prepared and developed for inclusion in a training company center. The promotional materials (Fig. 18) [8] such as a catalogue, business cards, travel card design, and merchandise (Fig. 19) such as bags, hoodies,

dog scarves, pens, organisers, mugs, etc. were also developed by our marketing team. Offers for prospective customers, order slips, and sales contracts have been prepared.

CONCLUSIONS

Following the analysis of the improvements for the commuters in the city of Ruse, 99 % of them express interest in the re-introduction of convenience in public transport. Our idea is not only to help the residents of the city but also to catch up with the European standards. Our company offers

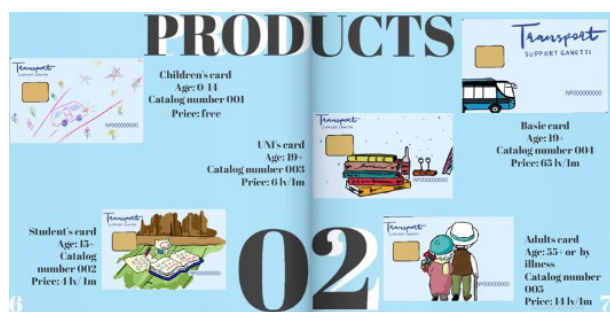


Fig. 18. Our advertising materials (catalogue).



Fig. 19. Our merchandise.

a comprehensive solution, including a mobile app and a website that are interactive and user-friendly for all age groups. We also offer reusable cards with a chip that are quick and easy to use, which stand out for their ease of purchase, use, and design.

In addition, our company provides innovative solutions that are superior to those already available in the city. Compared to the municipality, we are on the cutting edge of technology trends, provide more flexible and convenient travel options, and have the motivation to rise and maintain. Our systems are compliant with both national legislation and the specific needs of users in the city of Ruse.[9]

Our company, Transport Support Canetti Ltd., can become a reliable partner for the development of urban mobility, exceeding the expectations of users and achieving a significant improvement of public transport in the city. Our future plans include expanding to the districts of the city and improving the transport system there as well.

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