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A.K. Aitim[1] , A.E. Toleukhan[1*] , Sh.R. Chshir[1]

[1] International Information Technology University, Almaty, Kazakhstan
[*]e-mail: 31347@iitu.edu.kz

DEVELOPMENT OF A MOBILE APPLICATION FOR DELIVERY IN RURAL REGIONS

Abstract

The development of a mobile delivery application for rural regions is an urgent topic not only at the current time, but also. This topic has always been relevant and essential because the IT infrastructure in rural areas has always been underdeveloped compared with megacities and cities. This project aims to enhance digital technologies in rural areas, enabling residents to improve their living conditions and access more advanced technology. Our article highlights the key challenges and successes in the field of digital technology development in rural regions, drawing on an analysis of academic literature, open sources, and technical and practical factors. Our project will help simplify various digital aspects, such as product development among residents, navigating from one point to another without leaving home to order the correct items from another location in the city, finding and offering services, and more. Additionally, the project holds significant promise for digitalization and future development. Because our task is not only to collect and analyze large amounts of data, but also to automate routine tasks. Despite significant progress every year, the analysis results reveal substantial gaps in digitalization in rural regions, particularly in comparison to large cities that have greater access to digital technology. Our project helps to address this problem, at least partially, by providing rural regions with the opportunity to enhance digitalization and streamline work processes.

Keywords: delivery application, rural areas, transport services, emergency delivery, digital literacy training, online marketplace, improving IT infrastructure.

Ә.Қ. Әйтім[1], А.Е. Төлеухан [1], Ш.Р. Щир [1]

[1] Халықаралық Ақпараттық Технологиялар Университеті, Алматы қ, Қазақстан

АУЫЛДЫҚ АЙМАҚТАРДА ЖЕТКІЗУГЕ АРНАЛҒАН МОБИЛЬДІ ҚОСЫМШАНЫ ӘЗІРЛЕУ

Аңдатпа

Ауылдық аймақтар үшін мобильді жеткізу қосымшасын әзірлеу қазіргі уақытта ғана емес,әрқашан өзекті тақырып болып табылады. Бұл тақырып әрқашан өзекті және маңызды болды, өйткені ауылдық жерлердегі IT-инфрақұрылым мегаполистермен және қалалармен салыстырғанда әрдайым дамымаған. Бұл жобаның мақсаты-тұрғындар үшін өмір сүру жағдайларын жақсартуға және озық технологияларға қол жеткізуге мүмкіндік алу үшін ауылдық жерлерде цифрлық технологияларды жетілдіру. Біздің мақалада академиялық әдебиеттерді, ашық дереккөздерді, техникалық және практикалық факторларды талдауды пайдалана отырып, ауылдық аймақтардағы цифрлық технологияларды дамыту саласындағы негізгі проблемалар мен жетістіктер ашылады. Біздің жоба әртүрлі цифрлық факторларды жеңілдетуге көмектеседі, мысалы, жергілікті тұрғындар арасында сіздің өніміңіздің дамуы, бір нүктеден екінші нүктеге дейінгі жол, үйден шықпай-ақ, қаланың басқа нүктесінен керекті заттарға тапсырыс беру, қызметтерді табу және ұсыну және т.б. Сондай-ақ, жоба цифрландыру және одан әрі дамыту тұрғысынан өте перспективті болып табылады. Өйткені біздің міндетіміз-үлкен көлемдегі деректерді жинау және талдау ғана емес, сонымен қатар күнделікті тапсырмаларды автоматтандыру. Жыл сайын айтарлықтай прогреске қарамастан, талдау нәтижелері ауылдық жерлерде цифрландыруда, әсіресе цифрлық технологияларға қол жетімділігі жоғары ірі қалалармен салыстырғанда, айтарлықтай ақаулықтар бар екенін көрсетеді. Біздің жоба бұл мәселені, ең болмағанда, ішінара шешуге көмектеседі, осылайша ауылдық аймақтар цифрландыруды жақсартуға және жұмыс процестерін жеңілдетуге мүмкіндік алады.

Түйін сөздер: жеткізуге арналған қосымша, ауылдық аймақтар, көлік қызметтері, жедел жеткізу, цифрлық сауаттылықты оқыту, онлайн нарық алаңы, ИТ-инфрақұрылымды жетілдіру.

А.К. Айтим[1], А.Е. Толеухан[1] , Ш.Р. Щир[1]
[1] Международный Университет Информационных Технологии, г. Алматы, Казахстан

РАЗРАБОТКА МОБИЛЬНОГО ПРИЛОЖЕНИЯ ДЛЯ ДОСТАВКИ В СЕЛЬСКИХ РЕГИОНАХ

Аннотация

Разработка мобильного приложения доставки для сельских регионов является актуальной темой не только в текущее время. Эта тема была всегда актуальна и важна, потому что ИТ-инфраструктура в сельских регионах всегда была недостаточно развита, сравнивая с мегаполисами и городами. Целью этого проекта является улучшить цифровые технологии в сельских регионах для жителей, чтобы они имели возможность улучшить условия жизни, и имели доступ к более продвинутой технологии. Наша статья раскрывает главные проблемы и достижения в области развития цифровых технологии в сельских регионах, с помощью анализа академической литературы, открытых источников, технических и практических факторов. Наш проект поможет упростить различные цифровые факторы, такие как развитие своего продукта среди местных жителей, путь с одной точки на другую точку, не выходя с дома заказывать нужные вещи с другой точки города, найти и предлагать услуги и так далее. Также, проект весьма перспективна с точки зрения цифровизации и дальнейшего развития. Потому что, наша задача не только сбор и анализ больших объемов данных, но и автоматизация рутинных задач. Несмотря на значительный прогресс с каждым годом, результаты анализа показывают, что имеются значительные пробелы в цифровизации в сельских регионах, особенно по сравнению с большими городами, которые имеют большой доступ к цифровой технологии. Наш проект помогает решить данную проблему, по крайней мере, частично, чтобы в сельских регионах была возможность улучшить цифровизацию и упростить рабочие процессы.

Ключевые слова: приложение для доставки, сельские регионы, транспортные услуги, экстренная доставка, обучение цифровой грамотности, онлайн-маркетплейс, улучшение ИТ-инфраструктуры.

Main provisions

It isn't easy to live in the 21st century if a person cannot navigate modern technologies. Based on this, our primary objective for developing the project is to enhance the IT infrastructure among rural residents, enabling them to navigate the digital world more easily. Creating such a large project requires several essential factors, including researching the needs of residents for this application, implementing multiple functionalities within a single application, and others. As a result of our research, we concluded that the most suitable solution to address this problem is to develop a mobile delivery application for rural areas, thereby improving the daily lives of residents. A significant amount of effort is required to implement this idea; therefore, we will strive to ensure that rural residents have the same opportunities as those in urban areas.

Introduction

The study aims to improve the IT infrastructure in rural areas of Kazakhstan. The study addresses topical issues, including the accessibility of information technologies, literacy in information technologies, and the availability of technological educational resources in remote and rural areas of Kazakhstan. In small villages, the low level of quality education is often associated with limited access to resources, a shortage of qualified teachers, outdated teaching methods, and insufficient integration of digital technologies into education. In these localities, there is often a lack of adequate infrastructure for effective learning, which leads to lower student achievement, limited opportunities for future development, and low-quality IT infrastructure. In the era of digitalization and against the background of rapid technology development, the importance of IT infrastructure is increasing, especially in remote regions of the country. Rural communities often face challenges related to a lack of equipment, qualified specialists, and financial resources for digitalization within their districts. According to the latest data from the Ministry of Education, only 30% of schools in rural areas of Kazakhstan are equipped with modern computer technology. According to a UNESCO study (2022), approximately 40% of rural schools worldwide face a shortage of qualified IT specialists, which significantly hinders the integration of modern technologies into the educational process. Studies also show that schools in rural areas of Central Asia lack sufficient financial resources to upgrade

equipment and train staff, which hinders their educational development [1]. The purpose of this study is to assess the current state of IT infrastructure in rural regions and offer recommendations for its improvement and development. The primary challenges of the study are the lack of modern IT resources and a proper IT infrastructure for the digitalization of villages, the modernization of educational processes in rural schools, and the overall digital development in terms of percentage. Limited financial resources, disinterest from large corporations and local governments, as well as a shortage of qualified specialists, make it challenging to implement modern IT technologies.

Research questions:

– What are the primary and pressing issues with the existing IT infrastructure in rural areas?

– What specific technologies can be implemented in rural areas to improve and develop IT infrastructure/, and how do they meet the needs of residents?

– How do local communities and residents consider the role of digital technologies in their everyday lives, education, and how does this influence their willingness to participate in such initiatives?

This study hypothesizes that enhancing the IT infrastructure in rural areas will directly lead to improvements in the quality of life, infrastructure development, educational quality, and student access to modern digital technologies, ultimately having a positive impact on the overall growth and level of the area:

- Poor digital literacy regarding technologies and resources, as well as the lack of IT tools among local residents, reduces the efficiency and standard of living for local residents.
- Develop an application that facilitates the development and structuring of IT infrastructure in rural areas.

This study represents a significant step for rural residents and the IT sector in Kazakhstan as a whole, as its results can contribute to the development of new approaches to modernizing IT infrastructure in rural areas, local government, local communities, and educational institutions. It is essential to recognize that enhancing the IT infrastructure in rural areas not only improves the digital literacy of local residents but also, most importantly, facilitates equal access to education, a crucial factor in the socio-economic development of the regions. Modern technologies can contribute not only to improving academic performance but also to improving the digital literacy of students, which is especially important in the context of global digitalization [2]. The study also highlights the need to consider the economic factors that influence access to IT resources. According to research in Central Asia, rural schools often face budget constraints that limit their ability to upgrade equipment and introduce new educational technologies. This study aims to contribute to the development of education policies that bridge the digital divide in Kazakhstan between Cities and rural areas, as well as improve the quality of education in rural areas. With the help of such a mobile application, it is possible to address problems such as transportation difficulties, long wait times for goods, and a lack of educational resources, among others. The mobile application will provide residents with transport services tailored to their local area, enabling them to access these services quickly. Additionally, to save money, a system of shared trips will be implemented. Such a system will help save money, as the cost of a taxi on long roads is often more expensive than the user can afford. Therefore, the system of shared trips will enable the precise division of the amount that appears in the system among two or four people. This system has been widely implemented in large projects, such as YandexGo, inDrive, Uber, and others. However, these applications do not scale to all regions of the city; they are mainly aimed at large and central areas. Therefore, a mobile application for rural areas will enable residents of rural regions also to use such services and be closer to growth. Of course, when implementing such a system, it will be easier for residents to obtain the goods they need through the application, allowing them to order items that are not available in rural areas. Large projects do not study all points of the country so extensively, so every resident needs such an opportunity. Such opportunities enable residents to master digital technologies more effectively.

Research methodology

A quantitative approach was used in this study. This method was chosen to obtain a more comprehensive understanding of the state of IT infrastructure in rural areas and schools, identifying both objective data and subjective opinions from the study participants. A quantitative approach, in the form of a survey, also helps compensate for the shortcomings of each approach and expand the possibilities of analysis. Quantitative data were collected through a questionnaire survey of students, enabling the analysis of objective data for statistical purposes.

Quantitative sampling. Stratified sampling: A stratified approach will be used to ensure a representative sample of residents, teachers, and parents. Students will be classified by class, and parents will be categorized by educational level and socioeconomic status. Local residents will be classified by their lifestyle and occupation. This will enable you to obtain data from various categories and strata of the population.

For a study on the development of IT infrastructure in rural areas, the target audience will be the following groups. Teachers are key figures in the educational process, providing valuable insights into the quality of education and the availability of resources.

- Students are both high school and college students who can share their experiences and ideas about educational opportunities in rural areas.
- Parents of students are essential participants whose opinions on the quality of education and the availability of resources can be valuable for research.
- Local authorities, representing government and educational institutions, can provide information on the state of the IT infrastructure and educational initiatives in the region.
- Educational service providers are representatives of private educational centers and organizations that can share their experience and the results of their programs.
- Local residents – individuals who use and/or provide daily services, who can share their experiences and initiatives related to digitalization.

The study involved 20 rural schools in Kazakhstan, located in different regions of the country, which enabled the coverage of various geographical and economic conditions. The total number of participants was 200 people, comprising 50 teachers, 50 students, 25 representatives from the school administration, 25 representatives from local authorities, and 50 residents. Teachers and administrative staff represented different age and professional groups, which allowed us to get other opinions about the state of the IT infrastructure. The students were randomly selected from high school (aged 15-18), which allowed us to obtain more objective data on their digital literacy and technology experience. Questionnaires and semi-structured interviews were used to collect the data. The questionnaires for students included questions about access to IT resources, the frequency of computer and Internet use, and how the use of technology affects their learning. The questionnaire also included questions about digital literacy and cloud service skills. Interviews with teachers, local residents, and IT professionals included questions about the difficulties they face in implementing new technologies, as well as the level of support from school management and government agencies.

Surveys (questionnaires) Development of IT infrastructure in rural regions.

Questionnaire Design: We developed a structured questionnaire comprising both closed-ended and open-ended questions, covering topics such as internet access, quality of education, and satisfaction with educational resources. Questions to participants will also include their opinions on government initiatives in education.

Dissemination: We utilized online platforms (e.g., Google Forms) and distributed questionnaires at meetings with parents and in schools.

Data collection: We collected data from a sufficient number of participants (100 -200).

Data Analysis: We analyzed the results using statistical methods to identify trends and dependencies

A correlation analysis was conducted to investigate the relationship between the level of IT resource availability in rural areas, digital awareness in rural schools, and student academic performance. This method allowed us to determine whether there is a significant relationship between

the availability of IT tools, the number of computers, Internet access, and the efficiency and simplified lifestyle of local residents, as well as the educational results of students. Descriptive analysis was employed to examine the frequency of IT resource use, the level of digital literacy among local residents, students, and their experiences with IT technologies. This allowed us to identify general trends and average indicators that help us better understand the current state of IT infrastructure in rural regions. A thematic analysis was employed to process the qualitative data collected during the interviews. The main topics identified as a result of the study included aspects such as a lack of IT resources, low-quality Internet, a low level of teacher knowledge on the use of IT technologies, a general lack of technology, inadequate support from government agencies, and a lack of initiative from local authorities. By conducting a study using a quantitative method of analysis, it becomes more flexible. The advantages of quantitative data enable you to view the situation from different angles and gain insight into problems and hypotheses. In the context of studying infrastructure in rural areas, and more specifically in rural schools, where there are objectively significant problems such as a lack of resources, inadequate support, and a lack of initiative, this approach proved convenient. Thanks to this approach, we were able to identify both factual data and the actual causes of problems related to the implementation of IT technologies. Taking these factors into account, we present Table 1 below, which outlines the data collection process.

Table 1. Planning the data collection process

Stage	*Action*	*Data Collection place*	*Time*	*Data collection method*	*Ethical issues*
Preparation	*Questionnaire and interview design*	*Google Forms (online)*	*1 week*	*Online question-naire*	*Informing participants about the study's purpose and confidentiality. Obtaining consent to participate.*
Selection of participants	*Identify target audience (teachers, parents, students)*	*Online (social media, educational institutions) Offline (Schools, Small villages)*	*1 week*	*Purposive sampling*	*Notification of the right to withdraw at any time.*
Data collection	*Conducting interviews*	*In person/online*	*2 weeks*	*In-person interview/ video calls*	*Obtaining informed consent to record the interview. Promise of confidentiality.*
Data collection	*Distribution of the online questionnaire*	*Online (using a platform)*	*2 weeks*	*Online question naire*	*Informing participants about the purpose of the survey and the anonymity of responses.*
Observation	*Observation of learning in the classroom*	*Schools*	*1-2 weeks*	*Obser-vation*	*Consent for participation from the school administration and parents. Ensuring anonymity.*
Completion	*Processing and analyzing the data collected*	*Online*	*1 week*	*Data analysis*	*Notification to participants of the study results (optional).*
Total time: 2-2,5 months					

As shown in Table 1, we will require 2-2.5 months to collect the research data. During these months, we will explore various aspects, including data collection, participant recruitment, analysis, and other related topics. To summarize, we can say that quantitative data collection helped us better understand the need to implement our project in rural areas.

Results of the study

The study's results are presented in a logical sequence. Tables and diagrams are used to visualize data on the state of IT infrastructure in rural educational institutions. These data help to answer the key research questions. To understand the key research questions, refer to Table 2.

Table 2. Availability of IT resources in rural schools

School	*Number of Computers*	*Internet-connection (+/-)*
1	*10*	+
2	*8*	-
3	*15*	+
4	*7*	-
5	*12*	+

As shown in Table 2, only three out of five schools have access to an Internet connection, confirming the problems with Internet connections in rural areas. The number of computers also varies, and most schools face a shortage of equipment. To understand the general level of IT resource use in rural regions, we used rural schools as a basis. The study's results demonstrate the level of development of IT infrastructure in rural schools. Table 3 provides information on the number of computers and the availability of Internet connections in each school. Based on these data, we can conclude that the problems with Internet access and the lack of equipment in educational institutions indicate a very low overall level of use.

Table 3. Utilization of cloud technologies in rural schools

School	*Use of cloud technologies (+/-)*	*Level of digital literacy*
1	+	*High*
2	-	*Medium*
3	+	*High*
4	-	*Low*
5	+	*Medium*

Data analysis from Table 3 shows that schools using cloud technologies have demonstrated a higher level of digital training among both students and teachers. This highlights the importance of introducing modern technologies to improve the quality of education [2,3].

Table 3 shows the relationship between the use of cloud technologies and the level of digital literacy in rural schools. Schools that use modern technology have a higher level of training for both students and teachers. The diagram in Figure 1 illustrates the percentage of cloud technology usage in these schools, highlighting the importance of adopting advanced technologies to improve the quality of education.

Correlation between the availability of IT resources and student performance. To analyze the impact of IT infrastructure on the educational process, a correlation analysis was conducted, which revealed that the availability of modern technologies contributes to improved academic performance among students. In schools with access to the Internet and modern IT resources, students showed higher grades in key subjects such as mathematics and science [4, 5].

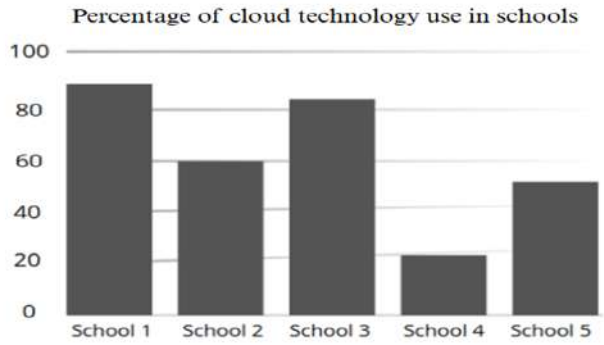

Figure1. Percentage of cloud technology use in schools

Key results

- Many schools lack access to computers and the internet.
- Schools using cloud technologies have shown a higher level of digital literacy among students and teachers.
- There is a direct relationship between the level of IT infrastructure and student academic performance.

One of the solutions is an APP that has all the functions and supports teaching new IT technologies to people in rural areas [6]. This is an application that promotes essential tasks, including taxi services for drivers and passengers, delivery, an online market for local goods, a recruitment and search service, a Map, and a section on digital literacy studies. The development of a mobile application is one solution to improve digital literacy in rural areas. We illustrate this more clearly in Figure 2.

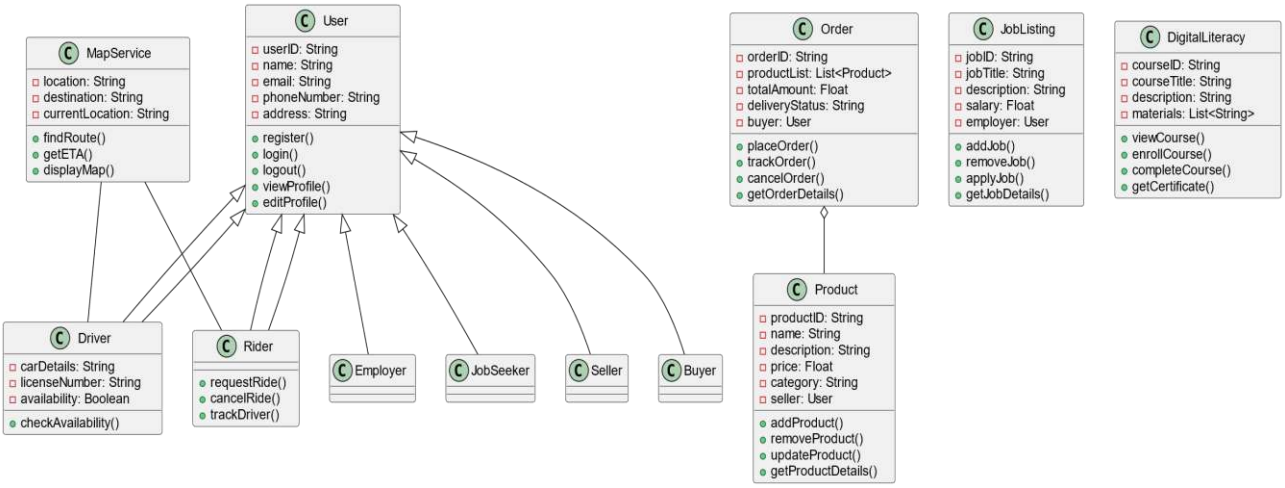

Figure 2. The UML diagram of the concept of the system for a mobile application

The UML diagram in Figure 2 illustrates the concept of a mobile application system that encompasses various functions, including taxi services, goods delivery, online marketplaces, maps, and digital skills training. This app can be a vital tool in supporting the local population.

We have illustrated the initial stage of interaction between the server and the user in the algorithm model. Each stage of the model is closely related to the subsequent one, ensuring consistent and accurate information processing. You can see an example in Figure 3. The algorithm consists of several consecutive steps, beginning with data input and culminating in the final result. The main components of the algorithm include the steps of data preprocessing, solution method selection, result evaluation, and optimization [7]. To clearly illustrate how our social project and volunteering system will function, we have created a UML diagram for the system concept. More can be seen in Figure 4.

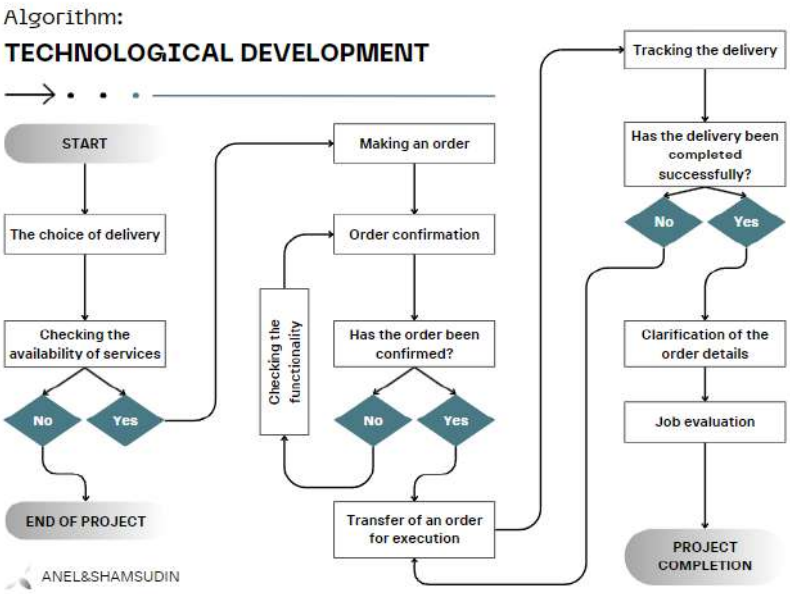

Figure 3. Model of an algorithm

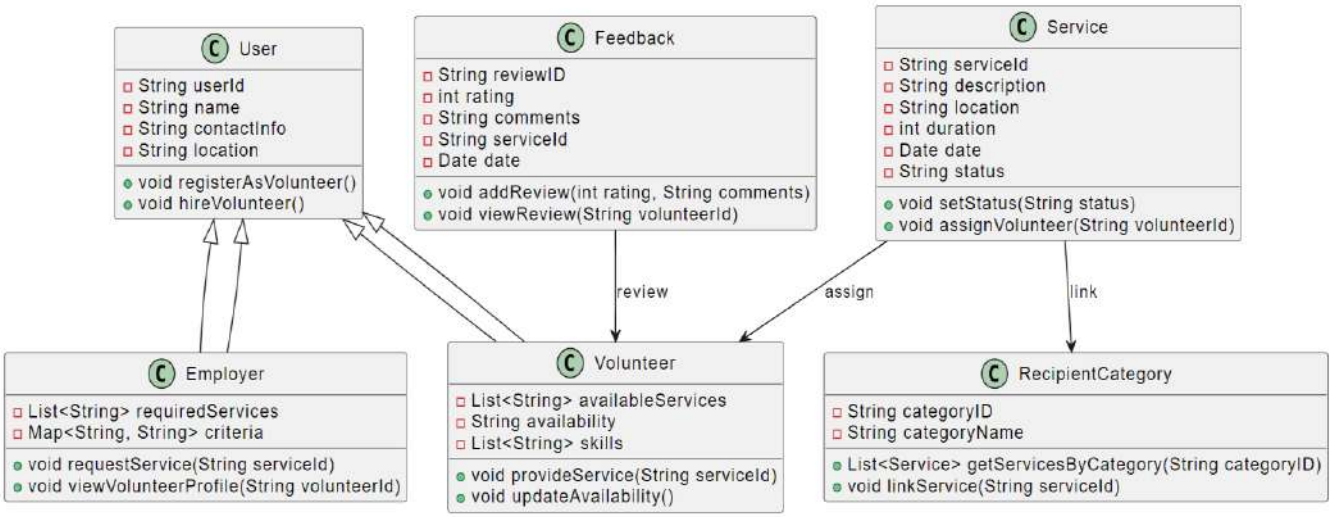

Figure 4. The UML diagram of the concept of the system of social projects and volunteering

One of the main sections in the application is "volunteering". Users of the application can become volunteers in various areas of life or connect with others to participate in specific activities, events, or public causes. We can see the structure in Figure 5. Section for hanging digital literacy and training in the use of IT technologies for all comers. The principle of operation is quite simple. In this section, users can choose the current level of their knowledge of technologies. Based on this, they can continue to gain knowledge and learn digital literacy. The structure and algorithm of work are illustrated in Figure 5. To make the Interface more quickly and readable for all ages, refer to the visual layout in Figure 6. These layouts illustrate the various screens, including the home screen, navigation menu, and user interaction interface. The layouts are carefully designed to provide intuitive navigation and usability. For example, buttons and input fields are arranged to enable the user to easily navigate between application functions.

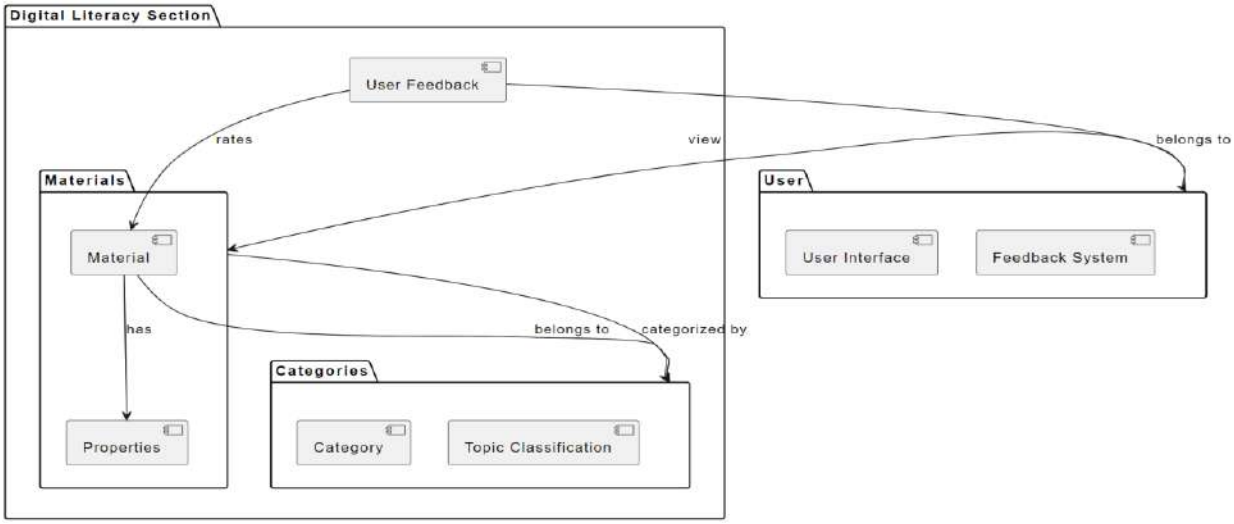

Figure 5. UML diagram of the concept of a video tutorial system for digital literacy

At each stage of the layout, it is possible to see how the system responds to the user and how the user interacts with the interface [8].

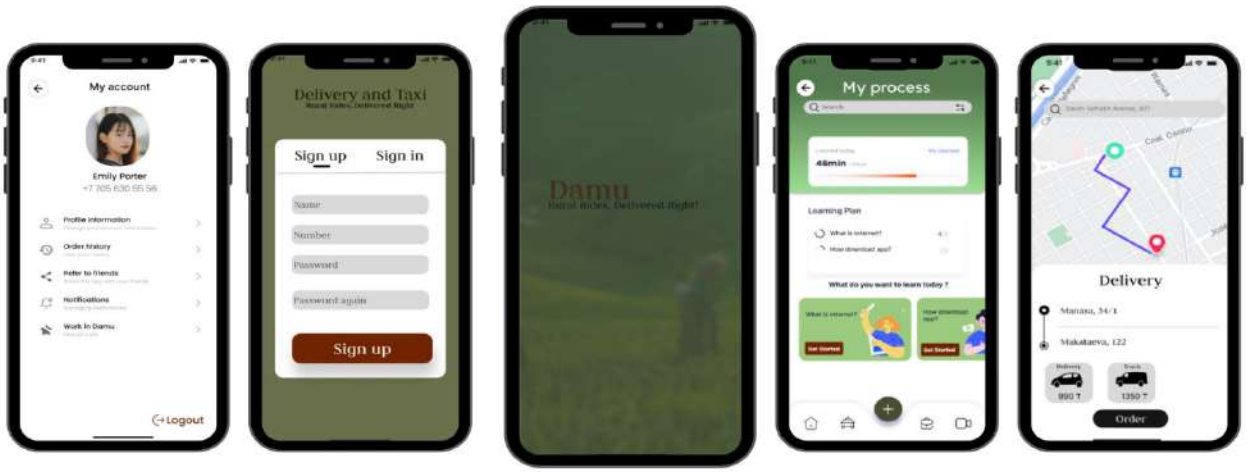

Figure 6. Mockup of the app

To implement this project, you can examine a piece of code that reflects processes such as processing user queries, interacting with the database, and performing calculations on the server side of the system. The code is designed with efficiency and ease of scalability in mind, allowing the application to be adapted to different workloads and usage scenarios. Important points include proper resource management, data security, and error handling, which ensure the application's stability. These are illustrated in Figure 7, which outlines the main elements of the code implementation.

The result of the algorithm's work is the receipt of visualized data that corresponds to the user's requests. As a result, the processed information is presented in a clear and easy-to-understand format, enabling users to analyze the obtained data and make informed decisions. This result demonstrates the effectiveness of the developed code and the accuracy of the algorithm. Based on careful analysis and hypotheses, this program is one of the most relevant and valuable solutions, since large corporations are not aimed at this market, this is an ideal opportunity for the state to increase the digital literacy of the people, as well as a good opportunity for businessmen to invest in a promising project, but most importantly, this application contributes and will increase the level of IT infrastructure in rural areas [9].

```
class Rider extends User {
    public Rider(String userID, String name, String email, String phoneNumber, String address) {
        super(userID, name, email, phoneNumber, address);
    }

    public void requestRide() { System.out.println(name + " заказывает такси."); }
}


class Driver extends User {
    String carDetails;

    public Driver(String userID, String name, String email, String phoneNumber, String address, String carDetails) {
        super(userID, name, email, phoneNumber, address);
        this.carDetails = carDetails;
    }

    public void updateLocation() { System.out.println(name + " обновил местоположение."); }
}
```

Figure 7. Code implementation

The research results confirm the initial hypothesis about the uneven distribution of IT resources among rural schools of Kazakhstan. As Table 2 shows, many schools lack computers and stable Internet access, which directly affects the quality of education. Internet access has a direct impact on the quality of education. This finding is consistent with the results of other studies, which indicate a significant lag behind rural schools in terms of IT infrastructure development compared to urban schools [10]. Additionally, the study's results showed that schools with higher levels of digital literacy tend to be more active in utilizing cloud technologies. This highlights the importance of integrating modern technologies into the educational process to enhance learning effectiveness, as noted in the works of UNESCO and other international organizations [11]. An unexpected result was the identification of a very low level of IT infrastructure development in one of the schools, despite its proximity to a large population center. The expectation is that schools closer to urban centers should have more developed infrastructure. However, this study has shown that even in such cases, there may be problems in providing the necessary resources. Possible reasons could include a lack of funding, inefficient resource allocation, or a lack of skilled professionals to manage the IT infrastructure. This aligns with previous studies that highlight the need for improved management and planning in the education system. In conclusion, we would like to note that the mixed-method approach helped us analyze the data more effectively. By combining quantitative and qualitative methods, we have obtained a more comprehensive and nuanced result.

Discussion

The study revealed differences in the IT infrastructure of rural schools, as only a few of them have access to the Internet and the corresponding computers. Schools that utilize cloud technologies demonstrate higher digital literacy among both teachers and students. There is also a clear link between improving IT infrastructure and student academic performance. The findings of this study are consistent with those of international studies, which also emphasize the existence of inequalities in IT resource allocation between rural and urban schools [12]. For example, studies conducted in rural schools in China and South Korea have also shown that schools located in remote areas face significant difficulties in accessing the Internet and modern technologies, which negatively impact the educational process. This study has several limitations. Firstly, it covers a limited number of schools (20 educational institutions), which may not provide a comprehensive picture of the state of IT infrastructure in rural schools in Kazakhstan. Additionally, data collection was hindered by the remoteness of some regions, which limited the ability to collect information from the most remote areas. These limitations should be considered when interpreting the results. It is also worth noting that qualitative data obtained during interviews may contain subjective opinions of participants, which require additional verification and analysis in the future [13]. For a more in-depth study of the problem, it is recommended to conduct research with a broader geographical coverage, including

schools from different regions of Kazakhstan, and to increase the sample size to 50-100 schools for a more accurate analysis. It is also essential to cover schools from the most remote and hard-to-reach areas to understand how geographical location affects access to IT resources. It is also recommended that attention be paid to examining the long-term impact of cloud technology and its use on student achievement, as well as teacher professional development. Including a more detailed analysis of economic factors and teacher training in the use of IT can help develop strategies for more successful digital inclusion in rural schools.

Conclusion

The study revealed that rural schools in Kazakhstan face numerous challenges in integrating modern information technologies into their educational processes. The main problems identified include an insufficient number of computers, outdated equipment, and limited access to high-speed Internet. Only 28% of rural schools have access to online educational resources, which puts them at a disadvantage compared to urban schools. The results confirm the hypothesis that there is a significant disparity in the distribution of IT resources between rural and urban schools, a key issue in Kazakhstan's education sector. In the context of Kazakhstan's digital initiatives, the importance and impact of accelerating the introduction of digital technologies have highlighted the need for significant reforms in the field of computer infrastructure in rural areas. The problem identified in the study is that, in the absence of proper investments or a strategic plan, the gap between urban and rural schools will continue to widen. This, in turn, may exacerbate the existing social inequality in the country. Applying the study's results in practice can help develop specific measures to bridge the digital divide, enhance students' digital literacy, and improve their readiness for further education and employment. This study makes a significant contribution to the scientific debate about the digital education gap. It complements existing theoretical research by providing empirical data that can inform the development of new government strategies and programs. The practical value of this research lies in the fact that government agencies can use it to inform decisions on the allocation of funding and the modernization of IT infrastructure in rural schools, a key step in achieving educational equality. Recommendations for future research: Expansion of geographical coverage: Future studies should cover more regions of Kazakhstan to identify regional differences in access to IT and educational resources. This will help to understand better the current state of IT infrastructure in rural schools. Study of teacher training: Special attention should be paid to studying the training of rural school teachers in the use of digital technologies. It is essential to evaluate the existing training programs and identify areas for improvement to optimize the utilization of IT resources. Research on the impact on students: Future research could aim to analyze the effect of access to modern technology on student achievement. This will help better understand the long-term impact of the digital divide and develop interventions to address it. Focus on teacher training: It is worthwhile to examine the extent to which teachers in rural schools are prepared to use digital technologies. The study should evaluate existing training programs and identify opportunities for improvement to optimize the utilization of IT resources. Research on the impact on students: Future research could focus on the effects of access to modern technology on student achievement in rural schools. This would enable a more accurate assessment of the long-term impacts of the digital divide.

Recommendations for Practical Implementation: Investments in Internet Infrastructure. Additional investments in high-speed Internet are necessary to enhance the quality of education in rural schools. This will allow more schools to connect to online resources and improve access to modern educational technology. Grant programs for schools: States should establish grant programs to upgrade IT infrastructure in rural schools, helping to bridge the technology gap between urban and rural schools.

Expand teacher training programs: It is essential to enhance teacher access to educational programs on the effective use of digital technologies. This will lead to better utilization of IT resources and improve student learning through increased digital literacy. Creating grant programs: States could establish grant programs to assist local schools in upgrading their IT infrastructure and purchasing necessary equipment. Expand teacher training programs: It is essential to increase access to

educational programs that train teachers in the effective use of digital technology. This not only promotes more efficient use of IT resources but also more effective student learning.

Ultimately, the study identified the existing problems faced by rural schools in Kazakhstan when implementing IT technologies and offered practical recommendations for their solution. Overcoming digital inequality will contribute not only to improving the educational process but also to promoting long-term social justice. Upgrading the IT infrastructure of rural schools should be a priority for Kazakhstan if it wants to achieve equal access to quality education for all students, regardless of their geographical location.

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