Brief information about the project

Name of the project	AP14871940 «Development of software, including a mobile application to record the time of employees of departments responsible for the diagnosis of mainline railroad tracks» (0122PK00566)
Relevance	Development of a fundamentally new software, including a mobile application operating on various modern operating systems, that enables the recording of GPS coordinates of employees' smartphones during the performance of their official duties.
Purpose	Ensure full transparency of the employee timekeeping process, including the calculation of overtime and additional payments, eliminating the need for employees to fill out any paper documents for this purpose. This will be helped by software, including a mobile application that will generate an electronic itinerary automatically based on the geolocation data and time stamps of the employee's smartphone.
Objectives	1. Development of scalable software and a mobile application enabling the collection and transmission of employees' coordinates and the routes of their actual movement during working hours, even in the absence of internet connectivity between route checkpoints. 2. Formation of electronic itinerary sheets. 3. Comparing the actual route of the employee with the planned one, identifying discrepancies if any. 4. Payroll accrual based on actual data.
Expected and achieved results	1. Expected results: Full volume of reliable and accurate data in electronic form on geolocation, routes of movement and working hours of employees with visualization of this data in special software (dashboards, BI analytics). 2. Expected results: A legally significant electronic itinerary created on the basis of transparent, verifiable geolocation data and smartphone timestamps of each employee, similar in type and content to a paper itinerary. The electronic itinerary must be generated automatically, without the employee's involvement. The electronic itinerary should fully replace the paper itinerary. 3. Expected results: Accelerating the formation of planned diagnostic routes, increasing the accuracy and transparency of route planning based on previously collected geolocation data. 4. Expected results: Accelerate the payroll process, reduce paperwork, increase accuracy and transparency of the payroll process, allow employees to concentrate on their direct responsibilities, without the distraction of filling out paperwork and getting marks at the stations. *Major results as of the end of the second half of 2022:* A mobile application has been developed and is available for download on Play Market and Apple Store platforms. The mobile application, which collects data on geolocation and movement routes during working hours even without an internet connection between checkpoint locations, has obtained a Certificate of Inclusion of Information in the State Register of Rights to Objects Protected by Copyright No. 30228 dated November 11, 2022, for the computer program "GPS FLT." A scientific article by the project's senior research fellow Sh.M. Suyunbayev has been published in the journal recommended by the Committee for Control of Social Organizations and Nonprofit

	Organizations (CCSON) - "Bulletin of KazNU. Series Economics" No. 4 (142) in 2022, pp. 16-28. *Major results as of the end of 2023:* The complete set of data in electronic format regarding geolocation, movement routes, and working hours of employees, with visualization of these data in specialized software (dashboards, BI analytics). A Certificate of Inclusion of Information in the State Register of Rights to Objects Protected by Copyright No. 32775 dated February 17, 2023, has been obtained for the computer program "GPS FLT 2." A scientific article by N.D. Adilova, M. Sultanbek, D.K. Sarzhanova has been published in the journal recommended by CCSON - "Bulletin of KarU. Series Economics" No. 2 (110). – Karaganda: Publishing House of Karaganda University named after Academician E.A. Buketov, 2023. – pp. 102-110. A monograph by N.D. Adilova titled "Mathematical algorithms for optimizing rail transport" has been published. / Al-Farabi Kazakh National University- Almaty: Al-Farabi KazNU, 2023. – 119 p. A scientific article by authors N. Adilova, M. Sultanbek, A. Sladkowski, A. Karibayev titled "Forecasting the demand for railway freight transportation in Kazakhstan: A case study" has been published in the peer-reviewed scientific journal "Transportation Research Interdisciplinary Perspectives." Volume 23, January 2024, 101028.
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	1. Nazdana Adilova, doctor (PhD). Hirsch index – 3, Researcher ID: C-4023-2019, Scopus author ID: 57193616524, ORCID ID: **0000-0002-8184-6993**. 2. Aleksander Sladkowski, c.t.s., professor. Hirsch index – 12, Researcher ID: 12838538, Scopus author ID: 6507140653, ORCID ID: **0000-0002-1041-4309**. 3. Sarzhanov Dauren, c.t.s., Associate Professor. Hirsch index – 4, Researcher ID: P-7057-2014, Scopus author ID: 57190379888, ORCID ID: **0000-0002-7250-1029**. 4. Sultanbek Madiyar, Master of Science in 7M11301 "Logistics (by branch)", PhD. Hirsch index – 0, Scopus author ID: 586345402000, ORCID ID: **0000-0002-4408-3552.** **5.** Shinpolat Suyunbayev**, Doctor of Technical Sciences, Associate Professor.** Hirsch index – 3, Scopus author ID: 57221665892, ORCID ID: **0000-0002-4867-8270**
List of publications with links to them	1. Sh. Suyunbayev, «Assessment of Economic Prospects for Implementing Electric Centralization Technology», «Bulletin of KazNU. Series Economics» No. 4 (142) in 2022, pp. 16-28. https://doi.org/10.26577/be.2022.v142.i4.02 *2.* M. Sultanbek, N. Adilova, D. Sarzhanov «Improvement of the demand planning system for freight transportation on the mainline railway transport», «Bulletin of Karaganda University. Series Economics» No. 2 (110). – Karaganda: Publishing House of Karaganda University named after Academician E.A. Buketov, 2023. – pp. 102-110. https://economy-vestnik.ksu.kz/apart/2023-110-2/10.pdf 3. M. Sultanbek, N. Adilova, A. Sladkowski, A. Karibayev «Forecasting the demand for railway freight transportation in Kazakhstan: A case study», Scientific journal «Transportation Research Interdisciplinary Perspectives». Volume 23, January 2024, 101028, https://www.sciencedirect.com/science/article/pii/S2590198224000149

Patents	-

To carry out the scientific and technical work of the project, the project team planned to participate in the Second International Scientific and Technical Conference "Railway Rolling

Stock: Issues, Solutions, Perspectives" from April 19 to 22, 2023, at Tashkent State Transport University (Uzbekistan, Tashkent). Within the framework of this conference, discussions were held on the development of long-term cooperation and joint activities, as well as the exchange of experience and discussions on the possibility of piloting the Mobile Application in the production units of JSC "Uzbekistan Temir Yollari." We believe that the experience of Kazakhstan Railways in this field may be of interest and beneficial for Uzbekistan Railways to enhance the efficiency of employee work.