InnoBuyer

FAST TRACK TO INNOVATION PROCUREMENT

OPTIDRIVE

UAB "KLAIPĖDOS PASLAUGOS"

OptiDrive

PITCH

Predictive eco-driving solution for service electric vehicles to optimise energy consumption, rank, analyse and enhance driver performance.

ORGANISATION DESCRIPTION

UAB "Klaipėdos paslaugos" (further - KP) provides regular passenger transport services in the city of Klaipeda, suburban areas, as well as intercity, and international routes. It is the largest passenger transportation company in Klaipeda and one of the largest companies specialising in this passenger transport in Lithuania. Klaipedos paslaugos is 100 percent owned by Klaipėda city municipality and has been providing public transport service for more than 30 years. In addition to the main service of passenger transportation, KP offers a range of related services: renting buses for trips and excursions; shipment transportation services; Baggage storage services; Selling tickets for international routes; Renting advertising space on buses; Providing transportation technical maintenance services. Organisation serves 55 routes in Klaipeda city and owns/leases a total of 123 vehicles. Approximately 19,6 million passengers are transported annually. The company has approximately 300 employees. The authorised capital of KP is 8,7 M eur.

CHALLENGE DESCRIPTION

Moving towards a passenger fleet powered with alternative fuels (such as electricity or hydrogen fuel) will be mandatory for all urban public transport operators by 2030 as per National law of alternative fuels. Considering that hydrogen production, charging infrastructure and vehicles are still scarce and expensive, the most likely alternative fuel selected by public transport operators will be electricity. Electric buses are expected to completely replace fossil-fuelled public transport vehicles in Lithuania and the EU also by 2030. KP owns/leases more 123 service vehicles. KP is one of the first ones in Lithuania using electric buses for urban public transport routes. KP successfully piloted 2 electric buses for a year and is expecting to increase its electric fleet to 33 vehicles until the end of 2024. As a result in two years the company will have a total of 35 electric buses running on regular routes in Klaipeda city streets.

Currently, fuel costs are one of the largest operational costs. As a result of shifting to electric vehicles, energy costs are expected to become one of the main costs' drivers in passenger transport operators' cost structure. To manage these costs, KP is looking into a possibility to apply eco-driving principles to public transport buses. Organisation realises the challenge and scope of change required to move to a fully electric fleet and aims to prepare for the

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change by learning about the most efficient ways to operate electric vehicles, plan service considering restrictions of electric vehicles and upskilling employees, especially drivers.

While eco-driving is well-established in logistics, its application in public transport is less explored. However, evidence shows that implementing eco-driving practices can lead to energy consumption reductions of up to 10% per driving shift. Conserving energy not only reduces costs but also helps extend battery life, as frequent charging can degrade batteries, and provides actionable data-driven insights to improve drivers' performance in an accurate and transparent manner.

The challenge, therefore, lies in developing a comprehensive solution that addresses two aspects: reducing operational costs and providing actionable data-driven insights to improve drivers' performance. By combining these elements, KP can enhance the eco-driving performance of their electric buses, improve energy efficiency, and optimize operational costs. The solution should provide data-driven insights, real-time feedback, and actionable recommendations to drivers, enabling them to make informed decisions that align with eco-driving principles and maximize the benefits of electric bus technology.

As the electric fleet is expected to expand significantly across Europe in the coming years, there is a growing demand for data-driven eco-driving tools. KP sees an opportunity to contribute to the development of a OptiDrive that fills this market gap and supports the efficient operation of their electric fleet and the broader public transport sector.

CHALLENGE MAIN OBJECTIVES

The main objective is to create a supporting IT tool to improve driver behaviour and energy consumption efficiency in electric public transport buses. OptiDrive would be implemented through a dedicated eco driving module, by implementing following steps subsequently:

- Big data analysis algorithm to profile drivers, identify energy conserving or consuming behaviours;
- Machine learning based tool to analyse electric bus datasets and provide insights on behaviours that align with eco-driving and behaviours that could be improved;
- Dedicated analysis tool with graphic user interface for uploading datasets and viewing driver score cards and improvement advice;
- If possible, dedicated app for tablets or smartphones displaying driving advice in real time (for training purposes).

SOLUTION FUNCTIONAL REQUIREMENTS

Key requirements that are already identified by this stage are listed in the Chapter 1.6.1 and 1.6.2. By meeting these requirements, developed innovative eco driving module will contribute to maximising energy efficiency, reduced emissions, improved driver etiquette,

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and enhanced overall sustainability of public transportation systems using electric buses. Requirements for the eco driving module dedicated for electric public transport buses:

Compulsory functional requirements

Compulsory functional requirements are listed for each expected OptiDrive component in the following table:

TABLE 1 COMPULSORY FUNCTIONAL REQUIREMENTS

Solution component	Key requirements
Big data analysis algorithm Machine learning based tool	• The module should have the capability to monitor and collect data in real-time, including energy consumption, battery status, and driving behaviour. • The eco driving module should be compatible with various models and types of electric buses. • The eco driving module should allow customization to adapt to different driving conditions and routes.
Dedicated analysis tool with graphic user interface	• The solution should provide performance metrics and indicators, such as energy consumption per kilometre, energy recovery efficiency, and overall driving efficiency, to evaluate and monitor the impact of eco driving practices. • The module should include training materials and resources to help drivers understand and implement eco driving techniques effectively. Ongoing technical support should also be available to address any issues or questions.
Dedicated app for tablets or smartphones	• The solution must provide immediate and clear feedback to drivers, informing them about their driving performance and suggesting improvements for energy efficiency. • The solution must optimise the energy consumption of electric buses by providing real-time feedback and recommendations to drivers on energy-efficient driving techniques.

Solvers are free to suggest exact technical solutions and approaches.

Desirable functional requirements

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Desirable functional requirements are listed for each expected OptiDrive component in the following table:

TABLE 2 COMPULSORY FUNCTIONAL REQUIREMENTS

Solution component	Key requirements
Big data analysis algorithm Machine learning based tool	• Utilise predictive analytics to anticipate traffic conditions, road gradients, and weather patterns to optimise energy consumption and driving strategies in advance.
Dedicated analysis tool with graphic user interface	• Provide comprehensive data analysis and reporting features, enabling them to evaluate the impact of the eco driving module on energy efficiency, emissions reduction, and operational costs. • The solution should be scalable to accommodate growing fleets of electric buses and adaptable to future advancements in electric vehicle technology, ensuring long-term relevance and compatibility. • The solution should seamlessly integrate with existing system(s) used by KP, allowing for centralised monitoring and management of eco driving performance across the entire fleet. Minimum integrations explored - with driver scheduling tool, route scheduling tool, financial and management accounting tools.
Dedicated app for tablets or smartphones	• Integrate gamification elements, such as leaderboards, achievements, and rewards, to motivate and engage drivers in adopting eco driving practices. This can enhance their participation and commitment to sustainable driving behaviours.
Other	• Incorporate diagnostic capabilities to detect potential issues related to the vehicle's energy system, providing alerts and recommendations for maintenance or repairs to ensure optimal performance. • Include features to promote public awareness and education on the benefits of eco driving and sustainable public transportation, such as passenger-

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	facing displays showing energy-saving tips or interactive information on reduced emissions.

The aim of the OptiDrive is to maximise energy efficiency, reduce emissions, and enhance the overall sustainability of public transportation. This solution strives to optimise the performance of electric bus drivers, minimise operational costs for KP, improve the experience for passengers, and contribute to a cleaner and greener environment.

Based on vehicle data, the same number of trips can be carried out consuming in the range of 35-45% of battery charge. Taking action to enable these savings on regular basis would contribute to following benefits:

- Economic. Lower costs to operate the public transport fleet. With recent increases in energy prices, electricity costs to charge buses no longer cover the price difference of electric buses that are 2-3 times more expensive than diesel or gas fuelled vehicles, moreover, additional charging infrastructure is also needed.
- Social. Public transport drivers must maintain a high level of professionalism and are responsible for safety and comfort for 19,6 million passengers in Klaipeda region per year. Public transport is an important means of mobility accessible especially to elderly and kids – sensitive social class.
- Environmental. Wasted energy contributes to increased demand and production of energy. Lithuania is still dependent on energy imports and unnecessary energy consumption not only has environmental impact but is also a matter of national security. Moreover, promotion of zero emission public transport fleet makes our cities more clean and less polluted.

PILOT SCOPE

The pilot will involve KP administration and drivers as the primary end-users. A diverse group of drivers, representing different routes and driving conditions (such as different seasons, peak and off-peak times), will participate in the pilot.

Solver will be provided with:

- electric bus data;
- driver schedules, route schedules;
- KP representative access for interviews, technical knowledge.

Expected minimal pilot scope is:

- Analysis of historic data to create Big data analysis algorithm, Machine learning based tool and Dedicated analysis tool with graphic user interface;

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Expected maximum pilot scope is (if minimal pilot scope is successful):

- Piloting in real-life conditions in electric buses on regular routes to develop Dedicated app for tablets or smartphones.

Type and number of targeted end-users

End-user type	Role	Number
Director of Operations department	provide requirements, use and validate the solution	1
CFO/PMO	participate in evaluation of solution value	1
Functional experts: Employee working with drivers, employee working with maintenance	provide expertise on parameters related with drivers driving skills and behaviour; provide his/her expertise on energy consumption parameters and electric vehicle maintenance	2
Drivers	provide insights and feedback to assess the module's usability, and impact on energy efficiency	5

Language

The main language is English. However, in case of language barriers with the drivers, the administration staff will be willing to cooperate with the translation into English.

Other aspects

To properly dimension the effort and investment during the pilot, it is important to consider additional relevant information such as the following:

- Determine if the eco driving module relies on any specific sensors or wearables. For example, some eco driving systems may require vehicle-mounted sensors or onboard diagnostics systems to collect data on parameters like acceleration, braking, and energy consumption. Assess whether these sensors are already available in the participating electric buses or if they need to be installed.
- Determine if the eco driving module has built-in data logging capabilities or if additional data collection systems are required. Assess the necessary software and hardware for collecting, storing, and analysing the data generated during the pilot, including any potential cloud-based solutions or data management platforms.

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- Determine the resources required to provide comprehensive training on eco driving techniques and the usage of the module. Consider the availability of trainers or instructional materials, such as manuals or videos, to ensure that the end-users understand how to effectively utilise the eco driving module.
- Determine if any modifications or adaptations need to be made to the existing electric buses' systems or software to integrate the module seamlessly. Consider the effort and potential costs associated with this integration process.
- Consider factors such as seasonal variations in driving conditions, any specific events or factors that may influence the outcomes.

PILOT SET-UP CONDITIONS

Ethical, legal or regulatory

The following requirements should be considered for the co-created pilot of the eco driving module:

- The OptiDrive must adhere to applicable data protection laws and regulations, such as the General Data Protection Regulation (GDPR). It should implement appropriate measures to ensure the confidentiality, integrity, and security of the collected data.
- The pilot's approach and methodology ensure ethical considerations, fairness, and compliance.
- Clearly communicate the purpose, scope, and potential risks and benefits of the pilot, and provide drivers with the opportunity to freely and knowingly consent to their involvement.
- Ensure that personally identifiable information (PII) is properly anonymized or pseudonymized to protect the privacy of drivers.
- Adhere to industry standards and best practices for data protection and security, such as ISO 27001, to establish a robust framework for data handling, storage, and processing.
- Provide transparency to participants regarding the types of data collected, how it will be used, and who will have access to it. Establish mechanisms for end-users to exercise their rights, such as accessing their data, correcting inaccuracies, or requesting data deletion.
- Minimise the collection of personal or sensitive data to what is strictly necessary for the pilot's objectives. Employ data minimization techniques to reduce risks and ensure compliance with privacy principles.
- If data sharing with third parties is involved, ensure that appropriate data sharing agreements are in place, outlining data protection obligations and limitations on data usage.

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Technological

The following requirements related to systems interoperability, authentication measures, and other considerations should be taken into account for the co-created pilot of the eco driving module:

- The eco driving module should have the capability to seamlessly integrate and exchange information with existing systems used by KP. Clear definition of needed integrations and data must be provided by the solution provider to ensure compatibility and smooth data exchange.
- Implement robust authentication measures to ensure secure access to the eco driving module and associated data. User authentication mechanisms, such as username/password combinations or two-factor authentication, should be employed to verify the identity of users and protect against unauthorised access.
- Define user roles and permissions within the eco driving module, granting appropriate access privileges based on the responsibilities and needs of different user groups. This ensures that access to sensitive functionalities or data is restricted to authorised individuals or roles.
- Determine the specific data integration requirements, such as data formats, protocols, or APIs, necessary for seamless data exchange between the eco driving module and other relevant systems. Define the scope and direction of data exchange (read and/or write) and ensure compatibility and consistency in data representation.
- Consider the scalability requirements of the eco driving module to handle increasing volumes of data and user interactions as the pilot expands or transitions to full-scale implementation. Ensure that the system's performance remains optimal even with larger datasets or higher user loads.
- Implement error handling mechanisms to capture and log system errors, exceptions, or failures. This aids in troubleshooting, system maintenance, and identifying areas for improvement. It also contributes to the overall stability and reliability of the eco driving module.
- Incorporate monitoring capabilities to track the performance, availability, and health of the eco driving module and associated systems. Define alert mechanisms to notify system administrators or relevant stakeholders in case of critical incidents or abnormal system behaviour.
- Adhere to industry-standard IT practices and security frameworks, such as ISO 27001, for system design, development, and maintenance. Implement secure coding

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practices, vulnerability management, and regular system updates to ensure a robust and secure eco driving module.

- Establish backup and disaster recovery procedures to safeguard the integrity of the data and ensure business continuity in the event of system failures or disruptions. Regularly back up critical data and test the recovery mechanisms to minimise downtime and data loss.

Data access

KP can provide Solvers with relevant electric vehicle data from existing electric buses. The extracted data include information about electric bus performance, driving actions (such as acceleration or braking), energy consumption, and other relevant metrics. The data provided will be properly anonymized to protect the privacy of individuals and comply with data protection regulations.

KP may impose certain restrictions or limitations on the data provided to Solvers. This could include constraints on data usage, data sharing with third parties, or the retention period of the data. Any data sharing agreements or contracts between the organisation and Solvers should outline the terms and conditions regarding the use, access, and storage of the data.

Other

Clarify the ownership and rights to any intellectual property generated during the pilot. The Solver will receive the intellectual property (IP) solution, but both the solver and challenger have the option to sign an extra agreement to come to a mutual understanding concerning the licensing of the solution.

KP collaborates with additional consultants who participate in the Innobuyer program. These consultants support KP in completing the necessary program documentation, provide valuable advice, and actively participate in meetings, among other responsibilities.

EXPECTED IMPACTS AND KPIs

As per existing data, maximum energy savings are up to 10 percent. Therefore, expected energy minimum energy savings demonstrated by the pilot to consider it successful are 10 percent. Possible KPIs related to pilot implementation are listed and defined below. KPIs that are expected to be used to measure the OptiDrive's performance and assess the success of the pilot are summarised in the table below:

- Primary KPIs - indicators of critical importance to assess whether further development of OptiDrive solution is feasible;
- Secondary KPIs - stemming from primary KPIs, other benefits created by the OptiDrive, however not necessarily a direct result of solution piloting. Achievement if

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these KPIs are important to the pilot, however failure to achieve secondary KPI or KPIs will not be considered as overall pilot failure.

TABLE 3 PILOT ASSESSMENT KPIS

Type of KPI	Description	Threshold value (if applicable)
Primary	Energy Savings. Measure the percentage of energy saved by implementing the eco driving module compared to standard driving practices. This can be quantified by monitoring the reduction in electricity consumption per kilometre travelled.	10 percent
Primary	Cost Savings. Quantify the cost savings achieved through improved energy efficiency. Calculate the reduction in operational costs, such as electricity expenses, resulting from the adoption of eco driving practices.	3 percent
Secondary	Emissions Reduction. Track the reduction in greenhouse gas emissions resulting from the eco driving practices enabled by the module.	Based on national guidelines for energy production emission estimates
Primary	Driving Behavior Improvement. Assess the improvement in driving behaviour among participating drivers. This can be measured by monitoring changes in factors such as harsh braking, excessive acceleration, or idling time, which contribute to overall driving efficiency.	Reduction in sudden actions (compared to person's previous performance) (Yes/No)
Secondary	Service Reliability: Measure the impact of the eco driving module on the reliability and timeliness of public transport services. KPIs could include reductions in average travel time, improved adherence to schedules, or decreased waiting times for passengers.	Reduction in schedule discrepancies (compared to person's previous performance) (Yes/No)

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Primary (driver satisfaction) Secondary (passenger satisfaction)	User Satisfaction: Gather feedback from drivers and passengers to assess their satisfaction with the eco driving module. This can be done through surveys or ratings that capture their perception of improved comfort, smoother rides, or overall service quality.	Improvement compared to pre-pilot survey for the same route (Yes/No)
Secondary	System Efficiency: Measure the efficiency gains achieved by optimising driving practices. This can be reflected in reduced maintenance costs, increased vehicle lifespan, or improved overall fleet performance.	Decreased number of battery charges Decreased charging time (Yes/No)
Secondary	Scalability and Replicability: Evaluate the ease of scalability and replicability of the eco driving module, considering factors such as adaptability to different bus fleets, compatibility with existing systems, and potential for widespread implementation in the public transport sector.	Solution replicable using electric busses from different manufacturers (Yes/No)

Considering that OptiDrive is innovative, quantitative value for some of the KPIs are not yet available. For these KPIs, assessment process will be as follows:

- Pre-pilot data collection for pilot route using questionnaires, by analysing existing data;
- Post-pilot assessment, by repeating the same survey approaches.

Pilot will be considered successful if desired improvements are achieved, as defined in the table presented above.

BUSINESS OPPORTUNITY

Market size

The challenge of implementing an eco driving module for electric public transport buses presents a significant opportunity for a supplier of innovative solutions. The need for sustainable and efficient public transportation is not limited to a single organisation or Challenger, but relevant to various public transport operators and cities on a larger scale.

Estimating the market size in terms of money or number of users will depend on various factors such as the cost of the eco driving module, the adoption rate of the solution, and the size of the electric bus fleet. Conducting market research and gathering data on the number

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of electric buses and potential interest from public transport operators will provide accurate estimates.

Additionally, it's important to consider the scalability and potential for growth beyond the initial implementation. The eco driving module can serve as a foundation for developing similar solutions for other types of vehicles or transportation sectors, both within the organisation and outside. This presents opportunities for expanding the solution's market reach and increasing the potential customer base beyond the initial Challenger organisation.

To obtain more precise market size estimates, it is necessary to conduct market analysis and consult with industry experts who have access to relevant data and insights specific to the public transport sector in Lithuania and Europe.

Adoption plans

If the pilot of the eco driving module for electric public transport buses proves to be successful in terms of achieving the desired outcomes and meeting the defined KPIs, it may provide a compelling case for KP to consider procuring and scaling up the OptiDrive. KP would need to evaluate the cost-effectiveness, feasibility, and compatibility of the OptiDrive within its existing infrastructure and systems. If the pilot demonstrates significant benefits such as energy savings, emissions reduction, improved operational efficiency, and positive feedback from participating drivers and other end-users, it could motivate KP to explore further implementation and expansion of the eco driving module across its electric bus fleet. Decision will be made based on whether the primary key performance indicators (KPIs) outlined in section 1.9, which are designated as the main indicators, will be achieved or surpassed at the specified threshold.

Ultimately, the decision to procure and scale up the OptiDrive would be based on a comprehensive evaluation of the pilot's results, cost considerations, requirements, and potential impact on KP's sustainability objectives.

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