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Evaluation of the Innovation Potential of Freight Road Transport Enterprises in Ukraine: Current State and Development Issues

Abstract
The *purpose* of the present article is to assess the current state and problems of the innovative potential of Ukrainian freight road transport enterprises. *Methodology*. The methodological framework for potential evaluation is hereby proposed, incorporating traditional evaluation indicators (aspects of resources, human resources, organisational, financial, and technological components) and supplemented by indicators that identify the impact of intellectual capital on development efficiency, the impact of human resources development costs on development efficiency, and the impact of technology investment on development efficiency. The work employs a range of analytical methods, including the comparative method, the index method, and the factor method. *Results*. An evaluation of the innovation potential of five leading enterprises in the freight transportation market in Ukraine was carried out. The study revealed that the enterprises primarily utilise innovative solutions in the technological and human resources components. It was established that PJSC "DHL International Ukraine" was the sole enterprise to demonstrate the implementation of innovative technological solutions from 2020 to 2023, thereby ensuring the effective management of human resources development in the context of fluctuating financial components. The evaluation results presented herein determine the formation of innovation potential characteristics of freight transport enterprises in Ukraine. *Practical implications*. The methodological support presented can be used to assess the innovative potential of Ukrainian road transport enterprises and related sectors. Moreover, the empirical research data can be utilised to compile lecture materials, practical classes, and test tasks related to the analysis of the features of innovative development of enterprises in the automotive sector of Ukraine and other countries.*Value / Originality*. The scientific novelty of the evaluation indicators list is predicated on the development of methodological support for evaluating the innovation potential level, with a focus on the relationship between innovation potential and enterprise performance.

DOI: https://doi.org/10.30525/2500-946X/2025-1-1

Keywords
innovation potential, freight road transport in Ukraine, human resources component, financial component, organisational component, resource component

JEL: L91, L92, O30, O32, O33

1 Introduction

Innovation and innovative activities are a strategic prerequisite for the market success of modern companies in various sectors of the economy. Many theoretical and practical studies (Garrido-Moreno et al., 2024; Wanicki and Nita, 2022; Shahid and Sheikh, 2021; Černe et al., 2023; Li et al., 2023) contain solid evidence of the direct positive impact of the introduction of innovations on the level of competitiveness, adaptation to external changes, financial and economic efficiency and sustainable development. Enterprises operating within the domain of freight road transport also implement innovations that impact both their market positions and economic development. The economic scientific

opinion includes a variety of indicators for evaluating innovations. Conversely, there is a paucity of research in the evaluation of enterprises' innovation potential, due to the absence of a standardised approach. A comprehensive definition of the characteristics and features of innovative development of enterprises in the field of freight road transport involves establishing a wide range of indicators that reflect the state of the specified sphere.

A plethora of scientific sources are available which employ a variety of approaches for the purpose of determining the characteristics of enterprises' innovation potential. These characteristics form the basis for developing methodological support for evaluating its level.

An approach (Chang, 2020; Cappa et al., 2016) has been developed that involves the combination of resource and performance components, with the components themselves being evaluated using a combination of quantitative and qualitative approaches.

In accordance with the scientific method (Piva and Vivarelli, 2007), the innovation potential can be evaluated by considering the range of resources from the primary domains that can be used comprehensively for the implementation of R&D. In this case, the relevant resources encompass human resources, economic resources, production resources, technological capital, and so forth. It is important to note that the evaluation of innovation capital according to the specified approach is open to debate, as it is unclear what proportion of the specified resource components should be evaluated, in particular, the entire capital or its innovation component. In the works (Adamenko, et al., 2021; Ciptono, et al., 2024), it is proposed to define human resources innovation capital as a component of total innovation.

The approach (Narasimhan et al., 2006) identifies the innovation potential as the level of development of the enterprise's scientific and technical, creative, intellectual, and scientific capacities. It also identifies the level of R&D expenditures (or innovations), which are presented in the balance sheet as developments.

One approach (elaborated in the works of West et al., 2014; Lööf and Heshmati, 2003; and West and Bogers, 2014) is related to defining this term as an indicator of the innovation potential of enterprises that ensures the achievement of strategic goals in innovative development. In accordance with this approach, it is imperative to utilise data pertaining to the strategic innovative objectives of the enterprises under scrutiny when evaluating the aforementioned indicator.

To summarise the aforementioned points, the term "innovation potential" is defined as an indicator that identifies a wide range of characteristics of enterprises' innovative development, from the resource and performance component to the capability component. Despite the existence of scientific studies devoted to the issue of the essence and structure of the innovation potential of enterprises, the problem of determining the methodological approach to its evaluation remains unresolved. This problem determines the relevance of the study.

2 Methodological Principles for Assessing the Innovative Potential of Freight Road Transport Enterprises

It is important to note that the issue of methodological support for the assessment of the innovation potential of enterprises is connected with the reference to its structural components, established in the above-mentioned scientific studies, and existing development trends. On the basis of the considered approaches and perspectives of modern scientists, the methodological support for the evaluation of this indicator should be defined.

It is imperative to emphasise that the issue of methodological assistance in evaluating the innovation potential of enterprises is associated with a reference to its structural components, as established in the aforementioned scientific studies, and existing development trends. The subsequent discussion will focus on the methodological support for evaluating this indicator, drawing upon the extant approaches and perspectives of contemporary scientists.

The proposed approach involves the use of traditional evaluation indicators (aspects of resources, human resources, organisational, financial, and technological components) and indicators that identify the impact of intellectual capital on the development efficiency (the innovation potential efficiency), the impact of human resources development costs on the development efficiency (the innovation potential efficiency under the impact of human resources development), and the impact of technology investment on the development efficiency (the innovation potential efficiency in light of the R&D implementation) (author's proposal). It is important to note that the organisational component is evaluated with the involvement of experts and qualitative evaluation (10 experts in the field of economics, including 3 researchers, 3 experts in innovation, and 4 experts in transport economics), while other indicators are evaluated using quantitative evaluations. The proposal to evaluate the impact on the efficiency of intellectual capital development, human resources development, or technologization costs includes the possibility of determining the actual potential and readiness for enterprise innovations, considering the existing trends of previous periods.

It is also noteworthy that within the framework of the presented list of indicators, an integral or arithmetic mean evaluation of the innovation

TABLE 1 Indicators of the innovation potential evaluation of freight road transport enterprises

No.	Indicator	Data sources for the calculation of indicators
1	Resource component	
1.1	Intangible assets	Assessment of the indicator based on the balance sheet data, dynamics of its change in value and relative terms. (The indicator defined in the non-current assets of the balance sheet is assessed at the residual value).
1.2	Highly liquid assets	The indicator is reflected in the balance sheet through cash and current financial investments. The growth indicates the ability of the enterprise to quickly convert assets into resources to increase its innovation potential.
1.3	Liquid assets	The indicator is reflected in the balance sheet through current receivables, goods and finished goods. Its growth indicates the company's ability to quickly convert assets into resources to build up its innovation potential.
2	Human resources component	
2.1	Human resources development costs	The indicator is reflected in the expenses (income statement) of the division/department to which they relate.
2.2	Labour productivity	The ratio of output (operating expenses in the income statement) to labour costs.
3	Organisational component	This is a type of organisational management that fosters innovation. The evaluation process is conducted by experts, with a scale ranging from 0.1 (low efficiency) to 1 (high efficiency). Horizontal organisational management has the capacity to promote innovation across a variety of levels.
4	Financial component	Return on sales (net profit to net revenue * 100% (based on the income statement)).
5	Technological component	R&D expenditures in terms of value, their dynamic assessment in relative terms.
6	Intellectual capital impact on development efficiency	Establishing the proportionality of changes in intellectual capital to changes in sales profitability.
7	Human resource development costs impact on development efficiency	Profitability of human resources development costs (net profit ratio to #2.1 * 100%).
8	Technological costs impact on development efficiency	Return on R&D expenditures (net profit ratio to #5 * 100%).

potential components is not provided due to the possibility of their separate evaluation. The scientific novelty of this indicators list lies in the development of methodological support for evaluating the innovation potential level considering the relationship between innovation potential and enterprise development efficiency.

The study was conducted using corporate materials from the evaluated freight transport enterprises, approaches of scientists in the field of management and analysis of innovative development of companies.

3 Evaluation of the Innovation Potential of Ukrainian Freight Transport Enterprises

The next step is the evaluation of the innovation potential of freight road transport enterprises in Ukraine. A sample of research subjects, namely industry enterprises, serves as a benchmark for sector leaders. The following enterprises are particularly noteworthy: subsidiary company "Kuehne + Nagel", Private Joint Stock Company "DHL International Ukraine", Limited Liability Company "Kashkan Logistic", Limited Liability Company "MSC Ukraine", Limited Liability Company "Grainsward".

The primary enterprise under scrutiny is the subsidiary "Kuehne + Nagel" (abbreviated as "Kuehne + Nagel" SE). An evaluation of its innovative potential is given in Table 2.

According to the conducted research (Table 2), the following provisions were established:

- As for the resource component, in 2020 and 2021, the company developed and implemented innovative software, respectively, a cargo delivery confirmation service (2020) and a real-time cargo tracking service (2021). These innovations (intangible assets) have increased demand for services, and the costs of their development and implementation have proved to be profitable. The company also has potential in highly liquid assets.
- In terms of human resources, the transformation of labour productivity with an improvement in 2023 should be noted, which indicates an improvement in the potential of the workforce.
- With regard to the organisational component, invariance is observed when combined vertical and horizontal management is used, which provides an opportunity for the manifestation of certain staff initiatives.
- The financial component, in particular the return on sales of services, showed fluctuations from 5.94% in 2020 to 4.34% in 2021, 6.73% in 2022 to 8.38% in 2023. It is worth noting the overall positive dynamics of this indicator since 2022.

TABLE 2 Indicators of the innovation potential of the State Enterprise "Kuehne + Nagel" for 2020-2023

No.	Indicator	Value			
		2020	2021	2022	2023
1	Resource component				
1.1	Intangible assets, thousand UAH, incl:	854	1002	576	460
1.1.1	Software	Cargo delivery confirmation service has been launched	Real-time cargo tracking service has been launched	Not implemented	Not implemented
1.2	Highly liquid assets, thousand UAH	38973	99367	157987	224979
1.3	Liquid assets, thousand UAH	224412	284206	208921	176144
2	Human resources component				
2.1	Human resources development costs	No data available	No data available	No data available	No data available
2.2	Labour productivity	2789,4	3502,2	2874	3255,4
3	Organisational component (from 0.1 to 1 point)	0,6	0,6	0,6	0,6
4	Financial component. Profitability of sales, %	5,94	4,34	6,73	8,38
5	Technological component. Expenditure on research and development (R&D), thousand UAH	201	148	No data available	No data available
6	Intellectual capital impact on development efficiency	Disproportionality of changes	Disproportionality of changes	Disproportionality of changes	Disproportionality of changes
7	Human resource development costs impact on development efficiency	No data available	No data available	No data available	No data available
8	Technological costs impact on development efficiency, %.	32316	40726	No data available	No data available

– The technological component of the potential decreased due to the recession in 2021 and the lack of innovative technological solutions in 2022 and 2023.
– The impact of intellectual capital on development efficiency was disproportionate; the impact of technology spending on development efficiency was positive in 2021 compared to 2020, and there were no innovative technological solutions that shape this indicator in the future.
– The second enterprise analysed is Private Joint-Stock Company "DHL International Ukraine" (PJSC "DHL International Ukraine"). The calculations for the following four enterprises were carried out using the same methodology as the first one, as outlined in the methodological guidelines. The evaluation of the results obtained demonstrates that the company PJSC "DHL International Ukraine" demonstrated the following indicators of innovation potential development, particularly:
– In terms of the resource component: improving the management of intellectual capital through the implementation of three technological solutions (software for customer interaction); increasing the growth of highly liquid assets, which is the basis for further use of this potential in the development of innovation activities.
– Fluctuations in the personnel component, including due to labour productivity. In particular, in 2021, this indicator increased by 32 thousand UAH/person; in 2022, it decreased by 62 thousand UAH/person due to military operations in Ukraine; in 2023, it increased by 105.1 thousand UAH/person.
– The organisational component has remained unchanged, and the company is implementing horizontal management guidelines.
– The financial component (return on sales) was low and fluctuated, decreasing from 2.23% in 2020 to 1.27% in 2021, increasing to 4.06% in 2022 and decreasing to 1.74% in 2023. Despite the negative impact of the military factor, this indicator increased by 1.74% in 2023.
– Positive impact of intellectual capital on performance in 2022 compared to 2021, in 2023 compared to 2022; fluctuations in the impact of technology costs on development efficiency, with a decrease in 2023.

The third company under scrutiny in this study is the "Kashkan Logistic" Limited Liability Company (abbreviated as "Kashkan Logistic" LLC). The analysis of the presented results of the enterprise innovation potential showed the following:

– As for the resource component, in 2020 and 2021, the company developed and implemented an

intangible asset component (online cargo tracking software), which is the basis of the company's technological component. The profitability of its use in 2020 and 2021 was determined. Aspects of the resource component, such as highly liquid and quickly liquid assets, showed fluctuations, but in 2023 they showed a positive increase, which indicates the company's promising readiness for innovative development.

– In terms of human resources and labour productivity, and its growth, which determines the ability of labour resources to develop further.
– The organisational component was determined by the constant focus on horizontal management of the enterprise.
– In terms of financial performance, the return on sales was low, but it has increased since 2021, which indicates a promising increase in the efficiency of financial development, including through the use of all components of innovation potential.
– The impact of technological costs on development efficiency was positive in 2020 and 2021, when the company had evidence of the development and implementation of innovative technological solutions, which necessitates their further development.

The fourth evaluated company is the limited liability company "MSC Ukraine" (abbreviated as "MSC Ukraine" LLC). According to the research data, the level of innovation potential of "MSC Ukraine" LLC was found to be as follows, namely As for the resource component, the growth of intellectual capital was noted due to the introduction of the online cargo tracking service in 2021, which determined its impact on development efficiency; the human resource component fluctuated in terms of labour productivity and was determined by growth in 2023, which is a positive indication of promising innovative development; as for the organisational component, no changes were made, management was carried out within a vertical approach; as for the financial component, namely the profitability of sales, transformations were noted; in particular, the specified indicator decreased in 2022, 2023.

The fifth evaluated company is the Limited Liability Company "Grainsvard" (abbreviated as "Grainsvard" LLC). The analysis showed that the company did not use innovative technological solutions. However, significant improvements were noted in the financial, resource and human resource components up to 2023. It was found that by 2020 the investigated company had implemented innovative solutions (in particular, real-time cargo tracking software). Nevertheless, owing to issues encountered in meeting delivery deadlines in 2020 during the course of the pandemic, the decision was taken to refrain from the implementation of intelligent digital solutions. The discontinuation of cargo tracking software updates led to a decline in net sales revenue, net profit and return on sales in 2023, following an initial period of growth in the financial component from 2020 to 2022.

In order to facilitate a comprehensive analysis of the results obtained, the specified indicators of the enterprises in question will be presented using a web diagram. Concurrently, the indicators that are presented in the value dimension, those that determine the efficiency in the percentage dimension, in the form of a point evaluation, will be considered separately.

A comparative analysis of enterprises' intangible assets' state will be carried out, which are a component of the resource component of the innovation potential.

The comparison of this indicator is important for a visual demonstration of the industry's enterprises orientation in relation to intellectual development. In this case, the five freight-trucking companies studied used software, particularly programmes and digital services for cargo tracking and delivery notifications. The following entities possessed the most substantial quantities of intangible assets: "Kuehne + Nagel" SE (fluctuating from 854,000 UAH at the end of 2020 to 460,000 UAH in 2023); PJSC "DHL International Ukraine" (fluctuating from 132,000 UAH at the end of 2020 to 460,000 UAH in 2023); "Kashkan Logistic" LLC (fluctuating from 169,000 UAH in 2020 to 131,000 UAH in 2023). LLC "MSC Ukraine" and LLC "Grainsvard" demonstrated low values of the specified indicator in 2020 and 2021, and did not have intellectual capital in 2022 and 2023. The absence in 2022, 2023 is due to the fact that technological innovations were not implemented. The development of the situation was characterised by the aftermath of the COVID-19 pandemic and, more importantly, the full-scale invasion by the Russian Federation into Ukraine. As a result, investment in intangibles was increasingly seen as high risk with uncertain returns. The enhancement of intangible assets is imperative for the advancement of enterprises in innovation capital, market development, and growth. Consequently, the enhancement of these assets through the integration and execution of innovative technological solutions can serve as the foundation for identifying and implementing optimisation pathways. Concurrently, the impact of potential asset losses can be distributed among all participants in the innovation chain and stakeholders.

The following comparative analysis will proceed to examine the state of fluctuations in other components of the resource component, with a particular focus on highly liquid and quickly liquid assets.

The two examined components of the resource component are important for the development of the innovation potential of enterprises in the specified sector, in particular for covering the costs of

developing, testing and implementing innovations in various fields. The largest growth results with highly liquid assets were LLC "Kashkan Logistic" (1374.59 thousand UAH); "Kuehne + Nagel" SE (growth amounted to 477.27 thousand UAH). As for the indicator of liquid assets, it should be noted the lack of growth in their volume at the level of enterprises.

This paper sets out to consider the changes in the indicators of the human resources and financial components of the studied enterprises for the period 2020-2023. The findings of the study indicate that the "Kuehne + Nagel" SE, which has been recognised for its noteworthy achievements in the domain of innovative development, exhibited a notable increase in labour productivity during the stipulated period (16.71%). However, the enterprise in question did not achieve a high level of growth in sales profitability for the specified period (2.44%). A significant increase in labour productivity was observed at "Kashkan Logistic" LLC (88.56%), attributable to the stability of the working environment and the augmentation of wages by 14.2%. It is noteworthy that despite the absence of innovation in 2022 and 2023, the enterprise successfully retained its market position and achieved development efficiency (including the enhancement of sales profitability) through the introduction of online cargo tracking in 2020 and subsequent refinement in 2021. LLC "MSC Ukraine" was found to have a reduced level of performance, including a decline in innovation. In the case of "Grainsvard" LLC, a consistent growth in performance indicators has been observed, devoid of any discernible innovative development. The enterprise under scrutiny has demonstrated notable strength in other areas, suggesting a high level of readiness for innovation.

In this study, an investigation is made into the comparison of the positions of five evaluated enterprises based on the state of the technological component. It was established that despite the crisis phenomena, PJSC "DHL International Ukraine" was able to implement R&D, although the costs for them were significantly reduced (from UAH 292 thousand hryvnias in 2021 to UAH 17 thousand hryvnias in 2023). In contrast, "Kuehne + Nagel" SE, LLC "Kashkan Logistic" and LLC "MSC Ukraine" did not implement R&D in 2022 and 2023, while LLC "Grainsvard" did not undertake these measures at all. Consequently, the implementation of these strategies is imperative for enhancing competitiveness. A heterogeneity of impact was observed on development efficiency in the enterprises, with technology spending exerting a differential effect. The most stable dynamic is demonstrated by PJSC "DHL International Ukraine," where the indicated impact was noted every year from 2021 to 2023. Other enterprises, due to the lack of R&D expenses, did not carry them out from 2022 due to risks. It is also noteworthy that "Grainsvard" LLC has not allocated any specific costs.

4 Findings

Determining the state of the innovative potential of Ukrainian freight road transport enterprises enables an assessment of their ability to be competitive and effective in a market environment that is changing in the difficult conditions of the military and post-war situation. It is evident that the methodological framework employed for the assessment of companies' innovative capacity within the designated industry has facilitated the identification of tangible challenges and the establishment of a precise state of affairs. The methodological support outlined is universally applicable and can be employed by enterprises in other sectors of the economy, including those operating in related sectors.

Based on the presented methodological support, the study revealed that the conditions of the military state influenced the fact that the leading companies in the industry showed problems in updating the main components of the innovative potential. At the same time, the specified enterprises maintained the appropriate state of innovative potential, which allowed them to function under the influence of complex threats and risks. In this case, it was found that all the studied enterprises did not experience crisis phenomena in development and continued economic activity, which indicates the prospects for improving the structure of the innovative potential.

5 Conclusions

A methodological framework has been developed to support the analysis of innovation potential. This framework draws upon the insights of scientists and their own proposals in this area, particularly concerning the relationship between innovative components (intellectual capital, human resources development, R&D) and development efficiency. This methodological support can be used for evaluating the specified indicator by enterprises in the studied sector.

The present study analysed the innovation potential of five leading enterprises in the freight road transport market in Ukraine. The analysis revealed that enterprises predominantly employ innovative solutions for technological and human resources components. However, it was found that only PJSC "DHL International Ukraine" demonstrated the use of innovative technological solutions during the period 2020-2023, ensuring sufficiently successful management of human resources development despite

fluctuations in the financial component. The results of the evaluation identify the specific characteristics of the innovation potential formation of freight road transport enterprises in Ukraine.

The potential for further research in this area lies in the establishment and substantiation of directions for enhancing the innovative capacity of enterprises in the industry.

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Received on: 17th of January, 2025
Accepted on: 21th of February, 2025
Published on: 31th of March, 2025