Engineering Management in Production and Services

Volume 16 • Issue 3 • 2024

received: 20 March 2024
accepted: 15 August 2024

pages: 56-74

Model for assessing engineering competencies of logistics specialists in transport organisations

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ABSTRACT

In today's dynamic, technology-driven, and diverse world of knowledge society, transport organisations should purposefully analyse and assess their operations since they often have to face problems emerging from the lack of knowledge and competencies of logistics specialists. The engineering competencies of logistics specialists are highly appreciated in transport systems. However, the selection of assessment criteria and determination of its importance is a difficult task for managers in this sector. Thus, it is reasonable to apply the multi-criteria methodologies, such as SAW, AHP, MOORA, and VIKOR, whilst determining the importance of criteria describing the competencies of logistics specialists in a transport organisation. Applying the multi-criteria methods provides prerequisites for an objective, precise, and the least time-consuming way to evaluate the engineering competencies of logistics specialists. The analysis of the results enables the most suitable decisions to utilise the significant potential of logistics specialists. The article examines the problem areas for evaluating the competencies of logistics specialists. The current paper presents the evaluation of logistics specialists' competencies based on the methodology used to determine the importance of criteria (SAW and AHP methods). Additionally, further recommendations are suggested to effectively manage certain corrections on competencies in transport organisations under investigation.

KEY WORDS
logistics, transport, logistics specialists, competencies, engineering competencies, assessment methods, SAW, AHP

10.2478/emj-2024-0024

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Introduction

The primary and most important resource in modern transport organisations is the competencies of logistics specialists (Gupta et al., 2022; Koh & Yuen, 2022; Kohl et al., 2020). Effective utilisation of these competencies requires analysis of their content, managing the knowledge process, and constantly renewing it. The majority of researchers emphasise the importance of competencies in ongoing operations. For instance, Doyle et al. (2017) investigated the demand for personnel competencies in biology,

Drejeris, R., Katinienė, A., Vaičiūtė, K., & Čiutienė, R. (2024). Model for assessing engineering competencies of logistics specialists in transport organisations. *Engineering Management in Production and Services, 16*(3), 56-74. doi: 10.2478/emj-2024-0024

Mulyanto et al. (2018) based their research on the environment, Golden and Hanlon (2018), Hartmann et al. (2021), Violato (2018), Kurnia et al. (2019) focused on medicine, Rullani et al. (2016) — economics, Najat (2017), Ketonen-Oksi (2022) — management, Andersson et al. (2016), Yaghi, Sindi (2016), Trusculescu et al. (2016), Wringe (2015), Wood et al. (2018) — philosophy, Galustyan et al. (2020) — areas of information technologies. Most of these researchers highlighted the benefits of knowledge as a form of competency, supported the idea of improving competence assessment (Wu et al., 2021), and discussed the questions of competence management (Lindgren et al., 2015).

Competencies are undisputedly important (Patalas-Maliszewska & Kłos, 2019); however, a disagreement exists regarding the competencies necessary for a logistics specialist to perform effectively in a workplace. Some authors consider creativity (Jankelova, 2022; Tsonkova, 2020), and others (Chand et al., 2022; Chowdhury & Murzi, 2020; Machado & Freiling, 2023; Suksanchananun et al., 2020) believe teamwork and engineering competencies are the most important. Several researchers (Martínez-Sánchez et al., 2020) claim that education is one of the principal factors for a successful career. The present paper lists the essential engineering competencies and their assessment criteria selected from a plethora of characteristics of engineering competence.

Diverse methods and models have previously been proposed and developed to solve different logistics tasks. Certain methods and models are specifically based on mathematical calculations, whilst others depend on qualitative dimensions. The selection of methods largely depends on the goal. However, competencies assessed following the same selected criteria are assigned to a group of multi-criteria tasks. Many researchers (Dweiri et al., 2017) state that assessment methods should be simple and easy to understand, and provide opportunities to obtain sufficiently accurate results. Thus, the selected assessment method should be characterised by constant results and be easily applicable to a transport organisation. The SAW method (Drejeriene & Drejeris, 2017; Skačkauskienė & Katinienė, 2017) fully meets these requirements. Estimates obtained by this method accurately reflect the competencies of logistics specialists evaluated following the selected criteria. It is also reasonable to apply the AHP method to research the competencies of logistics specialists, as it has an advantage over other multi-criteria decision-making methods. The AHP method is more flexible and convenient for decision-makers to verify the consistency of expert judgements.

Among the multi-criteria methods analysed by the authors of this paper, MOORA and VIKOR are also exceptional as they can be suitable for developing a tool to evaluate the competencies of logistics specialists in a transport organisation. These methods enable the identification and comprehensive evaluation of the competencies of logistics specialists in a transport organisation. If possible, SAW, AHP, MOORA, and VIKOR methodologies should be used simultaneously to assess the competencies of logistics specialists and eliminate the chances of subjectivity. The results of such an assessment are beneficial for improving management processes of labour resources. Additionally, it would provide valuable information on the competencies of logistics specialists in transport organisations and enable chief executives to come up with impartial solutions associated with employee salary ranges. These methods would also abate employee selection to corresponding positions and finding and applying the best and the most transparent incentives.

The research aimed to develop a methodology for assessing the competencies of logistics specialists in a transport organisation, which would be used to objectively/scientifically evaluate these competencies under real business conditions. It is, thus, obvious that the demand for engineering competencies of logistics specialists varies in different companies. Therefore, developing a universal assessment tool suitable for any logistics company is highly anticipated. In this case, it is confirmed that the assessment of competencies should be treated as a multi-criteria task, which would be solved using the multi-criteria assessment methods. The following research methods were used: comparative analysis, synthesis, expert assessment, and multi-criteria evaluation methods SAW and AHP.

1. Literature review

1.1. Content of the competencies of logistics specialists in transport organisations

Transport organisations are obliged to monitor changes, evaluate the competencies and qualifications of logistics specialists, improve work conditions and create an environment where they would willingly share their expertise, thus bringing new knowledge and substantial advantages to the company. Wang and Hsieh (2013) claimed that social and professional competency affects a company's growth and contributes to achieving professional goals by encouraging employees to apply their highest potential and abilities. According to Martinez-Sanchez et al. (2020), it is necessary to evaluate the levels of education and competencies of logistics specialists in assessing the effects of technological development on employee retention in transport organisations.

The competencies of logistics specialists in a transport organisation can be defined by individual characteristics, work culture, qualifications and creativity required to implement organisational goals (Jankelova, 2022; Taguma & Anger, 2015; Tsonkova, 2020).

The importance of engineering and social competencies for the future is highlighted by Hau et al. (2013). The authors claimed that in the fourth industrial revolution, robots would fully replace human input by using information technologies and algorithms. However, certain social competencies, such as motivation and creativity, cannot be replaced by robots.

Thus, many authors (Hau et al., 2013) perceive motivation as a driving force and a powerful tool to complete important tasks and jobs. The advantages of social and engineering competencies and teamwork were stressed by Chowdhury and Murzi (2020) and Chand et al. (2022), who argued that the decline in physical, manual skills and basic cognitive knowledge would greatly increase the demand for social and technological competencies in the industry. According to Taguma et al. (2018), logistics specialists must constantly acquire new technological and engineering skills to remain competitive in the labour market. These skills, in turn, require such characteristics as curiosity, flexibility, independence and a positive attitude towards lifelong learning.

Incompetence in technologies disrupts overall operations in transport organisations. According to Aloqaili et al. (2020), selecting an appropriate technological development for transport organisations becomes less complicated than their actual introduction or convincing employees to use it.

These processes must be managed by logistics specialists using their technological knowledge to attain an effective and rapid execution of transportation processes (Aloqaili et al., 2020). The engineering competence of logistics specialists comprises the most advanced knowledge, technical and coding skills, general understanding of logistics, and IT security processes (Kaur et al., 2020; Mikl, 2021).

Engineers may review/evaluate/prepare plans, specifications, calculations, and/or other engineering documentation, provide recommendations for higher-level engineering operations, analyse and design works of limited scope and complexity/execute inspections/audits/investigations, and provide consultations.

An engineer must effectively communicate with private and legal entities to explain standards and regulations or provide technical assistance (Litvinenko et al., 2022). They may be responsible for analysis or design to determine project implementation or continuity options, project review/approval; execution and supervision of infrastructure projects, and reassuring project implementation. A technical expert is a distinguished position of high engineering complexity, which may include supervisory duties. Engineers plan and manage large and complex projects/programmes independently and take responsibility. Additionally, they evaluate the completion of tasks and common achievements with technical accuracy, adhere to goals, and wait for the manager's approval to execute complex operations. Also, engineers must ensure quality standards, supervise operations and plan budgets (Młody et al., 2023; Peña et al., 2023). Communication with other specialists and

Tab. 1. Key competencies of logistics specialists

Group of explicit competencies	Code	Group of tacit competencies	Code
Use of information technologies (technically complex) in transportation process	I_1	Work complexity	N_1
Evaluation of the specifications of vehicle control systems	I_2	Employee influence on the realisation of organisational goals	N_2
Knowledge of vehicle technical assistance standards	I_3	Work culture	N_3
Preparation of engineering documentation	I_4	Creativity	N_4
Maintaining technological infrastructure in a transport organisation	I_5	Motivation to work	N_5
Consultations provided	I_6	Autonomy at work	N_6

professionals is also required. Engineers represent their organisations as experts. Singh and Fleming (2010) and Karácsony and Bokor (2021) argue that cooperation between logistics specialists improves the quality of competencies and economic value for transport organisations.

The essential and necessary competencies are selected from various engineering characteristics and grouped into two categories, i.e., explicit and tacit competencies (Table 1).

The following characteristics are linked to the direct function of the work executed by logistics specialists and are attributed to engineering competence: use of information technologies (technically complex) in the transportation process, knowledge of vehicle technical assistance standards and management of such systems, preparation of engineering documentation, and maintaining technological infrastructure.

Other competencies required for a logistics specialist are work complexity, employee influence on the realisation of organisational goals, work culture, creativity, motivation to work, and autonomy.

These competencies are not directly linked to work performed by a logistics specialist and may be applicable to all specialists (Hernandez-de-Menendez et al., 2020); however, they are inseparable from the competencies of a logistics specialist.

1.2. Criteria for evaluating competencies of logistics specialists in transport organisations

Regardless of the evidence confirming transport company's success linked to employee competencies, research has been scarce and methodological potential to measure competencies is insufficient and needs to be adjusted (Kilibarda et al., 2020; Sapper et al., 2021). Competence assessment methods are usually based on one criterion. The emphasis is usually placed on selecting such a criterion or measuring a certain element in a business sector. However, no attention is given to evaluating the engineering competencies of logistics specialists or offering objective, qualitative assessment methodology.

It is necessary to analyse the content of the existing competencies and its assessment criteria in the overall evaluation of logistics specialists employed in transport companies. The content analysis of the competencies provides more information on the specific and mastered competencies and their effects on the company's activities. The variety of criteria reflects the importance of specific competencies while more detailed results on assessing the researched competencies are obtained.

There are twelve distinguished assessment criteria based on the contents of engineering competencies. Therefore, the importance of competencies can be thoroughly researched (Fig. 1).

The research findings by Salazar et al. (2019) show that teams at transport companies are more likely to sustain in a competitive environment if they have interdisciplinary knowledge. This knowledge and skills are especially valuable in pursuing leadership (Salazar et al., 2019). The wider the spectrum of this knowledge and the ability to apply it interdisciplinarily, the better (Van Den Beemt et al., 2019). Such engineering knowledge is not required in all transport companies; however, having at least a minimal interdisciplinary knowledge shows a greater

Fig. 1. Criteria for evaluating competencies of logistics specialists in a transport organisation

competence of logistics specialists. Interdisciplinary knowledge is a more important evaluation criterion in small engineering companies where employees are assigned more than one function and are generally more responsible for performance results. Sabirov et al. (2021) argued that a greater number of completed educational (higher and vocational training) institutions leads to different possibilities for qualification development. Continuous qualification improvement is necessary to express engineering competence (Sabirov et al., 2021). Qualification is formalised, systemised and documented knowledge associated with a professional career covering a particular professional area. Thus, specialists of various professions must have professional knowledge (Manuel, 2017), subject skills, and abilities to perform tasks according to the relevant work field (Metro et al., 2019). The qualification granted by an educational institution may prove the value of an employee (Liu et al., 2020; Shmatko et al., 2020). The criterion of qualification improvement has a major impact on the existing competencies of a transport specialist and the overall assessment of their competencies; thus, it should be included in the criteria evaluation system (Dundiuk, 2021). Walker (2014) noted that general learning and improvement of qualifications in transport companies is achieved by correcting errors made by specialists. Error correction provides valuable insights and promotes new measures to be implemented to avoid failures in the future. Certain changes in the company's activities create conditions for the emergence of contradictions in the already established service provision rules. These contradictions appear due to human errors, which, in turn, are hard to avoid under numerous rules or when the need arises to alter them. Urbaitė (2020) emphasised one specific criterion, i.e., the ability to analyse and correct mistakes. According to Krishnan et al. (2017), Voline et al. (2019), Schwartz et al. (2017) and Brown (2019), one of the most important criteria associated with solving problems emerging from human errors is quick decision-making. This criterion requires the mastery of specific competencies. In particular, the demand for specific competencies may be a decisive criterion; thus, constant professional improvement possibilities are necessary to evaluate engineering competencies in the context of the modern industrial revolution. This criterion also determines the aspiration of employees to meet the challenges of global society and the requirements of contemporary businesses (Flores et al., 2020). The modern business approach strives to connect engineering solutions with operational sustainability; thus, the concepts of sustainable business model (Bocken et al., 2014) and sustainable technology (Heiskanen et al., 2005) emerge in tech businesses.

The use of these categories becomes inseparable from many technical solutions in engineering operations. Drejeris & Oželiene (2019) argued that sustainable development was undoubtedly more profitable than non-sustainable; thus, it is necessary to draw attention to attitudes, ideas and possibilities of the transport company's personnel to develop sustainable technologies in assessing engineering competencies. The number of ideas provided by logistics specialists in a transport company definitely indicates creativity. According to Bloom et al. (2019), creativity and innovativeness can be expressed as the number of ideas presented over a certain period. The ideas must be clarified and presented under real conditions while assessing the logistics specialists' competencies. Creativity and innovativeness are necessary characteristics for logistics specialists and technical personnel. Thus, the assessment of engineering competencies should include the criterion of the number of innovative ideas implemented over a certain period, for instance, five years. Pedron (2018) stated that tasks requiring creativity and emotional intelligence have been transferred to technological literacy. The assessment based on technological literacy encompasses the most advanced knowledge, technical and coding skills, process understanding and IT security awareness (Kaur et al., 2020). In their analyses of competencies, Bloodgood (2019) and Zhao et al. (2020) argued that IT knowledge transfer and co-worker education should provide specialists with the ability to apply innovations and improve technologies used in diverse knowledge processes. Therefore, the knowledge acquired and transferred to other employees or cooperation is an important factor in competence assessment. A logistics specialist needs language skills to convey information and train other transport company employees. Language skills are an integral part of the qualification, enabling access to the latest information, cooperation and exchanging experiences with colleagues worldwide (Karácsony & Bokor, 2021; Tiškus, 2019). Rahman et al. (2019) and Albantani and Madkur (2018) claimed that it was necessary to integrate foreign languages into the higher education system to raise the competencies of prospective employees. Proficiency in foreign languages would help update logistics specialists' knowledge and skills. Tsekeris (2019) argued that logistics specialists were required to update their technical and digital skills. In their research on operational skills and competencies, Fahmi and Ali (2022) claimed that work experience greatly impacted the quality of operational performance, project success, effective management of work equipment and technologies, decision-making, career planning and achieving transport company's goals. Thus, employees with more work experience will be more confident in their decisions, have more authority and, possibly, greater influence on others and carry out more specific tasks.

2. Research methods

Certain aspects must be considered upon completion of the content analysis on multi-criteria methods. First, the possibilities of deploying these methods in establishing competence criteria and evaluation systems for logistics specialists must be explored. Second, this method's results should be applied constantly, have low costs in terms of time, and the method should be easily implemented in the company (Skačkauskienė & Katinienė, 2017). The most suitable methods for evaluating logistics specialists' competencies are as follows: (1) SAW, which is based on the concept of finding the weighted sum of the performance of each alternative on all attributes (Aisyah, 2021), (2) AHP — the hierarchical structuring of the components considering their importance (Vaičiūtė et al., 2022); it uses pairwise comparison of the alternatives, (3) MOORA — a multi-objective optimisation based on ratio analysis consisting of two parts: the ratio system and the reference point approach (Fajar & Sarno, 2019), and (4) VIKOR, which determines the compromise ranking list aimed at optimising complex multi-criteria systems (Opricovic & Tzeng, 2004). The MOORA and VIKOR methods were refused as they were designed to optimise complex and multi-objective systems. The SAW and AHP methodologies were selected to research and evaluate the logistics specialists' competencies based on criteria.

The multi-criteria assessment methods were applied to evaluate the engineering competencies of logistics specialists in a transport organisation. An algorithm consisting of four stages was developed. The first stage is preparation, i.e., familiarisation with the transport company's management and organisational structure and discussion of the importance of researching competencies and expected results. This stage requires to form a group of experts selected according to certain criteria. The data on the criteria significance is required in SAW and AHP applications. The second stage is consulting, i.e., interviewing expert groups and logistics specialists. This stage requires providing the main concepts and discussing the peculiarities of the research. The third stage is interviews with experts and logistics specialists. The compatibility of data matrices and expert opinions is calculated. In the event of non-consistent opinions between data matrices and expert opinions, a regress to stage two is made. If the opinions are consistent, the results are summarised. The fourth stage processes data, and the transport organisation is introduced with evaluation results to be used by the management for effective solutions to improve logistics specialists' performance results, such as adjusting or completely changing objectives, setting new qualification improvement tasks, changing careers, using the company's strengths and eliminating its weaknesses. These changes could produce a safer environment in transport organisations, prompt logistics specialists to complete the assigned tasks faster and strengthen cooperation.

The SAW method was suggested for evaluating the competencies of logistics specialists in a transport organisation. The AHP method is applied in the case of a doubt about the reliability of the results.

The evaluation criteria for assessment must be as objective as possible (Drejeris & Miceikiene, 2018). A scale of 100 points was selected to evaluate the criteria, and the overall estimates were calculated as follows:

$$W_i = \sum_{e=1}^{n} W_{ie}\,,\; i = (1, \dots, m) \qquad (1)$$

here, W_i — the sum of all evaluations provided by the experts, W_{ie} — evaluation of the i-th criterion by the e-th expert, n — the number of experts, and m — the number of criteria.

The equation below is used to determine the relative importance of one of the questions:

$$n_i = \frac{W_i}{\sum_{i=1}^{m} W_i},\; i = (1, \dots, m) \qquad (2)$$

here, n_i — the importance and $\sum_{i=m}^{m} W_i$ — the sum of all i criterion estimates by all experts.

Thus, the sum of the importance of all criteria will be equal to 1:

$$\sum_{i=1}^{m} n_i = 1 \qquad (3)$$

The compatibility between expert opinions and the expert evaluation is assessed using the SAW and AHP methods.

The calculated competence coefficient, i.e., compatibility of opinions, determines and evaluates the competence of each expert.

Baležentis and Streimikiene (2017) suggested providing the same competence coefficient for all experts in the formula. Giving equal weight to all experts indicates that expert opinions are consistent and competent.

$$K_j^0 = \frac{j}{n}, j = 1, \dots, n \quad (4)$$

here, K_j^0 — expert competence coefficient, j — the coefficient equal to 1, and n — the number of experts.

$$X_j^t = \sum_{i=1}^{m} K_i^{t-1} \cdot x_{ij},\ j = 1, \dots, n \quad (5)$$

here, X_j^t — new matrix values, $\sum_{i=1}^{m} K_i^{t-1}$ — group assessments, x_{ij} — i-experts, and j — the alternative rank.

$$\lambda^t = \sum_{j=1}^{n} \sum_{i=1}^{m} x_j^t \cdot x_{ij} \quad (6)$$

here, λ^t lambda — all matrices, x_j^t — the sum of values, n — the number of experts, and m — the number of alternatives.

$$K_i^t = \frac{1}{\lambda^t} \cdot \sum_{j=1}^{n} x_j^t \cdot x_{ij},\ \sum_{i=1}^{m} K_i^t = 1 \quad (7)$$

The sum of all evaluation weights provided by each expert c_{ik} should be equal to 1 (or 100 %) when applying the direct method of criteria-weighting. The method here indirectly determines criteria weights and deploys a selected scoring system (5, 10, 20 and others). Evaluations may be repeated.

$$w = \frac{\sum_{k=1}^{r} c_{ik}}{\sum_{i=1}^{m} \sum_{k=1}^{r} c_{ik}} \quad (8)$$

Expert assessments are marked c_{ik} ($i = 1,\dots, m$; $k = 1,\dots, r$), where m — the number of the applied criteria and r — the number of experts. Expert rank assessments are presented in the matrix of indicators (Table 2).

The expert group n evaluates objects m quantitatively. The evaluations form a matrix of n rows and m columns (Šakalys et al., 2019). The evaluation can act as an indicator unit, part of a unit, a percentage or as a ten-point grading system. The ranking of expert indicators is suitable for calculating the concordance coefficient. The ranking is a procedure that gives the most important indicator a rank (R) equal to one, the second indicator — the second rank, and the last indicator — rank m (where m is the number of comparative indicators).

If the value of the calculated concordance coefficient W is close to 1, then it is possible to conclude that expert evaluation is consistent. The compatibility of expert evaluation is considered sufficient if the value of the concordance coefficient W reaches 0.6 or more.

Normalisation formula used in the SAW method to evaluate competencies:

$$\bar{r}_{ij} = \frac{r_{ij}}{\sum_{j=1}^{n} r_{ij}} \quad (9)$$

($\sum_{j=1}^{n} r_{ij}$, $\bar{r}_{ij} = 1$), here, r_{ij} — the value of the i-th criterion for the j-th alternative.

The criterion Sj in the SAW method is calculated according to the formula:

$$S_j = \sum_{i=1}^{m} w_i \bar{r}_{ij} \quad (10)$$

here, w_i is the weight of the i-th criterion.

Experts determine the maximum (minimum) value of each criterion. The value of the maximising criterion $\bar{r}_{ij}$ is calculated according to the formula:

$$\bar{r}_{ij} = \frac{r_{ij}}{max\, r_{ij}} \quad (11)$$

Tab. 2. Matrix of evaluation indicators

Expert code		**Indicator marker,** $j = 1, 2, \dots, m$				
X_1		X_2	X_3	…	X_m	
$i = 1, 2, \dots, n$	E_1	R_{11}	R_{12}	R_{13}	…	R_{1m}
	E_2	R_{21}	R_{22}	R_{23}	…	R_{2m}
	E_3	R_{31}	R_{32}	R_{33}	…	R_{3m}
	…	…	…	…	…	…
	E_n	R_{n1}	R_{n2}	R_{n3}	…	R_{nm}

Source: Elaborated by the author based on Sivilevičus, 2019.

The value of the minimising criterion $\bar{r}_{ij}$ is calculated according to the formula:

$$\bar{r}_{ij} = \frac{min\, r_{ij}}{r_{ij}} \quad (12)$$

here, $max\, \bar{r}_{ij}$ $(min\, \bar{r}_{ij})$ is the maximum (minimum) value of the i-th criterion determined by the experts.

The maximum theoretical value of the S_j criterion is equal to one. The most convenient way to demonstrate the S_j value is on the scale of percentages. The object comparison with the maximum value (100 %) is reflected on this scale (Podvezko, 2011).

The authors of this article suggest conducting an evaluation of the competencies of logistics specialists based on the methodology presented in Table 3.

The steps of forming a group of experts, analysis of a set of criteria, and research preparation are carried out during the preparation stage. These steps must be taken consistently, and the sequence should not be altered.

The step of forming a group of experts begins with determining the expert selection criteria (education, the number of completed projects, and work experience). Also, this step involves an interview with management staff to address the time required for research execution, expert competencies, and the number of experts partaking in the research. The selection criteria may vary, depending on the areas of the organisation's expertise. Usually, experts are selected on the basis of their professional competencies, i.e., work experience, seniority, scientific degree,

Tab. 3. Methodology for evaluating competencies of logistics specialists in transport organisation

Stage in evaluation methodology	Steps	Sequence of methodology applications in assessing the competencies of logistics specialists
Preparation for the evaluation	1.1. Forming a group of experts	1.1.1. Conducting an interview with management staff in the transport organisation regarding the selection of experts. 1.1.2. Forming a group of experts and suggesting the following criteria for expert selection: (1) position held (manager, deputy manager, department or branch manager), (2) the number of participations in assessment groups (for instance, audit or project groups), and (3) work experience (at least three years in the field of research) 1.1.3. Confirming the structure of the group.
	1.2. Validation/analysis/ compilation of a set of criteria	1.2.1. Reviewing a collection of explicit and tacit competencies (if there is a need to change the criteria, managers/the group of experts are the ones to suggest it during interviews) 1.2.2. Selecting an assessment scale
	1.3. Research preparation	1.3.1. Selecting the type of questionnaire 1.3.2. Preparing the research instrument 1.3.3. Preparing instructions for filling in the questionnaires
Consultation	2.1. Organising interviews	2.1.1. Conducting an interview with the management of the transport organisation 2.1.2. Conducting an interview with logistics specialists 2.1.3. Conducting an interview with the group of experts
Evaluation	3.1. Evaluating the competencies of logistics specialists and determining the significance of criteria	3.1.1. Surveying a group of experts: 3.1.1.1. Assessing the criteria 3.1.1.2. Evaluating the competencies of logistics specialists according to the criteria while using the ranking method 3.1.1.3. Evaluating the competencies of logistics specialists by pairwise comparison method 3.1.2. Surveying logistics specialists
	3.2. Determining the degree of compatibility of expert opinions	3.2.1. Calculating the degree of compatibility of expert opinions 3.2.2. Calculating the competence coefficient of experts
	3.3. Calculating the significance estimates of the competence criteria	3.3.1. Calculating the significance estimates of explicit and tacit competencies' block 3.3.2. Calculating the significance estimates of the criteria
Summary of the results	4.1. Data processing	4.1.1. Normalising explicit competencies of logistics specialists 4.1.2. Normalising tacit competencies of logistics specialists
	4.2. Synthesis of the competence values of logistics specialists	4.2.1. Calculating the estimates of explicit competencies' block of logistics specialists 4.1.2. Calculating the estimates of tacit competencies' block of logistics specialists Integrating estimates of all competencies into a generalised estimate 4.2.3. Integrating estimates of all competencies into a generalised estimate

research activities, and abilities to solve specific problems in the relevant field. An expert group is formed following the criteria specified in Point 1 of the methodology, or these criteria are determined by the management staff of the transport organisation. The number of experts in the group for evaluating the logistics specialists' competencies is determined by the management staff and the evaluator during the interview. The recommended number is no less than three to guarantee a better distribution of opinions and no more than ten for results to be objective and reliable (Podvezko, 2011). The optimal number of expert groups varies between eight to ten members, and at least five experts should be surveyed. The reliability of evaluation slightly increases as the number of experts maximises; however, the greatest accuracy of the estimates can be obtained with 5–9 experts in a group.

Next, the collected competencies of logistics specialists are analysed. The management staff and experts analyse the content of elicit and tacit competencies and may alter/eliminate the irrelevant ones. The evaluator, the management staff and/or the expert group review the criteria evaluation.

The research sample is calculated during research preparation. This step also involves selecting the questionnaire type and preparing the filling instructions. Then, interviews are organised, and instructions are provided for logistics specialists and experts during the stage consultations. The evaluation stage has three steps: evaluating the competencies of logistics specialists, determining the degree of compatibility of expert opinions and calculating the criteria significances. These steps involve formalised surveys of logistics specialists and experts. Questionnaires distributed to logistics specialists supply data on the existing competencies in general and those applied in everyday operations. Experts receive different questionnaires developed by an evaluator. These questionnaires are specially designed to be used with the SAW and AHP methodologies. Experts evaluate the groups of elicit and tacit competencies (AHP method) and those based on certain criteria (SAW method).

The summary of the results involves the following steps: data processing and synthesis of the competence values of logistics specialists. The evaluator summarises the obtained data and values for competence groups. Then, the results are visualised and presented to the management staff and logistics specialists of the transport organisation.

3. Research results and discussion

Empirical research based on the SAW method was conducted to verify the suitability of the developed methodology for evaluating the competencies of logistics specialists. The AHP pairwise comparison method was used to determine the significances. To be eligible for research, transport companies had to meet the following criteria: no less than five years of operation and the number of employees attributing the transport company to one of the four business types: large, medium, small, and very small. Financial data was also taken into consideration, i.e., the annual income of the company had to be no less than EUR 2 million. Generally, large transport organisations were split into subdivisions, which were evaluated. The number of logistics specialists in subdivisions usually did not exceed the average number of members in a transport organisation.

Two transport organisations were selected for this research based on the criteria mentioned above. They have two subdivisions in Lithuania and two more in Latvia (Table 4).

Forming a group of experts. There were three main criteria in the expert selection process: no less than five years of managerial experience, participation in no less than two projects or working groups and no less than ten years of experience in the transportation business. This way, nine experts from different transport organisations were chosen: two from Latvia, two from the Netherlands, and five from Lithuania. The average managerial experience of the experts was 10.4 years, and the average work experience was 16.5 years. On average, each expert took part in three projects or working groups.

The collection of major criteria that directly impact the competencies of logistics specialists is based on the research by Skačkauskienė et al. (2017). The criteria were selected and categorised into two groups of competencies according to their type (explicit and tacit) and form of evaluation, i.e., qualitative or quantitative (Points 1.2.1, 1.2.2 and 1.2.3 in Table 3).

Research preparation. Different questionnaires were designed for experts and logistics specialists to evaluate competencies and criteria using two methods, i.e., SAW and AHP. Instructions specifying the task for experts, main concepts and filling directions were prepared.

Tab. 4. Characteristics of the researched transport organisations

Title	No. of logistics specialists	Justification of the competencies of logistics specialists		Brief description of activities
JSC X transport	89	58 — professional bachelor's degree, 27 — bachelor's degree, 4 — master's degree	For interested/motivated employees: mechanics courses, internships at vehicle manufacturers.	Transport organisations. Transportation of passengers and cargo by diverse modes of transport. Subdivisions were categorised based on countries and activity directions.
JSC X I — subdivision	11	5 — master's degree, 3 — bachelor's degree	For interested/motivated employees: mechanics courses, internships at vehicle manufacturers.	
SIA B Transport	78	30 — professional bachelor's degree, 32 — bachelor's degree, 16 — master's degree	For interested/motivated employees: mechanics courses, internships at vehicle manufacturers. Courses on IT system development (obligatory for master's graduates).	
SIA B I — subdivision	7	2 — professional bachelor's degree, 3 — bachelor's degree, 2— master's degree	For interested/motivated employees: mechanics courses, internships at vehicle manufacturers. Courses on IT system development (obligatory for master's graduates).	

Tab. 5. Criteria estimates of the competencies' blocks by the SAW method

Criteria	Experts									In total	Significances
	E1	E2	E3	E4	E5	E6	E7	E8	E9		
KR1	8	10	8	10	9	8	9	10	9	81	0.090
KR2	8	7	9	9	10	10	9	8	7	77	0.086
KR3	10	10	9	10	10	10	10	10	10	89	0.099
KR4	9	7	6	5	5	7	7	8	5	59	0.066
KR5	10	10	9	10	10	9	10	9	10	87	0.097
KR6	8	7	7	6	7	6	6	6	6	59	0.066
KR7	7	8	7	7	9	8	9	8	10	73	0.081
KR8	8	9	9	10	9	9	8	8	9	79	0.088
KR9	8	9	10	9	8	10	9	10	10	83	0.092
KR10	6	8	7	7	5	5	6	6	7	57	0.063
KR11	8	7	10	8	8	8	7	9	8	73	0.081
KR12	10	8	9	9	10	10	10	8	9	83	0.092
Total	100	100	100	100	100	100	100	100	100	900	1

Organising interviews. The interviews with logistics specialists and a group of experts were conducted separately, considering the differences in questionnaires. During the consultation, the content of competencies and criteria was explained, instructions on filling out the questionnaires were given, and questions were answered.

Evaluating the competencies of logistics specialists. The survey method was used together with SAW. Experts were asked to evaluate the significances of each group and the criteria of competencies specified in each questionnaire.

The evaluation criteria for engineering competencies of logistics specialists were based on a scientific literature analysis and synthesised opinions and interpretations from various researchers. The following measurement units were assigned to the criteria of engineering competencies of logistics specialists:

KR1. Interdisciplinary knowledge (the number of operational duties — units, points).

KR2. Education (the number of qualifications granted by educational institutions — units, points).

KR3. Professional knowledge (the number of mastered systems used at transport organisations — units, points).

KR4. Qualification improvement (the number of hours of the completed courses — units, points).

KR5. Error analysis and correction (the number of errors (associated with technological development) prior to and after qualification improvement — units, points).

KR6. Decision-making (the position held — units, points).

KR7. Employee attitudes, ideas, and possibilities for developing sustainable technologies (knowledge and opinions towards sustainable technologies, abilities to apply sustainable methods that reduce pollution and waste — units, points).

KR8. A number of innovative ideas realised over a certain period (the number of years worked in a company — units, points).

KR9. Technological literacy (the number of completed courses on technologies — units, points).

KR10. Knowledge acquisition and transfer (the number of cases of transferred knowledge, i.e., consultations provided to other co-workers and employees — units, points).

KR11. Knowledge of foreign languages (the number of languages learned and the level of proficiency — units, points).

KR12. Work experience (the number of years — points).

It is worth noting that the values of all distinguished criteria become better when they are higher, i.e., these criteria are maximised; thus, the calculation of the estimates of engineering competencies becomes substantially simpler and faster.

It is also important to draw attention to the fact that final significances by the experts have the following distribution: 0.41 for the group of tacit competencies and 0.59 for the group of explicit competencies. According to experts, the most important criteria are professional knowledge (KR3) with 0.099 and error analysis and correction (KR5) with 0.097. The equal values were given to the criteria of technological literacy (KR9) and work experience (KR12). The criterion of interdisciplinary knowledge (KR1) with 0.090 was also in the top five (Table 5).

The evaluation of logistics specialists' engineering competencies using the SAW method entails determining the value of each competence according to the criterion specified in the questionnaire. The greatest significances and equal distribution can be detected in the group of tacit competencies: 0.22 (N_5 — motivation to work), 0.21 (N_2 — employee's influence on the realisation of organisational goals), 0.2 (N_6 — autonomy at work) (Table 6). This distribution indicates that experts have similar attitudes concerning the importance and impact of these competencies on logistics employee results.

The greatest significances are given to the knowledge of vehicle technical assistance standards (0.28) in the group of explicit competencies, while motivation to work excelled in the tacit group (0.22) (Table 6).

Experts ranked the competencies of logistics specialists according to their importance (from 1 as the most important to 6 as the least important). The distribution of the sum of ranks is presented in Table 7.

The following estimates in the group of explicit competencies were ranked the same: knowledge of vehicle technical assistance standards and the evaluation of the specifications of vehicle control systems are ranked as first, fifth and sixth, respectively. The ranking and evaluation process of tacit competencies motivation to work, autonomy at work, and work complexity received unanimous significances and positions were equally distributed, i.e., first, third and sixth (Fig. 2).

Experts evaluated the competencies of logistics specialists based on 12 criteria (where 10 was the most important and 1 was the least important). These values could repeat. The sum of values and distribution of final values is presented in Table 8.

To summarise, the sequence of criteria changed with expert evaluation. Only one congruence of the rank (N6) was detected in the group of tacit competencies.

Expert survey (AHP method). Expert questionnaires were designed and adapted to the AHP method. Each expert was given separate tables representing competence groups (e.g., Table 9), instructions for filling out the questionnaire, main concepts and evaluation scales. The attached AHP instruction specifies tasks for experts, i.e., to perform a pairwise comparison of the competencies. The examples of comparing statements were also attached to the instruction. In the case of uncertainties, experts were consulted via mobile and online chat platforms.

Experts evaluated the competencies of logistics specialists based on the selected scale from 0 to 9 (Table 10). Each numerical value corresponds to qualitative (verbal, linguistic) evaluation. It is convenient to choose a scale with more numerical values in the case of a large number of the evaluated competencies. It should be emphasised that diverse versions of the evaluation scale are possible:

0 ÷ 1 — possible values {0; 0,5; 1};

0 ÷ 9 — possible values {0; 1; 2; 3; 4; 5; 6; 7; 8; 9}.

Tab. 6. Competency estimates by the SAW method

Experts / Competencies	E1	E2	E3	E4	E5	E6	E7	E8	E9	Final significances	Ranks
Group of explicit competencies											
I_1	0.15	0.3	0.2	0.13	0.2	0.47	0.1	0.1	0.35	0.22	2
I_2	0.13	0	0.2	0.3	0.3	0.13	0.3	0.2	0.2	0.2	3
I_3	0.27	0.5	0.3	0.27	0.3	0.2	0.3	0.13	0.3	0.28	1
I_4	0.1	0	0.1	0.05	0.05	0.05	0.1	0.1	0.02	0.06	6
I_5	0.2	0.2	0.15	0.05	0.05	0.05	0.1	0.2	0.03	0.11	5
I_6	0.15	0	0.05	0.2	0.1	0.1	0.1	0.27	0.1	0.12	4
Group of tacit competencies											
N_1	0.2	0	0.2	0	0.1	0.1	0	0.1	0	0.06	6
N_2	0.15	0	0.2	0.5	0.2	0.15	0.5	0.15	0	0.21	2
N_3	0.1	0.3	0.1	0	0.2	0.23	0	0.1	0.1	0.13	5
N_4	0.23	0.2	0.2	0.3	0.2	0.22	0	0.22	0.2	0.19	4
N_5	0.22	0.5	0.2	0	0.1	0.23	0.05	0.23	0.4	0.22	1
N_6	0.1	0	0.1	0.2	0.2	0.07	0.45	0.2	0.3	0.20	3

here: the use of information technologies (technically complex) in transportation process — I_1, the evaluation of the specifications of vehicle control systems — I_2, knowledge of vehicle technical assistance standards — I_3, the preparation of engineering documentation — I_4, professional experience — I_5, maintaining technological infrastructure in transport organisation — I_6, work complexity — N_1, employee influence on the realisation of organisational goals — N_2, work culture — N_3, responsibility — N_4, motivation to work — N_5, autonomy at work — N_6, E1, E2 — experts from Latvia, E3, E4 — experts from the Netherlands, E5, E6, E7, E8, E9 — experts from Lithuania.

Tab. 7. Distribution of competence ranks by the SAW method

Group of explicit competencies						
	I_1	I_2	I_3	I_4	I_5	I_6
Sum of ranks	31	21	21	47	38.5	30.5
Final rank	4	1.5	1.5	6	5	3
Group of tacit competencies						
	N_1	N_2	N_3	N_4	N_5	N_6
Sum of ranks	45	42	44	33	26	37
Final rank	6	4	5	2	1	3

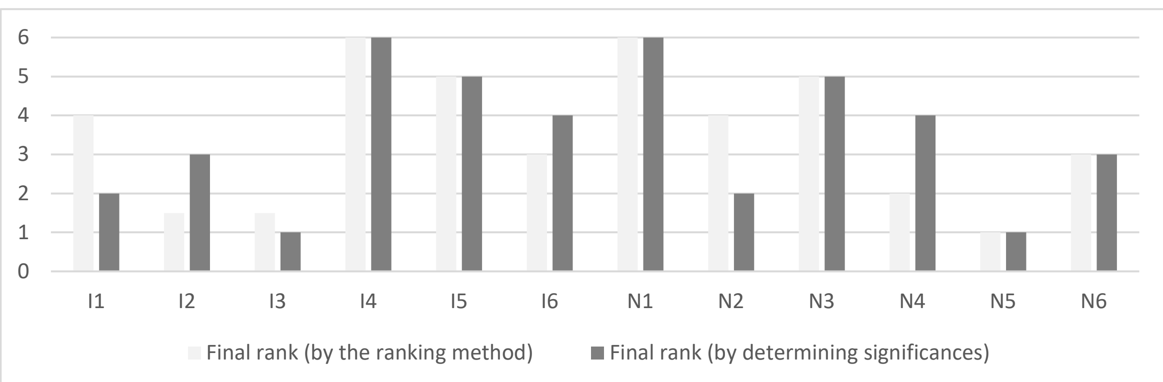

Fig. 2. Final ranks of competencies

Tab. 7. Distribution of competence ranks by the SAW method

GROUP OF EXPLICIT COMPETENCIES						
	I_1	I_2	I_3	I_4	I_5	I_6
Sum of ranks	31	21	21	47	38.5	30.5
Final rank	4	1.5	1.5	6	5	3
GROUP OF TACIT COMPETENCIES						
	N_1	N_2	N_3	N_4	N_5	N_6
Sum of ranks	45	42	44	33	26	37
Final rank	6	4	5	2	1	3

Tab. 8. Distribution of final ranks of logistics specialists' competencies based on the criteria

CRITERIA CODES AND THEIR COEFFICIENTS / COMPETENCIES	KR1	KR2	KR3	KR4	KR5	KR6	KR7	KR8	KR9	KR10	KR11	KR12	FINAL ESTIMATE	FINAL RANK
	0.09	0.085556	0.098889	0.065556	0.096667	0.065556	0.096667	0.081111	0.092222	0.063333	0.081111	0.092222		
I1	90	90	90	90	90	90	90	90	90	90	90	70	88.95556	2
I2	90	90	90	90	90	62	90	90	90	90	90	90	88.96444	1
I3	90	90	90	65	90	90	56	90	90	90	61	90	83.52222	4
I4	90	90	90	90	73	57	48	66	90	61	90	90	79.15	5
I5	90	58	90	90	90	90	90	90	90	90	90	90	88.06222	3
I6	90	62	90	61	90	58	90	62	51	90	50	90	75.29333	6
N1	90	90	90	90	90	90	90	90	90	90	90	90	90.8	1
N2	62	90	90	90	90	90	90	61	61	90	51	90	80.09	2
N3	45	90	45	45	45	50	90	50	45	90	90	48	61.11	6
N4	65	90	55	55	90	90	90	90	65	90	47	63	74.51111	4
N5	45	55	45	90	58	90	52	90	90	90	85	50	68.44444	5
N6	83	62	62	90	70	90	56	90	90	90	90	90	79.78556	3

Tab. 9. AHP table completed by an expert with pairwise comparison method

THE FIRST STATEMENTS OF THE GROUP OF EXPLICIT COMPETENCIES	THE SECOND STATEMENT OF THE GROUP OF EXPLICIT COMPETENCIES					
Criteria	I_1	I_2	I_3	I_4	I_5	I_6
I_1	1	7	5	1/3	8	3
I_2	1/7	1	9	3	7	5
I_3	1/5	1/9	1	8	7	5
I_4	3	1/3	1/8	1	7	5
I_5	1/8	1/7	1/7	1/7	1	5
I_6	1/3	1/5	1/5	1/5	1/5	1

here: the use of information technologies (technically complex) in transportation process — I_1, the evaluation of the specifications of vehicle control systems — I_2, knowledge of vehicle technical assistance standards — I_3, preparation of engineering documentation — I_4, maintaining technological infrastructure in a transport organisation — I_5, consultations provided — I_6.

Tab. 10. Values of expert estimates

NUMERICAL VALUE	DESCRIPTION
1	The influence of both competencies on the work skills of a logistics specialist is the same.
3	The influence of one competence on the work skills of a logistics specialist is slightly greater compared to the other.
5	The influence of one competence on the work skills of a logistics specialist is average compared to the other.
7	The influence of one competence on the work skills of a logistics specialist is greater compared to the other.
9	The influence of one competence on the work skills of a logistics specialist is substantially greater compared to the other.
2,4,6,8	Intermediate values to be used in the case of doubt about the adequacy of odd estimates
1/2, 1/3, 1/4, 1/5, 1/6, 1/7, 1/8, 1/9	Reverse evaluation

Source: Elaborated by the authors based on (Saaty, 1993).

Tab. 11. Expert competence coefficients

Expert competence coefficients								
E1	E2	E3	E4	E5	E6	E7	E8	E9
0.102	0.1023	0.129	0.129	0.102	0.129	0.129	0.0967	0.081

Tab. 12. Questionnaire response rate

Transport organisations / Type of the questionnaire response rate	JSC X transport	JSC X I subdivision	SIA B transport	SIA B I subdivision
Units	72	11	78	7
Percentages	82 %	100 %	100 %	100 %

Tab. 13. Distribution of the generalised estimate in the subdivisions of transport organisations by the SAW method

Organisations	SAW					Generalised estimate
	Estimates of explicit competencies' block	Normalised estimates	Estimates of tacit competencies' block	Normalised estimates	Sum of estimates	Normalised estimates
JSC X transport	151.49	0.17914	191.68	0.13619	343.17	0.31533
JSC X I subdivision	21.1	0.18751	44.51	0.24197	65.61	0.42947
SIA B Transport	31.95	0.20555	76.99	0.24934	108.94	0.45490
SIA B I subdivision	13.78	0.21561	31.56	0.25334	45.34	0.46895

Tab. 14. Estimates and their values

The scale of numeric estimates / Intervals	[0.13619; 0.17524)	[0.17524; 0.21429)	[0.21429; 0.25334]
The Scale of Linguistic Estimates	Low	Average	High
The estimates of explicit competence criteria in transport organisations falling into the interval		JSC X transport SIA B Transport JSC X I- subdivision	SIA B I subdivision
The estimates of tacit competence criteria in transport organisations falling into the interval	JSC X transport	-	JSC X I subdivision SIA B Transport SIA B I subdivision

Tab. 15. Measures to strengthen the competencies of logistics specialists

Group of explicit competencies	Measure
Use of information technologies (technically complex) in transportation	Learning by working Qualification development courses Methods for compensation of qualification development courses provided by the management
Evaluation of the specifications of vehicle control systems	
Knowledge of vehicle technical assistance standards	
Preparation of engineering documentation	
Maintaining technological infrastructure in the transport organisation	
Consultations provided	
Group of tacit competencies	**Measure**
Work complexity	Open communication Employee incentives (monetary and non-monetary) Applied training courses (not related to speciality)
Employee influence on the realisation of organisational goals	
Work culture	
Creativity	
Motivation to work	
Autonomy at work	

Determining the degree of compatibility of expert opinions. Verifying the compatibility of expert opinions is an obligatory step if a decision is made on their basis. It is highly recommended that the compatibility of all experts should be checked while using the SAW and AHP methods. The value of the concordance coefficient W approaches zero, i.e., W=0.0674. Therefore, experts were asked to fill out the tables once more. The concordance coefficient of the explicit competence block was equal to 0.4056 the explicit competence block was equal to 0.4056 after completing the second compatibility calculation of expert opinions. This shows that expert opinions were in weak agreement; thus, a formula X^2 (Formula 13) was calculated additionally. The values of X^2_{kr} were used from the table according to the level of significance α (in practice, the value of α is 0.05 or 0.01) and the degree of freedom $v = m - 1$.

$$X^2 = W\, r\, m\, (m-1) \tag{13}$$

If the value X^2 calculated by the formula (13) is greater than X^2_{kr}, expert evaluations are in agreement. The first verification according to the selected level of significance α=0.05 with a degree of freedom ν=5 and $X^2_{kr} = 11.07$, while $X^2 < X^2_{kr}$ showed that expert opinions were in agreement.

The calculated Kendall's coefficient of concordance did not identify the experts whose evaluations could differ. The coefficient of competence was calculated according to formulas (from 4 to 8). In this regard: $K_j^0 = \frac{1}{9} = 0.111$

The group estimates (Formula 5) and a new calculation matrix for the coefficient of competence were obtained. In order to calculate the final coefficients of competence based on Kendall, the sum of each row in the matrix was divided by lambda (Formula 6), which equals to 2089. It is important to note that the sum of the calculated estimates of the competencies should be equal to one. According to the analysis and results obtained from Table 11, it is possible to claim that experts 3, 4, 6 and 7 had the highest levels of competencies compared to other experts in the research.

The formula was used to check the competencies of all experts: $\overline{K}_i^t - 1.96s \leq K_i^t \leq \overline{K}_i^t + 1.96s$, $\overline{K}_i^t$ — the average of competence coefficient; s — the standard deviation and obtained intervals [0.013; 0.209]. The competence of the 9th expert was the lowest in this group (0.081) (Table 11). However, it was not as low as to eliminate this expert judgement from the research. Generally, it was possible to claim that experts with similar competence coefficients (0.129) held managerial positions for over five years. Notably, all experts had enough competencies to partake in the evaluation process.

Each subdivision of transport companies was presented with separate but identical questionnaires online. The questionnaire link was sent via email to each logistics specialist in the JSC X I subdivision, SIA B transport subdivision, and SIAB I subdivision. The questionnaire link for the JSC X transport was sent to a representative who forwarded the email to logistics specialists. The questionnaire response rate for JSC X I subdivision, SIA B and SIA B I subdivision was 100 %, while the JSC X transport had a response rate of 82 % (Table 12).

Normalised criteria estimates. The obtained data were normalised, and the generalised estimate was calculated for the competencies of the logistics specialists in each subdivision of transport organisations (Table 13).

The high estimates in the explicit competencies block show that logistics specialists have a substantial engineering competence in using information technologies (technically complex) in transportation. They can evaluate specifications of vehicle control systems and have a great understanding of vehicle technical assistance standards and engineering documentation, and maintain the technological infrastructure of the transport organisation. The low estimates indicate that managers should review the levels of education of all logistics specialists and provide opportunities to study, encourage the use of technologies and search for solutions to improve qualifications. The high estimates in the tacit competencies block show the great motivation to work, autonomy at work and initiative of a logistics specialist in achieving and realising the company's goals. Additionally, it shows the pursuit of high results by taking responsibility for one's actions and the ability to do complex work while complying with organisational culture. The low estimates in the tacit competencies block show that managers should draw their attention to the motivation of their employees and gather their team for joint activities, thus promoting communication. Also, pursuing objectives and initiatives is greatly important.

The step of interval estimation is calculated as a difference between the maximum and minimum estimate values divided by the number of intervals, i.e., the calculation is based on the formula:

$$h = \frac{x_{max} - x_{min}}{m} \quad (14)$$

here, h — the step of interval estimation, x_{max} — the highest criterion estimate, x_{min} — the lowest criterion estimate, m — the number of intervals.

$$h = \frac{0.25334 - 0.13619}{3} = 0.03905$$

Interval points t_n, $n=1,2,3,\ldots k$ are determined as follows:

$t_1 = x_{min}$, $t_1 = 0.13619$
$t_2 = t_1 + h$, $t_2 = 0.13619 + 0.03905 = 0.17524$
$t_3 = t_2 + h$,
…
$t_n = t_{n-1} + h <= x_{max}$

Thus, h=0.03905, and calculated intervals and their linguistics values are presented in Table 14.

The estimates for the group of tacit competencies in JSC X transport are rather low, signalling the issues of knowledge transfer, motivation, autonomy and cooperation between logistics specialists. The management staff of these transport organisations should focus on team-building and/or leadership to better use the potential of logistics specialists. This would encourage employee confidence and boost cooperation and motivation to collaborate. The lowest difference between tacit and explicit competencies groups can be detected only in the SIA B I subdivision. Logistics specialists in this subdivision have a substantial qualification in information technologies and their application in transportation. They can evaluate the specifications of vehicle control systems, have a great knowledge of vehicle technical assistance standards and may prepare engineering documentation. They monitor technological infrastructure in their transport organisation, continuously improve their qualifications, and pursue the goals and objectives of the transport organisation. These employees are autonomous, take responsibility for their decisions and are greatly motivated to work. The activities of logistics specialists in this organisation are organised properly. Thus, no performance-altering decisions should be implemented.

The evaluation of the competencies of logistics specialists provides information on the existing competencies and subsequently results in certain decisions and solutions for the effective management of such competencies. Upon completing the evaluation and reviewing the results of experimental research, it is purposeful to use the suggested measures to promote or upgrade the qualifications of logistics specialists (Table 15).

The competencies of logistics specialists in transport organisations fall into competence groups of the explicit and tacit categories. The multicriteria methodologies (SAW and AHP) were applied to evaluate the competencies of logistics specialists in transport organisations. The developed algorithm, consisting of four stages, may undergo the following corrections:

- while forming the expert group, alterations in the contents and number of the criteria are possible;
- changes in competence evaluation criteria are possible;
- changing competencies altogether is also possible;
- changing the scale of evaluations is possible.

Conclusions

The competencies of logistics specialists in transport organisations were classified into explicit and tacit competence groups. The developed methodology for evaluating competence criteria enabled a comprehensive evaluation and quantitative measuring of logistics specialists' competencies. The SAW methodology was used to determine the significances of the criteria, while a pairwise comparison was made using the AHP multicriteria methodology. Therefore, the analysis of the results provided opportunities for diverse and miscellaneous comparisons. Determining the most important competencies is an obligatory step for management staff to make decisions concerning employee qualification development, to encourage employees with extensive experience, and to strive for the best results.

The SAW methodology made it possible to objectively/scientifically evaluate the competencies of logistics specialists according to the selected criteria. The AHP method perfectly complements the SAW method — the competencies of logistics specialists are assessed by the pairwise method. Considering the existing competencies of logistics specialists, the result analysis of these methods enables managers to come up with reasonable decisions pertaining to qualification development and establishing an employee motivation system.

An expert evaluation of the competencies of logistics specialists determined that tacit competencies were more important for a logistics specialist. Consequently, experts prioritised organisational culture, motivation and autonomy in the workplace. The competencies "knowledge of vehicle technical assistance standards, motivation and autonomy at work" were of particular importance for a logistics specialist as they showed the relevance of engineering competencies for occupational duties performed by a logistics specialist.

The conducted experiment confirmed that the developed and standardised methodology to evaluate the competencies of logistics specialists in transport organisations is flexible, i.e., applicable in different transport organisations. An experiment in the selected subdivisions of transport companies determined that weak and strong competencies were highlighted. High estimates of tacit or explicit groups indicate that logistics specialists have a substantial number of competencies, and managers should simply monitor the situation. Average estimates of tacit or explicit groups show that managers should take a closer look at strengthening certain competencies. Low estimates of tacit or explicit groups mean that managers are obliged to take all the necessary steps and decisions to develop qualifications and apply corresponding measures.

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