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RISK MANAGEMENT IN THE CONTEXT OF DIGITALIZATION

ZARZĄDZANIE RYZYKIEM W KONTEKŚCIE CYFRYZACJI



STRESZCZENIE

Artykuł przedstawia analizę porównawczą dwóch powszechnie stosowanych metod wspomagania podejmowania decyzji w warunkach niepewności: analizy korelacji i regresji oraz metod ocen eksperckich. Omówiono ich podstawy metodologiczne, zalety, ograniczenia oraz obszary zastosowania w szkolnictwie wyższym. Szczególną uwagę poświęcono zastosowaniu metody ocen eksperckich do analizy opinii studentów dotyczących czynników wpływających na proces kształcenia. Badanie empiryczne przeprowadzono na podstawie danych ankietowych zebranych wśród studentów studiów licencjackich kształcących się na sześciu kierunkach na Lwowskim Uniwersytecie Handlu i Ekonomii: Informatyka, Zarządzanie, Turystyka, Logistyka i handel, Reklama biznesowa oraz Prawo. Metodę rangowania zastosowano w celu określenia priorytetowych czynników wpływających na aktywność edukacyjną studentów, natomiast współczynnik korelacji rang Spearmana oraz współczynnik konkordancji Kendalla wykorzystano do oceny zgodności opinii studentów w zależności od kierunku studiów. Wyniki wskazują, że konieczność łączenia nauki z pracą stanowi najważniejsze wyzwanie wspólne dla studentów wszystkich analizowanych kierunków, podczas gdy niewystarczające wsparcie dydaktyczne i metodyczne zostało uznane za czynnik o najmniejszym znaczeniu. Porównanie ocen studentów ujawniło zarówno wspólne dla całej uczelni priorytety, jak i różnice specyficzne dla poszczególnych kierunków, odzwierciedlające charakterystykę poszczególnych dyscyplin. Badanie potwierdza, że metody ocen eksperckich stanowią skuteczne narzędzie analizy procesów edukacyjnych w sytuacjach, w których dostępne informacje statystyczne są niewystarczające. Połączenie technik ocen eksperckich z ilościowymi metodami statystycznymi zapewnia bardziej kompleksową podstawę podejmowania decyzji oraz wspiera opracowywanie strategii doskonalenia jakości szkolnictwa wyższego opartych na dowodach.

SŁOWA KLUCZOWE

cyfryzacja, zarządzanie ryzykiem, ocena ekspercka, analiza korelacji i regresji, szkolnictwo wyższe, programy kształcenia

ABSTRACT

The paper presents a comparative analysis of two widely used decision-support approaches under conditions of uncertainty: correlation and regression analysis and expert assessment methods. Their methodological foundations, advantages, limitations, and areas of application in higher education are examined. Particular attention is devoted to the application of the expert assessment method for evaluating students' judgments regarding the factors influencing the educational process. A practical study was conducted using survey data collected from undergraduate students enrolled in six educational programmes at Lviv University of Trade and Economics: 'Computer Science', 'Management', 'Tourism', 'Logistics and Trade', 'Business Advertising' and 'Law'. The ranking method was applied to determine the priority factors affecting students' educational activities, while Spearman's rank correlation coefficient and Kendall's coefficient of concordance were used to evaluate the consistency of students' judgments across different fields of study.

The results demonstrate that the need to combine study and work represents the highest-priority challenge shared by students across the analysed programmes, whereas insufficient educational and methodological support was identified as the least significant factor. The comparison of students' evaluations revealed both common university-wide priorities and programme-specific differences reflecting the characteristics of individual disciplines.

The study confirms that expert assessment methods constitute an effective tool for analysing educational processes in situations where statistical information is insufficient. The combination of expert evaluation techniques with quantitative statistical approaches provides a more comprehensive basis for decision-making and supports the development of evidence-based strategies for improving the quality of higher education.

KEYWORDS

digitalization, risk management, expert evaluation, correlation and regression analysis, higher education, educational programmes

1. INTRODUCTION

In modern systems of management, economic forecasting, digitalization, and risk analysis, decision-making methods under uncertainty play a significant role. Among the most common approaches are correlation-regression analysis and expert assessment methods. The former is based on mathematical and statistical modeling of relationships between variables, while the latter relies on the professional knowledge and intuition of experts. The aim of this research is to conduct a comparative analysis of these methods, identify their advantages, disadvantages, areas of application, and the possibility of combined use.

Data Science is an interdisciplinary field that combines statistics, mathematics, computer science, and domain knowledge to extract meaningful information from data and support evidence-based decision-making. Its primary objective is to transform raw data into valuable insights that can improve forecasting, optimize processes, identify hidden patterns, and solve complex practical problems across various domains, including business, economics, tourism, healthcare, engineering, and public administration.

A typical data science workflow consists of several interconnected stages. The process begins with data collection from multiple structured and unstructured sources, followed by data storage, cleaning, and preprocessing to ensure data quality and consistency. The next stage involves data analysis, where statistical techniques, machine learning algorithms, and mathematical models are applied to identify relationships, trends, and significant patterns. Finally, the obtained results are communicated through reports and visualizations, enabling decision-makers to interpret analytical findings and support strategic planning.

The modern development of digital technologies has significantly expanded the range of tools used in data science. Among the most widely applied software environments are Python and R, which provide extensive libraries for statistical analysis, data manipulation and visualization. Python includes powerful libraries such as NumPy, Pandas, Matplotlib, and Scikit-learn, whereas R and RStudio remain leading platforms for statistical computing and graphical analysis. In addition, Microsoft Excel continues to be extensively used for

organizing datasets, performing preliminary statistical analysis, and creating charts, particularly in business analytics and educational environments.

An essential component of data science is statistical analysis, which provides the theoretical and methodological foundation for discovering relationships between variables, testing hypotheses, building predictive models, and supporting data-driven decision-making. Statistical methods enable researchers to quantify uncertainty, evaluate the significance of influencing factors, and develop reliable forecasting models. Depending on the availability and quality of data, different analytical approaches can be employed, ranging from classical statistical modelling to knowledge-based methods that incorporate expert judgement.

2. LITERATURE REVIEW

The development of higher education systems, their harmonization with European standards, and the formulation of future educational policies in the context of globalization require informed and well-founded decision-making. The increasing complexity of educational and socio-economic processes demands the application of approaches that can adequately address uncertainty and the growing number of influencing factors.

Current socio-economic conditions demonstrate that decision-making has become considerably more complex due to the increasing volume, diversity, and significance of available information. Although mathematical and statistical methods provide objective tools for analysing data, they are often insufficient for solving complex management problems that involve uncertainty or incomplete information. Consequently, researchers increasingly emphasize the importance of combining quantitative methods with expert assessment techniques. The main advantage of expert evaluation lies in its ability to support decision-making in situations where objective analytical methods cannot provide sufficiently reliable results, while taking into account

the specific characteristics, priorities, and strategic objectives of the system under consideration [2, 9].

Furthermore, expert surveys provide an opportunity to obtain a comprehensive understanding of the expected outcomes of management decisions at both the organizational and broader socio-economic levels. The results of expert evaluations can serve as a basis for developing alternative scenarios and selecting the most appropriate management strategies. Such scenarios facilitate the formation of sequential management decisions that remain adaptable to changes in the internal and external environment, emerging risks, and new challenges associated with globalization processes [7]. The importance of expert assessment methods is also steadily increasing in economic research, particularly in medium – and long-term forecasting, as well as in situations where statistical information is limited, incomplete, or entirely unavailable [4, p. 260].

Recent mathematical research also demonstrates the growing role of advanced analytical models in decision support systems [5] investigated the application of chaos theory to statistical models and showed that nonlinear dynamic behaviour may significantly influence the interpretation of statistical relationships in socio-economic systems. Their results indicate that classical statistical approaches should be complemented by methods capable of analysing complex and unstable processes.

Further development of this research direction was presented in [6], who examined chaotic dynamical systems and their applications in economics. The study demonstrates that nonlinear mathematical models provide additional opportunities for describing complex economic phenomena characterised by instability and uncertainty, thereby extending the analytical capabilities of traditional statistical techniques.

3. RESEARCH METHODOLOGY

Correlation and regression analysis makes it possible to formalise the relationships between indicators and to assess the extent to which factors influence the outcome variable. At the same time, in many cases the statistical information is insufficient or incomplete; therefore, expert assessment methods, which are based on the professional experience of specialists, play an important role.

Statistical Analysis Methods involves quantitative analysis, statistical methods, relationship between variables, data-based decision-making.

In quantitative statistical methods, it is very often necessary to assess the influence of one variable on another; for this purpose, the correlation coefficient is calculated. The following table shows the strength of this relationship between the variables we are investigating.

Table 1. The table of estimation of correlation density relationship

Range of values	Characteristic of relationship
0,1 - 0,3	weak
0,3 - 0,5	moderate
0,5 - 0,7	notable
0,7 - 0,9	strong
0,9 - 1,0	very dense

Advantages of the method: high accuracy when high-quality statistical data are available; the ability to make quantitative predictions; the mathematical validity of the results; the ability to automate calculations; the identification of hidden patterns.

Disadvantages of the method: dependence on the quality of statistical data; sensitivity to multicollinearity; risk of spurious correlations; difficulty in analysing non-linear processes; the need to fulfil statistical assumptions.

Expert assessment methods are based on drawing on the professional experience, knowledge and intuition of specialists to analyse complex or loosely formalised

systems. The most common methods include the Delphi method, questionnaires, brainstorming and the paired comparison method.

For detailed consideration expert methods:

- widely used in research and practical applications;
- based on expert opinions and evaluations;
- used when statistical data are insufficient;
- help support decision-making under uncertainty.

Some key features the expert method:

- A distinctive feature of this method is its subjective nature.
- Experts express their own opinions and judgments.
- They evaluate both current situations and future development.

This method is used when there is not enough statistical data for risk assessment.

Advantages of the method: the ability to operate in the absence of statistical data; the ability to take account of non-formalised factors; flexibility and adaptability; effectiveness in strategic forecasting; the ability to analyse innovation processes.

Disadvantages of the method: subjectivity of assessments; the influence of psychological factors; the possibility of bias; the difficulty of finding competent experts; the lack of complete mathematical precision.

Table 2. A comparative analysis of methods

Criterion	Correlation and regression analysis	Methods of expert assessment
The basis of the method	Statistical data	Experts' experience
Type of information	Quantitative	Qualitative
Level of formalisation	High	Average or low
Accuracy	High, provided there is sufficient data	Depending on the experts' expertise
Subjectivity	Minimum	Significant
Potential for automation	High	Partial
Sphere of application	Economics, finance, IT, forecasting	Risk management, education, IT, strategy, innovation

Modern management systems are increasingly adopting a combined approach that brings together statistical modelling and expert assessments. For example, experts can identify key risk factors, whilst regression models make it possible to assess the extent of their impact on a performance indicator.

Let us consider a practical example of the application of correlation and regression analysis and expert assessment methods in the field of the digitalisation of university education.

The first we consider the practical example of correlation and regression analysis. A statistical analysis was performed using data collected from 82 undergraduate students of the Faculty of Economics and Management at Lviv University of Trade and Economics enrolled in the course *Economic and Mathematical Methods and Models*. Three variables were analysed:

Y is current academic performance (points);

X_1 is percentage of completed distance learning course activities (%);

X_2 is total number of missed classroom hours (lectures and practical classes).

The objective was to determine whether students' activity in the learning management system and classroom attendance influence their academic performance.

The correlation coefficient $\rho = 0,963$ indicates a *very strong positive relationship* between the percentage of completed distance learning activities and students' academic. This indicates that students who completed a larger proportion of the online course generally achieved substantially higher academic results.

An *inverse strong correlation* $\rho = -0,814$ was observed between the total number of missed classroom hours and academic performance, indicating that increased absenteeism is associated with lower academic achievement.

A strong negative relationship $\rho = -0,810$ was also found between the percentage of completed online activities and the number of missed classes, suggesting that students actively engaged in the distance learning course also tended to attend classroom sessions more regularly.

To evaluate the simultaneous influence of both factors, a multiple linear regression model was constructed: $Y = 12,33 + 0,824X_1 - 0,216X_2$.

The coefficient of determination is $R^2 = 0,931$, indicating that 93,1% of the variation in students' academic performance is explained by the combined effect of distance-course completion and class attendance.

Overall, the obtained results demonstrate that students' engagement in the distance learning environment is the dominant factor influencing academic achievement, while regular classroom attendance provides an additional positive contribution to learning outcomes. The developed regression model may therefore be used as a practical tool for predicting students' academic performance and identifying learners at risk of poor achievement.

4. PRESENTATION OF THE MAIN RESEARCH MATERIAL

Group expert assessment methods comprise a set of approaches aimed at obtaining a consensus opinion from a group of specialists regarding the evaluation of a specific object, process or phenomenon. A collective decision is formed on the basis of the experts' individual judgements, which, following appropriate mathematical processing, are gathered into a single result.

Depending on how questions are framed and the format in which answers are presented, several main methods of expert assessment are distinguished.

The scoring method involves each expert assessing each alternative on a specified point scale. This method of assessment is based on a scale of differences and allows only the relative level of preference of one option over another to be determined; however, it does not show by how many times one alternative is more important than another, as the ratio scale does. To convert from a point-based assessment to a ratio scale, each score obtained is divided by the total sum of points for all alternatives. This results in the determination of the weighting coefficient for each alternative within the overall set of options.

The method for determining weighting coefficients involves assigning each decision option a specific significance coefficient that reflects its relative importance.

The ranking method involves an expert organising a set of alternatives according to their importance or preference. To ensure objectivity, it is recommended that the number of alternatives assessed simultaneously should not exceed 30. If there are more than this, it is advisable first to group the alternatives using the expert classification method, and only then to rank them. This article employs sequential ranking. The expert is presented with all the alternative options simultaneously, from which they select the highest priority one. After this, the best option is again determined from the remaining alternatives, and the procedure is repeated until all alternatives have been fully ranked. In this process, rank 1 is assigned to the most important option, rank 2 to the next most significant, and so on down to the last alternative.

A distinctive feature of the expert method is the combination of qualitative analysis with quantitative processing of the results. Despite the use of mathematical tools to generalise the assessments, the experts' initial judgements are subjective in nature, as they are based on their professional knowledge, practical experience and individual views on the current state of the object under study and possible directions for its development.

The process of conducting an expert assessment typically involves the following main stages:

1. selection of experts and formation of an expert panel;
2. definition of the research objective and formulation of the assessment tasks;
3. development of a list of questions or assessment criteria;
4. conducting an expert survey and obtaining individual assessments;
5. statistical analysis of the results and verification of the consistency of expert judgements.

The objects of expert assessment are factors, each of which is described by a set of relevant characteristics. Since different experts may assess the

significance of individual characteristics differently, and individual assessments may coincide, it is advisable to use the ranking method to summarise them.

During the ranking process, each expert assigns a corresponding rank to each factor, using a natural number sequence. *Rank 1* is assigned to the factor which, in the expert's opinion, is of the greatest significance, whilst *rank n* is assigned to the factor of the least importance, where *n* is the number of factors being assessed. In this way, the factors are ordered in descending order of importance of the characteristic under study.

The assignment of ranks is based on the specialist's professional knowledge, experience and expert judgements; therefore, the resulting assessments are subjective in nature. At the same time, further mathematical processing of the individual ranks makes it possible to form a generalised assessment and determine the level of agreement among expert judgements.

The information obtained from the experts can be used to determine the weighting coefficients of the factors characterising the object, process or phenomenon under study, which are calculated using the formula:

$$k_i = \frac{\sum_{j=1}^m n_{ij}}{\sum_{i=1}^n \sum_{j=1}^m n_{ij}}$$

To assess the consistency of the experts' opinions, we use Spearman's rank correlation coefficient, which is calculated using the following formula:

$$\rho = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n^3 - n}$$

where d_i is the difference in ranks of the i -th element of the sample, $d_i = x_i - y_i$, $i = 1, 2, \dots, n$; n is number of factors.

Spearman's rank correlation coefficient takes on the values $-1 \leq \rho \leq 1$. Positive values of the coefficient indicate agreement between the experts' rankings, whilst negative values indicate that their assessments are opposite in nature: high ranks assigned by one expert correspond to low ranks assigned by another. A coefficient value of 1 indicates a complete match in the rankings and, consequently, absolute agreement among the experts' opinions.

To determine the strength of the relationship between the rankings, the scale proposed by J. D. Evans [1] was applied:

Range of values for Spearman's correlation coefficient	Level of agreement among expert assessments
(0; 0,2)	almost complete lack of agreement
(0,2; 0,4)	weak agreement
(0,4; 0,6)	moderate agreement
(0,6; 0,8)	high agreement
(0,8; 0,9)	strong agreement
(0,9; 1)	very high agreement; the rankings are virtually identical

To assess the consistency of opinions within a group of m experts on n factors, Kendall's coefficient of concordance is used, which is calculated using the following formula:

$$W = \frac{12S}{m^2(n^3 - n)}, \text{ where } S = \sum_{i=1}^n \left\{ \sum_{j=1}^m x_{ij} - \frac{1}{2} m(n+1) \right\}^2.$$

where x_{ij} is the standardised rank of the i -th factor as assigned by the j -th expert; n is the number of factors; m is the number of experts. This expression in curly brackets represents the deviation of the sum of the ranks for the i -th factor, as provided by all experts, from the arithmetic mean of the sum of the ranks for the n indicators. The concordance coefficient can take values ranging from 0 (a complete absence of statistical correlation between the rankings under analysis) to 1 (all m rankings under analysis coincide).

The expert assessment method can be applied to the example of the educational process at Lviv University of Trade and Economics.

The methodology of group expert assessment, taking into account the experts' competence, is used to identify the most significant (priority) issues for improving activities in the field of education. We will demonstrate its application using the example of the educational process for students across six programmes: 'Computer Science', 'Management', 'Tourism', 'Logistics and Trade', 'Business Advertising' and 'Law' at Lviv University of Trade and Economics. To implement this methodology, a specialised questionnaire was used, containing a wide range of questions and suggested answers, and a scoring scale was established to enable the processing of the data obtained [3].

Consequently, as part of a study into the factors influencing learning within educational programmes, a survey was conducted amongst students at Lviv University of Trade and Economics during the 2025–2026 academic year to determine the extent to which teaching methods and approaches align with the principles of academic freedom and a student-centred approach to learning. To calculate the expert assessments, we used the results of a survey of students on six educational programmes: 'Computer Science', 'Management', 'Tourism', 'Logistics and Trade', 'Business Advertising' and 'Law'. To process the data obtained, we used the widely used general-purpose software package Microsoft Excel.

Table 3 presents the scores for the indicators, which are calculated using the formula

$$E = \omega \cdot k,$$

where ω is the weighting factor (selected depending on the number of applicants for each study programme), k is the applicants' score.

Table 3 summarises the scores assigned by students from six educational programmes to the factors influencing their educational activities. The results reveal considerable variation in students' evaluations across different fields of study, indicating that the perceived importance of individual factors depends on the specific characteristics of each educational programme. While some factors, such as the need to combine study and work or excessive workload, received high scores in several programmes, others were considered important only within particular disciplines. This diversity confirms that students'

perceptions are shaped by the content, organisation, and professional orientation of their educational programmes.

Table 3.

Indicators (factors influencing learning according to the educational program)		Score of indicators provided by applicants for educational and professional programs					
		Computer Science (E1)	Advertising in business (E2)	Management (E3)	Logistics and Trade (E4)	Tourism (E5)	Law (E6)
1.	Insufficient level of training at school	32	37	16	25	13	52
2.	Insufficient provision of educational and methodological literature (textbooks, study guides, methodological guidelines)	14	6	19	24	12	28
3.	Inconvenient schedule	22	15	23	17	30	20
4.	Excessive workload	44	18	14	25	27	48
5.	The need to combine study and work	10	34	26	50	46	35
6.	Disappointment in the educational program (specialty)	15	17	13	15	18	24
7.	Personal disorganization	23	7	41	34	36	20
8.	Lack of interest in learning	12	14	5	28	30	7
9.	Influence from other students that hinders the student's ability to perform during class	35	22	16	18	14	33
10.	Lack of employment prospects	5	8	39	43	30	9

The following table shows the results of the calculations for the weighting coefficients

Table 4.

Criterion	Correlation and regression analysis	Methods of expert assessment
The basis of the method	Statistical data	Experts' experience
Type of information	Quantitative	Qualitative
Level of formalisation	High	Average or low
Accuracy	High, provided there is sufficient data	Depending on the experts' expertise
Subjectivity	Minimum	Significant
Potential for automation	High	Partial
Sphere of application	Economics, finance, IT, forecasting	Risk management, education, IT, strategy, innovation

The most important factor is the 5th factor (the need to combine study and work), the weight coefficient is the largest $k_5 = 0,142$, the least important is the indicator: lack of interest in learning $k_8 = 0,068$.

To compare students' opinions across different educational and professional programmes, the obtained scores were transformed into *ranks*. Within each educational programme, the factors were ranked according to their scores. The factor with the *highest score*, corresponding to the greatest perceived importance, was assigned *Rank 1*. The factor with the second highest score received *Rank 2*, and the procedure continued until the least important factor was assigned the final rank. In cases where two or more factors had identical scores, the corresponding average rank was assigned to each of them. For example, in the Management programme two factors shared third and fourth positions; therefore, both were assigned the average rank of 6,5. (Fig. 1)

After assigning ranks within each educational programme, a *resulting rank* was determined for every factor by aggregating the rankings obtained from all six programmes. these average values were ranked once again using the RANK.AVG function in Microsoft Excel to obtain a unified priority order of all factors across the entire sample. The resulting ranking demonstrates that the need to combine study and work was identified as the highest-priority factor influencing students' educational activities, regardless of their field of study. The next most significant factors were insufficient level of training at school, excessive workload and personal disorganisation, indicating that these issues are common challenges shared by students across different educational programmes. In contrast, insufficient provision of educational and methodological literature, disappointment in the educational programme and lack of interest in learning received the lowest priorities, suggesting that they have a comparatively smaller influence on students' educational experience.

Fig. 1. Table of results

	A	J	K	L	M	N	O	Q
1	Indicators (factors influencing learning according to the educational program)	Indicator ranks						
2		E1	E2	E3	E4	E5	E6	Resulting rank
3	Insufficient level of training at school	3	1	6,5	5,5	9	1	2
4	Insufficient provision of educational and methodological literature (textbooks, study guides, methodological guidelines)	7	10	5	7	10	5	10
5	Inconvenient schedule	5	6	4	9	4	7,5	7
6	Excessive workload	1	4	8	5,5	6	2	3,5
7	The need to combine study and work	9	2	3	1	1	3	1
8	Disappointment in the educational program (specialty)	6	5	9	10	7	6	8,5
9	Personal disorganization	4	9	1	3	2	7,5	3,5
10	Lack of interest in learning	8	7	10	4	4	10	8,5
11	hinders the student's ability to perform during class	2	3	6,5	8	8	4	5
12	Lack of employment prospects	10	8	2	2	4	9	6

Fig. 2. Plot of Resulting rank



Let's calculate the Spearman's correlation coefficients:

Fig. 3. Table of results

	A	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1																
	Indicators (factors influencing learning according to the educational program)	d12*2	d13*2	d14*2	d15*2	d16*2	d23*2	d24*2	d25*2	d26*2	d34*2	d35*2	d36*2	d45*2	d46*2	d56*2
2																
3	Insufficient level of training at school	4	12,25	6,25	36	4	30,25	20,25	64	0	1	6,25	30,25	12,25	20,25	64
	Insufficient provision of educational and methodological literature (textbooks, study guides, methodological guidelines)															
4		9	4	0	9	4	25	9	0	25	4	25	0	9	4	25
5	Inconvenient schedule	1	1	16	1	6,25	4	9	4	2,25	25	0	12,25	25	2,25	12,25
6	Excessive workload	9	49	20,25	25	1	16	2,25	4	4	6,25	4	36	0,25	12,25	16
7	The need to combine study and work	49	36	64	64	36	1	1	1	1	4	4	0	0	4	4
	Disappointment in the educational program (specialty)															
8		1	9	16	1	0	16	25	4	1	1	4	9	9	16	1
9	Personal disorganization	25	9	1	4	12,25	64	36	49	2,25	4	1	42,25	1	20,25	30,25
10	Lack of interest in learning	1	4	16	16	4	9	9	9	9	36	36	0	0	36	36
	Influence from other students that hinders the student's ability to perform during class															
11		1	20,25	36	36	4	12,25	25	25	1	2,25	2,25	6,25	0	16	16
12	Lack of employment prospects	4	64	64	36	1	36	36	16	1	0	4	49	4	49	25
13	Sum	104	208,5	239,5	228	72,5	213,5	172,5	176	46,5	83,5	86,5	185	60,5	180	229,5

In our case $n = 10$ then $\rho_{12} = 1 - \frac{6 \cdot 104}{10^3 - 10} = 0,37$, $\rho_{23} = 1 - \frac{6 \cdot 213,5}{10^3 - 10} = -0,29$,
 $\rho_{13} = 1 - \frac{6 \cdot 208,5}{10^3 - 10} = -0,26$ etc. We get the following coefficients:

Fig. 4. Table of results

Spearman's coefficients					
$\rho_{12} =$	0,37	$\rho_{23} =$	-0,29	$\rho_{34} =$	0,49
$\rho_{13} =$	-0,26	$\rho_{24} =$	-0,05	$\rho_{35} =$	0,48
$\rho_{14} =$	-0,45	$\rho_{25} =$	-0,07	$\rho_{36} =$	-0,12
$\rho_{15} =$	-0,38	$\rho_{26} =$	0,72		
$\rho_{16} =$	0,56				

The Spearman's correlation coefficient between the second and sixth experts $\rho_{26} = 0,72$ indicates a positive and moderate correlation between the ratings. The Spearman's correlation coefficient between the second and fourth experts $\rho_{24} = -0,05$ indicates an inverse and very weak correlation between the ratings.

The calculated Spearman's rank correlation coefficients indicate varying levels of agreement between the rankings provided by students from different educational programmes. The coexistence of positive and negative correlations suggests that students' perceptions of the factors affecting the educational process are programme-specific and depend on the characteristics of their field of study. These findings confirm that the diversity of educational programmes naturally leads to differences in the prioritisation of learning-related factors, highlighting the necessity of considering programme-specific characteristics when interpreting the survey results.

We find Kendall's coefficient of concordance: in our case $n = 10$, $m = 6$ and $S = \sum S_i$.

Fig. 5. Table of results

	A	AG
1	Indicators (factors influencing learning according to the educational program)	Si
2		
3	Insufficient level of training at school	49
4	Insufficient provision of educational and methodological literature (textbooks, study guides, methodological guidelines)	121
5	Inconvenient schedule	6,25
6	Excessive workload	42,25
7	The need to combine study and work	196
8	Disappointment in the educational program (specialty)	100
9	Personal disorganization	42,25
10	Lack of interest in learning	100
11	Influence from other students that hinders the student's ability to perform during class	2,25
12	Lack of employment prospects	4
13	Sum	663

Concordance coefficient (Kendall)

$$W = \frac{12 \cdot 663}{6^2(10^3 - 10)} = 0,22.$$

The obtained value of Kendall's coefficient 0,22 indicates a relatively low level of overall agreement among the students. Such a result reflects the heterogeneous nature of the analysed educational programmes, whose students

assign different priorities to the factors affecting their learning. It should be emphasized that the relatively low value of Kendall's coefficient of concordance should not be interpreted as inconsistency or unreliability of the obtained results. Rather, it reflects the substantial heterogeneity of the educational and professional programmes included in the study. The survey involved students from six fundamentally different fields of study, namely 'Computer Science', 'Management', 'Tourism', 'Logistics and Trade', 'Business Advertising' and 'Law'. These programmes differ considerably in terms of curriculum content, educational objectives, teaching methods, practical training, digital competencies, labour market orientation, and students' career expectations. Consequently, students evaluate the factors influencing their educational activities from different professional perspectives and assign different priorities to the same issues. For example, students enrolled in 'Computer Science' are more likely to focus on digital learning technologies and technical aspects of education, whereas 'Management' and 'Business Advertising' students tend to pay greater attention to workload organisation and employment opportunities. Tourism and Logistics students often emphasise practical training and the need to combine study with work, while Law students demonstrate a different perception of classroom interaction, academic workload, and prior educational preparation. These programme-specific characteristics naturally lead to differences in the ranking of educational factors. Therefore, the relatively low concordance coefficient should be regarded as evidence of the diversity of students' perceptions rather than disagreement among students. At the same time, despite these differences, several common priorities were identified across all programmes, most notably the need to balance study and employment, which confirms the existence of university-wide challenges alongside programme-specific educational needs.

In the survey conducted on studying within the educational and professional programmes at LTEU, the most frequently cited response from students on the 'Marketing' and 'Business Advertising' programmes was an excessive academic workload, although students on the 'Law' programme do not share this view; the next most frequently cited issue was an inconvenient timetable.

An interesting fact is that, compared to students on the other two programmes, those on the 'Law' programme placed greater emphasis on the influence of fellow students, which hinders the demonstration of a student's abilities during lessons. The results obtained have made it possible to clarify that, on average, based on the number of responses, students across the three degree programmes cite the need to balance study and work as a factor.

The following issues are priorities for further analysis:

- the need to combine study and work (1)
- insufficient level of training at school (2)
- excessive workload (3)

At the same time, they are not relevant for further analysis of the issue:

- insufficient provision of educational and methodological literature (textbooks, manuals, methodological guidelines) (10)
- lack of interest in learning (9)
- disappointment in the educational and professional program (8)

Thus, a well-designed survey of higher education students will help to assess their intentions and identify priorities for the further development of educational activities, particularly in the face of uncertainty caused by factors of both internal and external origin.

It should be noted that the relatively low value of Kendall's coefficient of concordance 0,22 is not unexpected, given the heterogeneous nature of the educational and professional programmes included in the study. The survey covered programmes representing different fields of knowledge, including information technology, management, tourism, logistics, marketing, business advertising, and law. These programmes differ substantially in terms of curriculum structure, teaching methods, practical training requirements, expected learning outcomes, and students' professional aspirations. Consequently, students naturally perceive the factors influencing the quality and effectiveness of their studies differently.

Despite the low overall level of agreement, several common trends can be identified. The need to balance study and employment was consistently recognised as the most significant challenge across the programmes, indicating that financial independence and the necessity to gain professional experience during university studies are common concerns regardless of the field of study. Likewise, insufficient prior preparation at school and excessive academic workload were identified as important issues by most students, suggesting that these factors are systemic rather than programme-specific.

At the same time, differences between programmes reveal the influence of disciplinary characteristics. For example, students enrolled in law-related programmes demonstrated a different perception of academic workload compared with students in marketing and business advertising, while placing greater emphasis on the impact of the student environment on classroom participation. Such differences confirm that the educational context, curriculum design, and professional orientation of individual programmes shape students' perceptions of learning difficulties.

Therefore, although the overall concordance among students is relatively low, the obtained results should not be interpreted as contradictory. Rather, they reflect the diversity of educational environments and programme-specific characteristics. The identified priority factors may serve as a basis for university-wide strategic measures, whereas the programme-specific differences indicate the necessity of developing targeted interventions tailored to the particular needs of individual educational and professional programmes. Such an approach would contribute to improving both the overall quality of higher education and the effectiveness of quality assurance mechanisms within each field of study.

The research objective was achieved, and the obtained results can be summarised as follows:

- ◇ An analysis of the factors influencing students' educational activities was conducted, enabling the identification and ranking of the key factors affecting the quality and effectiveness of the learning process.

- ◇ The main priorities and challenges associated with studying in different educational and professional programmes were identified, making it possible to distinguish both common university-wide issues and programme-specific problems that require targeted managerial and educational measures.

CONCLUSION

A practical approach demonstrates that correlation and regression analysis is an effective tool for quantitative forecasting and identifying patterns in the digital educational environment. At the same time, expert assessment methods enable the analysis of complex risks and the making of strategic decisions under conditions of uncertainty. Combining both approaches provides a more comprehensive and reliable basis for managerial decisions in the digitalisation of university education. The use of statistical models makes it possible to assess the strength of individual risk factors, whilst expert methods take into account the practical experience and professional insights of specialists. Such a comprehensive approach helps to improve the effectiveness of the risk management system and ensures a higher level of adaptability of the educational institution to contemporary challenges. Furthermore, the integration of quantitative and qualitative methods enables the timely identification of potential threats and the development of preventive response measures. As a result, universities can implement digital development strategies more effectively and ensure the stability of the educational process.

REFERENCES

- Evans, J. D. (1996). *Straightforward statistics for the behavioral sciences*. Brooks/Cole Publishing.
- Kushchik, A. P. (2024). *Risk management: A study guide*. Zaporizhzhia National University.
- Lviv University of Trade and Economics. (2025). [The results of surveys of applicants of higher education of the first bachelor's level on the subject of determining the degree of compliance of forms, methods of learning and teaching with the principles of academic freedom and a student-centered approach during education]. <http://www.lute.lviv.ua/osvita/monitoring-jakosti-osviti/anketuvannja-zdobuvachiv-vishchoji-osviti/anketi-dlja-opituvannja-zdobuvachiv-vishchoji-osviti/?L=966>
- Martynova, O. V., & Shevchenko, O. K. (2021). [Application of the expert assessment method in economic research]. *Young Scientist*, 2(90), 259–266.
- Novosad, Z. (2024). Chaotic dynamic systems of shift operators and applications in economics. *Bukovina Mathematical Journal*, 12(2), 37–48. <https://doi.org/10.31861/bmj2024.02.03>
- Novosad, Z., Yakubiv, V., & Zagorodnyuk, A. (2022). Applications of chaos theory to statistical models. *Journal of the Lviv University of Trade and Economics*, (70), 48–56. <https://doi.org/10.36477/2522-1205-2022-70-07>
- Oleksiiienko, R., & Donets, A. (2021). [The place of expert assessment in administrative decision-making]. *Economy and Society*, (26), 1–7.
- Shapochka, M., & Makariuk, O. (2006). [Application of expert assessments in decision-making under conditions of uncertainty]. [Nazwa źródła niepodana]. <https://core.ac.uk/download/pdf/14035398.pdf>
- UK Government. (2023). *The Orange Book: Management of risk—Principles and concepts*.