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The Influence of Organizational Factors on the School's Achievements

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Abstract: The purpose of this paper is to examine the influence of the most significant organizational factors on primary school achievements, with a note that the achievement of the school is expressed through the quality of outcome knowledge. The research was conducted on a sample of 460 employees, from 21 primary schools, of which 439 are professionals and 21 are principals in the South Bačka County, Republic of Serbia. The collected data were processed using the Gretl software and AMOS for modelling structural equations. More precisely, the research is based on the application of exploratory and confirmatory factor analysis. A neural network based on a standard multilayer perceptron model was used in the paper to test the validity of the obtained results of the AMOS model. The results of the research show that school management is the most important factor in school achievement and that this influence is most pronounced through teaching staff and school infrastructure. The results, also show that teachers' competencies have the strongest direct influence on the quality of outcome knowledge. The results obtained indicate that decision-makers and creators of social policies must pay special attention to the selection of school principals as well as their professional education, while school principals to the selection of teachers. Future researchers are recommended to use the Sobel test to precisely determine the indirect influences of school management on school achievement.

Keywords: *organizational factors, school's achievements, primary education, outcome knowledge.*

Introduction

Primary school is considered a complex system, because it consists of many functionally connected elements. Elements that comprise the primary school system are teachers, the teaching process and students who are expected to adapt to change, as well as an interactive approach to achieve the expected goal. School is a so-called learning space both for teachers and professional associates as well as for educators and students. It represents a team effort in which all actors exchange experiences and acquired knowledge, which they expand daily, creating new ones. The school nurtures the principles of good practice, following current events, it encourages independence in the acquisition of knowledge, supports creativity and freedom of expression, advocates permanent employee training, monitors innovations in information and communication technologies, and strives to implement effective approaches characterized by flexibility. Hence, the quality of work of a school assessed according to the potential and readiness for the application of new knowledge, and the recognition and daily acquisition of new knowledge (Pribudhiana, Bin Don and Bin Yusof, 2021), that is, through its achievements, which are reflected in the degree of quality of learning outcomes. Namely, as the quality of educational work is a key factor in achieving the entire existence of the school, it seems logical that the achievements of the school should be expressed through a category such as the achieved results of educational learning outcomes including skills, knowledge, attitudes of students and competencies acquired through formal school education. This is more, because a quality education also implies a stimulating atmosphere which enables students to develop individually, daily. Outcomes allow students to see to what extent they have achieved the planned

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programs, which will serve as a basis for their enrollment into the next educational level. The choice of work methods, as well as materials of different content, are harmonized with the planned outcomes so that they can expect, and verify with certainty, what the student will be capable of doing, and what he will know, after the adoption of teaching content. What the teacher strives to teach students represents the learning goal, and what the student has adopted at the end of learning represents the outcome. One of the indirect ways of checking the quality of work, through the achieved outcomes of students completing their primary school education, can be the results achieved at the primary school exit exam which, together with school grades, give a result based on which students have the opportunity to enroll into high school (Baketa, Dedic and Jokic, 2020).

Factors that greatly affect the quality of schoolwork and educational outcomes are school management, teaching processes, infrastructural conditions, motivation, curriculum, pre-knowledge. (Wargocki and Wyon, 2017; Park and Weng, 2020; Tang, 2020; Gupta et al., 2023). Also, teaching staff is, to a significant degree, a mediator in the educational processes which, with its knowledge and skills, adapts the content to the characteristics of the students. Teaching staff also monitors students' aspirations and abilities, as well as the technical possibilities of the institution, adapting them to the abovementioned characteristics of the students. When implementing the curriculum, the creativity of teachers and a combination of work methods is important, so that teaching content is adopted at a higher level and as such persists longer in the minds of students. Successful management of an institution implies versatility and leadership qualities of the principal, who will be able to recognize, enable, motivate, successfully communicate, perceive and improve the existing qualities (Dou, Devos and Valcke, 2017).

Namely, from the above it can be easily concluded that organizational factors have a crucial role in learning outcomes, i.e., the outcome knowledge. The question that arises is which of the organizational factors has the strongest influence. Identifying the factors with the greatest influence and their ranking according to the intensity of influence is significant both for the creators of educational policies and for the management of schools. When they have knowledge about the importance of factors on learning outcomes and the school's, they will make more effective decisions regarding the allocation of, as a rule, limited resources. They will invest in those factors that have a greater impact. Therefore, identifying the factors with the greatest influence enables the desired goal to be achieved efficiently. In this context, the goal of this work is to determine the effects of the most significant limiting factors on school achievement in the South Bačka County, Republic of Serbia.

Materials and Methods

Most authors (Harden, 2002; Hussey and Smith, 2002; Levenberg, 2016; Barak and Levenberg, 2016) who deal with the topic of education believe that it is a pedagogical process in the function of enriching human knowledge. International law has defined education as one of the basic human rights and a general social good. Barak and Levenberg (2016) believe that educational changes are very fast with contemporary work models inevitably following the rapid development of technology, hence the work is directed towards encouraging initiatives, creativity, curiosity, risk acceptance and flexibility. Improving the professionalism of staff, and encouraging team spirit, tolerance and humane principles supports the development of each individual and is in line with the highest principles of preparation for life skills. However, in such circumstances, it is important to understand how organizational factors contribute to the achievement of this function of education. In other words, it is important to understand how key organizational factors influence learning outcomes, which represent what has been achieved and evaluated, at the end of the learning process, and not simply what the aspirations or the intentions were (Harden, 2002), and which when set appropriately can be used in curriculum planning, teaching and learning, which facilitates the management process (Hussey and Smith, 2002). This is especially important when you have to the last years, there has been a significant focus on school's accountability for learning outcomes. Policymakers have emphasized the need for educational institutions to transparently demonstrate student learning, while accrediting associations have set higher standards for institutions.

Blömeke et al., (2022) point out that teacher competence is a key factor for learning outcomes. They emphasize that recognizing the significance of human resources is crucial in developing teaching quality, and the quality of the entire educational process, the most important thinks for education achievement. They emphasize the importance of three main sets of educator/teacher competencies: knowledge of

information technology, working with people and working in a team and for a team. According to Ho et al., (2023), the preferred forms of teacher psychological competency that are within the function of methodical competency are social and emotional intelligence, cognitive autonomy, openness to new experiences, visualization of methodical situations and solutions, realistic judgment, objectivity and critical thinking, cognitive receptivity to innovation, creative and divergent thinking, stability of the value system, maturity of attitudes, wealth and stability of interest, self-perception (self-image), etc. Research conducted in Spain (Aragon-Sancheze, Barba-Aragón and Sanz-Valle, 2003) points to the significance of human resources training, with always current innovations and their direct impact on the quality of work outcomes. Fuadi, Nasution and Wijaya (2023) emphasize the importance of management of teacher professionalism development and suggest that the efforts of management must be known as efforts to develop teacher professionalism in the form of increasing expertise, and skills, broadening horizons, coaching carried out on the initiative and in collaboration with the regional government. A similar view is expressed by Rusyn et al. (2021). Especially important are the competencies of the teachers, which encourage student's motivation. While certain students demonstrate a willingness to resolve the challenges they encounter during lessons or at school, others tend to avoid seeking solutions for the problems they face. Among the various factors that influence students' behaviours within the same school, motivation emerges as a primary determinant. Motivation plays a crucial role in the effectiveness of the learning-teaching process as it empowers students to actively engage in their educational journey (Brooker et al., 2018; Yu, Gao and Wang, 2021; Karakose et al., 2023), which is presented through the expectancy-value theory of motivation in learning (Lo et al., 2022). At the same time, learning outcomes affect student motivation. Namely, according to the theory of expectations, a positive learning outcome leads to improved expectations, increases the value of the reward and clearly connects the learning effort with the achievement of the goal and the reward. This cycle leads to the strengthening of student motivation. The teacher's expectation plays a special role in this (Gentrup et al., 2020; Johnston, Wildy and Shand, 2023). On the contrary, amotivation represents an internal state in which students exhibit reluctance towards participating in classroom activities and become disengaged from the lesson (Leroy and Bressoux, 2016). In the case of amotivation, students lack any driving reasons to take action, and more significantly, it can lead to feelings of disappointment, ultimately negatively impacting productivity and overall well-being. For this reason, the competencies of teachers are important, which encourage and motivate students. The importance of motivation for school employees is particularly emphasized by Anselmus et al., (2022), Ahmadi et al., (2023), Robinson (2022) etc. These studies particularly emphasize the importance of teachers' motivational beliefs which direct and sustain their efforts to engage in relationship-building behaviours and, thus, lead to positive relationships with their students.

The infrastructure of the school is closely related to the previous one. It is not only important for student motivation, but also for teachers, especially contributing to the improvement of self-efficacy, which is considered a key concept in Bandura's Social Learning Theory. Studies on self-efficacy have emphasized its cognitive nature and their results showed that students' perceived self-efficacy was positively associated with learning outcomes such as task choice, task persistence, effective student activities, and academic achievement (Girelli et al., 2018; Gutiérrez and Tomás, 2019; Hayat et al., 2020). Brinson (2015) points to the importance of technology in facilitating the learning process and evaluating outcomes. Therefore, the results of learning outcomes are also used as a starting point for the further development of more advanced programs, and thus the development of information systems adapted to programs adjusted to the adoption of new curricula. Research shows that school conditions and equipment affect the organizational aspects of the school and thus have an impact on the education and learning process (Doyer and Bean, 2023). However, budget is often imposed as a limiting factor (Dadmand and Pooya, 2023).

Bouslama et al. (2003) propose a new academic model, based on the availability of laptops and IT classrooms, that will respond to the challenges of contemporary society and demonstrate how technology is used to facilitate the learning process, as well as being able to assess its impact on the success of learning outcomes. Brinson (2015) illustrates that learning success in virtual classrooms is the same, or greater, than that in traditional classrooms, according to all categories of learning outcomes (knowledge and understanding, research skills, practical skills, perception, analytical skills and social and scientific communication). It has been observed that learning theories need to be more heavily considered when developing virtual applications to make them more relevant to learning outcomes, which will increase the

accuracy of simulation (Radianti et al., 2020). Similar views were expressed by other authors (Alfoudari, Durugbo and Aldhmour, 2023; García-Tudela, Prendes-Espinosa and Solano-Fernández, 2023; Dimitriadou and Lanitis, 2023; Dai et al., 2023; Dadmand and Pooya, 2023; Doyer and Bean, 2023, Uyen and Thu, 2023).

Therefore, technological changes affect the shaping of both the education process and the learning outcomes and goals (Young, Klemz and Murphy, 2003). In this respect, education management, as well as the teaching and learning process, needs to be redesigned according to the needs of the individual and the sustainable development of the knowledge economy. The challenge is to effectively utilize these technologies in a way that serves the interests of students. Young, Klemz and Murphy (2003) believe that it is precisely through the use of ICT that we can influence the actualization of values that substantially support the paradigm according to which education is a student-centered process. It may be concluded that organizational learning is at the core of this process and that ICT are the optimal means for this transformation.

School management also plays an important role in this process. Analysis of data from scientific literature indicates that school management directly affects the scope and breadth of infrastructure and ICT implementation, the development of teacher competencies and learning outcomes. School management encourages and facilitates development planning and the development of the school (West-Burnham, 1997) and provides support in the management of the teaching process. Research in the United States indicated what we often find in our country as well, a lack of functional knowledge and basic skills in those who become able to work, over time (Nonaka, 1994). This is reflected through the harmonization of theoretical knowledge with the ability of its implementation while following the development of new technologies that enable greater functionality.

However, management, in an educational system, is achieved by an established state and educational policy. Hence, Harris and Hoppkins (2008) state that the theory of school leadership must be non-individualistic. Understanding school leadership must go beyond thinking about principal-hero. Leadership in the school environment can be manifested at different levels. Fullan (2011) points out the importance of the context within which school leadership is interpreted and considers it important to state the causes and ways of interpreting context in relation to the desired outcomes.

Conceptualization of previously performed analysis of the empirical studies on the impact of organizational factors on the school's achievements graphically can be displayed by the following research model, with a note that the achievement of the school is expressed through learning outcomes *i.e.*, the quality of outcome knowledge, which is expressed through the results achieved at the primary school exit exam. More precisely, the students' achievements were measured through the success of the final matriculation exam, which at the time of examination consisted of 3 tests: a test in mathematics, a test in the Serbian language and a combined test. The combined test includes material from biology, physics, chemistry, history and geography.

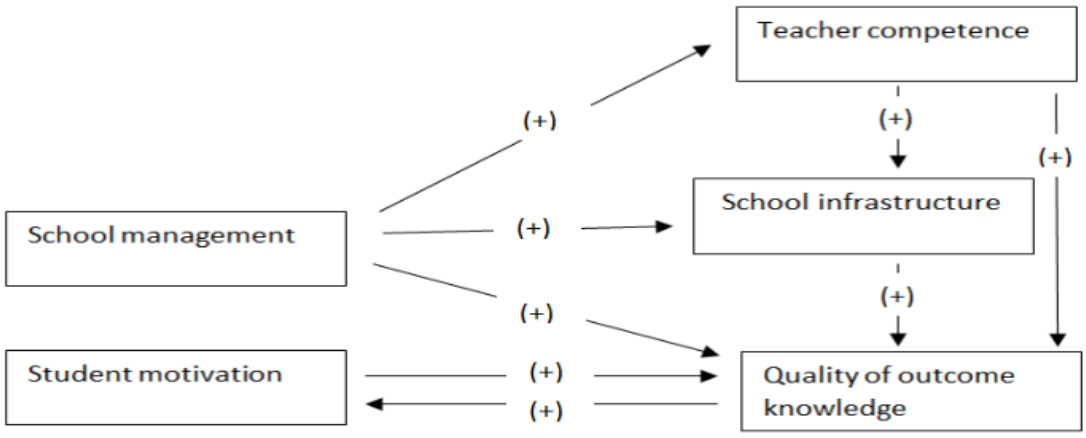

Figure 1. *Conceptual model*

The model assumes the role of management is crucial, so it is assumed that school management primarily affects the competency of teachers, and school infrastructure but also, directly, the quality of outcome knowledge. The effect of management on the quality of outcome knowledge is also indirect so that by selecting a quality teaching staff and investing in school infrastructure, it influences a higher quality of outcome knowledge. In addition, a quality teaching staff will influence an investment in school infrastructure, which also has a positive effect on the quality of outcome knowledge. In other words, teachers directly affect the quality of knowledge, by requiring management to invest in school infrastructure, while classroom equipment enables the modernization of the teaching process, thus raising the quality of outcome knowledge. On the other hand, it was assumed that the second most important factor influencing the quality of outcome knowledge was student motivation and it was assumed that this connection is twofold; higher student motivation leads to a higher quality of knowledge, which in turn empowers students and further increases their motivation.

Based on the presented model, it is possible to define the main hypothesis: *The better management of organizational factors in primary education will lead to better the school's achievements*, as well as and six auxiliary hypotheses were derived from the main hypothesis:

- H_1: *School management has a positive impact on the quality of primary education learning outcomes;*
- H_2: *School management has a positive impact on teacher competency.*
- H_3: *School management has a positive impact on the infrastructural conditions at the school.*
- H_4: *Teacher competency has a positive effect on the quality of primary education learning outcomes;*
- H_5: *Infrastructural conditions at the school have a positive effect on increasing the quality of primary education learning outcomes;*
- H_6: *The quality of learning outcomes has a positive effect on student motivation;*
- H_7: *Student motivation positively affects learning outcome quality, i.e., the quality of outcome knowledge.*
- H_8: *Teacher competency has a positive impact on the infrastructural conditions at the school.*

The data were collected based on a structured questionnaire, which was compiled based on relevant statements proposed in the scientific literature. The validity of the questionnaire was tested by applying principal component analysis (PCA), since a high Cronbach's alpha value does not indicate a high reliability as it can simply be the result of a large number of items included in the analysis. The research was conducted during 2022. The respondents assessed the statements from the questionnaire using the five-point Likert scale, with ratings from (1), "completely disagree", to (5), "completely agree". The heterogeneous sample included employees holding different positions within an educational institution, i.e., primary school (teachers, professional associates and principals). The schools included in the research are from the territory of the South Bačka County (Novi Sad School Administration), selected according to the random sampling method. The schools included in the research were selected according to the random sampling method. The number of participants in this research numbered 460 employees, from 21 primary schools, of which 439 are professionals and 21 are principals. Of the professionals, 114 are male (26%) and 325 are female (74%).

The sample adequacy is tested using the KMO test adequacy test (test value = 0.873). The results of the questionnaire validity test were shown in Table A1 in the Appendix, with the note that promax rotation was used. The results of the PCA indicate that items are grouped according to expectations, ie, so that the questionnaire can be used reliably in further analysis. The collected data were processed using the Gretl software and AMOS for modeling structural equations.

Although principals and teachers may have different views on the factors that are the subject of study in this paper, for example on the issue of the quality of school management work, the ANOVA analysis shows that there are no significant differences between these two groups of respondents. The stated view is confirmed by the ANOVA analysis results shown in Table A2 in the Appendix, from which it can be seen that in the case of all four factors, the critical values of the test are greater than the value of the F test for a confidence level of 0.05.

Results

Before the AMOS model parameters were assessed, a correlation analysis of the indicators was conducted. A crucial requirement for the accurate utilization of factor and structural analysis is that indicators be highly correlated and mutually replaceable. Table 2 shows the correlation matrix of indicators

(variables that are measured in the model), the average variance extracted (AVE) and Cronbach's alpha for estimating the reliability of the multi-item sections and the goodness-of-fit indices for the SEM model.

Table 1. *Correlation Matrix (squared correlation), AVE (average variance extracted)*

	SM	TC	SIC	StM	QOK
SM	1				
TC	0.569	1			
SIC	0.548	0.563	1		
StM	0.602	0.419	0.594	1	
QOK	0.512	0.534	0.502	0.521	1
AVE	0.611	0.569	0.691	0.672	0.641
Reliability	0.713	0.778	0.722	0.781	0.726
RMSEA (root mean square error of approximation) 0.046					
RMSR (root mean square residual) 0.051					
NNFI (non-normed fit index) 0.978					
AGFI (adjusted GFI) 0.902					

Note: SM – School management, TC - Teachers' competences, SIC - School infrastructural condition, StM - Student motivation, QOK - Quality of outcome knowledge.

All squared correlations are significant at 1% level of confidence

The correlation matrix analysis indicates that the variables are highly correlated with each other. The AVE for each construct was greater than the square of the correlation coefficient for the corresponding inter-constructs, which confirms discriminant validity, while the results of convergent validity of measures also contribute to convergent validity. Values of Cronbach's alpha in all cases are above 0.7, indicating an acceptable level of reliability for each construct. According to the goodness-of-fit indices, the proposed structural model was found to fit the data well.

Table 2. *Results of hypothesis testing*

Variables	Coeff.	Stand. error	Critical value	P value	Results
QOK←SM	0.208	0.067	3.097	< 0.01	H_1 accept
TC←SM	0.909	0.039	23.343	< 0.01	H_2 accept
SIC ←SM	0.470	0.052	9.117	< 0.01	H_3 accept
QOK←TC	0.673	0.062	10.926	< 0.01	H_4 accept
QOK←SIC	0.462	0.060	7.650	< 0.01	H_5 accept
SM←QOK	0.621	0.029	21.755	< 0.01	H_6 accept
QOK←StM	-0.475	0.096	-4.930	< 0.01	H_7 reject
SIC←TC	0.322	0.042	7.624	< 0.01	H_8 accept

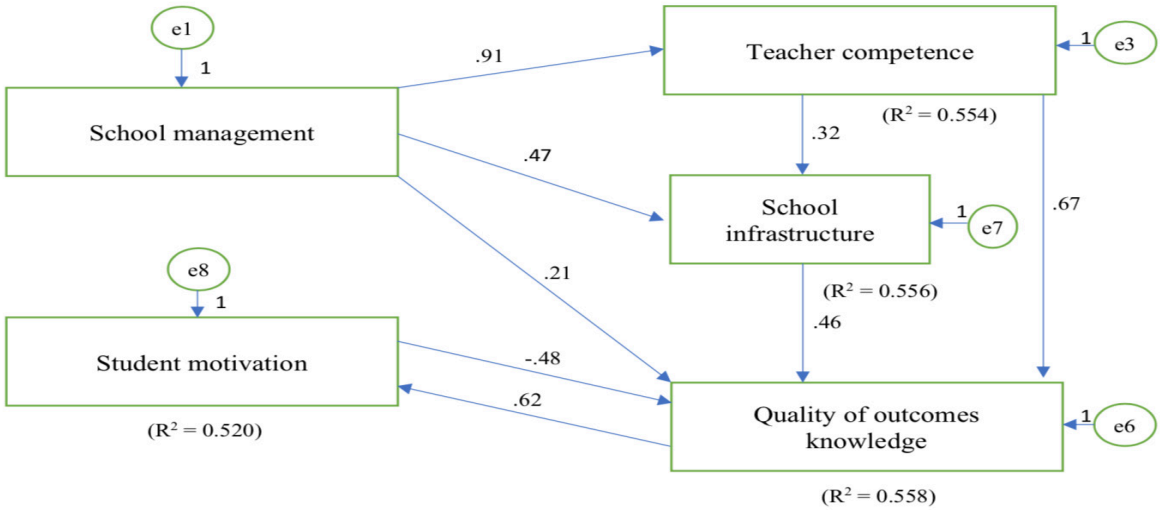

Figure 2. Tested structural model

The results of the confirmatory factor analysis are shown in Table 2 and Figure 2. Namely, Table 2 shows the values of the regression coefficient estimates together with the statistical significance tests. All examined connections are statistically significant. The strongest connection was made between school management and teacher competency: ß=0.909, t=23.343, p<0.01, which indicates the importance of management in the management of teaching staff, as well as the impact that this relationship has on the quality of schooling outcomes. Management has an impact on the quality of outcome knowledge through competent staff - the link between teacher competency and the quality of outcome training being also positive and significant: ß =0.673, t=10.926, p<0.01, but also with the teaching staff influencing the maintenance and improvement of the institution's infrastructure: ß =0.322, t=7.624, p<0.01. In other words, good management influences the school having a quality teaching staff, which directly affects the quality of outcome knowledge, as does a good school infrastructure that provides students with better teaching and thus, consequently, better outcome knowledge (ß=0.462, t=7.650, p<0.01). The direct influence of management on the quality of outcome knowledge is not so pronounced, but it is still statistically significant: ß=0.208, t=3.097, p<0.01. In other words, the influence of management is most pronounced through teaching staff and school infrastructure: ß=0.470, t=9.177, p<0.01, which is the ultimate goal of their function. When it comes to student motivation, it has a negative impact on the quality of outcome knowledge, which is very likely a consequence of the existence of an opposite connection between the quality of outcome knowledge and student motivation. However, the connection has been left in the model because it significantly affects the suitability and validity of the model. The negative impact of motivation on the quality of outcome knowledge could mean that when students are less motivated, teachers work harder and thus achieve a higher quality of outcome knowledge (Tella, 2007). On the other hand, achieving better outcomes has a positive effect on students' motivation - positive outcomes additionally motivate students (Johnson et al., 1981).

Figure 2 shows the coefficients of determination. As can be seen, the quality of outcome knowledge is explained with 55.8% of the predictor variance, i.e., the infrastructure, teacher competency, student motivation and school management share about 56% of the variance with the quality of outcome knowledge. Teacher competency was explained with 55.4% variance, school infrastructure with 55.4%, and student motivation was explained with 52% variance to the quality of outcome knowledge. This model has a significant percentage of explained variance.

Based on structural model testing, which is in accordance with the data, all initial hypotheses can be accepted with certainty, except H_7. H_7 hypothesis, which refers to the influence of students' motivation, has also been rejected because a connection was recorded in the opposite direction from the one that was assumed.

Thus, the structural model was tested by analyzing structural equations. With their testing, it can be concluded with certainty that school management is key to the quality of students' outcome knowledge. The action of management is threefold. The influence of competent teaching staff is most pronounced, followed by the influence of a quality infrastructure, with direct influence being of the least influence. In

other words, school management is the most responsible and can achieve the greatest action. It does so by maintaining and influencing the quality of teaching staff, as well as by providing students and teachers with a quality infrastructure within which the teaching process can be performed at a high level and at that level can influence the most favourable learning outcomes. The greatest direct impact on learning outcomes is the teacher's competence.

The results obtained by the AMOS model were subjected to validation using a neural network, which was developed in the paper. The paper uses a standard multilayer perceptron (MLP) model. The network was used to confirm the importance of organizational factors that were the subject of research in this paper. The structure of the network is shown in Figure 3, while information about Neural Network Hyperparameters is shown in Table A3 in the Appendix.

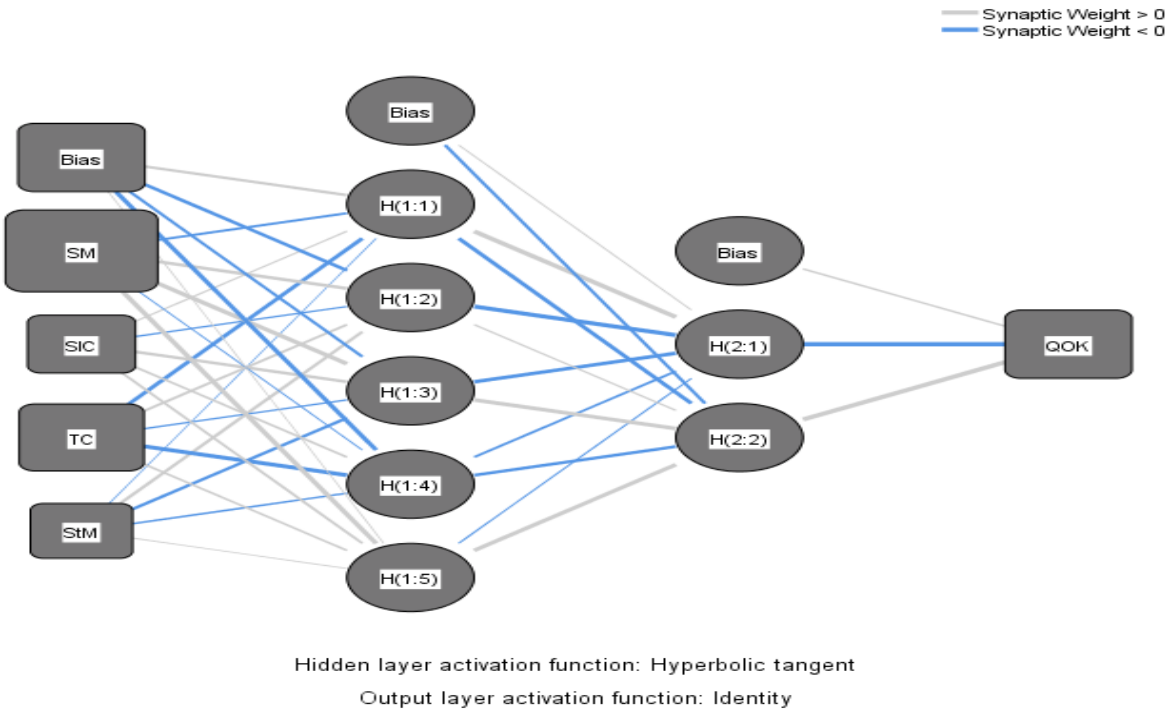

Figure 3. Neural network for testing AMOS model

For network testing, about 70% and about 30% for prediction testing. A summary of the neural network is shown in Table 3. The relatively low values of the relative errors during training and testing of the network indicate its high validity, which implies that it can be used to validate the obtained results regarding the importance of the influence of organizational factors that are the subject of analysis in the paper.

Table 3. *Summary of neural network quality*

Training	Sum of Squares Error	0.360
	Relative Error	0.002
	Stopping Rule Used	1 consecutive step(s) with no decrease in error[a]
	Training Time	0:00:00.02
Testing	Sum of Squares Error	0.122
	Relative Error	0.002

Note: [a]Error computations are based on the testing sample.

As can be seen based on the analysis of the importance of factors (Table 4 and Figure 4), the most significant influence on school achievements is school management, followed by teacher competence, then school infrastructure and finally student motivation. These findings are consistent with the findings of the AMOS model, which implies that the obtained results can be reliably interpreted.

Table 4. Independent Variable Importance

	Importance	Normalized Importance
School management	0.631	100.0%
School infrastructural condition	0.076	12.0%
Teachers' competences	0.288	45.6%
Student motivation	0.005	0.8%

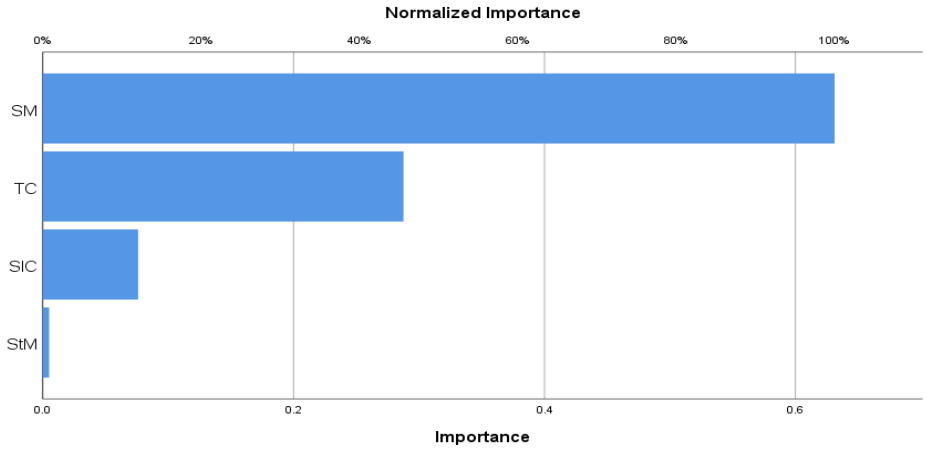

Figure 4. Independent variable importance

Discussions

By analyzing structural equations, we were primarily interested in testing a theoretical-conceptual model developed based on seven auxiliary hypotheses, which were set up to answer the main hypothesis. Results show that the influence of school management is key to the quality of students' outcome knowledge and that its performance is threefold. Through teaching staff, this impact is most pronounced, followed by a quality infrastructure of the institution, while direct impact is the least pronounced. Such a finding is logical and clear if the impact of school management on learning outcomes is looked at through the following chain: management shapes policies affecting the selection and support of teachers. Through quality infrastructure, teachers can perform better, thus directly influencing learning outcomes. The direct impact of management on student learning outcomes is less pronounced, as it is achieved indirectly through supporting teachers and creating optimal learning conditions.

The positive impact of school management on teachers' competencies can be explained through the support, resources, and atmosphere provided by the school. Effective management can establish clear goals, provide regular professional development, and offer mentorship, directly contributing to the development of teachers' competencies. Good management can also ensure a fair distribution of resources, including materials, training, and technological tools, supporting teachers in implementing innovative teaching methods. Dedication to creating a positive work environment can motivate teachers to continuously enhance their skills and contribute to the quality of instruction. Ultimately, well-led schools create an environment that fosters the professional development of teachers, enabling them to effectively impart knowledge to students.

The positive impact of school management on school infrastructure can be explained through the following arguments: Efficient Resource Allocation - effective school management contributes to the proper

allocation of resources. Through careful budget planning and management, the management can ensure sufficient funds for maintaining and improving the school's infrastructure; Strategic Planning - school management implementing long-term and strategic planning can identify priorities in infrastructure. For instance, setting clear goals and strategies can lead to improvements, such as renovating classrooms, acquiring modern equipment, or maintaining the premises; Effective Maintenance - management plays a crucial role in ensuring regular maintenance of school facilities. Continuous monitoring of infrastructure conditions and timely problem-solving can extend the lifespan of buildings and enhance their functionality; Enhanced Communication with the Local Community - well-managed schools establish effective communication with the local community. Through open communication, the management can attract additional funds, donations, or volunteer work that directly contributes to improving infrastructure; Focus on Student Needs - Management that prioritizes student needs recognizes that quality infrastructure directly impacts the learning experience. This may involve creating a stimulating environment that supports learning and development; Efficient Partnerships with External Resources - management that forms partnerships with organizations outside the school, local government, or the private sector can secure additional resources and support for infrastructure projects. These points highlight the role of management in guiding the school towards optimal resource utilization and improving infrastructure, directly contributing to the overall educational environment.

The finding that teacher competencies have the strongest direct positive influence on the quality of primary education learning outcomes can be explained by the fact that teachers with strong competencies create a stimulating environment, tailor instruction to various learning styles, and provide support for individual student needs. Namely, The ability to tailor instruction to different students and learning styles enables a personalized approach, directly supporting learning. Secondly, teachers' expertise in effectively delivering content, motivating students, and managing classroom dynamics is crucial for creating a stimulating environment. Teachers with strong competencies can recognize individual student needs and provide appropriate support. Additionally, teachers' competencies in employing diverse teaching methods and integrating technology contribute to dynamic instruction, often encouraging student engagement and deeper understanding of the material. This expertise directly contributes to enhancing the quality of teaching, leading to improved learning outcomes. this finding indicates that more attention must be paid to the training of teachers, but also to the selection of personnel during employment in education. These findings are in line with the results of research by Hattie (2003; 2012), which proved the influence and importance of teachers on student achievement. Hattie (2003; 2012) clearly show that the role of the teacher has a significant impact on student achievement. Studies show that the quality of teaching directly affects student success, which confirms the importance of professional development of teachers and their engagement in the classroom.

The finding that quality infrastructure has a positive effect on the quality of primary education learning outcomes can be explained by the fact that quality infrastructure provides an optimal environment for education. Well-equipped classrooms, laboratories, and access to technology facilitate a more effective learning process because support diverse teaching methods and create an inspiring atmosphere, all contributing to the improvement of students' academic achievements.

The finding that learning outcomes can positively impact student motivation has significant implications for school managers and education policymakers. School managers should recognize the importance of achieving measurable and positive learning outcomes as it can enhance student motivation, contributing to a better school environment in the long run. Managing resources, supporting teachers, and promoting innovative teaching methods can further facilitate the attainment of successful learning outcomes. Education policymakers should consider implementing strategies that encourage diverse teaching methods and provide support for teachers. Additionally, they need to support policies promoting measurable standards and the evaluations of learning outcomes. On the other side, the finding that motivation has a negative impact is surprising. The negative impact of motivation on learning outcomes can stem from various factors. For instance, insufficient or inadequate motivation may lead to a lack of student engagement and reduced attention during lessons, affecting the absorption of material. Additionally, a lack of motivation can result in inadequate effort in learning and completing school tasks, directly impacting the achievement of successful outcomes. However, the finding is a signal to school managers and education policymakers that they must recognize the need for approaches that encourage and sustain student motivation, while also considering factors that may contribute to its absence. Proper support for teachers,

including teaching methods, and the development of programs focusing on motivation can help overcome these challenges.

Conclusions

Based on the above, we can conclude that school management is key to the school's achievements, which is expressed in this paper through the quality of students' outcome knowledge since we are talking about schools as non-profit institutions whose basis and purpose is education. The action of management is threefold, it is most pronounced through teaching staff, followed by the influence of the quality of the institution's infrastructure, with the weakest being direct influence. In this manner, we see that school management is extremely important and that the greatest action can be achieved by maintaining and influencing the quality of teaching staff, as well as by providing students and teachers with a quality infrastructure so that the teaching process is realized at a high level and so that it can, in turn, influence better learning outcomes. Quality teaching staff affects the quality of learning outcomes directly, which is important, especially for those schools that do not have enough financial resources to invest in either the modernization of teaching or the institution itself.

The results obtained in this manner allow decision-makers to influence, in the future, those organizational factors which are ranked as the most important, about the goal which they want to achieve, and which will make the greatest contribution under the given conditions. School management influences the selection, and the building of teachers' competencies, while the given competence can indirectly affect the overall success of students through the establishment of an adequate school infrastructure, which affects the quality of outcome knowledge and therefore the overall success of students.

It remains for future researchers to examine whether and to what extent the differences in the socio-demographic characteristics of teachers and students by region affect the intensity of the influence of organizational factors on the school's achievement, expressed in the category of quality of outcomes knowledge.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, R, N. and P, V.; methodology, O, S.; software, R, N.; formal analysis, G, R, N. and P, V.; writing—original draft preparation, R, N and O, S. All authors have read and agreed to the published version of the manuscript.

References

Ahmadi, A., Noetel, M., Parker, P., Ryan, R. M., Ntoumanis, N., Reeve, J., ... & Lonsdale, C. (2023). A classification system for teachers' motivational behaviors recommended in self-determination theory interventions. *Journal of Educational Psychology.* https://doi.org/10.1037/edu0000783

Alfoudari, A. M., Durugbo, C. M., & Aldhmour, F. M. (2023). Exploring quality attributes of smart classrooms from the perspectives of academics. *Education and Information Technologies*, 1-43. https://doi.org/10.1007/s10639-022-11452-3

Anselmus Dami, Z., Budi Wiyono, B., Imron, A., Burhanuddin, B., Supriyanto, A., & Daliman, M. (2022). Principal self-efficacy for instructional leadership in the perspective of principal strengthening training: work engagement, job satisfaction and motivation to leave. Cogent Education, 9(1), 2064407. https://doi.org/10.1080/2331186X.2022.2064407

Aragon-Sanchez, A., Barba-Aragón, I., & Sanz-Valle, R. (2003). Effects of Training on Business Results. *The International Journal of Human Resource Management, 14*(6), 956-980. https://doi.org/10.1080/0958519032000106164

Baketa, N., Dedic, Z. R., & Jokic, B. (2020). All Are Equal, But Some Are More Equal Than Others: Secondary School Principals' Perspectives on the State Matura Exams and Issues of Equity and Equality of Access to Tertiary Education for Pupils from

Grammar Schools and VET in Croatia. *Revija za sociologiju*, *50*(2), 223-251. http://doi.org/10.5613/rzs.50.2.4

Barak, M., & Levenberg, A. (2016). A model of flexible thinking in contemporary education. *Thinking Skills and Creativity*, *22*, 74-85. https://doi.org/10.1016/j.tsc.2016.09.003

Blömeke, S., Jentsch, A., Ross, N., Kaiser, G., & König, J. (2022). Opening up the black box: Teacher competence, instructional quality, and students' learning progress. *Learning and Instruction*, *79*, 101600. https://doi.org/10.1016/j.learninstruc.2022.101600

Bouslama, F., Lansari, A., Al-Rawi, A. M., & Abonamah, A. A. (2003). A Novel Outcome-Based Educational Model and its Effect on Student Learning, Curriculum Development, and Assessment. *Journal of Information Technology Education: Research, 2,* 203-214. https://www.learntechlib.org/p/111473/.

Brinson, J. R. (2015). Learning Outcome Achievement in Non-Traditional (Virtual and Remote) Versus Traditional (Hands-On) Laboratories: A Review of the Empirical Research. *Computers & Education, 87*, 218-237. https://doi.org/10.1016/j.compedu.2015.07.003

Brooker, A., Corrin, L., De Barba, P., Lodge, J., & Kennedy, G. (2018). A tale of two MOOCs: How student motivation and participation predict learning outcomes in different MOOCs. *Australasian Journal of Educational Technology*, *34*(1). https://doi.org/10.14742/ajet.3237

Dadmand, F., & Pooya, A. (2023). Schools budgeting according to the condition of equipment and buildings under different scenarios changing the number of students using the system dynamics. *Governmental Accounting, 9(*2), 121-140. https://doi.org/10.30473/gaa.2021.57985.1458

Dai, Z., Sun, C., Zhao, L., & Zhu, X. (2023). The Effect of Smart Classrooms on Project-Based Learning: A Study Based on Video Interaction Analysis. *Journal of Science Education and Technology*, 1-14. https://doi.org/10.1007/s10956-023-10056-x

Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments*, *10*(1), 1-26. https://doi.org/10.1186/s40561-023-00231-3

Dou, D., Devos, G., & Valcke M. (2017). The Relationships Between School Autonomy Gap, Principal Leadership, Teachers' Job Satisfaction and Organizational Commitment. *Educational Management Administration & Leadership, 45*(6), 959-977. https://doi.org/10.1177/1741143216653975

Doyer, I., & Bean, W. L. (2023). As easy as OEE: enabling productivity improvement in schools by using overall equipment effectiveness as framework for classroom data analysis. *International Journal of Lean Six Sigma.* https://doi.org/10.1108/IJLSS-03-2022-0057

Fuadi, A., Nasution, W. N., & Wijaya, C. (2023). Management of Teacher Professionalism Development: A Multi-Site Study of State Madrasah Aliyah in Langkat Regency. *Tafkir: Interdisciplinary Journal of Islamic Education, 4*(1), 180-199. https://doi.org/10.31538/tijie.v4i1.444

Fullan, M. (2011). The Six Secrets of Change, What the Best Leaders do to Help. Their Organizations Survive and the Live. San Francisco; Jossey-Bass.

García-Tudela, P. A., Prendes-Espinosa, P., & Solano-Fernández, I. M. (2023). The Spanish experience of future classrooms as a possibility of smart learning environments. *Heliyon*, *9*(8). https://doi.org/10.1016/j.heliyon.2023.e18577

Gentrup, S., Lorenz, G., Kristen, C., & Kogan, I. (2020). Self-fulfilling prophecies in the classroom: Teacher expectations, teacher feedback and student achievement. *Learning and Instruction*, *66*, 101296. https://doi.org/10.1016/j.learninstruc.2019.101296

Girelli, L., Alivernini, F., Lucidi, F., Cozzolino, M., Savarese, G., Sibilio, M., & Salvatore, S. (2018). Autonomy supportive contexts, autonomous motivation, and self-efficacy predict academic adjustment of first-year university students. In *Frontiers in Education*, 3. https://doi.org/10.3389/feduc.2018.00095

Gupta, A., Mazumdar, B. D., Mishra, M., Shinde, P. P., Srivastava, S., & Deepak, A. (2023). Role of cloud computing in management and education. *Materials Today: Proceedings*, *80*, 3726-3729. https://doi.org/10.1016/j.matpr.2021.07.370

Gutiérrez, M., & Tomás, J. M. (2019). The role of perceived autonomy support in predicting university students' academic success mediated by academic self-efficacy and school engagement. *Educational Psychology*, *39*(6), 729-748. https://doi.org/10.1080/01443410.2019.1566519

Harden, R. M. (2002). Learning Outcomes and Instructional Objectives: Is There a Difference*? Medical teacher, 2*4(2), 151-155.https://doi.org/10.1080/0142159022020687

Hayat, A. A., Shateri, K., Amini, M., & Shokrpour, N. (2020). Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model. *BMC medical education*, *20*(1), 1-11. https://doi.org/10.1186/s12909-020-01995-9

Hattie, J. (2012). Visible learning for teachers: Maximizing impact on learning. Abingdon: Routledge.

Hattie, J. (2003). Teachers Make a Difference, What is the research evidence? Working paper.

Ho, H. C., Poon, K. T., Chan, K. K. S., Cheung, S. K., Datu, J. A. D., & Tse, C. Y. A. (2023). Promoting preservice teachers' psychological and pedagogical competencies for online learning and teaching: The TEACH program. *Computers & Education*, *195*, 104725. https://doi.org/10.1016/j.compedu.2023.104725

Hussey, T., & Smith, P. (2002). The Trouble with Learning Outcomes. *Active Learning in Higher Education, 3*(3), 220-233.

https://doi.org/10.1177/1469787402003003003

Johnson, D. W. & Johnson, R. T. (1989). *Cooperation and Competition: Theory and Research.* Edina, MN: Interaction Book Company.

Johnson, D.W., Maruyama, G., Johnson, R., & Nelson, D. (1981). Effects of Cooperative, Competitive and Individualistic Goal Structures on Achievement: A Meta-Analysis. *Psychological Bulletin, 89*, 47-62. https://doi.org/10.1037/0033-2909.89.1.47

Johnston, O., Wildy, H., & Shand, J. (2023). A grounded theory about how teachers communicated high expectations to their secondary school students. *European Journal of Psychology of Education*, 1-25. https://doi.org/10.1007/s10212-023-00689-2

Leroy, N., & Bressoux, P. (2016). Does amotivation matter more than motivation in predicting mathematics learning gains? A longitudinal study of sixth-grade students in France. *Contemporary Educational Psychology*, *44*, 41-53. https://doi.org/10.1016/j.cedpsych.2016.02.001

Lo, K. W., Ngai, G., Chan, S. C., & Kwan, K. P. (2022). How students' motivation and learning experience affect their service-learning outcomes: A structural equation modeling analysis. *Frontiers in psychology*, *13*, 825902. https://doi.org/10.3389/fpsyg.2022.825902

Leithwood, K., Harris, A., & Hoppkins, D. (2008). Seven Strong Claims About Successful. *School Leadership and Management, 28*(1), 27-42. https://doi.org/10.1080/13632430701800060

Karakose, T., Polat, H., Yirci, R., Tülübaş, T., Papadakis, S., Ozdemir, T. Y., & Demirkol, M. (2023). Assessment of the relationships between prospective mathematics teachers' classroom management anxiety, academic self-efficacy beliefs, academic amotivation and attitudes toward the teaching profession using structural equation modelling. *Mathematics*, *11*(2), 449. https://doi.org/10.3390/math11020449

Nonaka, I. (1994). A Dynamic Theory of Organizations Knowledge Creation. *Organization science, 5*(1), 14-37 https://doi.org/10.1287/orsc.5.1.14

Park, S., & Weng, W. (2020). The relationship between ICT-related factors and student academic achievement and the moderating effect of country economic index across 39 countries. *Educational Technology & Society*, *23*(3), 1-15. https://www.jstor.org/stable/26926422

Pribudhiana, R., Bin Don, Y., & Bin Yusof, M. R. (2021). Determining the Influence of Teacher Quality toward Teacher Readiness in Implementing Indonesian Education Policy. *Eurasian Journal of Educational Research*, *93*, 373-390. https://techniumscience.com/index.php/conference/article/view/2877

Radianti, J., Majchrzak, T.A., From, J., & Wohlgennant, I. (2020). A Systematic Review of Immersive Virtual Reality Applications for Higher Education: Design Elements, Lessons Learned, and Research Agenda. *Computers & Education 147.* https://doi.org/10.1016/j.compedu.2019.103778

Robinson, C. D. (2022). A framework for motivating teacher-student relationships. *Educational Psychology Review, 34*(4), 2061-2094. https://doi.org/10.1007/s10648-022-09706-0

Rusyn, H. A., Stynska, V., Matsuk, L., Korostelova, Y. Y., & Stetsyk, S. P. (2021). Efficiency of the project method in the development of professional competencies in future teachers. *Revista de la Universidad del Zulia*, *12*(35), 303-321. http://dx.doi.org/10.46925//rdluz.35.18

Seijts, G. H., Latham, G. P., & Woodwark, M. (2013). Learning goals: A qualitative and quantitative review. *New developments in goal setting and task performance*, 195-212.

Tang, K. N. (2020). The importance of soft skills acquisition by teachers in higher education institutions. *Kasetsart Journal of Social Sciences*, *41*(1), 22-27. https://doi.org/10.1016/j.kjss.2018.01.002

Tella, A. (2007). The Impact of Motivation on Student's Academic Achievement and Learning Outcomes in Mathematics Among Secondary School Students in Nigeria. *Eurasia Journal of Mathematics, Science & Technology Education, 3*(2), 149-156. https://doi.org/10.12973/ejmste/75390

Uyen, V.T.N., & Thu, P.X. (2023). The Multi-Criteria Decision-Making Method: Selection of Support Equipment for Classroom Instructors. *Applied Engineering Letters, 8*(4),148-157. https://doi.org/10.18485/aeletters.2023.8.4.2

Wargocki, P., & Wyon, D. P. (2017). Ten questions concerning thermal and indoor air quality effects on the performance of office work and schoolwork. *Building and Environment*, *112*, 359-366. https://doi.org/10.1016/j.buildenv.2016.11.020

West-Burnham, J. (1997). *Managing Quality in Schools*. London: Pearson Education Limited.

Young, M. R., Klemz, B. R., & Murphy, J. W. (2003). Enhancing Learning Outcomes: The Effects of Instructional Technology, Learning Styles, Instructional Methods, and Student Behavior. *Journal of Marketing Education, 25*(2), 130-142. https://doi.org/10.1177/0273475303254004

Yu, Z., Gao, M., & Wang, L. (2021). The effect of educational games on learning outcomes, student motivation, engagement and satisfaction. *Journal of Educational Computing Research*, *59*(3), 522-546. https://doi.org/10.1177/0735633120969214

Appendix

Table A1. Results of Principal factor analysis (factor loading)

Variable	Item	Factor loading			
		SM	SIC	TC	SM
SCHOOL MANAGEMENT (SM)	The school principal develops fair relations with the school staff	0.755			
	The school principal respects suggestions from the pedagogical and psychological school service	0.788			
	The school principal respects parent suggestions	0.891			
	The school principal respects suggestions made by the student parliament	0.774			
	The school principal provides continuous training for school employees	0.752			
	The school principal provides good conditions for teaching at school	0.872			
	The school principal provides pleasant conditions for staying at the school	0.783			
SCHOOL INFRASTRUCTURAL CONDITION (SIC)	The classrooms are pleasant for school teaching		0.775		
	The gym and other fields are a good place for students' physical activities		0.714		
	Computer cabinets are equipped with modern equipment		0.696		
	The safety of students at school is accompanied by the presence of persons professionally trained for this activity		0.783		
	Hallways, restrooms and other school areas are modernly equipped		0.709		
	The school yard is landscaped and safe for children		0.716		
	The students' achievements have been prominently displayed within the school		0.752		
TEACHERS' COMPETENCES (TC)	Teachers are adequately educated to teach			0.827	
	Teachers have developed communication skills			0.901	
	Teachers adequately transfer knowledge to students			0.772	
	Teachers use an interactive approach in teaching			0.763	
	Teachers continuously monitor achievements in their profession and apply them to teaching			0.754	
	Teachers' competencies affect the quality of knowledge with which students will be able to enroll in their desired school at the end of their schooling			0.811	
	Teachers only profess to agree with the introduction of innovations while in practice they do not advocate their implementation due to the uncertainties that they carry with them			0.729	
STUDENT MOTIVATION (SM)	Students strive to achieve the desired result throughout the year				0.729
	Students perceive innovations in work as a challenge				0.744
	Each teacher can motivate students				0.801
	Clear, understandable explication, explanation and presentation motivates a student for a quality of outcome knowledge				0.762
	The diversity of didactic-methodological possibilities, on the basis of which an appropriate choice can be made (depending on the specific situation), affects motivation				0.713
	Encouraging students to notice the value of what they are learning, i.e., make them want to learn and use the abilities they have, is the principle according to which teachers stimulate motivation				0.717
	Teachers' interest, participation and enthusiasm for what they are teaching motivates students				0.738

Table A2. *The results of ANOVA*

Groups	Count	Between Groups		
Principal	21	F	P-value	F crit
Teacher	439			
Schoool mangament		2.939	0.087	3.862
Teachers' competences		0.989	0.321	3.862
School infrastructural condition		0.258	0.612	3.862
Student Motivation		3.114	0.078	3.862

Table A3. *Information about Neural Network Hyperparameters*

Learning Algorithm	Back-propagation
Optimizer	Adam
Learning Rate	0.1
Loss	Sum Squared Error
Epochs	500
Hidden Layer(s) Activation Function	Hyperbolic tangent
Output Layer Activation Function	Identity