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Human Factors Influencing Productivity in Software Development Teams: A Correlational Study in a Public Sector Organization

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ABSTRACT

Productivity in software development teams is influenced by a complex interaction of human, organizational, and social factors. Understanding these relationships is particularly important in public sector organizations, where software projects often operate under institutional constraints and resource limitations. This study investigates the influence of individual, group, and organizational factors on the productivity of software development teams within a public sector institution in Peru. A quantitative and correlational research design was employed, using survey data collected from 46 software developers working in an information systems development unit. The measurement instrument assessed multiple dimensions of productivity-related factors, including job satisfaction, motivation, technical competencies, team cohesion, organizational climate, and leadership. The reliability of the instrument was confirmed through Cronbach's alpha ($\alpha = 0.892$), indicating strong internal consistency. Factor validity was assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity, confirming the adequacy of the data for factor analysis. Statistical analysis included Pearson correlation, multiple regression, and canonical correlation analysis. The results reveal that organizational factors exert the strongest influence on team productivity ($R^2 = 0.564$, $p < 0.001$), followed by individual factors ($R^2 = 0.510$, $p < 0.001$), while group factors show a comparatively weaker effect ($R^2 = 0.276$, $p = 0.001$). The canonical correlation coefficient (0.714) further confirms a strong multivariate relationship among the studied dimensions. These findings highlight the central role of leadership, organizational climate, and talent management in enhancing productivity within software development teams. The study provides empirical insights that can support more effective organizational strategies for improving performance in public-sector software development environments.

1. INTRODUCTION

In the contemporary business context, information systems are fundamental for organizational competitiveness, facilitating process automation, workflow integration, and resource optimization [1, 2]. However, their effectiveness critically depends on human factors. Factors such as efficiency, cost, and software development time are essential to maintain competitiveness, especially in public entities of the Peruvian state given the complexity of their systems and the pressure to maintain high levels of efficiency, security and quality. In this aspect, the productivity of software development teams not only depends on the technologies implemented in organizations, but also on a series of Human, Social and Organizational Factors, whose influence has been underestimated in certain [3-5].

Several studies have evidenced that motivation, job satisfaction, technical competencies and interpersonal relationships directly affect individual performance [6, 7] Likewise, group dynamics, expressed in cohesion, participation and effective communication, also influence the quality of teamwork, although with differentiated effects [8-10]. For their part, organizational factors such as leadership, organizational culture, work climate and knowledge management have been identified as the major drivers of productivity by facilitating collaboration, knowledge transfer and innovation [3, 5, 11].

In public institutions, integration and cohesion issues within teams are particularly challenging. Not only do teams face pressure to meet schedules, but they must also ensure that systems are robust and capable of handling large volumes of data and transactions.

The impact of these factors is not homogeneous. There is research that highlights the need for integrative models that allow understanding the interactions between human, social and structural dimensions [12, 13]. Along these lines, there are

authors who argue that a comprehensive understanding of productivity should include both tangible and intangible elements [14, 15], while other authors delve into how teams adapt and coordinate in complex collaborative environments [16, 17]. Other studies emphasize the competencies required in remote or hybrid work contexts, which directly impact team structure [18, 19].

Complementarily, a model based on the effectiveness of teamwork in agile environments [10], and the GamifiK strategy aimed at fostering collaboration through gamification [11], provide a modern vision on how to enhance human factors through innovative mechanisms. In turn, other researchers have contributed empirical evidence on the relationship between individual capabilities, leadership styles and productivity metrics [20, 21].

To address this issue, this research followed a quantitative and correlational approach, using surveys designed to measure the perception of software developers in a public entity on how Human Factors relate. The methodology was based on a non-experimental, transectional correlational design, in which questionnaires were administered to a sample of 46 programmers working in software development in a Peruvian public entity. This approach allowed measuring the correlation between the mentioned factors that are elements of productivity in information systems.

Based on this theoretical and empirical body, the present research aims to analyze the relationship between individual, group and organizational factors as elements of the productivity of software development teams in a Peruvian public entity, through a correlational and quantitative design, using multivariate statistical tools such as regression analysis, factor analysis and canonical correlation. This study seeks to fill a gap in the local literature and provide a practical and applicable framework to optimize talent management in information systems development projects, especially in Peruvian public sector institutions [19, 22].

2. RELATED WORK

The literature regarding productivity in software development has established precedents relevant to this research. A seminal study identified critical relationships between human factors and productivity in organizations, laying the groundwork for understanding how individual aspects influence performance [3]. Other work provided valuable insights into modern team dynamics after deeply analyzing the factors affecting productivity in agile environments [4]. Likewise, significant contributions have been made to the understanding of the impact of leadership and organizational climate on team performance [23] as well as the relationship between team maturity and team productivity, offering insights on their evolution and collective performance [5].

From a competency-focused view, some authors have highlighted the importance of technical and socioemotional skills in remote work contexts, underlining how these competencies impact team efficiency [19]. Along the same line, other studies identified the relevance of adaptability and trust in distributed teams, crucial elements to maintain sustained levels of productivity in complex environments [18].

On the other hand, recent research has addressed human factors from the perspective of empathy, interpersonal relationships and collaborative capacity in agile development, highlighting their influence on product quality [20]. At the organizational level, it has also been analyzed how operational excellence practices and process management affect the performance of software teams, especially in environments with hierarchical structures [14].

Regarding productivity measured by concrete results, a model that integrates objective performance metrics with human variables has been proposed, arguing that the combination of both approaches allows a more accurate assessment [24]. Complementarily, it has been explored how collaborative culture, fluid communication and constant feedback contribute to generate more cohesive and results-oriented teams [25].

Finally, from a systemic approach, a productivity assessment framework has been proposed that includes both human and technological factors, emphasizing the need for a balance between the two to achieve excellence in software development [16].

3. MATERIALS AND METHODS

This section describes the approach used for this research, detailing the questions that will guide its study, as well as techniques and tools used for data collection and analysis.

3.1 Population

The study population was made up of professionals dedicated to Computer Applications Programming who belonged to the Development Management unit. The population consisted of 52 programmers working with Java, Oracle, Informix, Redis, and MongoDB technologies in an information systems development project within the Systems Development Management.

3.2 Sample size

The sample size will be determined as follows:

$$n = \frac{Z^2 \cdot p \cdot q \cdot N}{e^2 \cdot (N-1) + Z^2 \cdot p \cdot q}$$

Based on the formula used to find the sample size adjusted for finite populations, values were replaced requiring a total of 46 computer application programmers.

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5 \times 52}{(0.05)^2(52-1) + (1.96)^2 \times 0.5 \times 0.5} \approx 46$$

The values of the formula can be seen in Table 1.

Table 1. Statistical parameters used for the calculation of the sample size

Parameter	Value
α	0.05
Z	1.960
N	52
e	5%
P	0.5
Q	0.5

3.3 Techniques and Instruments

Productivity was defined as the perceived efficiency, commitment, and goal achievement of software development teams. It was measured through a self-reported five-point Likert scale (1 = strongly disagree to 5 = strongly agree) across individual, group, and organizational dimensions. This perception-based approach follows recent studies that view productivity as a multidimensional construct shaped by motivation, collaboration, and organizational climate [16, 26, 27], as shown in Table 2.

Table 2. Dimensions and indicators of the measurement instrument for productivity in information systems development teams

Dimension / Indicator	Item/Question	Author
DIMENSION 1: Individual Factors		
Job satisfaction	V1.- I strive to deliver good quality work and feel satisfied with it.	(Machuca-Villegas et al.; Fatema & Sakib)
	V2.- I find the distribution of work adequate.	(Machuca-Villegas et al.; Fatema & Sakib)
Motivation	V3.- I feel that the assigned tasks are interesting and challenging.	(Park & Lee; Ramirez-Mora & Oktaba)
	V4.- I am provided with good furniture, computer equipment and optimal working conditions.	(Fatema & Sakib)
	V5.- I feel that the tasks I perform are valuable to achieve the objectives.	(Fatema & Sakib; Ramirez-Mora & Oktaba)
Work competencies	V6.- I feel I have the skills to move up to higher positions.	(Fatema & Sakib; Gilal et al.)
Relationships interpersonal and empathy	V7.- I receive training in interpersonal relations, effective management of emotions, teamwork and quality.	(Defranco & Laplante; Machuca-Villegas et al.)
	V8. - I participate in the activities carried out in the work area.	(Defranco & Laplante)
	V9.- I am willing to relate to others in a positive way.	(Machuca-Villegas et al.)
DIMENSION 2: Group Factors		
Cohesion	V10.- I provide support when necessary to my coworkers.	(Fatema & Sakib; Scott et al.)
Participation	V11.- I feel that the work team is cohesive.	(Mehtarizadeh & Pourkiani; Strode et al.)
	V12.- I always participate in team decisions and contribute to improve.	(Mehtarizadeh & Pourkiani; Strode et al.)
DIMENSION 3: Organizational Factors		
Organizational climate	V13.- Promotion is based on capabilities and better performance.	(Machuca-Villegas et al.; Park & Lee)
	V14.- There is a positive harmony manifested in the fellowship of the work team.	(Park & Lee)
Leadership	V15.- The leaders of the institution demonstrate a high level of ethics in their decisions and actions.	(Fatema & Sakib; Ramirez-Mora & Oktaba)
	V16.- The leader promotes participation.	(Fatema & Sakib; Ramirez-Mora & Oktaba)
Organizational Culture	V17.- You feel identified with the work team.	(Machuca-Villegas et al.; Galeano-Ospino et al.)
	V18.- The members of the project work in a coordinated manner.	(Machuca-Villegas et al.)
	V19.- The behavior of the members obeys the institutional identity.	(Machuca-Villegas et al.)

4. RESULTS

This section presents the results from the analysis of the data collected. The results provide a detailed view of how individual, group, and organizational factors are associated with, or influence, the productivity of information systems development teams. Statistical values are discussed, highlighting the practical and theoretical implications of these results.

4.1 Reliability analysis: Cronbach's alpha

The reliability of the instrument was evaluated using Cronbach's alpha coefficient, obtaining a value of 0.892 after excluding items V6 and V9, which confirmed a high internal consistency. Based on the results of Cronbach's alpha, it was reduced from 19 items to 17 items, ensuring the reliability of the questionnaire in the dimensions of the study. The Cronbach's alpha values obtained for each dimension are shown in Table 3.

Group factors are ancillary to team productivity. It is recommended to redefine items and add questions to improve their future measurement.

4.2 Factor analysis validity tests

The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity are standard tools used to validate the appropriateness of factor analysis. The KMO index assesses whether the sample size is adequate to identify underlying structures, while Bartlett's test evaluates whether significant correlations exist among variables. Both analyses were applied in this study to confirm that factor analysis was appropriate and reliable for extracting the relevant dimensions.

Table 4 visualizes the results obtained in both statistical analyses.

The KMO value of 0.766 indicates a good sample fit for the factor analysis, exceeding the minimum recommended threshold of 0.6 for this statistical test.

Bartlett's test shows a chi-square of 383.607 (gl = 136) with

significance $p < 0.001$, indicating that the correlation matrix is not an identity matrix, which means that there are significant correlations between the variables.

Table 3. Reliability by dimensions of information systems development productivity

Dimension	Cronbach's Alpha	Number of Items	Interpretation
Individual Factors	0.753	7	This value indicates acceptable internal consistency for items measuring individual factors such as job satisfaction, motivation and work competencies.
Group Factors	0.313	3	This value shows a relatively low internal consistency, suggesting some heterogeneity in the items measuring team cohesion and participation.
Organizational Factors	0.880	7	This value indicates high internal consistency for items assessing organizational climate, leadership, and organizational culture.

Table 4. KMO by dimensions of information systems development productivity

Dimension	KMO Value	Bartlett's Test	Interpretation
Individual Factors	0.722	Chi-cuadrado = 84.468, gl = 21, $p < 0.001$	Sampling adequacy is good for this dimension.
Group Factors	0.527	Chi-cuadrado = 4.574, gl = 3, $p = 0.206$	The sample adequacy is barely acceptable, and the non-significant Bartlett's test suggests limitations in the factor analysis for this dimension.
Organizational Factors	0.827	Chi-cuadrado = 166.740, gl = 21, $p < 0.001$	Sampling adequacy is very good for this dimension.

Note: KMO = Kaiser-Meyer-Olkin.

Table 5. Pearson's correlation matrix between factors of productivity in information systems development

		DIMENSION 1: Individual Factors	DIMENSION 2: Group Factors	DIMENSION 3: Organizational Factors
DIMENSION 1: Individual Factors	Pearson's Correlation	1	0.424**	0.711**
	Sig. (bilateral)		0.003	0.000
	N	46	46	46
DIMENSION 2: Group Factors	Pearson's Correlation	0.424**	1	0.520**
	Sig. (bilateral)	0.003		0.000
	N	46	46	46
DIMENSION 3: Organizational Factors	Pearson's Correlation	0.711**	0.520**	1
	Sig. (bilateral)	0.000	0.000	
	N	46	46	46

Note: **Correlation is significant at the 0.01 level (bilateral).

4.3 Pearson correlation analysis

Pearson's correlation allows us to analyze how the dimensions of the study are related and to determine if they are interconnected. The Pearson correlation values obtained for each dimension are shown in Table 5.

These values indicate that the individual, group, and organizational factors have moderate to strong relationships, suggesting that they may influence each other in the software development teams. However, the group work dimension is a weak element in productivity. This indicates that collaboration, communication and commitment should be strengthened to improve alignment with organizational objectives.

4.4 Regression analysis

Regression analysis was used to evaluate the causal relationships between the dimensions of the study (individual, group and organizational factors). Three regression models were constructed, where each one considers one of the dimensions as the dependent variable, while the other two act as predictors as shown in Table 6. The unit of measurement is R2 (the coefficient of determination in regression analysis). On the other hand, β (beta coefficient in regression analysis) measures the effect of a predictor on the dependent variable, and F (F-statistic in analysis of variance and regression) assesses whether the overall regression model significantly explains variance in the dependent variable.

Three regression models were constructed to examine the relationships among the study dimensions.

The first model examined organizational factors as the dependent variable. Individual and group factors together explained 56.4% of its variance ($R^2 = 0.564$). Individual factors emerged as the strongest predictor in this model ($\beta = 0.748$, $p < 0.001$), indicating that personal competencies and motivation have a substantial effect on organizational dynamics.

The second model focused on individual factors as the dependent variable. In this case, organizational factors were the only significant predictor ($\beta = 0.538$, $p < 0.001$), accounting for 51% of the variance ($R^2 = 0.510$). This finding suggests that the organizational environment strongly shapes individual performance.

The third model analyzed group factors as the dependent variable. Again, organizational factors were the only significant predictor ($\beta = 0.309$, $p = 0.021$), explaining 27.6% of the variance ($R^2 = 0.276$). This lower explanatory power indicates that group dynamics are less dependent on the other dimensions studied.

Taken together, these results confirm that organizational factors play a central role across all three models, significantly influencing both individual performance and group behavior.

Table 6. Regression analysis of causal relationship between factors of productivity in information systems development

Modelo	R^2	Adjusted R^2	Standard Error	Statistic F	Coefficients	Interpretation
Organizational Factors as Dependent Variable	0.564	0.544	0.32155	F = 27.812 (p < .001)	Individual Factors: β = 0.748 (standardized = 0.599), p < 0.001. Group Factors: β = 0.380 (standardized = 0.266), p = 0.021.	This model shows that individual and group factors explain 56.4% of the variance in organizational factors, with individual factors having the greatest impact.
Individual Factors as Dependent Variable	0.510	0.487	0.27278	F = 22.375 (p < .001)	Organizational Factors: β = 0.538 (standardized = 0.673), p < 0.001. Group Factors: β = 0.085 (standardized = 0.074), p = 0.555	This model indicates that organizational and group factors explain 51% of the variance in individual factors, with organizational factors as the only significant predictor.
Group Factors as a Dependent Variable	0.276	0.242	0.29007	F = 8.199 (p = .001)	Organizational Factors: β = 0.309 (standardized = 0.442), p =0.021. Individual Factors: β = 0.096 (standardized = 0.110), p = 0.555	This model shows that organizational and individual factors explain 27.6% of the variance in group factors, with organizational factors being the only significant predictor.

4.5 Canonical analysis

Canonical Correlation Analysis is used to examine the multivariate relationships between two sets of variables, allowing the association between them to be identified simultaneously. Table 7 shows the results obtained from the canonical analysis.

Table 7. Canonical correlation analysis between factors of productivity in information systems development

	Correlation	Autovalue	Wilks' statistic	F	Sig.
1	0.714	1.041	0.490	.	.

Nota. H0 for Wilks' test.

The canonical correlation of 0.714 indicateted a strong association between the sets of variables, while the eigenvalue of 1.041 suggested that the relationship is significant and explains a relevant part of the variance. The Wilks' statistic (0.490) confirmed that the relationship is moderate, partially rejecting the null hypothesis that the correlations are zero, indicating that the sets of variables are significantly related.

4.6 Comprehensive analysis of results

The individual factors include technical skills, experience, motivation, autonomy and personal competencies of the developer, and influence productivity by improving efficiency in problem solving, ability to adapt to new technologies and overall performance in software development. Regarding this factor, the Cronbach's Alpha reliability analysis for the individual factors shows a value of 0.753, indicating an acceptable internal consistency. There are also correlations with other factors, as the individual factors show a strong correlation with organizational factors ($r = 0.711$, $p < 0.001$) and a moderate correlation with group factors ($r = 0.424$, $p = 0.002$).

Group factors include team cohesion, effective communication, collaboration and teamwork culture, and influence productivity by facilitating teamwork, reducing errors and improving coordination in software development projects. Regarding this factor, the Cronbach's Alpha reliability analysis for the group factors is 0.313, indicating a low internal consistency for this construct. With respect to correlation with other factors, group factors show a moderate correlation with organizational factors ($r = 0.520$, $p < 0.001$).

Organizational factors include company policies, work climate, leadership and talent management, and affect productivity by providing stability, adequate resources and clear direction for software development. With respect to this factor, Cronbach's alpha for organizational factors is 0.880, indicating high internal consistency.

These results indicate that organizational factors are the most influential component in the productivity of development teams, indicating that an organization with strong leadership, good working conditions and structural support drives better performance in software development. On the other hand, individual factors have a significant, although lesser, influence on productivity. Finally, group factors have the lowest influence, with the least impact.

5. DISCUSSION

In this research, a multidimensional model was used to analyze the correlation between individual, group and

organizational factors through factor analysis, multiple regression and canonical correlation, determining their influence on the productivity of development teams.

The results indicate that productivity in development teams is mainly determined by organizational factors, followed by individual factors, while group factors have a minor influence. Integrated management of these elements is key to optimizing performance in software development teams within a Peruvian public entity.

Previous studies have shown that motivation and job satisfaction are key factors in individual productivity. Machuca-Villegas et al. [3] identified, through a factor analysis, that these elements improve workers' efficiency and commitment. Similarly, Mehtarizadeh and Pourkiani [8] used regression analysis to show that motivated programmers exhibit significantly superior performance, especially in demanding environments. The results obtained in this research support these studies, as we found that individual factors have a significant impact on the productivity of development teams. The strong correlation ($r = 0.711$) between organizational and individual factors indicates that organizational structure influences personal motivation. However, while previous studies primarily emphasize job satisfaction as a driver of productivity, our results suggest that the influence of these factors is enhanced when combined with an appropriate organizational environment.

Existing literature highlights the importance of cohesion and collaboration in development teams. Ramirez-Mora and Oktaba [5] found, through correlational analysis, that these factors are essential for improving software quality and reducing development times. Similarly, Scott et al. [9] applied analysis of variance (ANOVA) and concluded that more cohesive teams achieve higher efficiency and quality in their projects.

Our research confirms the relevance of group factors; however, their impact on productivity is lower than that of individual and organizational factors. Previous studies treat group cohesion as a key predictor of performance. In contrast, our results show that group factors explain only 27.6% of the variability in organizational factors. This limited explanatory power suggests that group dynamics play a secondary role in the context of a Peruvian public entity. One possible explanation is that the effect of cohesion and collaboration on productivity is conditioned by the prevailing organizational culture and management structure structure [15, 17].

Studies have shown that effective leadership and a positive organizational culture are determinants of development team productivity. Lee et al. [7] applied Structural Equation Modeling (SEM) and found that these factors foster knowledge transfer and organizational commitment, which directly impacts team performance. Our results were consistent with this finding, as organizational factors emerged as the most influential dimension on productivity. The reliability of the organizational construct in our analysis ($\alpha = 0.880$) was high, supporting the internal consistency of this factor. In addition, the variance explained indicated that organizational factors carried the greatest weight in the productivity structure of teams in a Peruvian public entity.

While previous studies highlight the influence of leadership and organizational culture in general terms, our research delves deeper into how these factors interact with individual motivation and group cohesion. Our data suggest that a strong organizational environment not only improves team performance, but also enhances the impact of individual and group factors on productivity.

6. CONCLUSIONS

The results obtained in this study provide empirical evidence on the influence of individual, group, and organizational factors on the productivity of software development teams in the public entity studied. Through a quantitative approach and detailed statistical analysis, it was identified that productivity not only depends on the technical skills of developers but also on their work environment, talent management, and team cohesion.

The reliability of the instrument was validated using Cronbach's Alpha coefficient, obtaining an overall value of 0.892 after the elimination of two items, which confirms high internal consistency. At the dimensional level, individual factors presented an Alpha of 0.753, considered acceptable, while organizational factors reached a value of 0.880, indicating high reliability. However, group factors obtained a coefficient of 0.313.

Regarding the validity of the factor analysis, the KMO sample adequacy index obtained an overall value of 0.766, indicating an adequate sample for the analysis. Bartlett's test of sphericity was significant ($\chi^2 = 383.607$, $df = 136$, $p < 0.001$), confirming the relevance of using factor analysis. Pearson's correlation analysis revealed significant relationships between the dimensions. A strong correlation was found between individual and organizational factors ($r = 0.711$, $p < 0.001$), while the relationship between group and organizational factors was moderate ($r = 0.520$, $p < 0.001$). The weakest relationship was observed between individual and group factors ($r = 0.424$, $p = 0.003$), suggesting that group dynamics need strengthening to improve their influence on productivity.

The regression analysis showed that individual and group factors explained 56.4% of the variance of organizational factors, with individual factors being the strongest predictor ($\beta = 0.748$, $p < 0.001$). Similarly, organizational factors explained 51% of the variance of individual factors ($\beta = 0.538$, $p < 0.001$), while in group factors, their explanatory power was 27.6%, being the only significant predictor ($\beta = 0.309$, $p = 0.021$).

Organizational factors proved to be the main determinant of productivity, with high statistical reliability ($\alpha = 0.880$), indicating that elements such as leadership, work climate, and organizational culture directly influence performance. Likewise, individual factors showed a strong correlation with organizational ones ($r = 0.711$), suggesting that an adequate organizational structure reinforces individual performance and improves overall team performance. In contrast, group factors had a more limited influence, with lower reliability ($\alpha = 0.313$).

This study confirms that, to optimize productivity, it would be advisable to strengthen organizational leadership through effective communication strategies and talent recognition, as well as improve the work climate and team stability. These findings constitute a reference framework for optimizing productivity in software development teams in the public institution studied, allowing for more efficient resource management and ensuring the delivery of higher-quality and more effective software solutions.

Based on these results, the following is recommended: To improve individual factors, it is recommended to design

training programs in interpersonal skills and agile methodologies, implement participatory and ethical leadership models that foster motivation and trust, and establish clear performance indicators aligned with institutional objectives to objectively assess individual progress. To improve group factors, it is recommended to promote cohesion through participatory integration activities, develop shared leadership combining group direction with individual autonomy, and create synergies between individual capabilities and organizational resources to enhance collective performance. To improve organizational factors, it is recommended to establish effective interdepartmental communication channels, promote collaborative decision-making in a climate that values participation, and ensure strategic alignment between software development objectives and the institutional vision.

In addition, the adoption of hybrid or flexible work models, supported by digital collaboration tools, can enhance engagement and maintain productivity in distributed development environments [16, 26].

7. LIMITATIONS AND FUTURE WORKS

This research has limitations such as the size of the sample and its cross-sectional approach, which prevents us from evaluating changes over time. It is recommended that future research expand the sample and use longitudinal studies. Future research should also explore the impact of artificial intelligence, agile methodologies and emerging technologies on productivity. It would also be relevant to conduct comparative analyses in different sectors. Methodologically, the use of structural equation modeling could improve the understanding of the factors involved. Finally, it is suggested to design evidence-based interventions, such as training programs and diagnostic tools, to optimize performance in software development teams.

Supplementary Materials: The data set used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions: 1st, 2nd author: Conceptualization, Formal analysis, Investigation, Writing – original draft. 3rd, 4th author: Data curation, Methodology, Writing – review & editing. 5th, 6th author: Conceptualization, visualization, Writing – review & editing. 7th, 8th author: Investigation, Supervision, Writing – review & editing.

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NOMENCLATURE

KMO	Kaiser-Meyer-Olkin
R^2	Coefficient of determination in regression analysis
β	Beta coefficient in regression analysis
F	F-statistic in analysis of variance and regression

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