

# EVALUATING THE IMPACT OF MANAGERIAL COMPETENCIES ON INSTITUTIONAL STRATEGIC PERFORMANCE: MODELING USING PENALIZED LASSO AND RIDGE REGRESSION

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## Abstract

This article evaluates the impact of managerial competencies (strategic action, communication, self-management, and global awareness) on organizational strategic performance, using penalized regression techniques (LASSO, Ridge, and Elastic Net) to address multicollinearity and select relevant predictors. A quantitative design was used, analyzing variables such as planning, ethical leadership, resource management, and systemic vision, with outcomes measured in ROI, goal attainment, and perceived quality. The results show that the Ridge model had the best fit, explaining up to 24.51% of the variability in ROI and 20.24% in goal attainment, although with limitations in perceived quality (4.60%). LASSO and Elastic Net presented poor fits, suggesting overfitting or nonlinear relationships. The findings indicate a positive but moderate relationship between managerial competencies and performance, influenced by contextual factors such as organizational culture. It is recommended to incorporate additional variables, explore interactions, and employ nonlinear models to improve prediction. The study highlights the importance of managerial competencies, but underscores the need to consider other organizational factors to optimize strategic performance.

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**Keywords:** Performance competencies, leadership, modeling, regression

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## 1. Introduction

Research indicates that managerial skills, including strategic, interpersonal, and personal competencies, substantially influence performance metrics across various sectors, particularly in public administration and local government. The application of penalized regression techniques, such as LASSO and Ridge, can improve the modeling of these relationships through the effective management of multicollinearity and the selection of relevant predictors (Geraldo et al., 2022; Safi et al., 2023). While evidence strongly supports the positive impact of managerial competencies on strategic performance, it is essential to recognize that the effectiveness of these competencies can vary depending on contextual factors, such as organizational culture and the external environment. Further research is needed to explore these dynamics in depth (Agrawal et al., 2022; Farida & Setiawan, 2022). The literature identifies two main interpretations of competencies: one related to the power and authority associated with specific functions, and the other focused on the skills needed to perform particular tasks effectively (Ahmed et al., 2021). The dimensions of managerial competencies encompass diverse skills that are an integral part of a manager's effectiveness, where each of these competencies plays a significant role in influencing employee behavior outcomes and organizational performance. Therefore, possessing a strong competency in strategic action can lead to better results for employees, fostering a more positive and productive work environment (Ali & Anwar, 2021; Kabii & Kinyua, 2023). Effective communication is another crucial dimension of managerial skills. It is fundamental to fostering teamwork and collaboration within organizations. Managers who excel at communication can clearly articulate their vision and expectations, which in turn improves team performance and employee satisfaction (Musheke & Phiri, 2021; Chen et al., 2023). Self-management competence involves a manager's ability to regulate their own emotions, behaviors, and performance. This competence is essential for modeling desired behaviors and attitudes in the workplace, as well as for maintaining personal accountability and resilience in the face of challenges (Stam, 2021; Vennon et al., 2021). In an increasingly globalized business landscape, global awareness is essential. This dimension involves understanding international market trends, cultural sensitivities, and global economic conditions that can affect organizational strategies and operations (Fong & Askun, 2023; Goswami, 2025). Managers who are globally aware are better positioned to capitalize on

international opportunities and mitigate associated risks. Empirical studies have established a positive correlation between management competencies and organizational performance (Hudson et al., 2021; Marín et al., 2022). Competencies such as strategic action and communication have been shown to have a significant impact on employee engagement and behavioral outcomes, ultimately leading to improved performance metrics within organizations. Future research could explore the application of these findings across different industries and organizational contexts to validate the universality of these competencies.

## 2. Materials and Methods

### Research design

This study employs a quantitative research design to evaluate the impact of managerial competencies on institutional strategic performance. It utilizes advanced regression techniques such as LASSO (Least Absolute Shrinkage and Selection Operator) and Ridge penalty regression, the methodology aims to address the multicollinearity problems commonly faced in datasets with correlated predictors

### 2.1 Models Statisticians

#### LASSO (Least Absolute Shrinkage and Selection Operator)

This method requires standardized, normalized data, predictor variables that are not highly correlated, and an adequate sample size. Its advantages include automatic variable selection, the ability to reduce coefficients to exactly zero, good at eliminating irrelevant variables, and usefulness when dealing with many variables. However, its disadvantages include potential instability with highly correlated variables, a tendency to select arbitrarily among correlated variables, and the potential to underestimate true coefficients.

#### Ridge (L2 Regularization)

It requires standardized and normalized data, works well even with correlated variables, does not require assumptions of independence between predictors, has the advantages of handling multicollinearity well, never completely eliminates variables, is more stable than LASSO with correlated variables and is a unique and stable solution, has the disadvantages of not performing variable selection, all coefficients are maintained, although they may be very small and it may be suboptimal if there are really irrelevant variables

#### Elastic Net

It requires standardized and normalized data, works well in most scenarios, needs fitting two

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parameters ( $\alpha$  and  $\lambda$ ), has the advantages of combining the best of LASSO and Ridge, can select variables and handle correlations, is more robust than LASSO or Ridge separately, and is especially useful when  $p > n$  (more variables than observations). Its disadvantages include requiring fitting two parameters (more complex), potentially being more computationally intensive, and the interpretation being less straightforward.

### 2.2 Data used

Study Variables

Predictor Variables (Managerial Competencies)

#### *Planning*

Of the numerical scale type (1-5), which measures the ability to set goals and develop strategies

#### *Ethical Leadership*

Of the numerical scale type (1-5), it was used to evaluate the ability to lead with principles and values

#### *Resource Management*

A numerical scale (1-5) that measures efficiency in the management of organizational resources

#### *Systemic Vision*

A numerical scale (1-5) was used to assess the ability to understand the organization as a whole

### Outcome Variables

#### *ROI (Return on Investment)*

Of decimal percentage type, it measures the financial return on investments made

#### *Goal Achievement*

As a decimal percentage, it indicates the level of achievement of established objectives.

#### *Perceived Quality*

A numerical scale (1-5) was used to evaluate the quality of the service or product, using a Likert scale score.

### 3. Results

The analysis of the relationship between managerial competencies and organizational performance measures reveals interesting patterns and significant areas for improvement. Below, we present a detailed interpretation of the findings for each dimension assessed.

#### **Analysis by Objective Variable**

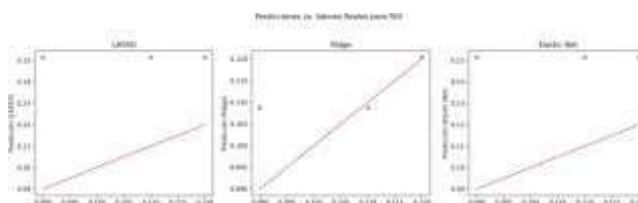
##### *ROI (Return on Investment)*

The Ridge model shows a moderately positive performance, explaining approximately 24.51% of the variability in ROI (Table 1). The negative results for LASSO and Elastic Net suggest a possible overfit in these models, indicating a need to adjust the regularization parameters. The relationship between competencies and ROI may be nonlinear.

**Table 1.** Comparison of models for the variable return on investment

Model	MSE	R2
LASSO	0.0022	-12.8805
Ridge	0.0001	0.2451
Elastic Net	0.0022	-12.8805

The predictive capacity (Figure 1) suggests that ROI is influenced by additional factors not captured in the model. The Ridge model could be useful as a decision-support tool, but not as the sole criterion.



**Figure 1.** Predictive capacity of models for the variable return on investment

#### *Goal Achievement*

Ridge again shows the best performance, explaining 20.24% of the variation; the LASSO and Elastic Net models show similar difficulties to the ROI case; the consistency in the pattern suggests an underlying structure in the data (Table 2)

**Table 2.** Comparison of models for the goal achievement variable

Model	MSE	R2
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LASSO	0.0095	-4.0681
Ridge	0.0025	0.2024
Elastic Net	0.0095	-4.07

There is a positive but moderate relationship between managerial skills and goal achievement (Figure 2), therefore, it is recommended to consider additional factors in goal planning

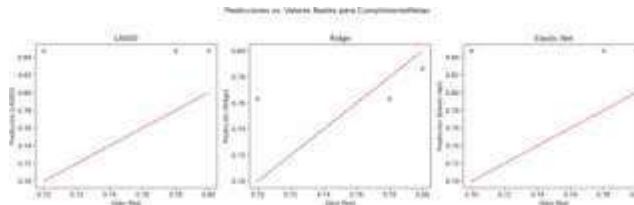


Figure 2. Predictive capacity of models for the goal achievement variable

*Perceived Quality*

All models show limited performance in this dimension (Table 3); perceived quality appears to be the most difficult variable to predict, due to the possible presence of non-linear factors or important omitted variables.

Table 3. Comparison of models for the goal achievement variable

Model	MSE	R2
LASSO	0.0858	-1.9715
Ridge	0.0276	0.0460
Elastic Net	0.0571	-0.9781

The relationship between managerial skills and perceived quality is more complex than anticipated (Figure 3), so it is suggested to explore additional quality metrics

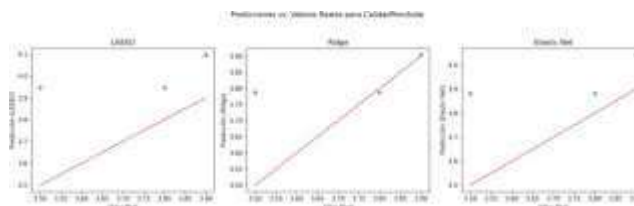


Figure 3. Predictive capacity of models for the perceived quality variable

**4. Discussion**

The analysis of the relationship between managerial skills and various measures of organizational performance reveals consistent patterns that invite critical reflection on the real and potential impact of these skills on institutional results.

**Return on Investment (ROI)**

The results show a clearly superior performance of the Ridge model ( $R^2 = 0.2451$ ), in contrast to the LASSO and Elastic Net models, whose negative  $R^2$  values (-12.8805) indicate a poor fit and probable overfitting of the model (Amin et al., 2023; Karthik & Geetha, 2023). This situation suggests that managerial skills, while important, are not the only determinants of ROI and that the return behavior may not be linear.

This finding aligns with previous research that warns that regularization models can fail if the independent variables are not strongly correlated with the dependent variable. Furthermore, the literature emphasizes that ROI (Lukman et al., 2022), as a financial indicator, is conditioned by a wide range of factors, including the economic environment, operational efficiency, and strategic decisions (Vanieri et al., 2019).

The Ridge model can be considered a complementary tool for evaluating managerial impacts, but its limited predictive capacity highlights the need to integrate other organizational dimensions (Yang et al., 2021; Uddin et al., 2024).

**Goal Achievement**

Similar to ROI, the Ridge model shows the best fit with an  $R^2$  of 20.24%, while LASSO and Elastic Net

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again show negative values ( Mubeu , 2021). This consistent pattern suggests a moderate underlying relationship between the assessed competencies and the achievement of strategic objectives.

This result is consistent with studies that highlight the influence of leadership and planning skills on institutional performance (Rosso and García, 2023; Zavaleta, 2023). However, the low percentage of explained variance suggests that other factors, such as organizational climate or the clarity of performance indicators, could be modulating this relationship ( Hanco et al., 2024). Therefore, a multivariate approach that considers both human and structural elements in goal planning and evaluation is needed.

### Perceived Quality

This component reveals the greatest limitations in predictive models. The Ridge model explains only 4.60% of the variability, while LASSO and Elastic Net again yield negative results ( Algamal et al., 2022). This suggests that the perception of quality is determined by intangible factors, possibly linked to organizational culture, internal communication, or customer service ( Alebiosu et al., 2021). Previous studies have shown that perceived quality depends on elements that are difficult to quantify, such as leadership commitment, managerial empathy, and constant feedback (Reiche et al., 2020). These factors, although related to managerial management, require more qualitative variables to be effectively modeled. Therefore, perceived quality is a complex dimension whose evaluation requires more sophisticated models, such as nonparametric techniques or machine learning methods that integrate latent variables ( Garg et al., 2022).

### 5. Conclusions

The results suggest that, while a positive relationship exists between managerial competencies and organizational performance, this relationship is partial and varies depending on the dimension assessed. The Ridge model offers the most consistent performance, reaffirming its value as a tool for addressing contexts where relationships are not perfectly linear. To improve the accuracy of predictions and the practical utility of models, new contextual and organizational variables should be included, and interactions and moderating effects should be considered, which implies evaluating the possibility of nonlinear or mixed models. The findings show that managerial competencies are the product of a combination of motivations, personal traits, abilities, knowledge, and values that are essential for improving

management performance in organizations and whose behavior can be predicted using mathematical models. This is key in modern management, given that these competencies are fundamental in a complex and rapidly evolving business environment, where effective leadership can provide a competitive advantage.

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