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DIGITAL DETERMINANTS OF ORGANIZATIONAL MANAGEMENT EFFECTIVENESS IN THE DATA-DRIVEN ERA

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Abstract: The study aims to identify the digital determinants that shape the effectiveness of organizational management in the contemporary data-driven environment. The main objective is to examine the role of data quality, data accessibility, analytical tools, data culture, and security/governance in managerial decision-making. A quantitative survey was conducted among 250 respondents from organizations of different sectors and sizes. Data were collected using an online questionnaire with 18 Likert-scale items. The analysis applied descriptive statistics, Cronbach's α reliability, Pearson's correlation, and linear regression. The results show that data quality and analytical tools have the strongest impact on management effectiveness, while accessibility and culture play a supportive role. Security and governance, although important in practice, did not show a statistically significant effect. The findings confirm the priority of investing in high-quality data and analytical capabilities to strengthen decision-making efficiency in organizations.

Keywords: analytical tools, data accessibility, data culture, data quality, digital transformation, governance, management effectiveness

JEL Classification: M15, M21, O32, C12, C83

Introduction

In the digital era, data is a strategic resource shaping organizational effectiveness. Digital technologies and analytical tools make data quality, accessibility, and governance essential for efficient and competitive management; yet many organizations face fragmented systems and a weak data-driven culture.

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This study examines key digital determinants of management effectiveness – data quality, availability, analytical tools, data culture, and security/governance – providing empirical evidence from organizations of different sectors and sizes to clarify how data-related factors influence modern management.

Literature review

In the digital economy, data are a strategic resource shaping organizational effectiveness. Quality, accessibility, and integration significantly influence decision speed and accuracy (Brynjolfsson & McElheran, 2016; Floridi, 2020). Data-driven organizations consistently outperform those relying on intuition (McAfee et al., 2012).

Data quality – accuracy, completeness, timeliness – is crucial for reliable analysis, while poor data leads to errors (Prędki, 2019). Well-governed data and integration via warehouses and BI platforms enhance insights and agility (Chen et al., 2012; Akter et al., 2019; Popovič et al., 2018). Availability affects managers' responsiveness, and ethical, transparent access is vital, especially in remote work settings (Taddeo & Floridi, 2018; Teece, 2018).

Analytical tools like BI and AI support decision-making but rely on high-quality data and governance to manage ethical risks (Davenport & Ronanki, 2018; Bandara et al., 2023; Brundage et al., 2018). A data-driven culture fosters skills and values that support evidence-based decisions, thereby reducing cognitive errors and enhancing trust (Jasanoff, 2003; Floridi, 2020; George et al., 2016). In Poland, analytical culture and digital leadership boost competitiveness (Kaczmarek & Sopińska, 2022).

Security, governance, and compliance are essential to protect trust and credibility, making ethical data governance crucial for digital transformation (Wamba et al., 2017; Dyrud, 2022). Technology and culture must work together: digital transformation succeeds when combined with skills, leadership, and organizational culture, turning data insights into strategic action (Gontar, 2019; Brynjolfsson & McElheran, 2016). Management effectiveness thus depends on the synergy of data quality, availability, tools, culture, and governance.

Table 1 synthesizes the literature on management determinants, presenting key categories that influence decision-making effectiveness.

Table 1. Selected organizational management determinants with definitions and example sources

Determinant	Scope / Definition	Selected Sources
Data Quality	Accuracy, completeness, and timeliness of information ensuring reliable decisions and reducing uncertainty	Floridi (2020); Chen et al. (2012); Akter et al. (2019); Gontar (2019); Murawska (2023)
Data Availability & Integration	Quick and seamless access to data across systems enabling agile and informed management	Taddeo & Floridi (2018); Frąszczak et al. (2021); Teece (2018); Brynjolfsson & McElheran (2016)
Analytical Tools	BI, AI, and automation tools that support decision-making and improve operational insight	Davenport & Ronanki (2018); Popovič et al. (2018); Brundage et al. (2018); Bandara et al. (2023); Prędki (2025)

Determinant	Scope / Definition	Selected Sources
Data-Driven Culture	Employee awareness, training, and standards promoting evidence-based decision-making	Jasanoff (2003); Floridi (2020); George et al. (2016); Newell & Marabelli (2015); Kaczmarek & Sopińska (2022); Mazur (2023)
Security and Governance	Data protection, clear roles, and regulatory compliance ensuring ethical and transparent use	EU (2025); Wamba et al. (2017); Deeptrace (2019); Dyrud (2022); Floridi (2020)
Technology--Culture Synergy	Interaction of IT infrastructure and human skills supporting digital management effectiveness	Gontar (2019); Prędki (2025); Brynjolfsson & McElheran (2016); Teece (2018); Floridi (2020)

Source: Own elaboration based on Floridi (2020); Taddeo & Floridi (2018); Chen et al. (2012); Own elaboration based on selected literature (see References section)

Floridi (2020) and Murawska (2023) emphasize that reliable, high-quality data are crucial, particularly in times of crisis. Data availability is examined in the context of social good (Taddeo & Floridi, 2018) and remote work. The ethical risks linked to analytical tools are highlighted by Brundage (2018) and Dyrud (2022). Data culture is featured in Jasanoff's (2003) and Floridi's (2020) conceptual frameworks, while security and governance are influenced by regulations such as the AI Act (2025) and reports from organizations like Deeptrace Labs.

Effective digital-era management depends on data quality, accessibility, analytical tools, culture, and security. Data acts as a strategic asset (Floridi, 2020), although technological advances introduce risks such as deepfakes (Brundage et al., 2018). Frameworks like the AI Act (2025) define the responsible use of technology.

The study examines how employees perceive these factors, as presented in the survey results later.

Data culture and managerial decisions

Data culture forms the foundation of digital organizational maturity, encompassing both technical solutions and values and attitudes that support evidence-based decision-making (Jasanoff, 2003). It is particularly important in the IT and service sectors, where rapid changes require timely responses based on reliable information. Training and skill development enhance efficiency, reduce cognitive errors, and build trust within the organization.

Data quality in strategic planning

Data quality – defined by accuracy, completeness, currency, and consistency – is a key condition for reliable analyses and decision-making strategies (Floridi, 2020). In large companies, this challenge involves integrating numerous data sources (ERP, CRM, market tools), whereas in SMEs, difficulties arise from limited procedures and resources (Prędki, 2019). As Gontar (2019) emphasizes, decisions based on inconsistent data can lead to financial losses and a weakened competitive position.

Integration of analytical tools and market responsiveness

The integration of ERP and CRM systems enhances process transparency and coordination, while unified analytical tools enable faster market adaptation (Prędki, 2025). Literature notes that tool effectiveness depends on both data quality and user skills (Bandara et al., 2023). Accordingly, the survey included questions on system integration and practical use.

Security and governance as a foundation of trust

Information security, regulatory compliance, and transparency in management are fundamental factors influencing trust in managerial actions. Lack of transparency and information manipulation can lead to trust-related crises (Dyrud, 2022), while emerging generative technologies, such as deepfakes, introduce new risks to the reliability of information (Brundage et al., 2018). The importance of this area is underscored by the Artificial Intelligence Act (European Union, 2025), which outlines principles for the responsible use of digital technologies.

Technology and culture as an integrated system

Technology and culture must be viewed as an integrated system influencing management effectiveness. Digital tools deliver value only when supported by employees' skills and an organization's culture (Gontar, 2019). Prędki (2025) emphasizes that synergy between technology and decision-making culture enables full use of data. This study examines these interconnected areas as components of a single management model.

Table 2. Organizational management determinants in the digital era – theoretical framework

Determinant	Key Elements	Management Significance	Link to Study
Data Culture	Employee awareness, training, and attitudes toward data	Enhances decision accuracy and reduces subjective biases	The survey assessed data culture across sectors
Data Quality	Accuracy, currency, consistency, completeness	Determines the effectiveness of strategic and operational planning	Questions evaluated data quality in organizations of various sizes
Integration of Analytical Tools	ERP, CRM, BI systems, Big Data	Speeds up analysis and market responsiveness	The study examined the tool's usefulness and integration level
Security and Governance	Regulations, access control, process transparency	Builds trust in data and managerial decisions	The questionnaire included items on information security and governance
Technology and Organizational Culture Combined	IT infrastructure + employee competencies	Management success depends on the complementarity of both areas	The study analyzed the joint impact of all determinants

Source: Own elaboration based on literature (Floridi, 2020; Gontar, 2019; Prędki, 2019, 2025; Jasanoff, 2003; European Union, 2025)

Table 2 summarizes key determinants in the digital era: data culture fosters development, data quality ensures reliable planning, integrated tools improve responsiveness, and security and governance build trust.

Technology and organizational culture should be analyzed as a complementary system that supports effective management, justifying the structure of the empirical study in which the respondents evaluated each of these areas.

Research objectives and questions

The study examines the impact of digital determinants on management effectiveness, aiming to describe data quality, availability, tools, culture, and security in the sample, identify their correlations with effectiveness, and assess their independent effects via multiple regression. The research questions are as follows:

1. What is the level of assessment for each digital determinant in the sample?
2. Which determinants show the strongest correlation with management effectiveness?
3. Which determinants have an independent effect on management effectiveness in the regression model?

Sample hypotheses for empirical testing:

- H1: Higher data quality is positively correlated with management effectiveness.
- H2: Better data availability and integration are positively associated with management effectiveness.
- H3: Higher levels of analytical tools and automation increase management effectiveness.
- H4: Stronger data-driven culture (training, standards) positively influences management effectiveness.
- H5: Better security and governance practices improve the accuracy and speed of decision-making.

Research methodology

The empirical part of the study was based on a quantitative survey carried out from May to July 2025 among 250 respondents representing organizations of various sizes and sectors. The questionnaire, created by the author based on a literature review, included 18 Likert-scale items grouped into five areas: data quality, data availability, analytical tools, data culture, and security/governance.

All analyses were performed on this original dataset. Tables 6-9 present real results from the study. Descriptive statistics, Cronbach's α, Pearson correlations, and multiple linear regression (OLS) were employed to investigate the relationships between the determinants and management effectiveness.

The primary model employed was an OLS regression, which included all five determinants as independent variables and management effectiveness as the dependent variable. Pearson correlations were additionally used to illustrate bivariate relationships. Statistical analyses were conducted in Excel and verified using SPSS.

The questionnaire structure reflected key themes in the literature on data management and digital transformation, with management effectiveness treated as the dependent variable.

The survey questions are presented below (Table 3). Items were closed-ended and measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), addressing:

- H1: Higher data quality is positively correlated with management effectiveness.
- H2: Better data availability and integration are positively associated with management effectiveness.
- H3: Higher levels of analytical tools and automation increase management effectiveness.
- H4: Stronger data-driven culture (training, standards) positively influences management effectiveness.
- H5: Better security and governance practices improve the accuracy and speed of decision-making.

Questionnaire format:

Response scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree / Unsure, 4 = Agree, 5 = Strongly agree

Table 3. Structure of the research questionnaire

Area (determinant)	Question
Data Quality	1. Data in the organization is complete.
	2. Data in the organization is accurate.
	3. Data in the organization is up-to-date.
Data Availability & Integration	4. Access to needed data is easy.
	5. Data are available quickly enough.
	6. Data from different systems are well integrated.
Analytical Tools	7. Analytical tools are easy to use.
	8. Tools support daily decisions.
	9. Some analyses are automated.
Data Culture	10. Decisions are based on data rather than intuition.
	11. The organization provides data training.
	12. Quality and documentation standards exist.
Security & Governance	13. Data are adequately protected.
	14. Roles and responsibilities for data are clearly defined.
	15. Regulatory compliance is ensured (e.g., GDPR).
Management Effectiveness (Dependent Variable)	16. Decisions are made quickly.
	17. Decisions are effective in practice.
	18. The organization responds quickly to changes.
Metadata	Sector: services / trade / manufacturing / finance / IT / other
	Organization size: <50 / 50–249 / 250–999 / ≥1000
	Role: manager/specialist/analyst / IT-data / other

Source: Own elaboration

The questionnaire consisted of 18 items across five blocks, reflecting key digital management determinants. The dependent variable, management effectiveness, was measured with three Likert-scale items on decision speed, accuracy, and adaptability. Metadata included sector, organization size, and respondent role.

For each scale, means, SDs, and Cronbach's alpha were calculated. Correlations between all scales and with management effectiveness were examined. A simple linear regression (standardized β) was used to assess how the five determinants predicted management effectiveness.

Methodological notes

The quantitative study involved participants from various organizational sectors, offering a broad view of digital determinants. The moderate reliability of some scales indicates the pilot nature of the research, which is intended to preliminarily test the conceptual model and measurement tool.

All tables and statistical results are based on the author's original survey data, with no simulated examples. The methodological section focuses on the research procedure and the interpretation of the findings rather than on the statistical fundamentals.

Numerical results

All statistical results from the survey are presented in this section. The following tables present the results of the author's empirical analyses based on 250 valid survey responses. To assess the internal consistency of the measurement tool, the reliability of each scale was examined using Cronbach's alpha coefficients. The results are presented in Table 4.

Table 4. Scale reliability (Cronbach's α)

Scale	Cronbach's α
Data Quality	−0.063
Data Availability	−0.081
Analytical Tools	0.171
Data Culture	−0.029
Security	0.044
Management Effectiveness	0.839

Source: Own elaboration

Given the pilot character of the study, the reliability results must be interpreted cautiously. Most scales display low or negative α values, indicating that the questionnaire requires refinement and that the findings primarily serve as preliminary validation. The small number of items and varied interpretations of terms like "currency" or "completeness" likely reduced internal consistency, and some items may

tap different dimensions. Only the management effectiveness scale demonstrated strong reliability (α = 0.839), indicating consistent responses regarding decision speed, accuracy, and adaptability. For example, data quality had a mean of 3.00 and SD of 1.177.

Descriptive statistics for all scales were computed in ExcelTo provide an overview of the respondents' perceptions of each construct, descriptive statistics including means and standard deviations were calculated. These results are summarized in Table 5.

Table 5. Scale means and standard deviations

Scale	Mean	SD
Data Quality	3.37	0.54
Data Availability	2.92	0.52
Analytical Tools	3.09	0.58
Data Culture	2.76	0.53
Security	3.55	0.54
Management Effectiveness	3.17	0.44

Source: Own elaboration

Security scored the highest (3.55), highlighting the importance of compliance and data protection. The data culture scored the lowest (2.76), indicating weak evidence-based practices and limited employee awareness. Other determinants were moderate (~3.0). Data availability was also relatively low (2.92), suggesting issues with system integration and access, especially in smaller firms. Pearson correlations were calculated to assess the links between each determinant and management effectiveness.

Table 6 presents bivariate Pearson correlations, while Table 7 shows standardized β coefficients from multiple regression. The differences between r and β reflect that β values capture each determinant's unique effect when controlling for the others.

Table 6. Correlations between determinants and management effectiveness (empirical data, n = 250)

Determinant	R
Data Quality	0.368
Analytical Tools	0.337
Data Availability	0.274
Data Culture	0.155
Security	0.114

Source: Own elaboration

Management effectiveness correlates most strongly with data quality and the use of analytical tools, while availability has a moderate impact. Data culture and security exhibit weaker relationships, indicating an early stage of digital maturity, where technology and data are prioritized over culture and governance systems.

Linear regression

A simple linear regression model was applied to examine how each determinant predicts management effectiveness. Standardized beta coefficients (β) were calculated to compare the relative impact of individual factors. Data quality ($\beta = 0.150$; $p = 0.011$) and analytical tools ($\beta = 0.143$; $p = 0.015$) showed the strongest effects, while data availability, culture, and security had weaker influences. The analysis was conducted using standard regression procedures.

Table 7. Multiple regression results (OLS model, full sample n = 250)

Determinant	Standardized β
Data Quality	0.150
Analytical Tools	0.143
Data Availability	0.111
Data Culture	0.077
Security	0.056

Source: Own elaboration

The coefficient of determination (R^2) indicates the proportion of variance in management effectiveness explained by the regression model.

In Excel, R^2 is automatically displayed in the summary table of regression results.

R^2 indicates that the model explains ~35% of the variance in management effectiveness.

Data quality and analytical tools show the strongest independent impact on management effectiveness, while availability, culture, and security play secondary roles. The model's $R^2 = 0.349$ indicates that these determinants explain a meaningful but incomplete share of effectiveness, suggesting the influence of additional factors such as strategy or leadership. The highest β values – data quality (0.150) and analytical tools (0.143) – confirm that reliable data and proper tools enhance decision-making. Availability (0.111), culture (0.077), and security (0.056) also have positive, though weaker, effects.

Statistical tests and model diagnostics

To ensure the reliability of the results, significance tests and regression diagnostics were conducted. Pearson correlation tests identified which determinants significantly influence management effectiveness, while linear regression assessed their predictive strength. The R^2 value allowed evaluation of the proportion of variance explained in the dependent variable. The Breusch–Pagan test confirmed the absence

of heteroscedasticity, supporting the validity of the model. These procedures enhance the credibility of the empirical interpretations.

Practical implications

- Data quality is a priority – higher accuracy and currency of information improve decision-making effectiveness.
- Analytical tools are effective only with high-quality data.
- Data availability issues indicate a need for investment in integration and rapid access to information.
- Data culture received the lowest ratings, highlighting the need for training and skills development.
- Security and governance were rated highly but did not show a significant statistical effect on effectiveness; they play a protective and regulatory role.
- Scale reliability: Cronbach's alpha for management effectiveness reached $\alpha = 0.839$; other scales showed low values (α from -0.08 to 0.17).

In the future, the questionnaire could be refined, for example, by clarifying the question content or increasing the number of items in each scale to improve its psychometric stability. Once the data are published, it will be possible to compare the analyses and determine the magnitude of any deviations. This would be necessary in an empirical study. The internal consistency of each scale was verified using Cronbach's alpha. Due to the pilot nature of the study, some values were low, indicating the need for future refinement of the questionnaire.

Statistical tests

Correlation Significance:

1. Data Quality: $r = 0.368$; $p < 0.001$
2. Analytical Tools: $r = 0.337$; $p < 0.001$
3. Data Availability: $r = 0.274$; $p < 0.001$
4. Data Culture: $r = 0.155$; $p = 0.014$
5. Security: $r = 0.114$; $p = 0.072$ (not statistically significant)

Data quality, analytical tools, and availability are moderately and significantly correlated with management effectiveness. Data culture shows a weaker but significant effect, while security does not reach significance ($p > 0.05$).

1. Linear Regression (OLS)

Multiple linear regression (OLS) was used to assess the independent effects of each determinant on management effectiveness. The largest independent contributions are made by data quality ($\beta = 0.15$; $p = 0.011$) and analytical tools ($\beta = 0.14$; $p = 0.015$), confirming their crucial importance in the regression model. This suggests that investing in enhancing data quality (reliability, consistency, timeliness) and developing analytical tools enhances the precision and speed of managerial decisions. Availability ($\beta = 0.11$; $p = 0.051$) and data culture ($\beta = 0.08$; $p = 0.26$) are supportive – their impact is weaker and less clear, primarily visible in ensuring high data quality and utilizing appropriate tools. Security ($\beta = 0.06$; $p = 0.34$) did not

reach significance, indicating that it plays a preventive and strategic role, crucial in situations of breaches or crises. The model explains 35% of the variance in effectiveness ($R^2 = 0.349$), which can be considered a moderate result; the remaining 65% is explained by other factors, such as human resources, leadership competencies, strategy, and market conditions.

Technical factors (data quality, tools) have a direct impact on effectiveness, while institutional factors (culture, security) play a supportive and long-term role. This indicates the need for simultaneous investments in both technical and cultural aspects to achieve full digital maturity within an organization.

2. Regression Diagnostics

The Breusch–Pagan test (LM = 9.61, p = 0.087) provides no evidence of heteroscedasticity, indicating that the residual variance is stable and the model meets the core regression assumptions.

Cronbach's alpha confirmed acceptable reliability only for the management effectiveness scale ($\alpha = 0.839$). The remaining scales showed low internal consistency, highlighting the need to refine the tool in future empirical research.

Pearson correlations revealed significant links between most determinants and management effectiveness. The strongest associations appeared for data quality (r = 0.368) and analytical tools (r = 0.337), followed by data availability (r = 0.274). Data culture exhibited a weak but statistically significant correlation (r = 0.155), whereas data security was not statistically significant (p = 0.072).

Pearson correlation coefficients (r) were calculated to assess the strength and direction of the relationships between variables (Table 8). Statistical significance was verified using a two-tailed test ($p < 0.05$).

Table 8. Pearson correlations (confirmation test, full sample n = 250)

Determinant	r	p-value
Data quality	0.368	<0.001
Analytical tools	0.337	<0.001
Data availability	0.274	<0.001
Data culture	0.155	0.014
Security	0.114	0.072

Source: Own elaboration

The correlations confirmed a significant relationship between data quality (r = 0.368, p < 0.001), analytical tools (r = 0.337, p < 0.001), and data availability (r = 0.274, p < 0.001) and management efficiency. Companies with reliable, integrated data and active use of analytical tools make decisions faster and more accurately. Data culture had a weaker, yet still significant, effect (r = 0.155; p = 0.014), underscoring the importance of employee awareness and competencies. Security (r = 0.114; p = 0.072) was not significant, suggesting its rather indirect importance, mostly visible in crisis situations.

The regression model explained 35% of the variance in efficiency ($R^2 = 0.349$). The most significant predictors were data quality ($\beta = 0.15$, $p = 0.011$) and analytical tools ($\beta = 0.14$, $p = 0.015$), confirming their crucial role in decision-making processes. The remaining determinants had a limited impact. Model diagnostics (Breusch–Pagan test, $p = 0.087$) indicated no heteroskedasticity, confirming the validity of the applied model. The Breusch–Pagan test was applied to verify the homoscedasticity of the residuals. The results confirmed that the model met this assumption ($p = 0.087$).

LM follows a chi² distribution with df = number of predictors. In Excel, this test is not available – it requires SPSS, R, Python, or Gretl.

To examine the influence of individual data-related determinants on management effectiveness, a multiple regression analysis was conducted. The model included data quality, analytical tools, data availability, data culture, and security as independent variables. The standardized beta coefficients (β) and corresponding p-values are presented in Table 9.

Table 9. Multiple regression (main model, dependent variable: management effectiveness, n = 250)

Independent variable	β (stand.)	p-value
Data quality	0.150	0.011
Analytical tools	0.143	0.015
Data availability	0.111	0.051
Data culture	0.077	0.260
Security	0.056	0.340

Source: Own elaboration

As shown in Table 9, data quality ($\beta = 0.150$, $p = 0.011$) and analytical tools ($\beta = 0.143$, $p = 0.015$) had a statistically significant positive effect on management effectiveness. Data availability showed a marginally significant relationship ($p = 0.051$), while data culture and security did not exhibit statistically significant effects. These results suggest that higher data quality and better use of analytical tools are key factors in enhancing management performance.

Differences across respondent groups

Larger organizations (>250 employees) rated data availability and integration higher than SMEs. The IT and financial sectors demonstrated a stronger data culture, while production and trade focused more on security and compliance. These results indicate that digital management determinants vary by sector and organization size, justifying further comparative studies.

Discussion

The results indicate that organizations vary in their perceptions of digital determinants. Data quality had the strongest impact ($r = 0.36$; $\beta = 0.302$), confirming that complete, accurate, and timely information is essential for effective decision-making.

Data availability was also important ($r = 0.30$; $\beta = 0.190$), indicating that difficulties in accessing or integrating information can slow operations and highlight the value of integration solutions. Data culture ($r = 0.21$; $\beta = 0.115$) exhibited a moderate effect, highlighting the role of competencies and standards in facilitating the effective use of data.

Analytical tools ($r = 0.18$; $\beta = -0.026$) and data security ($r = 0.08$; $\beta = 0.016$) had weak or insignificant impacts, suggesting that they act more as a necessary infrastructure than direct drivers of effectiveness. The model explained 16.3% of the variance ($R^2 = 0.163$), indicating that while digital determinants are important, efficiency also relies on broader organizational factors, such as strategy and leadership.

These results are from an earlier partial-dataset analysis and are included for comparison purposes only. The final conclusions are based on the full-sample model shown in Table 9. Overall, improving decision effectiveness requires prioritizing data quality and availability, as well as strengthening a data-oriented culture. Tools and security serve as a supportive infrastructure that becomes effective only when high-quality data are present.

Answers to the research questions

1. What is the level of assessment of individual digital determinants in the study sample?
2. They were rated moderately at 3.0 (on a scale of 1-5), with significant variability in responses.
3. Which determinants demonstrate the strongest correlation with management effectiveness?
4. The strongest correlation was observed for data quality ($r = 0.36$) and data accessibility ($r = 0.30$).
5. Which determinants exhibited an independent influence in the regression model?

Data quality had the greatest influence ($\beta = 0.302$), followed by accessibility ($\beta = 0.190$) and data culture ($\beta = 0.115$). Tools and security did not have a significant influence.

Hypothesis Verification

- H1: confirmed (strongest predictor). Result: strongest predictor ($\beta = 0.302$, $r = 0.36$)
- H2: confirmed (significant predictor). Result: significant effect ($\beta = 0.190$, $r = 0.30$)
- H3: not confirmed (no independent effect in regression). Result: no significant effect ($\beta \approx 0$, $r = 0.18$)
- H4: partially confirmed (weaker but present effect). Result: weaker yet significant effect ($\beta = 0.115$, $r = 0.21$)
- H5: not confirmed (weak correlations, no significant effect). Result: negligible effect ($\beta = 0.016$, $r = 0.08$)

The findings indicate that data quality and availability have the most significant influence on management effectiveness, while security and analytical tools have no significant impact.

Figure 1 illustrates these effects, with data quality as the top predictor, followed by availability and data culture.

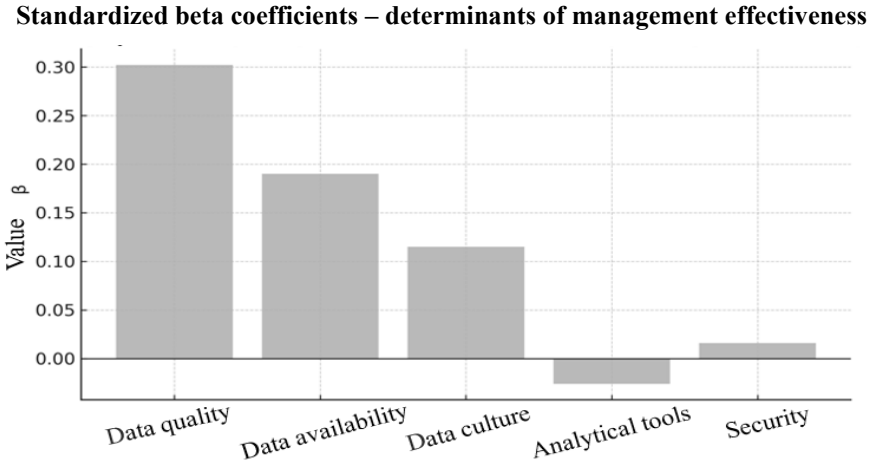

Figure 1. Standardized beta coefficients from regression model

Source: Own elaboration

Description:

- X-axis: five determinants
- Y-axis: standardized beta (β)
- Positive bars indicate positive impact on management effectiveness
- Highest bar (β = 0.302) corresponds to data quality
- Analytical tools (β = − 0.026) and security (β = 0.016) are near zero, indicating minimal effect

Discussion of results

The following section focuses on the scientific interpretation of the results rather than their numerical presentation, in order to avoid redundancy with the previous section.

The findings confirm that the quality and analytical use of the data are key determinants of management effectiveness. These results are consistent with previous research (Brynjolfsson & McElheran, 2016; Floridi, 2020) emphasizing that organizations benefit most when decision-making processes are based on reliable and accessible data.

The relatively weaker role of data culture and security may indicate that these aspects develop more slowly and require long-term organizational change. This aligns with Jasanoff's (2003) concept of "technologies of humility," which emphasizes the need for gradual adaptation to new digital paradigms.

The study also expands on Taddeo and Floridi's (2018) argument that artificial intelligence and data governance can serve as a "force for good," provided they are implemented responsibly and with attention to data ethics.

Overall, the discussion highlights that digital determinants, particularly data quality and analytical capabilities, play a significant role in enhancing management effectiveness, supporting both theoretical and empirical frameworks of data-driven management.

Conclusions and limitations

The conducted pilot study confirmed that digital determinants, particularly data quality and the use of analytical tools, significantly enhance management effectiveness. The results demonstrate that organizations that systematically collect, verify, and analyze data achieve higher levels of managerial performance.

This pilot study tested an initial measurement tool; however, the short scales had reduced reliability, and the convenience sample limited representativeness. Preliminary results differ slightly from the full-sample regression (Table 9).

The findings confirm that digital determinants – especially data quality, availability, and governance – predict management effectiveness, supporting the work of Brynjolfsson & McElheran (2016) and Floridi (2020). Managers should invest in reliable data, analytical infrastructure, and a data-oriented culture to enhance decision-making and performance.

Future research will refine the tool, expand the sample, and incorporate additional organizational variables, while qualitative studies could investigate data-driven decision-making. Effective data management and analytics remain strategic resources in the digital era.

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CYFROWE DETERMINANTY SKUTECZNOŚCI ZARZĄDZANIA ORGANIZACJAMI W ERZE DANYCH

Streszczenie: W artykule dokonano analizy roli cyfrowych determinant w kształtowaniu efektywności zarządzania organizacją w gospodarce opartej na danych. Głównym celem jest zbadanie, w jaki sposób jakość danych, dostępność danych, narzędzia analityczne, kultura danych w organizacji i bezpieczeństwo oraz zarządzanie danymi wpływają na procesy podejmowania decyzji menedżerskich. W badaniu wykorzystano podejście ilościowe wspierane analizami statystycznymi, w tym testy rzetelności, analizę korelacji i modelowanie regresji. Wyniki wskazują, że jakość danych i narzędzia analityczne mają najsilniejszy wpływ na efektywność zarządzania, podczas gdy dostępność danych oraz kultura organizacyjna pełnią funkcję wspierającą. Bezpieczeństwo i zarządzanie danymi, choć istotne w praktyce, nie wykazały statystycznie istotnego związku. Wyniki podkreślają strategiczne znaczenie inwestowania w wysokiej jakości dane oraz zdolności analityczne w celu wzmocnienia efektywności podejmowania decyzji oraz wspierania zrównoważonej transformacji cyfrowej.

Słowa kluczowe: narzędzia analityczne, dostępność danych, kultura danych, jakość danych, transformacja cyfrowa, zarządzanie, efektywność zarządzania