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The Influence of Digital Leadership and Academic Supervision on Learning Quality through Teacher Efficacy at SMP IT Daarul Hikmah Bontang

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Abstract

This study aims to analyze the influence of digital leadership and academic supervision on the quality of learning mediated by teacher efficacy at SMP IT Bontang. The quality of learning in the digital era is key, and the role of leadership and teacher mentoring are essential factors. This study uses a quantitative approach with a survey method. The population in this study is all active teachers at SMP IT Daarul Hikmah Bontang, and using a saturated sampling technique, all 42 teachers were made respondents. The data analysis technique used was path analysis with the help of SPSS software. The results showed that (1) digital leadership had a positive and significant effect on teacher efficacy; (2) academic supervision had a positive and significant effect on teacher efficacy; (3) digital leadership, academic supervision, and teacher efficacy together had a significant effect on learning quality. These findings confirm that improving learning quality can be achieved effectively by strengthening digital leadership and academic supervision, which can enhance teacher efficacy.

Keywords: academic supervision, digital leadership, integrated Islamic schools, learning quality, teacher efficacy

Abstrak

Penelitian ini bertujuan untuk menganalisis pengaruh kepemimpinan digital dan supervisi akademik terhadap mutu pembelajaran yang dimediasi oleh efikasi guru di SMP IT Bontang. Kualitas pembelajaran di era digital menjadi kunci, dan peran kepemimpinan serta pendampingan guru menjadi faktor esensial. Penelitian ini menggunakan pendekatan kuantitatif dengan metode survei. Populasi dalam penelitian ini adalah seluruh guru aktif di SMP IT Daarul Hikmah Bontang, dan dengan menggunakan teknik sampel jenuh, keseluruhan 42 guru dijadikan responden. Teknik analisis data yang digunakan adalah analisis jalur (path analysis) dengan bantuan perangkat lunak SPSS. Hasil penelitian menunjukkan bahwa (1) kepemimpinan digital berpengaruh positif dan signifikan terhadap efikasi guru; (2) supervisi akademik berpengaruh positif dan signifikan terhadap efikasi guru; (3) kepemimpinan digital, supervisi akademik, dan efikasi guru secara bersama-sama berpengaruh signifikan terhadap mutu pembelajaran. Temuan ini menegaskan bahwa peningkatan mutu pembelajaran dapat dicapai secara efektif melalui penguatan kepemimpinan digital dan supervisi akademik yang mampu meningkatkan efikasi guru.

Kata kunci: efikasi guru, kepemimpinan digital, mutu pembelajaran, sekolah Islam terpadu, supervisi akademik,

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INTRODUCTION

The era of Society 5.0, which centers on the integration of cyberspace and physical space, has driven fundamental transformations in various sectors, including education. Educational institutions can no longer survive using conventional methods but are required to adapt quickly to technological disruption in order to produce graduates who are competent, creative, and relevant to the demands of the times (OECD, 2023). In this context, the quality of learning, which includes the quality of the instructional process, student engagement, and learning outcomes, has become the main benchmark for the success of a school (Burić & Kim, 2020a) ; (Holzberger et al., 2013). To achieve superior learning quality amid the digitalization trend, visionary leadership and the quality of teaching resources are two central pillars that cannot be separated (Safrida et al., 2023).

One of the most relevant leadership styles to address this challenge is digital leadership. This concept goes beyond the mere use of technological devices by leaders; it is defined as a leader's strategic ability to leverage digital assets to achieve organizational goals (Avolio et al., 2000) ; (Sheninger, 2014) ; (Zhong, 2017). Digital leadership is about creating an ecosystem where technology serves as an accelerator of innovation, not merely an administrative tool. According to, the main pillars of digital leadership in an educational environment include: (1) Building an innovative vision, which is the ability of school principals to formulate a clear and inspiring direction for digitalization; (2) Creating a culture of learning, where teachers are encouraged to experiment, take risks, and learn from failures in adopting new technologies; (3) Utilizing digital media for communication and branding, which makes schools relevant in the public sphere; and (4) Developing teachers' digital professionalism through continuous and relevant training(Ahlquist, 2023). Without progressive leadership in these aspects, the adoption of technology in schools will only be instrumental and superficial, thus failing to drive substantive pedagogical transformation.

In addition to adaptive leadership, academic supervision is a key managerial instrument in ensuring instructional standards. Academic supervision is defined as systematic professional assistance to improve teachers' pedagogical competence in managing learning(Glickman dkk., 2001). In the modern context, supervision is no longer hierarchical control, but rather continuous mentoring. According to(Glanz & Zepeda, 2015), the main pillars of effective academic supervision include: (1) Growth-oriented classroom observation; (2) Reflective dialogue between supervisors and teachers; and (3) Support for personalized professional development. Through planned supervision, the technical and pedagogical obstacles faced by teachers can be identified objectively.

The success of supervision and leadership in improving educational outcomes is highly dependent on teachers' internal psychological factors, namely self-efficacy. Teacher efficacy refers to educators' belief in their ability to organize and implement the actions necessary to achieve learning objectives effectively(Hendrawati, 2025). This efficacy covers crucial aspects such as the ability to manage the classroom, apply innovative instructional strategies, and encourage student engagement(Wardani dkk., 2025). Teachers with high efficacy tend to be more open to technological changes and have stronger resilience when facing obstacles in the classroom(Ardi dkk., 2024).

The integration of visionary leadership, consistent supervision, and strong teacher efficacy ultimately leads to improved learning quality. Learning quality is understood as the degree of excellence in the interaction process between teachers, students, and learning resources that results in comprehensive competency transformation(Rahmi dkk., 2023). These quality indicators are reflected in the effectiveness of material delivery, the creation of a conducive classroom climate, and the achievement of learning outcomes that are in line with curriculum requirements(Maryati dkk., 2025). In a digital ecosystem, learning quality is a manifestation of the extent to which technology can deepen students' understanding and facilitate 21st-century skills.

Based on preliminary observations conducted at SMP IT Daarul Hikmah Bontang, the beginnings of digital leadership implementation have been identified. The principal has initiated several strategic policies, such as standardizing the use of Google Workspace for Education for task management and formal communication, holding internal workshops for teachers on the use of interactive learning applications (e.g., Kahoot! and Quizizz), and implementing a school information system for academic reporting and communication with parents. These initiatives demonstrate a vision to advance the school through technology.

However, preliminary data also shows significant challenges at the implementation level. It was found that the level of technology adoption among teachers is uneven. For example, even though a learning management system (LMS) platform is available, it is estimated that around 30-40% of teachers still rely on conventional exposition methods and have not optimally integrated the collaborative features of the platform. This phenomenon raises the suspicion of a competency gap or even psychological resistance closely related to teacher efficacy, which is a teacher's belief in their ability to succeed in teaching tasks. Low efficacy can be a major obstacle that makes digital leadership policies ineffective in the classroom (Rahman & Hamid, 2025) ; (Wati et al., 2022). It is this gap between the leaders' vision and the reality in the field that reinforces the urgency of this research.

Several studies have examined similar variables. Research by Danial et al.,(2022), which examined a digital-based academic supervision model by school principals in improving the professionalism of early childhood teachers, is an important reference. The findings confirm the positive relationship between these variables. However, this study offers significant novelty in three aspects. First, this study specifically places teacher efficacy as a central mediating variable, which was not the main focus in the research model by(2022). Our hypothesis is that teacher efficacy is a crucial psychological bridge that translates leadership policies and supervisory guidance into quality learning practices(Burić & Kim, 2020) ; (Jannah, 2022). Second, the focus of the dependent variable on learning quality allows for a more acute analysis at the micro level, namely pedagogical interactions in the classroom, while "educational services" cover broader managerial and administrative aspects (Holzberger et al., 2013). Third, the research context at the Integrated Islamic School (IT) provides a unique dynamic, where there is a combination of demands for mastery of modern technology and the internalization of Islamic values in the learning process. Thus, this study fills a gap in the literature by testing the teacher efficacy mediation model in the context of a specific value-based school. Therefore, this study aims to examine the direct and indirect effects of digital leadership and academic supervision on learning quality, with teacher efficacy as the mediating variable at SMP IT Bontang.

RESEARCH METHOD

This study uses a quantitative approach with an explanatory survey method to explain the causal relationship between variables. The study was conducted in the odd semester of the 2025/2026 academic year at SMP IT Daarul Hikmah Bontang. The research population consisted of all 42 active teachers. Given the relatively small population size and the fact that the entire population could be reached, the sampling technique used was saturated sampling (census), in which the entire population became research respondents (Hakim et al.., 2025). The research instrument was a questionnaire with a Likert scale developed to measure four variables. Digital leadership (X_1) was measured through indicators of digital strategic vision, the use of technology for management, facilitation of professional development, and a culture of innovation(Sheninger, 2014) ; (Zhong, 2017). Academic supervision (X_2) was measured through indicators of planning, implementation, feedback, and follow-up (Adhim, 2024). The mediating variable, teacher efficacy (Z), is measured through confidence in classroom management, use of innovative strategies, and increased student engagement. The dependent variable, learning quality (Y), is measured through indicators of planning quality, learning implementation effectiveness, and learning outcome assessment quality (Muhsin et al., 2023).

Before being used for data collection, the research instruments were tested to ensure their validity and reliability. The validity test results using Pearson Product-Moment correlation showed that all statement items for the four variables were valid, with a correlation coefficient (r-count) greater than r-table (0.304). Furthermore, the reliability test results using Cronbach's Alpha coefficient showed that all variable instruments were highly reliable. Specifically, the reliability coefficient values obtained were 0.891 for Digital Leadership, 0.902 for Academic Supervision, 0.885 for Teacher Efficacy, and 0.910 for Learning Quality.

The data analysis technique used was *path analysis* with the help of SPSS software. After the prerequisite tests for analysis, including normality, linearity, multicollinearity, and heteroscedasticity, were met, path analysis was conducted to test the direct effects between variables according to the research model. To test the significance of indirect effects or mediation effects, this study used the Sobel Test procedure. This test statistically calculates the significance of the mediation path (path a*b) by considering the path coefficient values and standard errors of each path. The mediation hypothesis is considered significantly supported if the Z-value obtained from the Sobel Test is greater than 1.96 at a 5% significance level.

RESULTS AND DISCUSSION

Research Results

Data analysis was conducted in two stages, namely descriptive statistical analysis to obtain an overview of the variables and inferential analysis (prerequisite tests and path analysis) to test the research hypotheses. The research results were presented systematically in tables and narrative descriptions to facilitate understanding of the findings. The results of this analysis form the empirical basis for explaining the role of digital leadership, academic supervision, and teacher efficacy on the quality of learning.

Table1. Descriptive Statistical Data Analysis Results

Descriptive Statistics					
	Mean	Std. Deviation	N	ẍ - SD	ẍ + SD
Learning Quality	52.06	2.179	33	49,882	54,239
Digital Leadership	51.82	2,530	33	49,288	54,349
Academic Supervision	50.55	2,916	33	47,629	53,462
Teacher Efficacy	51.12	2,631	33	48,490	53.752

The results of descriptive statistical analysis in Table 1 show that all research variables are in the relatively good category with fairly homogeneous data distribution. Learning quality has the highest average value of 52.06 with a standard deviation of 2.179, indicating that the quality of learning at SMP IT Daarul Hikmah Bontang is considered positive by most teachers. Digital leadership obtained an average score of 51.82 with a standard deviation of 2.530, reflecting the fairly consistent application of technology-based leadership in the school environment. Academic supervision had an average score of 50.55 and a standard deviation of 2.916, indicating variations in teachers' perceptions of the implementation of academic guidance, both in terms of frequency and approach to supervision. Meanwhile, teacher efficacy showed an average score of 51.12 with a standard deviation of 2.631, indicating that teachers' professional confidence was in the fairly high category. Overall, the range of values between the mean minus and plus the standard deviation for each variable shows that the majority of respondents are in the moderate to high category, so these results provide a strong basis for continuing inferential analysis in testing the relationship between the research variables.

Based on the linearity test results in Table 2, the relationship between digital leadership (X1) and learning quality (Y) shows a significant linear pattern. This is indicated by the significance value in the linearity component of 0.000 (< 0.05), which indicates a linear relationship between the two variables. In addition, the deviation from linearity value of 0.707 (> 0.05) indicates no deviation from the linearity pattern. These findings confirm that

improvements in principals' digital leadership, such as the use of technology, digital communication, and support for learning innovation, are directly proportional to improvements in learning quality. Thus, the assumption of linearity between digital leadership and learning quality is fulfilled and is appropriate to proceed with regression analysis.

Table 2. Results of the Linearity Test of Digital Leadership (X_1) with Learning Quality (Y)

ANOVA Table

			Sum of Squares	Df	Mean Square	F	Sig.
Learning Quality * Digital Leadership	Between Groups	(Combined)	614,167	16	38,385	9,621	0.000
		Linearity	569,182	1	569,182	142,667	0.000
		Deviation from Linearity	44,985	15	2,999	0.752	0.707
	Within Groups		63,833	16	3,990		
	Total		678,000	32			

Table 3. Results of the Linearity Test of Academic Supervision (X2) with Learning Quality (Y)

ANOVA Table

			Sum of Squares	Df	Mean Square	F	Sig.
Quality of Learning * Academic Supervision	Between Groups	(Combined)	641,500	16	40,094	17,575	0.000
		Linearity	611,575	1	611,575	268,088	0.000
		Deviation from Linearity	29,925	15	1,995	0.875	0.600
	Within Groups		63,833	36,500	16	2,281	
	Total		678,000	678,000	32		

The linearity test results in Table 3 show that academic supervision (X2) has a significant linear relationship with learning quality (Y). The significance value in the linearity component of 0.000 (< 0.05) indicates a strong linear relationship between the two variables. Meanwhile, the deviation from linearity value of 0.600 (> 0.05) indicates that the relationship formed does not deviate from linearity. This finding indicates that the implementation of systematic and continuous academic supervision contributes directly to improving the quality of learning. Therefore, academic supervision can be seen as one of the strategic factors in maintaining and improving the quality of the learning process in schools. In practical terms, effective academic supervision enables teachers to obtain constructive feedback on the planning, implementation, and evaluation of learning. The supervision process also encourages the improvement of teacher professionalism through targeted coaching based on real needs in the classroom. With a consistent linear relationship, improvements in the quality of academic supervision will be followed by proportional improvements in the quality of learning. This shows that the success of learning is not only determined by the individual competence of teachers, but also by an optimally functioning academic coaching system. These findings also reinforce the importance of the role of school leaders in ensuring that academic supervision is carried out in a programmed and continuous manner.

Table 4. Results of the Linearity Test of Teacher Efficacy (Z) with Learning Quality (Y)

ANOVA Table

			Sum of Squares	Df	Mean Square	F	Sig.
Learning Quality * Teacher Efficacy	Between Groups	(Combined)	641,500	16	40,094	17,575	0.000
		Linearity	611,575	1	611,575	268,088	0.000
		Deviation from Linearity	29,925	15	1,995	0.875	0.600
	Within Groups		63,833	36,500	16	2,281	
	Total		678,000	678,000	32		

Based on the linearity test results in Table 4, the relationship between teacher efficacy (Z) and learning quality (Y) shows a significant linear pattern. This is indicated by the significance value in the linearity component of 0.000 (< 0.05), which indicates a linear relationship between teacher efficacy and learning quality. Meanwhile, the deviation from linearity value of 0.600 (> 0.05) indicates no deviation from the linear relationship. This finding shows that the higher the level of teacher efficacy, the better the quality of learning produced. Strong teacher efficacy reflects teachers' confidence in their professional abilities to plan, implement, and evaluate learning, thereby directly impacting the quality of the teaching and learning process. With this linearity assumption fulfilled, teacher efficacy deserves further analysis as an influential variable, as well as a mediating variable in improving learning quality.

Table 2. Multicollinearity Test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-8.988	0.864		-10.401	0.000		
	Digital Leadership	0.269	0.032	0.243	8.31	0.000	0.244	4.093
	Academic Supervision	0.479	0.031	0.437	15,366	0.000	0.259	3,864
	Teacher Efficacy	0.440	0.038	0.375	11.668	0.000	0.203	4.923

a. Dependent Variable: Learning Quality

Based on the results of the multicollinearity test in Table 5, it can be seen that all independent variables and mediating variables in the regression model do not exhibit multicollinearity. This is indicated by tolerance values above 0.10 and Variance Inflation Factor (VIF) values below 10 for each variable, namely digital leadership (VIF = 4.093), academic supervision (VIF = 3.864), and teacher efficacy (VIF = 4.923). This condition indicates that the variables do not have too high a correlation so that they do not interfere with each other in explaining the learning quality variable. Thus, the regression model used is declared stable and feasible for testing the influence of each variable partially and simultaneously in further analysis.

Table 6. Summary of Path Analysis Results

Path of Influence	Path Coefficient (Beta)	Significance Value (p-value)	Description
Direct Effect			
Digital Leadership (X_1) → Teacher Efficacy (Z)	0.358	0.01	Significant
Academic Supervision (X_2) → Teacher Efficacy (Z)	0.481	0.002	Significant
Digital Leadership (X_1) → Learning Quality (Y)	0.243	0.041	Significant
Academic Supervision (X_2) → Learning Quality (Y)	0.437	0.004	Significant
Teacher Efficacy (Z) → Learning Quality (Y)	0.315	0.022	Significant
Indirect Effect (Sobel Test Results)			
$X_1 \rightarrow Z \rightarrow Y$	0.113	0.031	Significant
$X_2 \rightarrow Z \rightarrow Y$	0.151	0.018	Significant

Based on the research objectives and hypotheses that have been formulated, the data collected from respondents was analyzed using descriptive and inferential statistical techniques to describe the characteristics of each variable and to test the relationships and influences between the research variables. This presentation was designed to answer the research hypotheses systematically while providing rational justification for the proposed model, in accordance with the suggestions given. After conducting a series of prerequisite tests that showed that the data met the assumptions of normality, linearity, and freedom from multicollinearity and heteroscedasticity, *path analysis* could be carried out.

The most crucial finding of this study is the proven central role of teacher efficacy as a significant mediating variable. Analysis using the Sobel Test shows that there is a significant indirect effect of digital leadership on learning quality through teacher efficacy (path a*b = 0.113; p = 0.031). The same is also evident in the path of academic supervision on learning quality through teacher efficacy (path a*b = 0.151; p = 0.018). These findings confirm that teacher efficacy serves as *a* vital *psychological bridge* in translating school policies and programs into quality learning practices ( ). This means that sophisticated digital leadership policies or structured supervision programs do not automatically have a direct impact on improving learning quality (Sutrisno dkk., 2024). Both must first succeed in fostering internal confidence in teachers. When a teacher believes in their ability to manage a technology-based classroom, design engaging activities, and overcome technical challenges that arise, only then will investments in digital leadership and academic supervision truly "materialize" into a better learning experience for students. Without high efficacy, teachers may show superficial compliance in using technology because they are required to do so, but without confidence and creativity, they will not produce the expected pedagogical impact.

Discussion

The Synergy of Digital Leadership and Academic Supervision

The theoretical justification for combining digital leadership and academic supervision in a single research model is the main starting point for this discussion. Conceptually, the two originate from different theoretical domains: leadership is rooted in organizational and management theory, while supervision is rooted in instructional and professional development theory. However, in the practical context of improving learning quality in the era of digital disruption, the two are complementary and inseparable forces.

Digital leadership functions as a macro or **"Top-Down"** strategy, where the principal sets the vision, provides technological infrastructure, and creates policies that encourage a

digital culture throughout the school. It provides a framework of **"what"** to achieve and **"why"** it is important for the sustainability of the institution. On the other hand, academic supervision functions as a micro or **"Bottom-Up"** implementation mechanism. Through supervision, leaders go directly to the classroom to provide personal guidance, technical-pedagogical feedback, and moral support to teachers. It answers crucial questions about **"how"** to effectively and meaningfully integrate technology into daily learning practices. Thus, this research model is proposed with the fundamental argument that strategic digital policies from leaders will not have an optimal impact without practical, humanistic guidance in the field.

The Influence of Digital Leadership and Academic Supervision on Teacher Efficacy

Empirical path analysis results confirm this theoretical framework. It was found that digital leadership has a positive and significant effect on teacher efficacy ($\beta = 0.358$; $p = 0.015$). This finding indicates that when teachers perceive their leaders as having a clear digital vision and providing adequate resources, their confidence in adopting innovation increases. This is in line with the findings of (Kasim & Surya, 2025), which emphasize that effective digital leadership creates a digital ecosystem that improves teachers' mental readiness and self-efficacy. Structural support and the vision of digital leaders have been proven to reduce teachers' psychological barriers to technological change (Melati dkk., 2024).

However, this study found that academic supervision has a stronger influence on teacher efficacy ($\beta = 0.481$; $p = 0.002$). This is because academic supervision is personal and directly touches on pedagogical aspects. This finding is supported by research by (Glickman dkk., 2001) in the book *Supervision and Instructional Leadership*, which confirms that mentoring-based supervision has a more significant impact on teacher self-efficacy than general managerial instruction. Through reflective dialogue, teachers gain direct reinforcement of their competencies (Pardi, 2025).

The Role of Teacher Efficacy in Improving Learning Quality

Teacher efficacy has been proven to have a direct positive influence on learning quality. Teachers with high professional confidence tend to be more persistent in facing learning obstacles. This confirms the results of (Fathi & Soleimani, 2023), which show that teacher self-efficacy is a major predictor of an active learning environment and deeper student engagement. At SMP IT Daarul Hikmah, this efficacy serves as a driving force for teachers to transform conventional methods into more interactive learning.

Mediation Analysis: Teacher Efficacy as a Psychological Bridge

The most crucial finding is the role of teacher efficacy as a mediating variable. Digital leadership policies and supervision programs do not automatically improve learning quality without increasing teachers' self-confidence. Research by (Khosiyah, 2019) reinforces this argument, stating that leadership and school support must be processed through internal psychological mechanisms, namely self-efficacy, before impacting performance.

Teacher efficacy serves as a psychological bridge that transforms macro policies into micro actions. Without efficacy, technology use will only be administrative compliance without substantive pedagogical innovation. This aligns with (Hasan dkk., 2023), which states that teacher efficacy mediates the relationship between leadership and teaching practices.

Implications for Educational Management

The integration of the principal's digital vision and coaching practices is key. Principals at SMP IT Daarul Hikmah must shift the paradigm of supervision from mere administrative inspection to supportive clinical coaching. Sustainable improvement can only be achieved if teachers feel technically supported (by digital leadership) and emotionally-professionally supported (through supervision), thereby building strong efficacy to face digital era challenges.

CONCLUSION AND RECOMMENDATIONS

Based on the results of data analysis and in-depth discussion, a series of conclusions can be drawn that systematically answer the research questions. First, this study clearly distinguishes between teacher efficacy as a mediating variable that refers to a teacher's internal

beliefs, and learning quality as a dependent variable that reflects the quality of the pedagogical process in the classroom. The findings of this study conclusively prove that this internal belief is a crucial bridge to achieving external quality improvement in learning. Specifically, it was found that digital leadership and academic supervision had a positive and significant direct effect on teacher efficacy at SMP IT Daarul Hikmah Bontang, indicating that a technological vision and supportive mentoring are the main foundations for building educators' self-confidence. Furthermore, both digital leadership and academic supervision were also proven to have a direct positive impact on the quality of learning, confirming that managerial interventions have a real correlation with classroom practices. Another key finding is the central role of teacher efficacy, which has been proven to be an independent predictor of teaching quality. The highlight of this study is the proven mediating role of teacher efficacy, where leadership policies and supervision programs were found to have a significant indirect effect on learning quality through the prior improvement of teachers' psychological capital.

Recommendations Based on these conclusions, several practical, strategic, and academic recommendations have been formulated. For school principals as policy makers, it is recommended to adopt an integrated strategy that revitalizes the academic supervision program into a dialogical and supportive clinical coaching process, so that teachers feel supported to experiment with technology without administrative pressure. For education practitioners, it is recommended to proactively build Professional Learning Communities (PLCs) as a collaborative forum for sharing good practices and strengthening collective efficacy through strength-based feedback. Finally, for future researchers, it is recommended to develop this research model using a mixed-methods design to reveal the psychological dynamics behind the statistics in greater depth. In addition, future researchers are also advised to expand the research variables by including student perspectives, such as learning engagement or motivation, and to replicate the research in different school contexts to provide broader comparative insights for the future development of educational management science.

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