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RESEARCH ARTICLE

Artificial Intelligence and the Evolution of Managerial Expertise in the Digital Age: How AI has Impacted Managerial Skills

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ABSTRACT

This empirical study revolves around managers using AI in their daily operations and decision-making. The aim was to understand how AI-driven recruitment, time management, and communication have helped their managerial skill improvement. 467 managers from different sectors participated in the survey, and structural equation Modelling was built. The result showed that AI-augmented recruitment, time management, and communication have enhanced managers' decision-making competency, therefore increasing how they plan, organize, or control things. The findings emphasize the importance of integrating AI into key managerial functions to improve both decision-making processes and organizational performance, offering practical insights for organizations looking to leverage AI for strategic advantage.

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INTRODUCTION

Since the 1990s, innovative progress has been possible only by changing the locus of decision power away from those with real control of knowledge to those with actual access to it. This change is done to overcome dichotomies between real and formal authority (Christie et al., 2003). The decision power locus has greatly changed since artificial intelligence (AI) was introduced in industrial and social environments. Being one of the most disruptive technologies (Păvăloaia & Necula, 2023), It has changed the pace of the fourth industrial revolution (Ray & Thomas, 2019) and continues to develop rapidly (Lu et al., 2018). The future of work design has changed (Giraud et al., 2021), and in this process, managerial skills are witnessing a major remoulding. AI has surely changed how decisions are made in modern organisations (Stone et al., 2020). Some studies have shown how AI might change managerial responsibilities and skills due to its integration into organisations. Still, more theoretical and empirical insights are needed on this topic. For instance, Huang and Rust's (2020) research was about the possibility that AI may replace some managerial skills. However, their research still needs to be done on managers. Also, Huang et al. (2020) suggested that managers change the structure of their roles to consider AI's ability to do cognitive and analytical tasks; however, their analysis was done at a high-level utilising secondary data. Deepa et al.'s (2024) study has given an interesting outline of how managers are now recruiting and what skills are needed. However, their study is also grossly based on human resource managers and thus can only be generalised for some. While these studies acknowledge that AI affects managerial competencies, they do not identify which skills are being enhanced. Hence, a gap in the current literature needs to be addressed, highlighting the potential impact of AI on managerial skills and the need for preparedness and adaptation.

Although AI is being used increasingly in business, less than 15% of current managers are said to use it in their everyday operations, while 40% of current business graduate students are learning to develop skills related to generative AI (Rosanni and Farri, 2024). Therein lies the mismatch between present-day managerial practices and future leaders' technological capabilities. Many of today´s executives, mostly millennials or older, understand too little about AI's technological capabilities and limitations. This lack of understanding hinders their ability to deploy it effectively in strategic decision-making or supporting operations, highlighting the need for continuous learning and adaptation in the digital age. When business graduate students proficient in advanced AI enter the workforce, they will find an environment that is not ready for their knowledge. Not only that, present studies on AI and organisational environment also explored very little about managers. Most of the researchers left the managerial perspective out while giving importance to aspects like Employee skill development (Malik et al., 2021; Cramarenco et al., 2023; Wang, 2023), organisational readiness (Jöhnk et al., 2021; Holmström, 2022), organisational ethics (Schiff et al., 2020; Mäntymäki et al., 2022). This study addresses this gap by exploring how AI is reshaping managerial expertise. Also, the studies that explored managerial decisions machining and AI have expressed their concern over bias (Papagiannidis et al., 2023), reluctance (Brink et al., 2024), lack of trust and transparency (Booyse & Scheepers, 2024) etc. These dimensions have restricted many organisations from adopting a completely AI-based managerial decision-making culture. However, Hradecky et al. (2022) argue that the hesitation stems from a lack of understanding of how AI-based decisions can enhance managers' skills over time. Organizations are hesitant to adopt AI more fully without clearly understanding which managerial skills can be improved by AI-augmented decision-making. Over time, different classifications of managerial skills have evolved. Fayol (1916) classified managerial skills into planning, organising and controlling. This research addresses these different managerial skill categories and determines whether different dimensions of managerial operations, such as AI-augmented recruitment, AI-augmented time management and AI-augmented communication (Giraud et al., 2021), have affected these skill dimensions. This study proposes that AI-augmented settings have enhanced managerial decision-making areas, further affecting managers' planning, organisation and controlling abilities.

LITERATURE REVIEW

Planning skills

Planning skill is the first and foremost managerial skill that Fayol (1916) categorised. It is all about defining the goals of an organisation and operation strategies based on those. This managerial skill involves setting objectives and establishing their or their staff's actions to realise organisational goals. It allows managers to estimate future needs, allocate resources properly and define timelines for goal achievement. Historically, planning has been a manual and strategic process that should have deep knowledge of internal and external conditions in which the business operates (Mintzberg 1973). AI tools enable managers to process large amounts of data and draw correlation predictions with higher accuracy. The plans are mostly informed nowadays, and the reason behind this is the data. For instance, AI-driven predictive analytics enables managers to forecast market trends, customer requirements, and operational demands based on information, allowing managers to make decisions. AI also allows scenario analysis and resource optimisation to plan for more agile and adaptable scenarios. Overall, modern-day resource and operation planning has become data-driven. The priority is to make quicker and more accurate decisions. Therefore, it becomes necessary to investigate whether AI-augmented decisions can improve the planning skills of managers.

Organising skills

Fayol (1916) has suggested that organising skills are another dimension of managerial competency. Organising is a management function associated with arranging, structuring, and integrating resources. Once the planning is done, managers need to allocate and arrange resources. This resource organising includes operations tasks, assigning responsibilities, and creating a workflow that ensures smooth operations. As AI continues to pick up, the organisation has progressed from purely manually curated to automated resource planning. By examining how various organisational strategies will pan out, AI systems can help managers predict the result of building certain team structures, adjusting workflow processes and optimising resource allocations. For instance, some industries

have already implemented AI task management systems (Tyagi et al., 2020). This AI-based task management system requires very little managerial intervention, which can help managers assign more efficient tasks according to individual skills and availability. This arrangement also happens in a very short period, thus increasing productivity. Upon the arrival of AI-augmented decision-making,

Controlling skills

Fayol (1916) identified that controlling skills is a management competency associated with monitoring performance, comparing it with goals, and taking corrective action as needed. A manager must control the planned process to ensure it meets the requirements. This role allows managers to determine when and how a plan is going off track, how to manage risk better, and what must be modified for an organisation to remain on course (Fayol, 1916). Controlling activities is establishing performance standards and measuring actual performance against them. Jukka & Pellinen (2020) mentioned that this goal-oriented function allows for measuring activity dimensions. It measures how actual performance deviates from standards and whether there is a need for additional activities. Therefore, controlling operations becomes essential as the successful completion of activities depends on this managerial skill. Nowadays, AI controls organisations. By adapting to changes as they happen, AI systems can automatically collect and process performance data instantly. This enabled managers to make better decisions quickly. AI, for example, can identify deviations from planned to actual KPIs, enabling managers to respond faster to the initial signals within manufacturing industries (Castañé et al., 2023). The more AI is integrated into this process, the more accurate and quick decision-making happens. When decisions are taken quickly, controlling can happen much more smoothly. Therefore, an investigation is necessary to find whether AI-augmented decisions have enhanced managerial controlling skills even more accurately.

Enhanced managerial decision-making ability

Managerial decisions influence an organisation's direction, efficiency, and success (Zhao, 2022). The effectiveness of a manager's decision-making ability directly impacts an organisation's ability to adapt, grow, and compete. Previously, these decisions were taken based on skills and experiences. However, AI has changed how new managers make decisions. Decision-making based on human judgment has shifted to data-driven insights powered by artificial intelligence (Tabesh, 2022). AI was already a solution-based tool that helped managers increase productivity; however, recently, organisations have started implementing this into managerial discretion (Zhao, 2022). For instance, Deep Knowledge, a Hong Kong venture capital firm, recently added VITAL, a decision-making algorithm, to its board (Nelson, 2019). Amazon has also created an automated warehouse-worker tracking system that supervises worker efficiency (Bort, 2019). Zhao (2022) The study identified that AI supports three business needs: automation of business processes, presenting insights from data, and customer engagement. In a managerial context, AI-based automation can be associated with faster communication through automated mail delivery, feedback, and scheduling, reducing managers' time for routine tasks.

Similarly, human resource managers have used insights from data to shortlist candidates for future recruitment (Aydın & Turan, 2023). Therefore, AI-based enhanced decision-making in business can be due to AI-augmented time management, recruitment and communications. Zhao (2022) the study has already stated that AI needs to be treated as an assistant to managers with low or no autonomy at the lowest level. The AI-augmented support in recruitment, time management, and communication is an AI-based assistance with no autonomy that can deliver this enhanced managerial decision-making ability.

AI-augmented recruitment and decision-making

Recruitment is a vital managerial function that affects organisational performance by defining staff quality. Traditionally, managers had to review many resumes, conduct several interviews, and evaluate individuals based on abilities, experience, and cultural fit, which took time and resources (Breaugh, 2008). However, with AI, recruitment procedures have shifted to data-driven and automated decision-making, improving efficiency and accuracy (Albassam, 2023). Studies have shown that AI-based resume screening is a trending resource selection area (Cai et al., 2024). Literature also suggests that AI is increasingly used to conduct pre-employment assessments (Oberst

et al., 2021. This assessment mainly focuses on the applicant's technical skills, cognitive abilities, and personality traits. Wright & Atkinson (2019) suggested that AI only partially automates recruitment; however, it has the potential to do this completely. Although there is still a bias issue, managers' decision-making is now influenced by decision-making that screens, analyses, and selects candidates (Albassam, 2023). Ai-augmented solutions provide data-rich environments where judgements are based on objective criteria, not interview impressions. The consistent data-driven insights given by AI certainly help these managers make quick decisions without a manual selection process. These decisions, in return, influence planning, organising, and controlling. Although human resource managers are using AI for their recruitment decisions, they are still required to coordinate meetings to align hiring decisions with company strategy, and product developers must collaborate with marketing to connect products with business models (Raisch & Krakowski, 2021). Hence, AI-augmented recruitment is still nascent, although AI controls a large section of decision-making (Keding & Meissner, 2021). Based on these, the following hypotheses can be developed.

AI-augmented time management and decision-making

Manual task scheduling was one of the primary challenges of traditional organising activity. AI has revolutionised these practices by providing advanced tools. AI has made scheduling highly automated, thus helping to reduce time constraints. Maruthi et al. (2022) state that automated planning and scheduling are critical elements of artificial intelligence, allowing intelligent systems to make decisions and execute actions in intricate and dynamic contexts. AI-driven task managers are now significantly popular among managers who automatically schedule deadlines and allocate tasks to the right person. AI has been proven to generate the most efficient schedules by considering different variables, such as employees' performances and preferences (Robert et al., 2020). Also, Serrano-Ruiz et al. (2021) found that automated planning and scheduling are critical elements of artificial intelligence, allowing intelligent systems to make decisions and execute actions in intricate and dynamic contexts. AI systems can analyse data from various projects and tasks to help managers prioritise activities based on urgency and importance (Pookandy, 2024). The author found a significant reduction in task time delays after implementing AI-augmented schedules and task monitoring. AI tools enable managers to track progress in real time, providing insights into how time is allocated across tasks and projects (Karamthulla et al., 2024). This continuous monitoring fosters a proactive approach to time management, allowing for timely interventions that keep projects on track. AI-augmented schedules save significant time, whether in manufacturing or corporate, as managers only need to review some data and schedule based on that. This time-saving through AI-augmented scheduling needs to be investigated to determine whether it affects managers' decision-making.

AI-augmented communication and decision making

The integration of AI into communication practices has significantly transformed how managers communicate. AI helps with communication by managing common inquiries, organising meetings, and using AI tools like a smart chatbot and virtual assistant (Nirala et al., 2022). These AI tools can assist with drafting emails, analysing customer messages, and summarising discussions, enabling managers to engage more effectively with colleagues and stakeholders. The post-approval procedures are designed to streamline routine operations management so managers can focus more on strategic decision-making. AI frees managers from administrative responsibilities and allows them to streamline repetitive processes such as Emails, notifications and other communication strategies used in an organisation. Managers can focus on critical thinking and foresight by having chatbots answer frequent questions. These chatbots are extremely fast in response. Studies have found that AI helps to improve response times and information, allowing teams to make more immediate decisions (Bharatiya, 2023). This response time can be used against customers or teammates. Although the author said this about employees, managers must also improve their response time. Another study found that AI can be utilised to assess how well information is shared among team members and make necessary adjustments to enhance communication strategies (Arslan et al., 2022). Thus, AI-augmented communication has become a part of everyday managerial operations in many industries. This makes it necessary to understand whether AI-augmented communication affects the managers' decision-making abilities.

Theoretical underpinnings

AI-augmented managerial skills and decision-making theories are limited because AI is early in implementation in managerial domains. There is still limited literature on how AI is implemented to improve organisational managerial skills. Still, a few theories can be associated with this issue. One such theoretical framework is the based view (RBV). According to RBV, the success of an organisation depends on its resources being valuable, rare, unique, and non-substitutable (Zvarimwa & Zimuto, 2022). AI-augmented recruitment, scheduling, and communication procedures greatly improve an organisation's capacity to create value. Therefore, these valuable resources influence managers' capacity to plan, coordinate, and oversee their activities efficiently. Even though AI technologies are becoming more widely available, how they are incorporated into particular organisational processes makes them unique. Businesses using AI to improve managerial decision-making will have a clear edge. Organisations have different ways of customising AI systems to manage hiring, scheduling, and communication operations. This results in a special use of the technology that might be challenging for rivals to imitate. Therefore, firms that embrace AI early and effectively may find it a rare strategic advantage due to its capacity to enhance decision-making skills. Because AI-driven decision-making systems can constantly improve from data collected themselves, they are becoming more and more irreplaceable. From an RBV standpoint, AI-enhanced hiring, time management, and communication are rare, unique, and non-replaceable resources that improve managerial decision-making. Considering how AI-augmented recruitment, time management, communication and decision-making are unique and non-substitutable, these can surely provide competitive advantages. These competitive advantages will enhance managerial planning, organising, and controlling skills. The figure below explains how AI-augmented recruitment, time management, and communication as strategic resources can enhance decision-making, thereby increasing the managers' planning, organising and controlling skills.

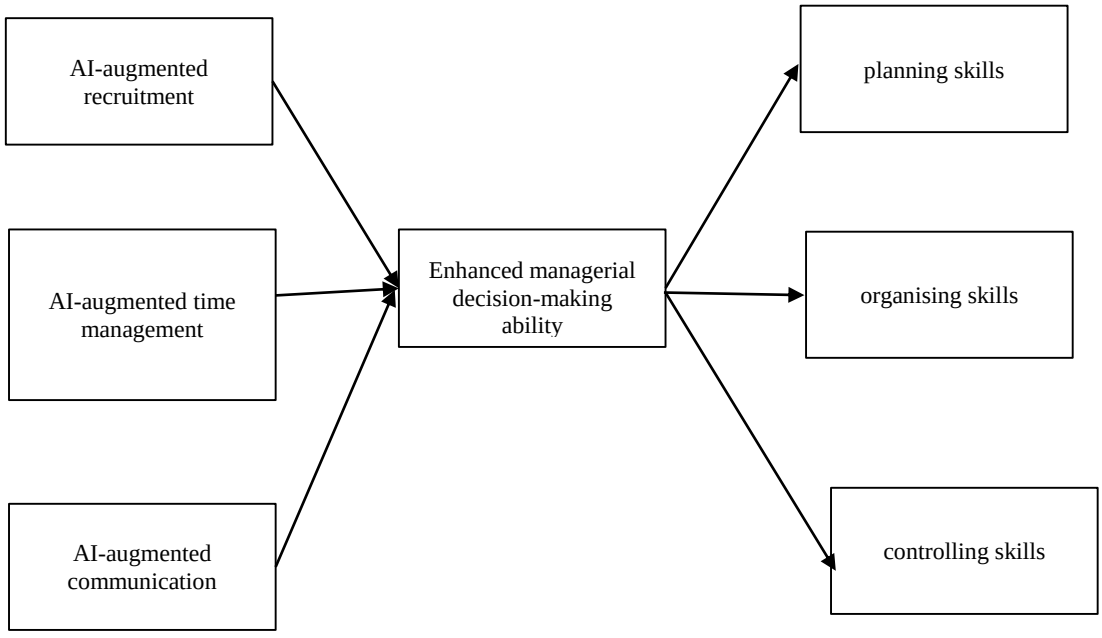

Figure 1: Conceptual framework

Hypotheses

H_1: AI-augmented recruitment positively influences enhanced managerial decision-making ability.

H_2: AI-augmented time management positively influences enhanced managerial decision-making ability.

H_3: AI-augmented communication positively influences enhanced managerial decision-making ability.

H_4: Enhanced managerial decision-making ability positively influences the enhancement of managers' planning skills.

H_5: Enhanced managerial decision-making ability positively influences enhancing managers' organising skills.

H_6: Enhanced managerial decision-making ability positively influences the enhancement of managers' controlling skills.

METHOD

The primary survey involved 192 Chinese small and medium-sized enterprises from various sectors. Two to three managers from each selected organisation participated in the data collection process. Data were collected over a six-month period during which these enterprises were selected. The selection of SMEs and managers was purposive, and social media helped in this sampling process. The questionnaire was structured in two sections: Demographic and factor-based. The instrument was a close-type questionnaire with 5-point Likert scale-based measurement dimensions. The scale items (table 1) were adapted from Bordbar & Almoghrabi (2023), Zhang (2024), Sadeghi et al. (2024), and Rožman et al. (2022). After selecting SMEs, their managers were identified and contacted via mail or social media. A brief knowledge about the purpose was given, followed by a request to participate in the survey. The response rate was above 70%, and the final response size obtained was 467. The analysis involved descriptive statistics and inferential statistics. In descriptive statistics, demographic data such as Gender, familiarity with tool use, etc., have been analysed. The inferential statistics were based on a structure equation Modelling.

Table 1: Measurement scale

Construct Name	Items
AI-augmented Time Management	1. Using an AI chatbot enhances my communication effectiveness in managing my team.
	2. I find the AI chatbot useful for communication in my managerial role.
	3. Using an AI chatbot helps me accomplish communication tasks more quickly with my team.
	4. AI chatbots help me manage my time more efficiently by automating routine communication tasks.
AI-augmented Communication	1. Interacting with AI-based tools for communication within my team is clear and understandable.
	2. AI-based tools for communication can be used flexibly in my managerial role.
	3. I find using AI-based tools is effortless.
	4. Becoming familiar with AI-based communication tools as a manager is easy.
AI-augmented Recruitment	1. AI helps in making better-quality decisions for recruiting and selecting candidates.
	2. AI helps in conducting primary interviews of bulk candidates using chatbots.
	3. AI technology saves the monotony of the job during the process of finding candidates.
	4. AI technology reduces the time spent in finding candidates.
Managerial Planning Skill	1. I prioritise tasks for the near future in managing my team and operations.
	2. I make various strategic calculations to aid decision-making for the coming year's operations.
	3. I actively seek new information that may be relevant to the development and growth of my team or department.
	4. It is necessary to consider the ultimate goals of our business when planning and managing resources.
Managerial Controlling skill	1. I regularly monitor the progress of tasks to ensure they are completed on time and within the set standards.

	2. I use data and performance metrics to evaluate the success of projects and initiatives.
	3. I identify and address deviations from the planned action to maintain control over outcomes.
	4. I implement corrective measures when necessary to keep the team aligned with organisational goals.
Managerial Organizing skill	1. I effectively allocate resources (e.g., personnel, budget, time) to meet organisational objectives.
	2. I schedule tasks for team members based on their skills and expertise to optimise productivity.
	3. I establish clear roles and responsibilities within the team to ensure smooth operations.
	4. I coordinate activities across different departments or units to ensure alignment with the overall strategy.

FINDINGS

Descriptive statistics

Table 1: Descriptive statistics

Variable	Category	Frequency	Per cent	Valid Percent	Cumulative Percent
Gender	Male	338	72.4%	72.4%	72.4%
	Female	129	27.6%	27.6%	100.0%
	Total	467	100.0%	100.0%	100.0%
Job Position	Manager	207	44.3%	44.3%	44.3%
	Sr. Manager	130	27.8%	27.8%	72.2%
	Director	52	11.1%	11.1%	83.3%
	Executive	78	16.7%	16.7%	100.0%
	Total	467	100.0%	100.0%	100.0%
Managerial Experience	1-3 years	104	22.3%	22.3%	22.3%
	4-6 years	207	44.3%	44.3%	66.6%
	7-10 years	104	22.3%	22.3%	88.9%
	> 10 years	52	11.1%	11.1%	100.0%
	Total	467	100.0%	100.0%	100.0%
Industry	IT	233	49.9%	49.9%	49.9%
	Finance & Banking	78	16.7%	16.7%	66.6%
	Healthcare	26	5.6%	5.6%	72.2%
	Manufacturing	130	27.8%	27.8%	100.0%
	Total	467	100.0%	100.0%	100.0%
Company Size	1-50 employees	155	33.2%	33.2%	33.2%
	51-100 employees	156	33.4%	33.4%	66.6%
	101-500 employees	52	11.1%	11.1%	77.7%
	> 500 employees	104	22.3%	22.3%	100.0%
	Total	467	100.0%	100.0%	100.0%

Familiarity with AI	Very familiar	130	27.8%	27.8%	27.8%
	Somewhat familiar	129	27.6%	27.6%	55.5%
	Not sure	26	5.6%	5.6%	61.0%
	No familiarity	182	39.0%	39.0%	100.0%
	Total	467	100.0%	100.0%	100.0%
Used AI Tools for Decision Making	Yes	441	94.4%	94.4%	94.4%
	No	26	5.6%	5.6%	100.0%
	Total	467	100.0%	100.0%	100.0%
AI Tool Name	Chatbots	26	5.6%	5.6%	5.6%
	AI Automated Resume Screening	259	55.5%	55.5%	61.0%
	Virtual Assistants	104	22.3%	22.3%	83.3%
	Task Scheduling Tools	78	16.7%	16.7%	100.0%
	Total	467	100.0%	100.0%	100.0%

The study of 467 respondents reveals important demographic and professional insights. Most participants (72.4%) are men, and 44.3% hold managerial jobs. With 4-6 years of managing experience, a sizable percentage (44.3%) has worked primarily in the IT industry (49.9%). The sample shows a balanced distribution of company sizes, with many falling between 51 and 100 employees. 39% of people say they are unfamiliar with AI, while 27.8% say they are very familiar. AI is widely used in workplace activities, as evidenced by 94.4% of respondents using AI tools for decision-making, with AI automated resume screening being the most popular (55%) application. Some have also used virtual assistants (22.3%) and task scheduling tools (16.7%). These descriptive statistics show that the participants are significantly relevant to AI implementation and managerial operations.

Reliability statistics

Table 2: Reliability test

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AI-Augmented communication	0.868	0.877	0.911	0.72
AI-Augmented time management	0.814	0.822	0.877	0.642
AI-augmented recruitment	0.903	0.903	0.932	0.775
Enhanced managerial decision-making abilities	0.881	0.882	0.926	0.807
Managerial planning skills	0.862	0.864	0.907	0.709
Managerial Organizing Skills	0.877	0.882	0.915	0.73
Managerial controlling Skills	0.929	0.93	0.95	0.825

Strong internal consistency is found across all constructs according to the reliability analysis, which is based on Cronbach's alpha, composite reliability (rho_a, rho_c), and average variance extracted (AVE). High dependability is shown by Cronbach's alpha values, which range from 0.814 to 0.929 (beyond the acceptable threshold of 0.7). The reliability can also be supported by composite reliability values (rho_c), which show that all constructs have values greater than 0.87, which means that items within each construct are very consistent. A significantly great convergent validity is suggested by the AVE values, which are all over 0.642. The AVE value suggests that each construct accounts for more than 50% of the variance in its components. Overall, the findings support strong concept validity and dependability.

HTMT

Table 3: HTMT tests

	AI-Augmented communication	AI-Augmented time management	AI-augmented recruitment	Enhanced managerial decision-making abilities	Managerial planning skills	Managerial Organizing Skills	Managerial controlling Skills
AI-Augmented communication							
AI-Augmented time management	0.793						
AI-augmented recruitment	0.554	0.744					
Enhanced managerial decision-making	0.636	0.770	0.593				
Managerial planning skills	1.050	0.768	0.513	0.601			
Managerial Organizing Skills	0.436	0.728	0.530	0.460	0.429		
Managerial controlling Skills	0.523	0.798	0.541	0.517	0.490	0.489	

The discriminant validity of the model's constructs is revealed by the Heterotrait-Monotrait (HTMT) ratio analysis. While separate, AI-Augmented Communication and AI-Augmented Time Management have a moderate association (0.793). The validity of AI-augmented recruitment is supported by its lower correlations with other constructs. There may be an overlap between Enhanced Managerial Decision-Making Abilities and Managerial Planning Skills, as indicated by their unsettling correlation (1.050). Although most HTMT values show good discriminant validity overall, more research is necessary to ensure that the constructs can be distinguished clearly, given the substantial link between Managerial Planning Skills and Enhanced Managerial Decision-Making Abilities.

Table 4: Factor loadings

	AI-Augmented communication	AI-Augmented time management	AI-augmented recruitment	Enhanced managerial decision-making abilities	Managerial planning skills	Managerial Organizing Skills	Managerial controlling Skills
AI-AUG_TM1		0.761					
AI-AUG_TM2		0.829					
AI-AUG_TM3		0.785					
AI-AUG_TM4		0.827					

AI_AUG_CM1	0.759						
AI_AUG_CM2	0.813						
AI_AUG_CM3	0.920						
AI_AUG_CM4	0.893						
AI_AUG_REC1			0.871				
AI_AUG_REC2			0.871				
AI_AUG_REC3			0.913				
AI_AUG_REC4			0.867				
EMDMA1				0.913			
EMDMA2				0.891			
EMDMA3				0.892			
MCS1							0.935
MCS2							0.907
MCS3							0.897
MCS4							0.893
MOS1						0.855	
MOS2						0.854	
MOS3						0.861	
MOS4						0.848	
MPS1					0.802		
MPS2					0.795		
MPS3					0.911		
MPS4					0.855		

The above table shows the factor loadings of each item used in this study. The loadings for AI-Augmented Communication range from 0.759 to 0.920, with the strongest indicator, AI_AUG_CM3 (0.920), indicating a strong relationship. Similarly, loadings for AI-Augmented Time Management range from 0.761 to 0.829, with AI_AUG_TM2 (0.829) being especially noteworthy. The important item in the AI-Augmented Recruitment construct is AI_AUG_REC3 (0.913), with loadings ranging from 0.867 to 0.913. Strong loadings from 0.891 to 0.913 are seen in Enhanced Managerial Decision-Making Abilities, highlighting EMDMA1 (0.913) as an important metric. High loadings are seen for managerial controlling skills, ranging from 0.893 to 0.935, with MCS1 (0.935) serving as the most typical item. With MOS3 (0.861) being the strongest indication, the Managerial Organising Skills construct exhibits moderate loadings between 0.848 and 0.861, suggesting improvement opportunities. Lastly, the range of Managerial Planning Skills is 0.795 to 0.911, with MPS3 (0.911) being the highest. Overall, the item loadings are all above 0.7, which suggests a significantly good construct validity, with most items demonstrating strong relationships with their respective latent constructs.

Path coefficients

	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics (|O/STDEV|)**	**P values**
AI-augmented communication -> Enhanced managerial decision-making abilities	**0.198**	**0.200**	**0.063**	**3.119**	**0.002**

AI-augmented time management -> Enhanced managerial decision-making abilities	**0.424**	**0.420**	**0.069**	**6.133**	**0.000**
AI-augmented recruitment -> Enhanced managerial decision-making abilities	**0.158**	**0.158**	**0.052**	**3.019**	**0.003**
Enhanced managerial decision-making abilities -> Managerial planning skills	**0.523**	**0.522**	**0.058**	**8.974**	**0.000**
Enhanced managerial decision-making abilities -> Managerial Organizing Skills	**0.408**	**0.406**	**0.068**	**5.992**	**0.000**
Enhanced managerial decision-making abilities -> Managerial controlling Skills	**0.468**	**0.467**	**0.053**	**8.811**	**0.000**

Path coefficients show the strength and direction of AI-augmented elements' effects on managerial decision-making abilities and their effects on managerial skills. AI-Augmented Time Management has the highest effects on Enhanced Managerial Decision-Making Abilities (0.424, $p=0.000<P_{0.05}$). This demonstrates that one-unit changes in time management improve decision-making by 0.424 times. AI-Augmented Communication (0.198, p = 0.000 < 0.05) and Recruitment (0.158, p = 0.000 < 0.05) exhibited relatively lower impacts on decision-making abilities. Hence, it suggests that while relevant, AI-augmented time management is the most important factor that AI has delivered to improve managerial decision-making. Managerial Planning Skills (0.523, $p=0.000<P_{0.05}$) have been affected by improved decision-making. The effect size is quite strong and positive. This effect size implies that better decision-making through AI has helped managers improve their planning skills. To a lesser extent, enhanced managerial decision-making abilities improve managerial controlling (0.468, $p=0.000<P_{0.05}$) and organising (0.408, $p=0.000<P_{0.05}$). Although the effect size is comparatively lower than that of planning skills, controlling and organising skills have been improved by AI.

R-square

Table 5: R square

	R-square	R-square adjusted
Enhanced managerial decision-making abilities	0.474	0.470
Managerial planning skills	0.274	0.272
Managerial Organizing Skills	0.166	0.164
Managerial controlling Skills	0.219	0.218

The analysis of R-square values reveals that **47.4%** of the observed variance in enhanced managerial decision-making abilities is explained by independent variables AI-augmented communication, management and recruitment (Table 5). This variance % is moderately good explanatory power, indicating a moderately strong model fit. In contrast, managerial planning skills account for only **27.4%**, suggesting that enhanced managerial decision-making explains not very much of the observed variance. However, it should be stated that 27.4% of the observed changes in managerial skills can be attributed to enhanced decision-making abilities. However, this also indicates other factors besides enhanced decision-making abilities that increase planning skills. Similarly, managerial organising skills show a low explanatory power at **16.6%**, while managerial controlling skills explain **21.9%** of the variance from enhanced decision-making abilities. Overall, enhanced decision-making abilities positively affect planning, organising and controlling skills, with planning skills being the highest enhancement.

Final structural model

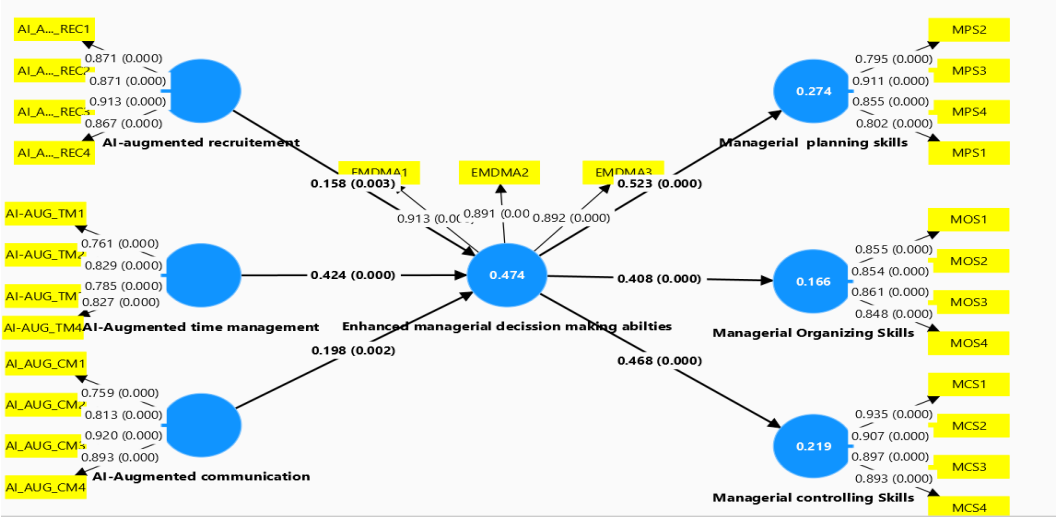

Figure 2: Final structural model

Figure 2 shows the final structural model with path analysis. The path suggests how AI-enhanced communication, time management, and recruitment improve managerial decision-making. It shows how better decision-making affects managerial planning, organization, and control. The substantial route coefficients show that AI-augmented time management has the greatest impact on decision-making, underscoring its importance in managerial performance.

Table 6: Final result

Hypothesis	Acceptance Status
H1: AI-augmented recruitment positively influences enhanced managerial decision-making ability.	Accepted
H2: AI-augmented time management positively influences enhanced managerial decision-making ability.	Accepted
H3: AI-augmented communication positively influences enhanced managerial decision-making ability.	Accepted
H4: Enhanced managerial decision-making ability positively influences the enhancement of managers' planning skills.	Accepted
H5: Enhanced managerial decision-making ability positively influences enhancing managers' organising skills.	Accepted
H6: Enhanced managerial decision-making ability positively influences the enhancement of managers' controlling skills.	Accepted

DISCUSSION

The study's findings signify a critical dimension of artificial intelligence's impact on managerial decision-making. Six hypotheses were initially proposed. The final structural model shows that all of these have been accepted. The proposed path was AI-augmented recruitment, communication, and time management, increasing managers' decision-making abilities. In return, decision-making abilities have enhanced the employees' managerial skills. This path analysis shows that this directed path is right, and AI first increased managers' decision-making competencies. Later, this increased their decision-making ability and enhanced their planning, organising, and controlling skills. The study indicated that all the managerial skills improved. Skills like planning, controlling, and organising are enhanced due to AI improving managers' decision-making abilities. Enhancement is not isolated to one area at the expense of another; rather, the impact of AI is holistic, positively

influencing all key management aspects in tandem. AI-augmented recruitment helps managers make better decisions when choosing candidates. AI-enhanced communication tools improve information exchange and decision-making. AI-augmented time management helps managers optimise resource allocation and prioritise tasks, improving decision-making. Now that managers have better decision-making skills, they also witness improved organising, controlling, and planning abilities. Improved decision-making empowers managers to plan strategically, organise teams more efficiently, and take more control over day-to-day operations. Therefore, the interconnectedness of these skills is key. As AI enhances decision-making abilities, the ripple effect spreads across all management areas. Managers become more adept at planning because AI provides them with data-driven insights. They become better at organising because AI helps structure resources efficiently. They have become more effective at controlling operations because AI gives them real-time feedback and performance monitoring.

The implications of these major findings are highly relevant to management when adopting AI technologies as part of the decision-making process. To enhance decision-making capabilities, managers and organisations should consider adopting AI-augmented tools in recruitment, communication, and time management. Managers have the necessary decision-making skills; however, AI makes this decision-making faster and more accurate (Thaduri, 2020). In previous studies, such as Davenport (2016) and Raisch & Krakowski (2021), researchers found that integrating AI into strategic decision-making enhances human and machine competencies. Managers who previously struggled with decision-making speed and accuracy in areas like planning and organising saw significant improvements after incorporating AI, as the technology helped address these shortcomings. This explains why managers have experienced an improvement in their planning, controlling and organising. AI-based managerial decisions are precise, fast and have better clarity (Radonjić, 2022). This enables managers to make informed decision-based plans, have better control over plans, and organise activities. AI's ability to deliver fast, accurate analyses has amplified its effectiveness. Using AI conserves the healthy decision-making of a manager and, in parallel, emerges with more planning, organising and controlling skills. Therefore, AI-augmented managerial and strategic areas have improved decision-making scenarios, increasing overall skill dimensions.

CONCLUSION

This empirical research was conducted to understand how AI affects managerial skills. The results suggested that AI has a positive influence on these skills. The study demonstrates that AI significantly enhances managerial decision-making through augmented recruitment, communication, and time management. Improved decision-making directly develops essential managerial skills, including planning, organising, and controlling. In conclusion, managerial skill dimensions such as planning, organizing, and controlling will not experience divergent effects. Industry managers will not witness divergent skill development due to AI, where one improves while another diminishes. Instead, AI will positively impact all these skills, enhancing them simultaneously and leading to an overall improvement in managerial performance. The managerial implication of this research, despite issues like bias in decision-making or ethics, is that managers need to implement AI-augmented task management. The sceptic view regarding AI and whether managers also need this should be changed. AI should be normalised in decision-making areas for all managers, regardless of industry. This finding suggests that companies need AI-based support to enable managers to refine their planning, organising, and controlling skills, leading to more effective leadership. It will eliminate decision-making bottlenecks related to time and accuracy, allowing managers to shift their focus from routine operational tasks to higher-level strategic thinking.

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