

GREEN LEADERSHIP AND COMPETITIVE ADVANTAGE: THE ROLE OF MEDIATION FROM KNOWLEDGE MANAGEMENT AND TALENT MANAGEMENT

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ABSTRACT

This research aims to analyze the impact of green leadership on competitive advantage through the mediating roles of knowledge management and talent management. In the context of the Industrial Revolution 4.0 (IR4.0), where technology companies worldwide have international ramifications on innovation, sustainability issues, and environmental impacts such as carbon emissions, e-waste, and natural resource extraction that garner global attention, we chose technology companies in Indonesia as a model. Data was collected using an e-questionnaire, distributed to company managers, and then analyzed using SEM-AMOS. The research results demonstrate that green leadership does not have a direct influence on competitive advantage but rather exerts an indirect influence through knowledge management and talent management. These findings strengthen the view that sustainable strategy must be an essential part of an organization's efforts to achieve competitive advantage.

Keywords: Green Leadership, Knowledge Management, Talent Management, Competitive Advantage

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INTRODUCTION

The Fourth Industrial Revolution (IR4.0) has intensified the pressure on businesses to enhance their competitiveness, extending

beyond their products and services to encompass their human resources (Muisyo et al., 2022). In recognition of the pivotal role of the human element within organizational structures, enhancing its quality becomes imperative for

bolstering overall success (Gil-Cordero et al., 2023). Companies must comprehend that, alongside investments in advanced technology, nurturing and developing human resources stand as critical factors in attaining and sustaining a competitive advantage (Alserhan & Shbail, 2020). The effective amalgamation of technology, robust business strategies, and a focus on employee development is pivotal for achieving enduring competitiveness amidst this dynamic era (Chen et al., 2020).

Leadership emerges as a critical human resource factor influencing competitive advantage (Amoako, 2019; Banmairuroy et al., 2022), exerting a profound impact on various facets shaping a company's competitiveness and distinctive market position (Sibghatullah & Raza, 2020). Diverse conclusions have arisen from research on the nexus between leadership and competitive advantage, however. Studies conducted in the Americas by Jardon & Martínez-Cobas (2019) unveiled a robust correlation between strategic leadership and competitive advantage in the forestry industry. Similarly, research by Yangailo (2023) and Banmore et al. (2019) underscored the positive impact of strategic and transformational leadership on the competitive advantage of railroad and insurance firms in Africa. However, Yvonne Augustine (2019) found no significant relationship between leadership and competitive advantage in Asian businesses. Kafetzopoulos & Gotzamani (2021) arrived at a similar conclusion, indicating that transformative leadership failed to enhance the competitive advantage of small and medium enterprises (SMEs) in Europe. These findings underscore the importance of transformational and strategic leadership styles in influencing competitive advantage.

To bridge this research gap, our study introduces the concept of green leadership and incorporates mediating variables from knowledge management and talent management. While prior studies have predominantly focused on forestry industry companies, railway companies, SMEs, Thai S-curve industries, and banking, we aim to broaden our research scope by examining companies in the technology sector. The technology sector, renowned for its significant environmental impact, generates substantial electronic waste and relies on natural resources, often leading to environmental degradation. With its potential to

drive change and promote sustainability, the technology sector plays a crucial role in global innovation.

To reinforce these novel aspects, including the concept of green leadership, mediating variables from knowledge management and talent management, and exploration of technology companies in Southeast Asia, particularly Indonesia, our study employs structural equation models (SEM-Amos). This research, therefore, is indispensable for elucidating the factors influencing competitive advantage in technology companies, namely green leadership through knowledge management and talent management.

In addition to the factors mentioned, several other contextual elements have contributed to the significance of examining competitive advantage in technology companies, particularly in Southeast Asia. First, the rapid pace of technological innovation in this region, fueled by a growing digital economy and increasing connectivity (Ha & Chuah, 2023), amplifies the importance of understanding how leadership and human resource management practices impact competitiveness. Moreover, the unique socio-cultural and economic landscape of Southeast Asia presents distinct challenges and opportunities for technology firms compared to other regions (Ullah & Ming Yit Ho, 2021). Factors such as diverse consumer preferences, regulatory frameworks, and infrastructure development influence the strategies and operations of technology companies, underscoring the need for tailored approaches to leadership and talent management.

Furthermore, the global shift towards sustainability and environmental responsibility has placed greater scrutiny on the practices of technology companies, particularly concerning their environmental impact. As awareness of climate change and resource depletion grows, stakeholders increasingly demand that businesses operate in an environmentally conscious manner (Cadez et al., 2019; Javaid et al., 2022). In this context, the concept of green leadership becomes particularly relevant, as it offers a framework for integrating sustainability principles into organizational strategy and decision-making processes. By examining the role of green leadership in technology firms, this study aims to contribute to the broader discourse

on sustainable business practices and their implications for competitive advantage.

Additionally, Indonesia's choice as a focal point for the study holds strategic significance. As one of the largest and fastest-growing economies in Southeast Asia, Indonesia represents a dynamic and diverse market for technology companies. Understanding the dynamics of competitive advantage within this context can provide valuable insights for both domestic and multinational firms operating in the region. Moreover, Indonesia's unique environmental challenges, including issues related to deforestation, pollution, and biodiversity conservation (Zhang & Savage, 2019), underscore the importance of promoting sustainable practices within the country's technology sector. By investigating the interplay between green leadership, knowledge management, and talent management in Indonesian technology companies, this research seeks to offer practical recommendations for fostering both competitiveness and environmental sustainability in the region.

LITERATURE REVIEW

Green Leadership

Green leadership is a leadership style that emphasizes environmental sustainability and responsibility in organizational decision-making processes and practices (Zhong et al., 2023). Leaders who practice green leadership aggressively promote and incorporate environmentally friendly policies, initiatives, and principles into their strategic objectives, operational procedures, and organizational culture (Zacher et al., 2024). This leadership style emphasizes the significance of minimizing environmental impact, lowering the carbon footprint, conserving natural resources, and encouraging sustainable practices within the organization (Tuan, 2021). Green leaders motivate and encourage people to adopt eco-friendly behaviors, develop sustainable solutions, and participate in environmental stewardship initiatives both internally and externally (Y. Wang et al., 2023). By promoting green leadership, organizations hope to achieve not only ecological sustainability but also long-term financial success by integrating environmental goals with broader strategic objectives and public expectations. In the context of technology companies, green

leadership is closely related to psychological dimensions such as self-enhancement, openness to change, ethics, and ecomotives (Lee et al., 2014). Leaders who embrace sustainability practices strengthen their identity as responsible agents of change, able to confront and lead changes in business paradigms, and prioritize ethical values in decision-making and business conduct. They also can motivate others within the organization to adopt more environmentally friendly behaviors, reinforcing long-term commitments to sustainable business practices.

Knowledge Management

Knowledge management is the systematic process of developing, organizing, storing, sharing, and utilizing knowledge assets inside an organization to improve decision-making, problem-solving, innovation, and overall performance (Stachera-Włodarczyk, 2019). It includes a variety of techniques, practices, and technologies aimed at capturing explicit and implicit information, encouraging employee collaboration and knowledge sharing, and facilitating knowledge dissemination across the organization's departments and levels. To drive organizational effectiveness and competitive advantage, effective knowledge management initiatives prioritize creating a supportive organizational culture that values knowledge creation and sharing, implementing strong knowledge management systems and tools, and promoting continuous learning and knowledge exchange (Edgar & Albright, 2023; Johannessen, 2020; Stachera-Włodarczyk, 2019).

Talent Management

Talent management is the strategic process of attracting, developing, retaining, and deploying skilled and talented workers inside an organization to achieve current and future business goals (Skuzza et al., 2022). A variety of activities are included, such as recruitment, onboarding, training and development, performance management, succession planning, and career development. Effective talent management entails identifying key talent needs that are aligned with organizational goals, implementing targeted strategies to attract and retain top performers, providing opportunities for ongoing learning and professional development, and creating a supportive work environment that promotes employee

engagement and productivity (Gallardo-Gallardo, 2019). Investing in talent management programs allows organizations to develop a strong pipeline of qualified people, improve organizational agility and resilience, and gain a competitive advantage in the marketplace (Collings et al., 2022).

Competitive advantage

Competitive advantage refers to a company's distinct characteristics or capabilities that allow it to outperform its competitors and achieve tremendous success in the marketplace (Sigalas & Pekka Economou, 2013). These advantages can come from a variety of sources, including cost leadership, differentiation, innovation, customer service, and market niches. Companies with a competitive advantage are better positioned to attract customers, raise prices, increase market share, and produce long-term profits (Sigalas et al., 2013). Achieving and maintaining a competitive advantage necessitates a thorough grasp of client demands and preferences, efficient resource utilization, continual development and innovation, and the ability to respond to shifting market conditions (Prasad, 2020). Companies can differentiate themselves from competitors by capitalizing on their competitive advantages and creating long-term value for consumers, employees, and shareholders (L. L. Wang & Gao, 2021).

The Relationship Between Variables

Long-term competitive advantages are formed primarily by the distinctive resources that a company possesses, according to the resource-based view (RBV) theory (Wernerfelt, 1984). Companies can create and maintain competitive advantages by utilizing and allocating resources that are scarce and difficult for competitors to follow (Bintara et al., 2023). RBV highlights the role that distinctive resources have in creating a competitive edge. According to the green leadership paradigm, firms may be able to gain a competitive edge by implementing a leadership style that prioritizes environmental responsibility, sustainable practices, and incorporating environmental factors into strategic decision-making (Ahuja et al., 2023). Implementing environmentally sound business practices can produce rare resources that are difficult for competitors to compete with and that are in line with RBV principles, so

implementing green leadership can help businesses achieve long-term competitive advantage.

Green leadership encourages organizations to generate and share knowledge about sustainable practices, such as green technology, waste management, and renewable energy (Javaid et al., 2023). Green leadership provides opportunities for staff to contribute through platforms, training, and internal meetings. This inspires companies to develop new environmentally friendly products and procedures. Knowledge about environmentally friendly technologies and materials can be integrated into knowledge management, encouraging the development of sustainable goods and services. The effectiveness of operations is enhanced through sustainable practices (Sachdeva & Singh, 2023), including waste reduction, more efficient use of resources, and the implementation of environmentally friendly technologies. This creates harmony between productivity and environmental preservation.

Green leadership makes organizations attractive to top employees who care about the environment (Manoj et al., 2022). Individuals with environmental values tend to be attracted to companies that prioritize green leadership supporting company values (Kardoyo et al., 2020). Benefits include higher employee motivation and engagement. Employees feel connected to a company that cares about its impact on the environment and society, increasing productivity, creativity, and retention. Green leadership also encourages the sustainable development of new skills. Employees have the opportunity to learn about green technologies, waste management, and renewable energy, improving their knowledge and skills.

Knowledge management opens up opportunities for innovation and new product development, creating competitive advantages (Sukoroto et al., 2023). Shared knowledge and the promotion of new ideas produce services that differentiate a company from competitors. Increased employee productivity occurs through structured knowledge that minimizes errors and saves time, resulting in more efficient operations and lower costs. Competitive advantage is established through faster and more accurate responses to customer needs, strengthening relationships, and a positive brand image.

According to Almalki and Al-Shammari (2023), market analysis and competitive information facilitate the identification of industry trends and allow for astute strategic decision-making, giving a competitive edge in the face of shifting market conditions.

Talent management contributes to a company's competitive advantage by improving the quality of work teams (Hong et al., 2023). Improved skills and training in employees enable the production of better goods or services, creating excellence. Diverse and unique team innovation produces superior ideas, differentiates the company from competitors, and provides a competitive advantage (Al-Haraisa et al., 2021). Talent management helps optimize employee capabilities, leading to increased productivity through assignments that match their skills and interests. A focus on talent also creates adaptive and fast learners, enabling companies to adapt to market and technological changes and maintain success in a dynamic environment.

An organization's ability to gain a competitive edge and reap the benefits of green leadership is

significantly mediated by knowledge management. When it comes to the application and sharing of knowledge about sustainable methods that are endorsed by leaders who care about the environment, knowledge management is crucial. Consequently, this plays a significant role in gaining a competitive edge.

When it comes to connecting the benefits of green leadership with gaining a competitive edge within an organization, talent management is a crucial middleman. Talent management serves as a mediator in the process of cultivating, attracting, nurturing, and retaining employees who possess the requisite abilities and a sincere interest in the sustainable behaviors advocated by green leadership, as per this theoretical framework. Consequently, this contributes significantly to strengthening an organization's edge over competitors.

Figure 1 displays the conceptual foundation for the investigation; the previous section's discussion of the relationships between variables served as the foundation for this framework.

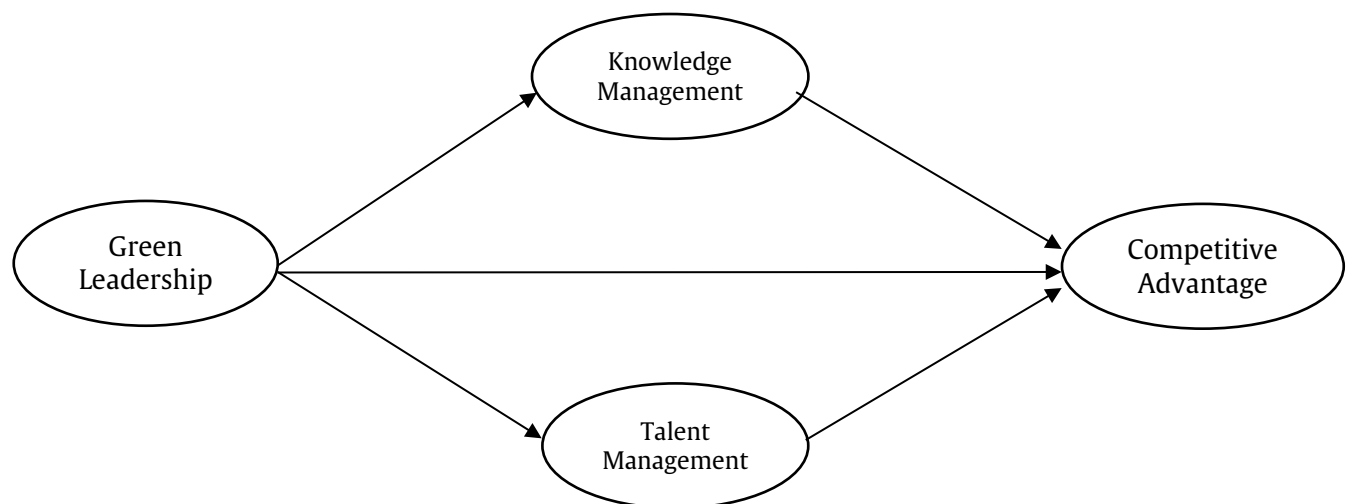


Figure 1: Conceptual Framework.

Source: Authors' Work (2023).

Our hypotheses, which are predicated on the previously mentioned conceptual framework, are as follows:

- H1. Green leadership influences competitive advantage.
- H2. Green leadership influences knowledge management.

H3. Green leadership influences talent management.

H4. Knowledge management influences competitive advantage.

H5. Talent management influences competitive advantage.

- H6. Knowledge management mediates the influence of green leadership on competitive advantage.
- H7. Talent management mediates green leadership toward competitive advantage.

METHODOLOGY

With a focus on the mediating role of people and knowledge management, this research aims to investigate the relationship between green leadership and competitive advantage in technology sector businesses. A Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was employed for each indicator. The research methodology utilized a quantitative approach, combining descriptive and verification strategies. In this exploratory study, the informative examination was used to explore the factors while varying from one variable to another, thereby revealing causal links between variables. Respondents were directed to the survey questions through a web page with instructional cues, and an online poll was distributed accordingly.

The study sample consisted of managers employed in thirty-one technology-related enterprises located in Indonesia. The rationale for selecting this population is rooted in the significance of the technology sector, specifically IT services & consulting, online applications & services, software, computer hardware, electronic equipment and instruments, and networking equipment, in driving innovation and economic growth in Indonesia. The sampling technique employed was proportional random selection, aiming to ensure representation across different technology businesses. Seven managers were chosen from each organization using this procedure, resulting in a total of 217 observations.

The e-questionnaire was distributed via email to the selected managers from the thirty technology-related enterprises. Each manager received a unique link to access the questionnaire, ensuring confidentiality and preventing duplicate responses. Follow-up reminders were sent to non-respondents at regular intervals to maximize the response rate and ensure the validity of the data. Efforts were made to establish rapport with the participants and address any concerns or questions they may have had regarding the questionnaire. Out of the 217 e-questionnaires distributed, a total of 210

valid responses were returned, resulting in a response rate of 96.7%. Valid responses refer to completed questionnaires with all required fields filled out accurately. The high response rate indicates the effectiveness of the distribution method and the willingness of the participants to engage with the research. By utilizing e-questionnaires and employing diligent follow-up procedures, the study was able to obtain a robust dataset that accurately reflects the perspectives of managers in the technology sector in Indonesia.

Structural Equation Modeling (SEM-AMOS) was chosen as the analytical tool for this study due to its capability to assess complex relationships among variables and test the proposed theoretical model. The choice of AMOS over other methods was justified by its robustness in handling latent variable relationships and its widespread use in similar research contexts.

In measuring green leadership characteristics, the indicators of self-enhancement, openness to change, ethics, and eco-motives were adopted (Lee et al., 2014). Metrics such as knowledge discovery, capture, sharing, and application were utilized to assess knowledge management (Fernandez & Sabherwal, 2001). Talent development, binding, and attraction were quantified as aspects of talent management (Indra Setia et al., 2022). Competitive advantage was measured through elements that are valuable, uncommon, and unique, arranged to capture value (Amaya et al., 2022).

RESULT

Testing was predicated on a legitimate and trustworthy questionnaire instrument to ensure that there was no bias or data inaccuracy in the test outcomes. Methods for knowledge management and talent management mediating variables addressed research gaps in earlier empirical investigations. The findings indicate that there is a link between every variable and competitive advantage. Convergent validity and reliability yielded good results, as Table 1 illustrates. Composite reliability, or CR, is the criterion used to evaluate reliability and must be more than 0.70. Meanwhile, the indicators that are employed yield outcomes that meet the stipulated requirements, which include the need for an AVE (average variance extracted) size of greater than 0.50 and a factor loading value of

greater than 0.50. (Hair J. et al., 2010; Gaskin & Lim, 2016a).

Table 1: Evaluating the Measurement Model

Variable	CR	AVE	MaxR(H)
Green Leadership	0.929	0.814	0.948
Knowledge management	0.890	0.670	0.903
Talent management	0.939	0.831	0.941
Competitive Advantage	0.933	0.777	0.939

Source: Data Processing Results (2023).

A novel research model based on theory and empirical studies that can serve as a guide for the findings is presented in SEM-AMOS research, which is an analysis. The goodness of fit model findings are shown in Table 2 below, and the

Table 2: The Fit Indices of the Model

Indices of Good Fit	Results of the Testing Model	Cut-Off Value	Decision
CMIN/DF	2.620	≤ 3.00	Good Fit
GFI	0.947	>0.90	Good Fit
RMSEA	0.072	<0.08	Good Fit
AGFI	0.977	>0.90	Good Fit
CFI	0.910	>0.95	Fit
TLI	0.988	>0.95	Good Fit
NFI	0.988	>0.95	Good Fit

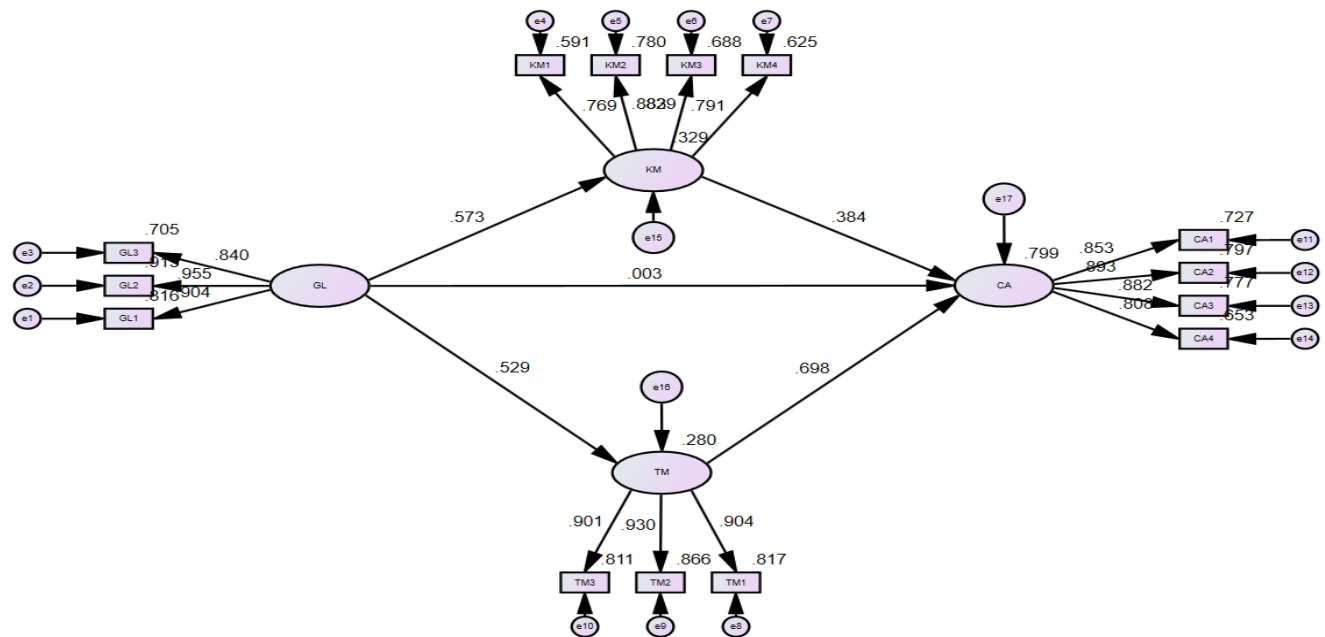
Source: Data Processing Results (2023).

The results of research model testing are acceptable because CMIN/DF is one of the indicators for measuring the level of suitability of a model. The CMIN/DF value is relatively in accordance with the recommended one, namely ≤ 3.00 . (Gaskin & Lim, 2016). The chi-square tendency, which has a value between 0.072 and 0.08, is increased by the RMSEA metric. Additionally, the model's overall Goodness of Fit Index (GFI) value, which displays a good fit for the data, is $0.947 \geq 0.90$ (Arbuckle, 2019; Gaskin & Lim, 2016). Other goodness of fit indicators, namely AGFI, TLI, and NFI, are above the recommended values, so they are included in the good fit category. Meanwhile, the CFI goodness of fit indicator is below the recommended value but is still at a reasonable and acceptable stage. (Hair

model can be employed because the analysis results demonstrate the suggested criteria. (Hair J. et al., 2010; Byrne, 2016).

et al., 2010). The next step was model interpretation. The SEM results are shown in Figure 1. Table 3, which shows the amount of the effect contribution between study variables, provides evidence for hypothesis testing.

Figure 2: Full Model of Green Leadership (GL), Knowledge Management (KM), Talent Management (TM), and Competitive Advantage (CA).



Source: Data Processing Results (2023).

As demonstrated in Table 3, the results can be presented more clearly for understanding. The results show the estimated standard loading factor values for each indicator that forms a variable. All of the indicators utilized for each

variable are higher, as can be seen from the SEM-AMOS results because the loading factor value is larger than 0.7, indicating that the model's indicators satisfy the suggested criteria. (Gaskin, 2012; Hair & Associates, 2010)

Table 3: Weights for Standardized Regression (Group number 1: Default model)

			Estimate	S.E.	C.R.	P	Label
KM	<---	GL	.5734	.0714	7.7275	***	GL_KM
TM	<---	GL	.5289	.0724	7.7530	***	GL_TM
CA	<---	GL	.0026	.0515	.0484	.9614	GL_CA
CA	<---	KM	.3835	.0881	4.4054	***	KM_CA
CA	<---	TM	.6978	.0744	8.6039	***	TM_CA
GL1	<---	GL	.9036				
GL2	<---	GL	.9553	.0511	22.7733	***	par_6
GL3	<---	GL	.8399	.0571	17.3055	***	par_7
KM1	<---	KM	.7688				
KM2	<---	KM	.8831	.0797	13.7574	***	par_8
KM3	<---	KM	.8293	.0814	12.1576	***	par_9
KM4	<---	KM	.7906	.0813	11.5977	***	par_10
TM1	<---	TM	.9039				
TM2	<---	TM	.9303	.0457	21.6598	***	par_11
TM3	<---	TM	.9006	.0501	20.0447	***	par_12
CA1	<---	CA	.8527				
CA2	<---	CA	.8927	.0487	19.4240	***	par_13
CA3	<---	CA	.8816	.0510	19.1264	***	par_14
CA4	<---	CA	.8084	.0510	16.1503	***	par_15

Source: Data Processing Results (2023)

Tables 3 and 4 demonstrate the analysis of significant values in SEM-AMOS based on critical values, providing valuable insights. First, it reveals that estimated values should exceed ± 1.96 or > 1.96 (Arbuckle, 2019) for a model to be considered robust. Regarding specific findings, the study highlights that the impact of green leadership on competitive advantage lacks significance, with an estimated CR value of 0.0484, falling below the threshold of 1.96. This suggests that while green leadership may exhibit a positive direction, its effect on competitive advantage is not statistically significant. Conversely, the research indicates a positive correlation between green leadership and both knowledge management and talent management, with estimated CR values of 7.7275 and 7.7530, respectively, surpassing the threshold. This implies that an increase in green leadership contributes to enhancements in both

knowledge and talent management practices within technology sector businesses.

Furthermore, the study demonstrates a significant and positive relationship between knowledge management and competitive advantage, as evidenced by an estimated CR value of 4.4054. Similarly, talent management shows a similar positive impact on competitive advantage, with an estimated CR value of 8.6039. Moreover, the research reveals that both knowledge management and talent management act as mediators between green leadership and competitive advantage, with estimated values of 0.220 and 0.369 and p-values of 0.003 and 0.001, respectively, falling below the threshold of 0.05. These findings emphasize the critical role of adequate knowledge and talent management strategies in translating green leadership initiatives into tangible competitive advantages within the technology sector.

Table 4: Indirect Effects

Indirect Path	Unstandardized Estimate	Lower	Upper	P-Value	Standardized Estimate
GL --> KM --> CA	0.214	0.104	0.360	0.003	0.220**
GL --> TM --> CA	0.359	0.258	0.503	0.001	0.369***

Source: Data Processing Results (2023).

DISCUSSION

Green leadership does not have a direct influence on competitive advantage. RBV theory states that a company's competitive advantage can come from resources that are rare, valuable, inimitable, and non-substitutable (VRIO resources). Green leadership, although essential and worthwhile in terms of ethics and corporate social responsibility, may not be a resource that directly qualifies as a VRIO resource. This is because many companies can adopt sustainable practices if they decide to do so, meaning these practices may not be truly rare or inimitable resources. Based on relative advantage theory, competitive advantage occurs when a company has a more significant advantage than its competitors in things that customers consider necessary (Varadarajan, 2023). Green leadership may not always be regarded as important by all customer segments, so its impact on competitive advantage may vary (Zhong et al., 2023).

Green leadership influences knowledge management. Green leadership in technology

companies can create a culture that encourages awareness of environmental and sustainable issues. This culture may include respect for sharing knowledge and ideas related to sustainable practices. In a culture like this, employees are more likely to contribute to knowledge management by sharing their knowledge and experience. Green leadership encourages sustainable innovation by encouraging employees to seek innovative solutions to environmental problems (Iqbal et al., 2021). This innovation process produces new knowledge that needs to be managed and shared throughout the organization.

Green leadership influences talent management. Green leadership creates a culture that cares about environmental and sustainable issues (Rehman & Zeb, 2023). This culture can influence how a company attracts and retains top talent. Employees who care about sustainability may be more interested in working for companies that share similar values. Technology companies compete fiercely for the best talent in

the industry. Effective green leadership can make companies more attractive to individuals who have an interest in and competence in environmental issues (Ma et al., 2023). This can help companies attract high-quality employees who have the skills needed in the industry.

Knowledge management influences competitive advantage. Knowledge management ensures that relevant information and knowledge are available for good decision-making. In technology companies, where business decisions are often based on complex technical information, knowledge management can help leaders and employees make better and more informed decisions (Rahimli, 2012). Technology companies must continually innovate to stay relevant. Knowledge management facilitates the development of new products and services by ensuring that knowledge about the latest technologies, market trends, and customer needs is available and accessible to R&D (Research and Development) and product design teams (Idrees et al., 2023). Knowledge management can help companies identify employee training and development needs (Pergner & Horejc, 2023). Skilled and continuously developing employees can be an important asset in achieving a competitive advantage.

Talent management influences competitive advantage. Good talent management ensures that companies are able to attract and recruit individuals with high technical skills and knowledge (Nsour & Tayeh, 2018). This helps companies have a high-quality team that can make significant contributions to innovation and product development. Technology companies must ensure that their employees continue to develop skills that are relevant to technological developments. Effective talent management includes employee development through training, certification, and special development programmes (Sadat Muhammad Ashif, 2019).

Knowledge management mediates the influence of green leadership on competitive advantage. This indicates that effective green leadership can influence knowledge management, which in turn influences a company's ability to achieve and maintain a competitive advantage. In the context of technology companies, where innovation, sustainability, and adaptation to technological change are critical (Inigo & Albareda, 2019), good

knowledge management can facilitate the collection, storage, and dissemination of relevant knowledge regarding sustainable practices. This, in turn, can help companies in (1) identifying sustainable innovation opportunities that can differentiate them from competitors, (2) increasing employee understanding of environmental issues and sustainable practices, (3) measuring the impact of sustainable practices on business performance, and (4) making sustainable decisions that take ethical and environmental considerations into account.

Talent management mediates the influence of green leadership on competitive advantage. This indicates that effective green leadership can influence talent management, which in turn influences a company's ability to achieve and maintain a competitive advantage. In the context of technology companies, where competition for highly competent talent is fierce, good talent management can help companies in (1) recruiting and retaining the best talent who have the skills and technical knowledge needed for product innovation and development, (2) developing employee skills and competencies related to environmental issues and sustainable practices; (3) encouraging collaboration and knowledge sharing between teams and individuals within the organization; (4) identifying potential future leaders who can guide the company in implementing sustainable practices and achieving competitive advantage.

The findings carry significant theoretical implications for understanding the relationship between green leadership, knowledge management, talent management, and competitive advantage in technology firms. First, the Resource-Based View (RBV) theory suggests that while green leadership holds ethical value, it may not directly qualify as a VRIO resource, challenging traditional notions of competitive advantage. The Relative Advantage Theory underscores the varying importance of green leadership across customer segments, highlighting the need for nuanced approaches in assessing its impact on competitive advantage.

Furthermore, the mediating roles of knowledge management and talent management reveal the mechanisms through which green leadership influences competitive advantage. Effective green leadership enhances knowledge management processes, enabling companies to identify sustainable innovation

opportunities and make informed decisions. Similarly, talent management practices, influenced by green leadership, facilitate the recruitment and retention of talent aligned with sustainability goals, enhancing a company's competitiveness in the technology sector. These implications underscore the importance of integrating sustainability-driven leadership practices with robust knowledge and talent management strategies to maintain a competitive edge in today's dynamic business landscape.

Practically, the findings suggest actionable insights for technology companies aiming to enhance their competitive advantage through sustainability initiatives. Adopting green leadership practices can foster a culture that values environmental and sustainable issues, attracting top talent and encouraging innovation. Leveraging effective knowledge management processes can aid in identifying sustainable innovation opportunities and making informed decisions aligned with ethical and environmental considerations. Similarly, investing in talent management initiatives that prioritize sustainability can help companies recruit and retain high-quality talent capable of driving innovation and achieving sustainable competitive advantage. Thus, integrating sustainability-oriented leadership, knowledge management, and talent management practices can position technology companies to thrive in a rapidly evolving business environment while contributing positively to society and the environment.

The findings highlight the importance of employing sophisticated research designs and statistical techniques to thoroughly investigate the relationships among green leadership, knowledge management, talent management, and competitive advantage in technology firms. Longitudinal designs could shed light on temporal dynamics and causal relationships over time. Additionally, qualitative methodologies such as in-depth case studies or focused interviews can offer profound insights into individuals' experiences and perceptions within the organizational context, complementing quantitative findings with nuanced qualitative factors influencing the relationships under scrutiny. Integrating both qualitative and quantitative approaches enables a more comprehensive understanding of the intricate

interplay among these variables. Moreover, exploring potential moderators and adopting multi-level analysis approaches could provide insights into contextual factors and organizational dynamics that shape these relationships, enhancing the generalizability and applicability of research findings across various organizational contexts and levels. By embracing mixed-methods approaches, researchers can capture both quantitative data and qualitative insights, facilitating a holistic examination of the underlying mechanisms and complexities involved. Overall, these methodological considerations pave the way for future research to advance theoretical understanding and practical implications in organizational sustainability and performance within the technology sector.

CONCLUSION AND RECOMMENDATION

According to this study, the impact of green leadership on competitive advantage is mediated by knowledge management and people management. To support this research, verification analysis was carried out using the Structural Equation Model (SEM)-AMOS analysis tool. The study's findings show that talent and knowledge management are more important factors in determining competitive advantage than green leadership alone. Technology businesses must find and nurture executives who can steer their organization on a sustainable path and who possess a thorough understanding of sustainable practices. This calls for continual development and training in leadership. Technology businesses need to concentrate on managing knowledge and talent, which means they must create efficient methods for managing knowledge and talent that adhere to sustainable standards.

The study's limitations and avenues for further research should be addressed. First, the findings are specific to the 30 surveyed technology companies, primarily in IT services and consulting, online applications and services, software, computer hardware, electronic equipment and instruments, and networking equipment sectors. Expanding the sample to include companies from various countries or industries would validate the findings more broadly. Second, the quantitative approach used may limit the understanding of the relationships between green leadership, knowledge

management, talent management, and competitive advantage. Future research could employ qualitative methods such as case studies or interviews to explore individuals' experiences within organizational contexts more deeply. Additionally, the study's reliance on Likert scales to measure constructs like green leadership, knowledge management, and talent management may introduce biases and limit variable complexity. Using more objective and comprehensive measurement methods would address these limitations.

Based on the findings, recommendations can be directed to stakeholders to leverage the insights gained. Organizational leaders should prioritize integrating green leadership practices into corporate culture to attract and retain talent, while human resource managers can focus on implementing talent management strategies that emphasize both technical skills and sustainability. Policymakers could advocate for supportive regulations, industry associations may foster knowledge-sharing platforms, and investors should consider sustainability performance when making investment decisions. These efforts collectively contribute to advancing sustainability and competitive advantage within the technology sector, aligning with broader environmental and social goals.

The findings yield both theoretical and practical implications, offering insights into the complex interplay among green leadership, knowledge management, talent management, and competitive advantage in technology firms. Theoretically, they challenge traditional views on competitive advantage by emphasizing the nuanced role of green leadership within the RBV framework and the necessity of segment-specific assessments according to the Relative Advantage Theory. Furthermore, the mediating roles of knowledge management and talent management reveal the pathways through which green leadership influences competitive advantage, highlighting the importance of integrating sustainability-driven leadership practices with robust knowledge and talent management strategies.

Practically, the findings provide actionable guidance for technology companies seeking to bolster their competitive advantage through sustainability initiatives. Embracing green leadership practices can cultivate a culture valuing environmental issues, attracting top

talent, and fostering innovation. Effective knowledge management processes aid in identifying sustainable innovation opportunities and making ethically aligned decisions, while talent management initiatives prioritizing sustainability can help recruit and retain high-quality talent, which is crucial for innovation and sustainable competitive advantage. However, limitations such as the focus on specific technology firms in a particular geographic location may restrict the generalizability of findings. Future research endeavors could explore diverse industry contexts, utilize longitudinal designs, and employ mixed-methods approaches to deepen understanding and advance both theoretical insights and practical implications in organizational sustainability and performance within the technology sector.

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