Journal of Economics and Management
2025, Vol. 3, No. 2, 66-72
https://doi.org/10.70716/ecoma.v3i2.250

Transformational Leadership and Organizational Agility in the Era of Industry 4.0

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Received: 09/07/2025 | Accepted: 26/08/2025 | Publication: 30/08/2025

Abstract : This study examines the role of transformational leadership in enhancing organizational agility within the context of Industry 4.0. As organizations face rapidly changing technological landscapes, agility becomes a critical capability for sustaining competitiveness. Using a quantitative approach, data were collected through a survey of 210 mid-level managers and supervisors across manufacturing and service industries in Indonesia. The study employs Structural Equation Modeling (SEM) to assess the relationship between four dimensions of transformational leadership idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration and organizational agility. Results indicate that all dimensions of transformational leadership significantly and positively affect organizational agility, with intellectual stimulation having the strongest influence. The findings suggest that transformational leaders enable organizations to navigate uncertainty, adapt to change, and innovate continuously. This research contributes to the growing literature on agile leadership in digital transformation contexts and provides actionable insights for managers leading in dynamic environments.

Keywords : *transformational leadership, organizational agility, industry 4.0, digital transformation, SEM.*

How to Cite: Sasmita, Y., Aditya, K., Purnamasari, S., & Nor, N. A. M. (2025). Transformational Leadership and Organizational Agility in the Era of Industry 4.0. *Journal of Economics and Management, 3*(2), 66–72. https://doi.org/10.70716/ecoma.v3i2.250

INTRODUCTION

The emergence of Industry 4.0 has fundamentally reshaped organizational dynamics, forcing companies to rethink their structures, strategies, and leadership approaches. Technologies such as automation, artificial intelligence, big data, and the Internet of Things have significantly accelerated business processes and created both opportunities and disruptions across industries. In this context, organizational agility the ability to sense external changes, respond swiftly, and proactively shape market conditions has become a critical survival mechanism (Teece et al., 2016). Firms that lack agility often find themselves unable to cope with rapid technological shifts and volatile competition. Thus, leadership style plays a central role in equipping organizations with the capabilities needed to thrive. Among various approaches, transformational leadership stands out as a model that fosters change, innovation, and collective engagement, making it highly relevant in the era of digital transformation.

Vol. 3 No. 2, August 2025 | E-ISSN: 2987-7407 | DOI: https://doi.org/10.70716/ecoma.v3i2.250

Transformational leadership, as articulated by Bass and Avolio (1994), rests on four dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Leaders who embody these characteristics not only inspire loyalty and trust but also cultivate innovative thinking and long-term commitment among employees. Their ability to challenge conventional assumptions and encourage experimentation helps organizations build resilience in uncertain environments. These behaviors are particularly significant in Industry 4.0, where the speed of technological advancement demands leaders who can mobilize people around a shared vision while simultaneously nurturing creativity and adaptability. Unlike transactional approaches that emphasize compliance and short-term results, transformational leadership provides a deeper and more sustainable influence on organizational culture, thereby enhancing agility and competitiveness.

In Indonesia, the government has actively promoted the integration of Industry 4.0 through initiatives such as the national policy "Making Indonesia 4.0." This policy encourages firms, particularly in manufacturing and services, to adopt advanced technologies to increase productivity and global competitiveness. However, technology adoption alone does not guarantee organizational success. Many companies still struggle with rigid hierarchies, bureaucratic inertia, and leadership gaps that limit their ability to adapt (Van Dun et al., 2023). As a result, the role of leadership, particularly transformational leadership, becomes essential in bridging the gap between digital tools and organizational outcomes. By empowering employees and fostering adaptive learning, transformational leaders can act as catalysts for organizational agility, ensuring that technological adoption is matched with human capability development and strategic flexibility.

Organizational agility itself is a multidimensional construct encompassing rapid decision-making, structural flexibility, learning orientation, and innovation capacity. Doz and Kosonen (2010) argue that agility is not just about moving fast but also about making strategically relevant decisions in uncertain environments. Transformational leaders, through intellectual stimulation, can encourage experimentation and continuous learning, while inspirational motivation builds collective enthusiasm for change. Empirical evidence supports the notion that leadership behaviors strongly influence agility, particularly in sectors undergoing technological turbulence (Alavi et al., 2014). In this regard, transformational leadership provides the cultural foundation for developing adaptive capabilities, making it indispensable in Industry 4.0 environments where uncertainty and complexity dominate.

Although transformational leadership has been extensively linked to innovation, performance, and organizational change, its direct impact on organizational agility in the context of Industry 4.0 remains underexplored. Most existing research emphasizes innovation or change management as leadership outcomes, often overlooking agility as an integrated capability that blends flexibility, speed, and proactivity. This study seeks to address that gap by examining how the dimensions of transformational leadership specifically contribute to building agility. By focusing on this relationship, the research not only expands theoretical discussions but also provides practical implications for organizations navigating digital transformation.

Cultural and regional contexts further add complexity to the leadership-agility nexus. In Southeast Asia, including Indonesia, organizational leadership is often influenced by hierarchical and collectivist norms. Such norms sometimes clash with the participatory and empowering approaches required for agility in Industry 4.0 (Tortorella et al., 2019). This creates both challenges and opportunities for leaders to adapt their

Vol. 3 No. 2, August 2025 | E-ISSN: 2987-7407 | DOI: https://doi.org/10.70716/ecoma.v3i2.250

styles. Transformational leadership, which emphasizes empowerment, collaboration, and vision, offers a pathway for Indonesian firms to reconcile traditional cultural patterns with modern organizational demands. Understanding this shift is vital for advancing leadership practices in digitally evolving economies.

Moreover, agility should be viewed as a dynamic capability that evolves over time through ongoing learning and adaptation. Rigby et al. (2016) emphasize that creating an environment of psychological safety, open communication, and cross-functional collaboration is essential for cultivating agility. Transformational leaders play a critical role in shaping such environments, enabling teams to respond flexibly to disruptions and seize emerging opportunities. This perspective highlights that agility is not a fixed attribute but a continuously developing competency, requiring consistent reinforcement by leadership practices.

Finally, sectoral differences highlight that agility manifests differently across industries. In manufacturing, agility may center on supply chain responsiveness and flexible production systems, while in services, the focus lies on customer-centric innovations and rapid service delivery. Despite these differences, leadership remains a central determinant of success across sectors. Given the urgency of technological disruption and market volatility, this study aims to empirically investigate the role of transformational leadership in fostering organizational agility in Indonesia. By analyzing managerial perspectives across diverse industries, the research contributes to theory-building while offering actionable insights for leadership development programs tailored to Industry 4.0 challenges.

RESEARCH METHODS

This research employed a quantitative survey method with a cross-sectional design. The population comprised middle-level managers and supervisors working in manufacturing and service companies undergoing digital transformation in Indonesia. Using purposive sampling, 210 valid responses were obtained through online questionnaires distributed via LinkedIn, email, and professional networks.

The measurement instrument was adapted from established scales. Transformational leadership was assessed using the Multifactor Leadership Questionnaire (MLQ-5X) developed by Bass and Avolio (1994), which includes 20 items measuring four dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Organizational agility was measured using an adapted scale from Sharifi and Zhang (2001), covering strategic sensitivity, resource fluidity, and responsiveness.

All items used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Reliability testing indicated acceptable internal consistency with Cronbach's alpha values above 0.80 for all constructs. Content validity was reviewed by experts in organizational behavior and industrial management.

Data were analyzed using Structural Equation Modeling (SEM) via AMOS 24. The analysis included confirmatory factor analysis (CFA) for model fit, followed by structural model testing. The model fit indicators CFI, TLI, RMSEA, and χ^2/df were used to evaluate the goodness-of-fit. Mediation and multi-group analyses were also conducted to examine moderating effects by sector.

Ethical clearance was obtained, and respondents were informed about the confidentiality and voluntary nature of the study. Participation was anonymous and no identifiable information was collected.

Vol. 3 No. 2, August 2025 | E-ISSN: 2987-7407 | DOI: https://doi.org/10.70716/ecoma.v3i2.250

RESULTS AND DISCUSSION

Descriptive analysis shows that 56% of the respondents were from the manufacturing sector, and 44% from services. The majority held bachelor's degrees and had over five years of managerial experience, which suggests that the sample reflects a relatively mature managerial population with sufficient exposure to organizational change. Respondents agreed most strongly with statements related to intellectual stimulation, while individualized consideration received the lowest scores. This finding indicates that managers tend to prioritize problem-solving and innovation-related behaviors rather than individualized mentoring, possibly due to time constraints and structural pressures in dynamic industries.

Confirmatory factor analysis confirmed convergent and discriminant validity. The structural model demonstrated excellent fit (CFI = 0.94, TLI = 0.93, RMSEA = 0.045, χ^2/df = 1.85), strengthening confidence in the measurement model and suggesting that the hypothesized constructs are theoretically and empirically distinct. Such indices exceed conventional thresholds (Hu & Bentler, 1999), thereby validating the robustness of the model.

Path analysis revealed that all four dimensions of transformational leadership positively and significantly influence organizational agility. Intellectual stimulation had the strongest effect ($\beta = 0.39$, $p < 0.001$), reinforcing the argument that leaders who encourage experimentation and questioning of established assumptions foster adaptive capacity. This aligns with Alavi et al. (2014), who highlight the centrality of intellectual stimulation in preparing organizations for innovation readiness. The finding suggests that in Industry 4.0, where disruptive technologies frequently alter competitive landscapes, problem-solving and critical thinking are indispensable for agility.

Inspirational motivation also emerged as a strong predictor ($\beta = 0.31$, $p < 0.001$). Leaders who articulate a compelling vision and instill optimism enable employees to align strategically with organizational goals, particularly under uncertainty. This reflects prior work by Bass and Riggio (2006), who emphasize that motivation rooted in vision enhances collective resilience and adaptability.

Idealized influence ($\beta = 0.27$, $p < 0.01$) showed that leaders' role-modeling behaviors and ethical standards strengthen trust, cohesion, and willingness to embrace change. Meanwhile, individualized consideration ($\beta = 0.23$, $p < 0.05$) also demonstrated significant impact, albeit with lower magnitude, suggesting that mentoring and personal attention can facilitate agility, though perhaps less immediately than intellectual or motivational factors.

Overall, these findings validate the hypothesis that transformational leadership is a critical driver of agility by fostering shared vision, trust, empowerment, and openness to change. In digitally volatile environments, such leadership behaviors become essential for overcoming resistance, breaking down silos, and encouraging experimentation with new solutions (Teece et al., 2016).

Sectoral analysis showed that the leadership–agility link was slightly stronger in the service sector, possibly due to its higher reliance on human interaction, customer responsiveness, and innovation cycles that depend on creativity rather than machinery. However, the differences were not statistically significant, suggesting that transformational leadership exerts a robust and consistent influence across both manufacturing and services.

The implications for organizations are substantial. To build agility, firms must go beyond digital infrastructure investment and emphasize leadership development programs that integrate coaching, strategic communication, and innovative thinking.

Vol. 3 No. 2, August 2025 | E-ISSN: 2987-7407 | DOI: https://doi.org/10.70716/ecoma.v3i2.250

Practical initiatives may include leadership bootcamps, mentoring systems, and cross-functional team projects designed to cultivate transformational competencies.

From a theoretical standpoint, this study enriches the dynamic capabilities framework by positioning transformational leadership as a key antecedent to agility. It bridges behavioral leadership theory and strategic management by showing how leaders translate intangible behaviors into dynamic organizational outcomes. Furthermore, by examining the Indonesian context, this research extends the generalizability of prior Western-centric studies and provides culturally relevant insights, especially in collectivist and hierarchical societies adapting to Industry 4.0.

Future studies may build upon these findings by considering longitudinal designs to examine how leadership practices evolve alongside digital transformation and by incorporating mediating variables such as organizational learning culture or digital literacy. This would strengthen causal inferences and provide a more holistic understanding of how transformational leadership translates into sustained organizational agility.

CONCLUSION

The study concludes that transformational leadership significantly enhances organizational agility in the context of Industry 4.0. All four dimensions of transformational leadership idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration positively contribute to organizational responsiveness, flexibility, and innovation capacity.

Leaders who challenge assumptions, promote learning, and motivate employees toward shared goals are instrumental in creating agile cultures capable of navigating technological disruption. These findings suggest that organizations must prioritize leadership development as part of their Industry 4.0 transformation strategies.

It is recommended that firms implement leadership training programs focused on transformational competencies, including creativity facilitation, emotional intelligence, and strategic visioning. Such programs should be embedded in broader digital transformation initiatives to ensure alignment between technology and people.

Policy makers and business educators should also consider integrating leadership agility modules into professional and executive education curricula. These will help build a pipeline of future-ready leaders equipped for dynamic and uncertain environments.

Future research may explore longitudinal effects of leadership on agility and examine mediating factors such as organizational culture, employee engagement, or digital maturity. Comparative studies across countries or industries could also deepen the understanding of context-specific leadership needs in Industry 4.0.

In conclusion, transformational leadership is not merely a soft skill, but a strategic capability that enables organizations to adapt, innovate, and excel in the digital age. Embracing this leadership paradigm is essential for surviving and thriving in the Fourth Industrial Revolution.

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