

When green leadership matters: The role of knowledge absorption and creativity in green product development

Utik Bidayati^{1*}, Muhammad Ali Fikri¹, Desta Rizky Kusuma¹

¹ Department of Management, Faculty of Economics and Business, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

*Corresponding Author(s) Email: utik.bidayati@mgm.uad.ac.id

ABSTRACT

This study examines the relationship between green transformational leadership (GTL) and green product development performance (GPDP), with green absorptive capacity (GAC) and green creativity (GC) serving as mediating mechanisms. Previous studies often treat creativity as a direct factor in product development, which leaves a limited understanding of how leadership values are translated into concrete outcomes. To address this issue, this research uses a quantitative survey approach with purposive sampling based on business experience, ownership status, and participation in environmental training. The study involved 165 owners and managers of batik Micro, Small, and Medium Enterprises (MSMEs) in Yogyakarta, Indonesia, and the data were analysed using PLS-SEM. The results show that GTL is positively related to GPDP; however, this relationship does not operate directly but is partly channelled through the ability of business actors to absorb environmental knowledge (GAC) and process it into creative ideas and practices (GC). Thus, the findings suggest that green leadership leads to tangible improvements in environmentally friendly product development only when knowledge from training and production experience is properly understood and applied in daily practices. Accordingly, the practical implication of this study is that environmental training programs should be closely integrated with everyday production activities, rather than focusing solely on awareness or normative commitment among MSME actors.

Keywords: Green Transformational Leadership; Green Product Development; Green Absorptive Capacity; Green Creativity; Sustainable Innovation

JEL Code:
M12, O31, Q56, L26

DOI:
10.31106/jema.v22i2.24108

Article History:
Received 2025-08-08
Reviewed 2025-08-24
Revised 2025-09-18
Accepted 2025-12-31

Licensed:
CC-BY

How to Cite:
Bidayati, U., Fikri, M. A., & Kusuma, D. R. (2025). When green leadership matters: The role of knowledge absorption and creativity in green product development. *JEMA: Jurnal Ilmiah Bidang Akuntansi dan Manajemen*, 22(2), 299-332. doi: 10.31106/jema.v22i2.24108

Introduction

Transformational leadership can inspire, empower, and support employee engagement (Chen & Kim, 2023; Kim et al., 2017) and organizational performance (Bakir et al., 2024; Xie et al., 2019). The complexity of environmental issues requires a leadership paradigm shift, with a focus on ecological aspects, including green transformational leadership. This leadership style encourages employees to adopt environmentally friendly behaviors and support green initiatives within the organization (Chen & Kim, 2023; Crucke et al., 2022; Pham et al., 2020; Singh et al., 2020; Suherman et al., 2025). In an effort to achieve sustainability, organizations are required not only to be efficient in their production process but also to develop a holistic green strategy. Several studies have found that green transformational leadership is positively correlated with green creativity (Zhang et al., 2020). The implementation of green transformational leadership is crucial for fostering green creativity and innovation and for improving green product development performance (Li et al., 2024).

The success of green product development is determined by the company's ability to produce products, meet customer and stakeholder expectations, consider the life cycle and ecological impact, and ensure product performance (Y. S. Chen et al., 2015). Green products are defined as products made from recycled materials, energy-efficient, with minimal packaging, and strategic tools for creating competitive advantages, and that meet the demands of increasingly environmentally conscious consumers (Adomako & Nguyen, 2023; Chen & Chang, 2013). With the increasing demand for green innovation, SMEs are required not only to be proactive but also to be innovative in absorbing and applying green knowledge from both within and outside the organization (Çelik et al., 2024). This is where the role of green absorptive capacity becomes critical in encouraging creativity-based green innovation supported by green leadership. The contribution of green SMEs in reducing carbon pollution and energy consumption is also increasingly evident (Awan et al., 2021; Bai et al., 2015). In addition, research is increasingly focused on specific functional areas, such as green innovation, green creativity (Awan et al., 2021; Zailani et al., 2012), and green human resource management (Begum et al., 2022; Bhutto et al., 2021).

Currently, the development of green innovation depends on green absorptive capacity, such as an organisation's ability to recognise, assimilate, and apply external knowledge in environmental contexts (Albort-Morant et al., 2018; Zhang et al., 2020). Companies with green absorptive capacity are more flexible in responding to environmental pressures and are

better able to create green product innovations (Du & Wang, 2022; Jia et al., 2018). In addition to supporting adaptation, green absorptive capacity also strengthens companies' financial performance and competitiveness through sustainable innovation (Albort-Morant et al., 2018).

Green creativity is a central aspect of the green innovation concept. Green creativity refers to the development of new and valuable ideas for green products, methods, or practices (Arici & Uysal, 2022; Song & Yu, 2018; W. Zhang et al., 2020). This creative behavior supports the achievement of organizational environmental goals in innovative ways (Bhutto et al., 2021), including developing solutions to environmental challenges in service sectors such as hospitality (Adomako & Nguyen, 2023). Green creativity cannot be separated from the innovation process, as creativity is the core of innovation (Adomako & Nguyen, 2023; Anderson et al., 2014; Arici & Uysal, 2022; Chen & Chang, 2013). Green creativity is influenced by organizational factors such as leadership and corporate values regarding the environment (Adomako & Nguyen, 2023), as well as by tangible green behaviors behaviours in the workplace, such as energy efficiency and recycling (Li et al., 2024; Mittal & Dhar, 2016).

The theories of transformational leadership and the resource-based view support this study. Transformational leadership theory emphasizes the role of leaders in inspiring and empowering their followers to go beyond personal interests for the achievement of collective goals (Bass & Avolio, 1994), while the resource-based view approach asserts that a company's competitive advantage depends on their ability to manage valuable, rare, difficult to imitate and irreplaceable internal resources (Barney, 1991). The presence of green transformational leadership will lead to superior green product development performance and strengthen the organization's competitive advantage by focusing on environmental issues (Jia et al., 2018; Li et al., 2024).

Previous research has not fully elucidated how green transformational leadership can enhance green product development performance through the simultaneous mediating mechanisms of green creativity and green absorptive capacity. This study aims to examine this relationship in the context of organizations, particularly in the Batik SME sector in Yogyakarta, which has strong local cultural characteristics and sustainability. In addition, a comprehensive understanding of this influence pathway is fundamental, especially for SMEs operating in creative and environmentally oriented sectors.

Yogyakarta is one of the national centres of the creative economy, with cultural values and global competitiveness. As one of the oldest batik centres in Indonesia, Yogyakarta is

widely known for producing distinctive hand-drawn and stamped batik with symbolic and philosophical motifs that reflect the customs of the Mataram tradition. Yogyakarta has been designated as a batik cultural heritage centre by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) since 2009 (Putra & Mukminan, 2018).

Batik SMEs, as part of Indonesia's cultural heritage and creative industry, face significant challenges in implementing environmentally friendly practices. Batik production generally still uses synthetic chemicals, which contribute to environmental pollution, especially hazardous liquid waste (Kusumawardani et al., 2024). In addition, most batik SMEs remain limited in terms of visionary leadership, green transformation, utilization of external knowledge, and innovation capacity to develop environmentally friendly products (Kurniawati et al., 2022; Nawi et al., 2020).

A study found that many Batik SMEs remain classified as "very unprepared" to face market competition, reflecting ongoing weaknesses in leadership systems and overall organizational readiness to manage environmental transformation (Kusumawardani et al., 2024). Although some SMEs have adopted environmentally friendly technologies, such as electric batik stoves that reduce fuel costs by up to 85% compared to kerosene stoves, the majority still lack the absorptive capacity to use them due to limited access to knowledge and training (Kurniawati et al., 2022). This indicates a weak green absorptive capacity in SMEs in recognizing, assimilating, and applying external knowledge related to green creativity. However, limited creativity in designing innovative, market-appropriate green products indicates that the level of green creativity among SMEs remains suboptimal. The lack of green leadership that fosters innovative ideas also contributes to the underdevelopment of competitive green products. Thus, the main challenges faced by batik SMEs in Yogyakarta are closely related to the weakness of green transformational leadership, limited capacity to absorb green knowledge, and underdeveloped green creativity. In addition, these three aspects are important determinants in improving the performance of environmentally friendly green product development. Therefore, it is important to empirically examine how green transformational leadership influences green product development performance through the mediating role of green creativity and green absorptive capacity in the context of Yogyakarta batik SMEs.

The batik SMEs sector in Yogyakarta faces strategic challenges and opportunities, making this research highly relevant. From a business development perspective, while quantitative data on the exact number of batik SMEs remains limited, empirical research indicates that market orientation and product innovation play key roles in the marketing

performance of Yogyakarta batik SMEs. However, the impact of online marketing still needs improvement (Hanif et al., 2022). On the demand side, while there has been no specific quantitative study on preferences for naturally dyed batik, evidence suggests that a design approach that meets consumer desires, such as quality function deployment, increases customer satisfaction with Yogyakarta batik (Fauziyah, 2021). In the context of green innovation, the literature shows that green transformational leadership strengthens an organizational identity culture that supports green creativity through mechanisms such as green organizational identity and green thinking in the SME sector (Al-Ghazali et al., 2022).

Meanwhile, green absorptive capacity has been shown to foster green creativity as a competitive advantage by leveraging and transforming environmental knowledge (Albort-Morant et al., 2018). However, research on batik in Yogyakarta generally focuses more on price, design, quality, and consumer purchase intentions, without exploring the role of transformational leadership and green innovation mechanisms, such as knowledge absorption and environmental creativity. Considering that Yogyakarta batik SMEs also represent UNESCO-recognized intangible cultural heritage, while facing the demands of modern adaptation and sustainability, this context offers a unique contribution to enriching the literature on green leadership and innovation in the creative SME sector.

This study aims to make theoretical contributions by enriching the transformational leadership theory and the resource-based view (RBV) in the context of creative SMEs, integrating green absorptive capacity and green creativity as key mechanisms to strengthen the performance of green product development in the Yogyakarta batik sector. The practical contributions of this study include the development of implemented strategies for batik SME owners and policy makers in the form of: strengthening green leadership styles that facilitate increased ability to absorb environmental knowledge and trigger creativity in product innovation, as well as concrete guidelines in building adaptive, innovative and environmentally friendly organizational capabilities in accordance with sustainable market demands.

Literature Review

Green Transformational Leadership on Green Product Development Performance

Transformational leadership theory explains that transformational leaders can improve organizational innovation performance by encouraging followers to think creatively and address challenges from different perspectives (Keller, 1992; Waldman & Bass, 1991). Rooted in the transformational leadership theory proposed by Bass & Avolio (1990), green

transformational leadership includes four core dimensions of transformational leadership: idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration, all oriented to the ecological context.

Transformational leadership extends the concept by emphasizing the importance of environmental and sustainability values within organizations. Leaders with a green orientation use charismatic influence to shape pro-environmental values in the organization, inspire employees with a vision of sustainability, and encourage the exploration of new, environmentally friendly ideas (Farrukh et al., 2022; Pham et al., 2020). Such leaders not only influence the technical aspects of innovation but also shape the collective spirit, which is important in the design and development of green products (Podsakoff et al., 1990; Sarros et al., 2008).

Previous literature also shows that green transformational leaders play an important role in sustainable product development by empowering employees to adopt environmentally friendly behaviors, such as energy efficiency, waste reduction, recycling, and the use of sustainable materials (Khan & Khan, 2022; Yang et al., 2024). By articulating a clear environmental vision and setting high standards for green behavior, leaders can build an organizational culture that supports green product innovation. Thus, when transformational values are contextualised within the environmental dimension, green transformational leadership can play a strategic role in driving competitive, sustainable green product development performance. Based on the above explanation, the hypothesis one is:

H₁: Green transformational leadership has a significant positive impact on green product development performance.

Green Transformational Leadership on Green Absorptive Capacity

Transformational leadership theory that emphasises the importance of vision, long-term, stimulation, intellectual and individual attention (Bass & Avolio, 1990). Green transformational leadership plays a key role in building green absorptive capacity in an organisation. Green transformational leadership not only catalyses changing values and behaviour in a supportive environment but also helps foster a culture of sustainable learning. Leaders with a green transformational style create a work environment that supports the collection and dissemination of environmental knowledge, encourages openness to external information and strengthens cross-departmental collaboration in understanding and implementing green solutions (Pham et al., 2020; Yang et al., 2024).

Furthermore, transformational green leaders actively shape the organisation's collective awareness of the importance of environmental innovation by providing emotional support, strengthening ecological values, and facilitating learning. Green absorptive capacity refers to an organization's ability to acquire, assimilate, transform, and exploit external knowledge to support green innovation. Therefore, strong leadership in sustainability values serves as the foundation for activating all dimensions of green absorptive capacity, from obtaining environmental information to its practical implementation in the development of organisational products and processes.

The resource-based view explains that green absorptive capacity is a strategic capability based on rare, difficult-to-imitate, and high-value knowledge, which ultimately can create long-term competitive advantage (Barney, 1991; Xie et al., 2018). To optimally develop the capacity for green absorption, organisations need leadership that can manage internal organisational elements alongside external resources through strong relationships, knowledge-sharing systems, and a high level of trust within collaborative networks (Saleh & Brem, 2023; Yimer et al., 2025). Green absorptive capacity not only supports adaptation to external environmental pressures but also encourages organizations to develop innovative product knowledge aligned with changing market needs (Makumbe, 2024). Thus, green transformational leadership is not only an independent variable in the sustainable organizational performance model but also a key driver of organizational capabilities oriented towards green innovation and sustainable ecological learning. Based on the above explanation, hypothesis two is:

H₂: Green transformational leadership has a significant positive impact on green absorptive capacity.

Green Transformational Leadership on Green Creativity

Transformational leadership theory is known as a style of effective leadership in pushing behaviour, innovative and creative in an organisation (Bass, 1985; Khalili, 2016). This theory explains four dimensions main: inspirational motivation, idealized influence (charisma), individualized consideration and intellectual stimulation. Through stimulation intellectuals, for example leaders push employee for think about approach new and complete problem with innovative way (Tang et al., 2020). When this concept is adopted in the context of sustainability, a green transformational leadership approach emerges with leadership behaviors that inspire employees to achieve environmental goals and demonstrate a

commitment to practicing green within the organization (Bass, 1998; Chen & Chang, 2013; Gardner & Avolio, 1998).

Green creativity is the ability of individuals or groups to generate original and useful ideas in the context of environmentally oriented products, processes or practices (Chen & Chang, 2013). Green transformational leaders create a work environment that encourages the exploration of ideas, provides freedom of expression and supports the achievement of creative goals that are aligned with sustainability values (Mittal & Dhar, 2016). The individualized attention dimension in green transformational leadership allows leaders to recognize the unique potential of each employee, while charisma and inspirational motivation build collective commitment to green innovation (Ding et al., 2023; Sidney et al., 2022).

Empirical research also shows that transformational leadership significantly influences creativity at both the individual and team levels (Athia et al., 2024; Qian & Kee, 2023; Xu et al., 2024). Through a strong vision and intellectual stimulation, leaders are able to shape an organizational climate that supports innovation and the renewal of ideas (Nabi et al., 2023; Rehmani et al., 2023). Transformational leadership has been shown to significantly increase team creativity (Xu et al., 2024). Several studies also reinforce that green transformational leadership contributes to green creativity in various sectors, such as manufacturing, electronics and SMEs by providing the motivational boost and autonomy needed for employees to create green solutions (Begum et al., 2022; Mittal & Dhar, 2016). Based on the above explanation the third hypothesis is:

H₃: Green transformational leadership has a significant positive impact on green creativity.

Green Absorptive Capacity on Green Product Development Performance

The resource-based view theory explains that sustainable competitive advantage can be achieved when an organization possesses valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Absorptive capacity is an important source of strategic strength for companies to recognize or assimilate external knowledge, and apply it in innovative processes (Cohen & Levinthal, 1990). Motohashi et al., (2024), expanded this draft into dynamic capabilities with a variety of organizational process sets in acquiring, transforming, and utilizing knowledge to create sustainable innovations that are adaptive to environmental changes. Furthermore, this concept has evolved into green absorptive capacity, the ability of organizations to actively acquire, integrate, transform, and utilize environmentally oriented knowledge to produce green innovations (Awwad et al., 2025; W. Zhang et al., 2020). Green absorptive capacity not only supports the organizational learning process in sustainability but

also encourages innovative uses in the development of high-value green products (Heubeck, 2024; Mehralian et al., 2024).

Previous literature also emphasizes that green absorptive capacity supports organizations in combining internal and external knowledge to create adaptive solutions and innovative products (Aboelmegeed & Hashem, 2019; Çelik et al., 2024). In contrast, organizations that fail to update their knowledge base tend to experience structural rigidity and difficulty following technological trends, which ultimately reduce product development performance (Leonard-Barton, 1992; Wang et al., 2022). Therefore, by increasing the capacity for green absorption, organizations not only strengthen their innovative capabilities but also enhance the effectiveness of green product development processes by focusing on sustainability and market needs. Based on the above explanation then hypothesis four is:

H₄: Green absorptive capacity has a significant positive impact on green product development performance.

Green Creativity on Green Product Development Performance

The resource-based view holds that creativity is a source of power, not an intangible resource that is valuable, rare, difficult to obtain, imitable, and not replaceable (Barney, 1991). Green creativity, as a form of organization-specific knowledge and ideas, becomes a source of competitive advantage because it produces products that are unique, innovative and in line with the needs of increasingly environmentally conscious consumers. Original creative ideas not only help organizations create superior product solutions but also support the process of adapting to green market demands and environmental regulations (Amabile et al., 1996; Ford, 1996).

Green creativity is one of the important foundations in producing innovative and environmentally friendly product solutions. Green creativity is defined as the ability of individuals or teams to generate new and useful ideas with a focus on environmental sustainability, including energy efficiency, the use of eco-friendly materials, and waste reduction (Adomako & Nguyen, 2023; Chen & Chang, 2013).

Previous literature indicates that team creativity is a key factor in the product development process because creative ideas emerge from interactions among team members, thereby driving innovations that reflect the product's novelty and usefulness (Acar et al., 2024; Marques et al., 2025). Moreover, the team's creativity in product development directly contributes to the performance of developing green products, such as the performance in producing products with minimal impact on the environment, using recycled materials, and

being efficiently produced in terms of energy use (Griffin & Page, 1996; Song & Yu, 2018). When green creativity is internalized in the product development process, organizations can proactively create innovative products and meet the sustainability standards expected by the market. Based on the above explanation then hypothesis five is:

H₅: Green creativity has a significant positive impact on green product development performance.

Green Absorptive Capacity as a Mediator

The resource-based view theory states that superiority sustainable competitive obtained through utilization source valuable, rare, non-existent internal power easy imitated and not can replaced (Barney, 1991). One of the source power relevant strategic in context sustainability is green transformational leadership that drives pro environmental values, inspiring vision green and stimulating behavior innovative through stimulation intellectual and motivational inspirational (Al-Ghazali et al., 2022; Mittal & Dhar, 2016). Green transformational leadership is important in creating an organizational environment that supports the achievement of sustainability goals, including through the development of environmentally friendly products (Micheli et al., 2020; Samad et al., 2021).

However, the influence of green transformational leadership on green product development performance is not entirely direct. Research previously shows that there is mechanism significant mediation, one of which is green absorptive capacity with ability organization for acquire, assimilate, transform and exploit knowledge environment external to in its internal processes (Y. S. Chen et al., 2015; Ozgul, 2022). Green absorptive capacity as an organizational process is undertaken by companies to adapt resource knowledge in response to market dynamics and the ever-evolving demands for sustainability (Fan et al., 2023; Teece et al., 1997).

Green transformational leadership acts as a key driver in the development of green absorptive capacity by instilling a strong environmental orientation in individuals and teams. Leaders who emphasize the importance of sustainability and green innovation can encourage employees to be more open to environmental learning and internalize new information related to green practices (Begum et al., 2022; Ozgul, 2022). Furthermore, as green absorptive capacity increases, organizations become more adaptive in absorbing new knowledge and applying it to develop environmentally friendly and highly competitive products. Green absorptive capacity serves as a strategic bridge between the influence of green leadership and the achievement of green product development performance.

Several studies have emphasized the importance of this mediation in ensuring that the vision and values brought by green transformational leadership are truly implemented in the product innovation process (Begum et al., 2022; Li et al., 2024). Green absorptive capacity facilitates the translation of ideas and directives from leaders into concrete actions that encourage energy efficiency, the use of environmentally friendly materials and more sustainable product designs. Based on the above explanation then hypothesis six is:

H₆: Green transformational leadership has a positive and significant effect on green product development performance mediated by green absorptive capacity.

Green Creativity as a Mediator

The resource-based view theory states that superiority competitive term long can achieved through management source valuable, rare, non-existent internal power can imitate and not can replaced (Barney, 1991). Green transformational leadership an important role in encouraging employee creative behavior by instilling sustainability values, visions, and goals. One of these resources is green creativity, which is the ability of individuals or groups to generate new ideas that are original and useful in the context of environmental sustainability (Sidney et al., 2022; W. Zhang et al., 2020). When this creativity is systematically cultivated through a green transformational leadership style, the organization is able to improve performance in developing innovative and highly competitive green products.

The four main dimensions of green transformational leadership intellectual stimulation, individualized consideration, charisma and inspirational motivation directly contribute to creating an organizational climate conducive to the growth of green creativity (Mi et al., 2019; Mittal & Dhar, 2016). Through intellectual stimulation, leaders encourage the exploration of new solutions to environmental problems. Individualized consideration encourages employees to be empowered according to their unique potential, while charisma and inspirational motivation create a work culture that values green initiatives and innovative thinking (Jia et al., 2018; Song & Yu, 2018; Srivastava et al., 2024; W. Zhang et al., 2020). Thus, green transformational leadership acts as a motivator and as a facilitator for the emergence of pro-environmental creative ideas within the organization.

Furthermore, green creativity acts as a mediating mechanism in transforming the influence of green transformational leadership into concrete results in the form of green product development performance. Green creativity supports product development teams in creating environmentally friendly solutions that are energy-efficient and responsive to the needs of the green market and to strict environmental regulations (Griffin & Page, 1996;

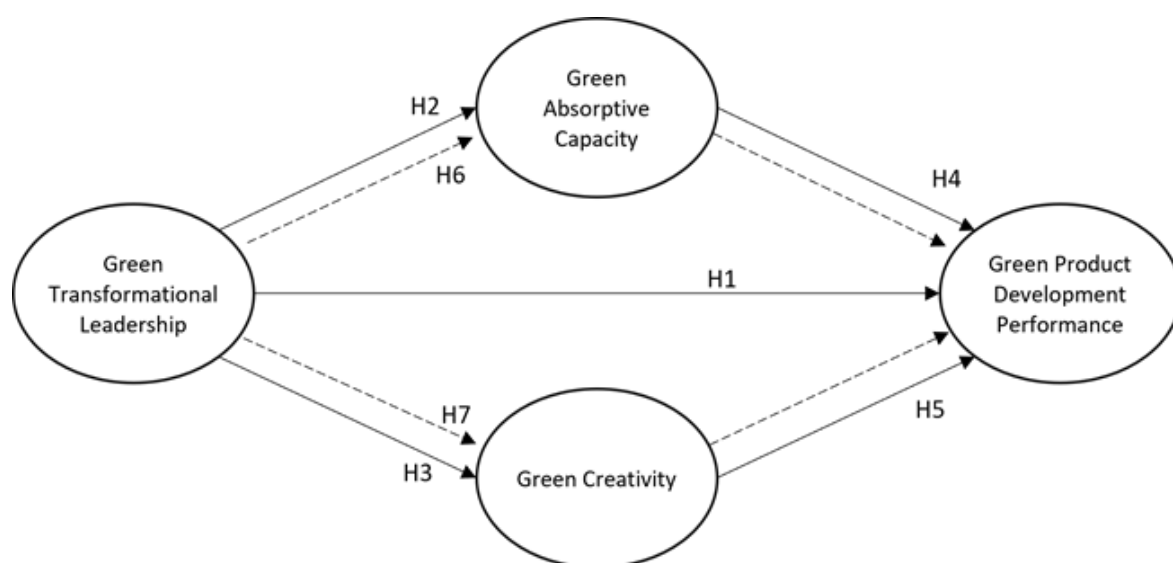
Mansoor et al., 2021; Song & Yu, 2018). By treating creativity as a knowledge-based organizational capability, organizations can leverage their intellectual assets to develop sustainable product innovations. This is in line with the resource-based perspective because green creativity is an intangible, rare resource that is difficult for competitors to imitate and a driver of long-term competitive advantage.

Previous literature supports this mediating role, showing that green transformational leadership can significantly influence employee creativity and that team creativity is a key determinant of successful product development performance (Cooper, 1979; Mansoor et al., 2021; Song & Yu, 2018). Therefore, green creativity is not only a result of effective leadership but also an important bridge to achieving optimal performance in green product development. Based on the above explanation then hypothesis seven is:

H7: Green transformational leadership has a positive and significant effect on green product development performance mediated by green creativity.

Figure 1 illustrates the conceptual framework of this study, showing how green transformational leadership influences green product development performance both directly and indirectly through green absorptive capacity and green creativity. The framework suggests that green leadership is more effective when organizations are able to absorb environmental knowledge and apply creative ideas in product design, material selection, and production processes.

Figure 1. Research Framework



Methods

This study uses a quantitative, survey-based approach to examine the relationships among green transformational leadership (GTL), green absorptive capacity (GAC), green creativity (GC), and green product development performance (GPDP) in batik MSMEs in Yogyakarta. Primary data were collected through a structured questionnaire based on indicators from Chen & Chang (2013) and Chen et al. (2014), using a 5-point Likert scale. Instrument validity was tested through content validity by experts and construct validity by evaluating factor loading values (>0.70), AVE (>0.50), and cross-loading for discriminant validity. In contrast, reliability was assessed using Cronbach's Alpha (>0.60) and composite reliability (>0.70), in accordance with the guidelines of Ghazali & Latan (2015). The sampling technique used was purposive sampling based on specific criteria, resulting in 165 respondents from a total of 1,750 batik MSMEs. Data analysis was performed using the PLS-SEM method, which is considered appropriate for complex models with small sample sizes and non-normal data distributions (Hair et al., 2019). Hypothesis testing was performed using a bootstrapping procedure with a 5% significance level and a t-statistic > 1.96 (Ghozali & Latan, 2015).

Table 1 presents the measurement results for the indicators of each construct in the study. Each construct was measured using several statement items adapted from previous studies, and factor loadings were used to assess construct validity. All indicators showed factor loadings above 0.70, indicating they were valid indicators of their respective constructs (Ghozali & Latan, 2015; Hair et al., 2019). GPDP had five indicators with loadings between 0.897 and 0.952; GTL had six indicators with loadings between 0.743 and 0.872; GAC had five indicators with loadings between 0.814 and 0.898; and GC had six indicators with loadings between 0.810 and 0.941. Thus, all indicators used were deemed valid and suitable for the measurement model. Moreover, it shows the results of validity and reliability tests for each construct in the study. Construct validity was tested using the Average Variance Extracted (AVE) value, while reliability was measured using Composite Reliability (CR) and Cronbach's Alpha (α). All constructs met the recommended criteria, namely factor loading values > 0.70 , AVE > 0.50 , CR > 0.70 , and $\alpha > 0.60$ (Ghozali & Latan, 2015; Hair et al., 2019). GPDP had an AVE of 0.857, CR of 0.968, and α of 0.958; GTL with an AVE of 0.676, CR of 0.926, and α of 0.904; GAC with AVE 0.717, CR 0.927, and α 0.901; and GC with AVE 0.747, CR 0.946, and α 0.932. These results indicate that all constructs have

excellent validity and reliability, making them suitable for use in the measurement model of this study.

Table 1. Factor Loadings (FL), Average Variance Extracted (AVE) and Reliability Results

Dimensions	Item	FL
GTL (AVE = 0.676; Cronbach's Alpha = 0.904; Composite Reliability = 0.926)		
GTL1	The leader inspires members with clear environmental plans.	0.872
GTL2	The leader provides a clear environmental vision for members.	0.869
GTL3	The leader encourages members to work toward shared environmental goals.	0.840
GTL4	The leader motivates members to achieve environmental objectives.	0.820
GTL5	The leader respects members' environmental beliefs and values.	0.743
GTL6	The leader encourages members to consider and share green ideas.	0.780
GAC (AVE = 0.717; Cronbach's Alpha = 0.901; Composite Reliability = 0.927)		
GAC1	Firms understands and interprets external environmental information effectively.	0.814
GAC2	Firms shares environmental knowledge across different organizational units.	0.847
GAC3	Firms integrates existing and newly acquired environmental knowledge.	0.856
GAC4	Firms recognizes and acquires important external environmental knowledge.	0.898
GAC5	Firms successfully applies external environmental knowledge in its business.	0.817
GC (AVE = 0.747; Cronbach's Alpha = 0.932; Composite Reliability = 0.946)		
GC1	Members propose new approaches to achieve environmental goals.	0.894
GC2	Members suggest new green ideas to improve environmental performance.	0.941
GC3	Members promote and support new green ideas to others.	0.867
GC4	Members develop clear plans to implement new green ideas.	0.833
GC5	Members rethink and refine new green ideas when needed.	0.836
GC6	Members find creative solutions to environmental problems.	0.810
GPDP (AVE = 0.857; Cronbach's Alpha = 0.958; Composite Reliability = 0.968)		
GPDP1	The green product development project contributes significantly to company revenue.	0.921
GPDP2	The project develops high-quality green products.	0.923
GPDP3	The project continually improves its green development processes.	0.952
GPDP4	The project is more innovative than competitors in green products.	0.936
GPDP5	The project successfully achieves its environmental goals.	0.897

Table 2. Discriminant Validity (Heterotrait-monotrait - HTMT)

	(1)	(2)	(3)	(4)
(1) GAC				
(2) GC	0.907			
(3) GPDP	0.901	0.865		
(4) GTL	0.985	0.881	0.881	

Table 3. Demographic Profiles

Profiles		Frequency	Percentages
Gender	Female	15	9.09
	Male	150	90.91
Age	18-25 years	15	9.09
	26-35 years	25	15.15
	>35 years	125	75.76
Education Level	High School	150	90.91
	Diploma	10	6.06
	Bachelor's Degree	5	3.03
Business Experience	0-2 years	0	0.00
	3-5 years	98	59.39
	>6 years	67	40.61
Revenue	<5 million	90	54.55
	5-10 million	63	38.18
	>10 million	12	7.27
Position	Owner	165	100.00
	Distributor	0	0.00
	Employees	0	0.00

Discriminant validity was checked using the heterotrait–monotrait (HTMT) ratio, which is often used in place of the Fornell–Larcker approach to see whether constructs can be distinguished clearly. As a general reference, HTMT values below 0.90 are usually considered acceptable. In Table 2, most values are reported within this range, indicating that the constructs are empirically distinct. An exception is observed in the relationship between green absorptive capacity and green creativity, where the HTMT value is above the suggested threshold. This higher value reflects a strong association between the two constructs and should therefore be interpreted with some caution.

Previous studies note that HTMT threshold values are intended as practical guidelines rather than fixed rules, especially when constructs are conceptually related and the research setting supports such overlap (Henseler et al., 2015; Hair et al., 2019). In the context of MSMEs, organizational learning activities and creative practices are often closely connected and tend to be concentrated at the level of the owner-manager. From this perspective, a higher level of association between green absorptive capacity and green creativity reflects the way these processes are intertwined in practice, rather than indicating a problem with discriminant validity.

The demographic characteristics of the respondents in this study (Table 3) indicate that the majority were female (91%), while only 9% were male. Based on age, the majority of

respondents were in the 35+ age group (76%), followed by the 26–35 age group (15%) and the remainder in the 18–25 age group (9%). In terms of education, the majority of respondents had a high school education or equivalent (91%), while those with a diploma accounted for 6% and those with a bachelor's degree accounted for 3%. Based on business experience, the majority of respondents had 3–5 years of experience (59%), followed by those with more than 6 years (41%), and no respondents had less than 2 years of experience. In terms of monthly income, the majority of respondents had an income of less than 5 million rupiah (55%), followed by those with an income of 5–10 million rupiah (38%), and those with more than 10 million rupiah (7%). All respondents in this study were business owners, with no distributors or employees, dominated by female entrepreneurs with relatively mature business experience and secondary education, which may influence perceptions and the implementation of green transformational leadership in batik businesses.

Result and Discussion

Table 4 shows that the direct and indirect effects of this research (H_1 – H_5) have t-values > 1.96 and p-values < 0.05 . Based on Table 5, all hypotheses were accepted. Based on results testing hypothesis that green transformational leadership is influential positive to green product development performance. These findings indicate that environmentally oriented leadership directly contributes to an organization's ability to produce more environmentally friendly products (Y. S. Chen & Chang, 2013; Li et al., 2024; Yan & Hu, 2022). Green transformational leadership supports organizations in forming green teams dedicated to environmental goals and encourages the adoption of green practices in product development (Al-Ghazali et al., 2022; Özgül & Zehir, 2023). This leadership can influence employees' beliefs and values about the importance of green products through transformational dimensions such as charisma, intellectual stimulation, inspirational motivation, and individual consideration (Abourokbah et al., 2024; Bass, 1985). Green transformational leadership is relevant because leaders play a central role in shaping an organization's strategic direction and culture towards sustainability (Mittal & Dhar, 2016). Thus, the role of green transformational leaders in batik MSMEs can inspire, motivate, and direct employees to develop more environmentally friendly batik products, such as through the use of natural materials, waste reduction, and energy efficiency (Li et al., 2024).

Based on resource-based view, green transformational leadership can be considered as source power strategic nature valuable, rare, inimitable and non-substitutable, which encourages creation superiority competitive sustainable (Barney, 1991). Green leadership

facilitates creativity and product innovation and strengthens market position through an approach that combines brand culture and environmental awareness (Ding et al., 2023; He et al., 2023; Jia et al., 2018; Rasheed et al., 2025).

Based on the results, the hypothesis proposing a positive effect of green transformational leadership on green absorptive capacity is supported. A significant relationship is observed between green leadership practices and the organisation's ability to absorb and make use of environmental knowledge. This finding is consistent with the resource-based view, which explains that internal capabilities—such as leadership and knowledge absorption—can act as strategic assets. When these capabilities are developed and applied to support innovation, including green innovation, they may contribute to sustainable competitive advantage (Barney, 1991; Teece et al., 1997). These results strengthen view that leader transformational that has vision strong environment can forming internal organizational processes for acquire, assimilate, transform and exploit knowledge green in a way effective (Ozgul, 2022). Leaders with an environmental orientation are important in creating a learning system responsive to ecological issues such as the use of natural dyes, waste reduction, and energy efficiency (Begum et al., 2022; Su et al., 2020). Through dimensions of transformational leadership such as intellectual stimulation, individual consideration, charisma, and inspirational motivation, green transformational leadership encourages employees to actively engage in exploring and developing green ideas (Bass, 1985; Jia et al., 2018).

Green transformational leadership shapes employees' green behavior, builds cognitive infrastructure, and fosters an organizational culture that supports the absorption of external environmental knowledge (Ozgul, 2022). Green transformational leadership is crucial for strengthening green absorptive capacity, thereby improving the organization's ability to meet sustainability demands by effectively utilizing environmental knowledge (Ozgul, 2022; Zhang et al., 2019).

Table 4. Structural Model Results and Hypothesis Testing

Hypothesis		β	<i>t</i> -value	<i>p</i> -value	Decision
H ₁	GTL → GPDP	0.272	2.104	0.035	Supported
H ₂	GTL → GAC	0.889	39.227	0.000	Supported
H ₃	GTL → GC	0.814	26.267	0.000	Supported
H ₄	GAC → GPDP	0.322	3.047	0.002	Supported
H ₅	GC → GPDP	0.332	3.541	0.000	Supported
H ₆	GTL → GAC → GPDP	0.286	3.031	0.002	Supported
H ₇	GTL → GC → GPDP	0.270	3.519	0.000	Supported

Green transformational leadership has an influence positive towards green creativity. This result in line with theory leadership that green transformational leadership consists of from four dimensions main, such as intellectual stimulation, individualized consideration, idealized influence, and inspirational motivation, all of which proven contribute in increase creativity employees (Al-Ghazali et al., 2022; Bass, 1985; Maitlo et al., 2022). Intellectual stimulation encourages innovative solutions to environmental problems and provides space for the development of individual creative potential (Çekmecelioglu & Özbağ, 2016).

Leadership with an environmental orientation significantly encourages the emergence of creative ideas focusing on green innovation within organizations (Mittal & Dhar, 2016). Leaders with a vision for environmental sustainability can stimulate employees to think critically, generate creative solutions related to the use of environmentally friendly materials, and innovate in the production process (Dong & Han, 2025; Zhu et al., 2022). In addition, green transformational leadership can enhance green creativity by responding to market pressures and environmental regulations adaptively and innovatively (Jia et al., 2018).

Green absorptive capacity has an effect positive on green product development performance. The greater an organization's capacity to absorb, assimilate, and utilise knowledge from its environment, the greater its ability to develop innovative, environmentally friendly products (Cohen & Levinthal, 1990; Du & Wang, 2022; Zahra & George, 2002). In line with the perspective of the resource-based view, which states that capabilities unique to knowledge, such as green absorptive capacity, can become a source of sustainable competitive advantage (Barney, 1991).

Green absorption capability aligns organizations to integrate external knowledge, such as environmental regulations and consumer preferences for green products, into internal innovation processes, thereby enhancing the effectiveness of product development (Y. S. Chen et al., 2015; Du & Wang, 2022). Green absorptive capacity will be better able to utilise external information on sustainable production practices, such as the use of natural dyes, reduction of liquid waste, recycling of waste, and their application in the development of new environmentally friendly products (Amaranti et al., 2024; Çelik et al., 2024).

Green creativity positively affects the performance of green product development. From a resource-based perspective, green creativity can be categorized as a rare, inimitable intangible asset that supports sustainable competitive advantage (Barney, 1991). The creativity embedded in the product development process encourages organizations to innovate and respond to market continuously changing market needs with more ecological solutions (Amabile et al., 1996; Greeley et al., 2025). By fostering green creativity,

companies develop new products with greater market appeal and support sustainable brands (Cooper, 1979). In addition, the implementation of green creativity also strengthens the image of a culture that is adaptive to modern environmental challenges and expands access to green markets both domestically and internationally. Thus, promoting a culture of green creativity is a crucial strategy for companies to enhance competitiveness and support sustainable business growth, especially in response to global demands for a greener and socially responsible industry.

Table 4 also shows that the indirect effects of this research (H_6 – H_7) have t-values > 1.96 and p-values < 0.05 . Based on Table 6, all hypotheses were accepted. Green absorptive capacity mediates the influence of positive green transformational leadership on green product development performance. Green transformational leadership influences the development of green product performance by enhancing the organization's green absorptive capacity (Y. S. Chen et al., 2015; Kumar Kar & Harichandan, 2022).

The resource-based view theory states that sustainable competitive advantage can be achieved through the management of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). Green absorptive capacity is an intangible resource that serves as an internal mechanism for organizations to recognize, assimilate, transform, and utilize knowledge from the external environment (Cohen & Levinthal, 1990; Du & Wang, 2022).

Green transformational leadership provides a contribution to strengthening green absorptive capacity through stimulating intellectual, individual considerations and motivational and inspirational encouragement for employees to be open to learning and development of green knowledge (Al-Ghazali et al., 2022; Bass, 1985; Ozgul, 2022). Green absorptive capacity acts as a bridge between leadership and innovative performance for organizations with the ability to absorb external knowledge, create environmentally friendly solutions, and adapt to changes in the market and regulations (Y. S. Chen et al., 2015; Idrees et al., 2023; Teece et al., 1997). Green absorptive capacity also facilitates cross-functional integration and the dissemination of environmental information during green product innovation (Du & Wang, 2022). Thus, the role of green absorptive capacity mediation confirms that the success of green transformational leadership in enhancing green product development performance is not only dependent on the leader's ability to motivate but also on the organization's ability to absorb and utilize environmental knowledge to produce sustainable product innovations (Ding et al., 2023; Ozgul, 2022).

Green creativity mediates the influence of positive green transformational leadership towards green product development performance. Green transformational leadership can play

a role in pushing creativity among green employees, who ultimately impact positive performance and product development (Chen et al., 2015; Mittal & Dhar, 2016). Resource-based view theory states that organizational capabilities are valuable, rare, and complex, and that they are imitable and become determinants of main success in innovation and excellence in competition (Barney, 1991; Grant, 1996). Green creativity is a form of intangible asset that enables organizations to develop new ideas oriented towards environmental sustainability (Amabile et al., 1996; Chen et al., 2015).

Green transformational leadership encourages the creation of a supportive climate for green creativity through dimensions such as intellectual stimulation, inspirational motivation, individualized consideration, and idealized influence. Through intellectual stimulation, leaders motivate employees to think outside the box to solve problems in challenging environments (Mansoor et al., 2021; Van et al., 2023). Individual attention encourages the development of potential, creativity, and charisma in every individual, and charismatic leaders help build a collective vision of the importance of innovation and sustainability (Van et al., 2023; W. Zhang et al., 2020). Green creativity is important in the development of successful, environmentally friendly products because creative ideas enable companies to create efficient, innovative, and eco-friendly products (Mansoor et al., 2021; W. Zhang et al., 2020).

Green transformational leadership is important for building a creative culture and serves as a basis for enhancing competitiveness in the green market (Begum et al., 2022; Ngoc Huynh et al., 2024). Thus, the mediation of green creativity strengthens the influence of green transformational leadership on green product development performance, confirming that the role of leaders is not only to inspire but also to create a safe and supportive space for the emergence of creative ideas in an environment relevant to green product development (Ding et al., 2023; Jia et al., 2018).

Lastly, these findings should be interpreted in light of the study's context and design. All respondents were owner-managers of batik MSMEs, reflecting the owner-centric nature of decision-making in small enterprises. While reliance on a single informant may increase the potential for common method variance, owners are the most appropriate and knowledgeable respondents for assessing leadership behaviours, organisational learning capabilities, creativity, and product development performance in this setting. The observed relationships are therefore unlikely to be attributable to respondent bias alone, but rather reflect the integrated roles typically found in MSMEs. A broader view might also emerge if similar studies draw on more than one respondent or observe changes within firms over time.

Conclusion and Suggestion

This study concludes that green transformational leadership plays an important role in improving green product development performance, both directly and indirectly through green absorptive capacity and green creativity. The findings indicate that leadership effectiveness in supporting environmentally friendly product development depends not only on the ability of leaders to inspire and motivate, but also on the organisation's capacity to absorb environmental knowledge and apply it in creative and practical ways. By considering these mediating factors together, the study adds to the resource-based view by showing how leadership, learning, and creativity work jointly to support sustainable competitive advantage among SMEs.

From a practical point of view, the findings suggest that SMEs need to strengthen green leadership while also putting systems in place that support environmental learning and creativity. Environmental training programmes should be connected more directly to daily production activities, such as choosing materials, reducing waste, and improving production processes, rather than focusing only on general awareness. Future research could explore how green transformational leadership develops over time and how it influences green absorptive capacity and green creativity in real organisational settings. Studies that follow organisations over a longer period may help show how these capabilities gradually affect green product development performance. Similar research in other industries or MSME contexts could also help determine whether the same patterns are found elsewhere. In addition, examining factors such as the quality of environmental training, organisational learning routines, and everyday knowledge-sharing practices may provide a clearer understanding of when green leadership leads to concrete improvements in environmentally friendly products.

Disclosure The Use of AI Technologies

During the writing process, the author used several AI tools to help refine this article. These tools include Grammarly AI for grammar correction, Quillbot for paraphrasing, and ChatGPT for brainstorming and improving writing. After using the AI tools, the author reviewed and edited the text to ensure it was consistent with the manuscript. The author is responsible for the final published manuscript.

References

Aboelmaged, M., & Hashem, G. (2019). Absorptive capacity and green innovation adoption in SMEs: The mediating effects of sustainable organisational capabilities. *Journal of*

Cleaner Production, 220. <https://doi.org/10.1016/j.jclepro.2019.02.150>

Abourokbah, S., Bajaba, S., & Yaqub, M. Z. (2024). Leading the green wave: How and when green transformational leadership cultivates employee green creativity. *Acta Psychologica*, 250, 104503. <https://doi.org/10.1016/J.ACTPSY.2024.104503>

Acar, O. A., Tuncdogan, A., van Knippenberg, D., & Lakhani, K. R. (2024). Collective Creativity and Innovation: An Interdisciplinary Review, Integration, and Research Agenda. In *Journal of Management* (Vol. 50, Issue 6). <https://doi.org/10.1177/01492063231212416>

Adomako, S., & Nguyen, N. P. (2023). Green creativity, responsible innovation, and product innovation performance: A study of entrepreneurial firms in an emerging economy. *Business Strategy and the Environment*, 32(7). <https://doi.org/10.1002/bse.3373>

Al-Ghazali, B. M., Gelaidan, H. M., Shah, S. H. A., & Amjad, R. (2022). Green transformational leadership and green creativity? The mediating role of green thinking and green organizational identity in SMEs. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.977998>

Albort-Morant, G., Leal-Rodríguez, A. L., Fernández-Rodríguez, V., & Ariza-Montes, A. (2018). Assessing the origins, evolution and prospects of the literature on dynamic capabilities: A bibliometric analysis. *European Research on Management and Business Economics*, 24(1). <https://doi.org/10.1016/j.iedeen.2017.06.004>

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, 39(5). <https://doi.org/10.2307/256995>

Amaranti, R., Govindaraju, R., & Irianto, D. (2024). Do Green Dynamic Capabilities and Absorptive Capacity Affect Green Innovation Performance? A Study on Companies in Indonesia. *Journal of Industrial Engineering and Management*, 17(2), 424–444. <https://doi.org/10.3926/jiem.6197>

Anderson, N., Potočník, K., & Zhou, J. (2014). Innovation and Creativity in Organizations: A State-of-the-Science Review, Prospective Commentary, and Guiding Framework. In *Journal of Management* (Vol. 40, Issue 5). <https://doi.org/10.1177/0149206314527128>

Arici, H. E., & Uysal, M. (2022). Leadership, green innovation, and green creativity: a systematic review. *Service Industries Journal*, 42(5–6).

<https://doi.org/10.1080/02642069.2021.1964482>

- Athia, I., Amin, M. S., & Salleh, M. Z. M. (2024). Green beauty care choices: Mediating effects of self-generated word of mouth on Gen Z buying behavior. *JEMA: Jurnal Ilmiah Bidang Akuntansi dan Manajemen*, 21(1), 144-171. <https://doi.org/10.31106/jema.v21i1.21697>
- Awan, U., Sroufe, R., & Shahbaz, M. (2021). Industry 4.0 and the circular economy: A literature review and recommendations for future research. *Business Strategy and the Environment*, 30(4). <https://doi.org/10.1002/bse.2731>
- Awwad, M. S., Abuhommous, A. A., & Adaileh, A. M. (2025). Unravelling the relationship between absorptive capacity, innovation, and financial performance: A longitudinal study. *International Journal of Innovation Studies*, 9(2), 116–128. <https://doi.org/10.1016/J.IJIS.2025.02.001>
- Bai, C., Sarkis, J., & Dou, Y. (2015). Corporate sustainability development in China: Review and analysis. *Industrial Management and Data Systems*, 115(1). <https://doi.org/10.1108/IMDS-09-2014-0258>
- Bakir, S. M. A., Hanandeh, R., & Alzghoul, A. (2024). Influencing Employee Innovative Behavior Through Sustainable Business Practices: The Moderating Role of Transformational Leadership. *Journal of Information Systems Engineering and Management*, 9(3). <https://doi.org/10.55267/iadt.07.14775>
- Barczak, G., Lassk, F., & Mulki, J. (2010). Antecedents of team creativity: An examination of team emotional intelligence, team trust and collaborative culture. *Creativity and Innovation Management*, 19(4). <https://doi.org/10.1111/j.1467-8691.2010.00574.x>
- Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1). <https://doi.org/10.1177/014920639101700108>
- Bass, B. M. (1985). Leadership and Performance Beyond Expectations. *Academy of Management Review*, 12(4), 756–757.
- Bass, B. M. (1998). Transformational leadership: industrial, military, and educational impact. *Choice Reviews Online*, 35(08). <https://doi.org/10.5860/choice.35-4579>
- Bass, B. M., & Avolio, B. J. (1990). The Implications of transactional and transformational leadership for individual, team, and organizational development. *Research in Organizational Change and Development*, 4.

- Bass, B. M., & Avolio, B. J. (1994). Improving organizational effectiveness through transformational leadership. In *The Journal of Academic Librarianship* (Vol. 21, Issue 3).
- Begum, S., Xia, E., Ali, F., Awan, U., & Ashfaq, M. (2022). Achieving green product and process innovation through green leadership and creative engagement in manufacturing. *Journal of Manufacturing Technology Management*, 33(4). <https://doi.org/10.1108/JMTM-01-2021-0003>
- Bhutto, T. A., Farooq, R., Talwar, S., Awan, U., & Dhir, A. (2021). Green inclusive leadership and green creativity in the tourism and hospitality sector: serial mediation of green psychological climate and work engagement. *Journal of Sustainable Tourism*, 29(10). <https://doi.org/10.1080/09669582.2020.1867864>
- Çekmecelioğlu, H. G., & Özbağ, G. K. (2016). Leadership and Creativity: The Impact of Transformational Leadership on Individual Creativity. *Procedia - Social and Behavioral Sciences*, 235, 243–249. <https://doi.org/10.1016/J.SBSPRO.2016.11.020>
- Çelik, A. K., Yildiz, T., Aykanat, Z., & Kazemzadeh, S. (2024). Green Innovation Adoption in Turkish and Iranian SMEs: The Effect of Dynamic Capabilities and the Mediating Role of Absorptive Capacity. In *Journal of the Knowledge Economy*. <https://doi.org/10.1007/s13132-024-01990-1>
- Chen, P., & Kim, S. K. (2023). The impact of digital transformation on innovation performance - The mediating role of innovation factors. *Heliyon*, 9(3), e13916. <https://doi.org/10.1016/J.HELİYON.2023.E13916>
- Chen, Y. S., & Chang, C. H. (2013). The Determinants of Green Product Development Performance: Green Dynamic Capabilities, Green Transformational Leadership, and Green Creativity. *Journal of Business Ethics*, 116(1). <https://doi.org/10.1007/s10551-012-1452-x>
- Chen, Y. S., Chang, C. H., & Lin, Y. H. (2014). The determinants of green radical and incremental innovation performance: Green shared vision, green absorptive capacity, and green organizational ambidexterity. *Sustainability (Switzerland)*, 6(11). <https://doi.org/10.3390/su6117787>
- Chen, Y. S., Lin, Y. H., Lin, C. Y., & Chang, C. W. (2015). Enhancing green absorptive capacity, green dynamic capacities and green service innovation to improve firm

- performance: An analysis of Structural Equation Modeling (SEM). *Sustainability (Switzerland)*, 7(11). <https://doi.org/10.3390/su71115674>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, 35(1). <https://doi.org/10.2307/2393553>
- Cooper, R. G. (1979). The Dimensions of Industrial New Product Success and Failure. *Journal of Marketing*, 43(3). <https://doi.org/10.1177/002224297904300310>
- Crucke, S., Servaes, M., Kluijtmans, T., Mertens, S., & Schollaert, E. (2022). Linking environmentally-specific transformational leadership and employees' green advocacy: The influence of leadership integrity. *Corporate Social Responsibility and Environmental Management*, 29(2). <https://doi.org/10.1002/csr.2208>
- Daghfous, A. (2004). Absorptive capacity and the implementation of knowledge-intensive best practices. In *S.A.M. Advanced Management Journal* (Vol. 69, Issue 2).
- Ding, H., Su, W., & Hahn, J. (2023). How Green Transformational Leadership Affects Employee Individual Green Performance—A Multilevel Moderated Mediation Model. *Behavioral Sciences*, 13(11). <https://doi.org/10.3390/bs13110887>
- Dong, X., & Han, Z. (2025). Environmentally-Specific Empowered Leadership and Employee Green Creativity: The Role of Green Crafting and Environmental Culture. *Sustainability (Switzerland)*, 17(18), 1–18. <https://doi.org/10.3390/su17188183>
- Du, Y., & Wang, H. (2022). Green Innovation Sustainability: How Green Market Orientation and Absorptive Capacity Matter? *Sustainability (Switzerland)*, 14(13). <https://doi.org/10.3390/su14138192>
- Fan, Q., Abbas, J., Zhong, Y., Pawar, P. S., Adam, N. A., & Alarif, G. Bin. (2023). Role of organizational and environmental factors in firm green innovation and sustainable development: Moderating role of knowledge absorptive capacity. *Journal of Cleaner Production*, 411. <https://doi.org/10.1016/j.jclepro.2023.137262>
- Farrukh, M., Ansari, N., Raza, A., Wu, Y., & Wang, H. (2022). Fostering employee's pro-environmental behavior through green transformational leadership, green human resource management and environmental knowledge. *Technological Forecasting and Social Change*, 179. <https://doi.org/10.1016/j.techfore.2022.121643>
- Fauziyah. (2021). The Development of Yogyakarta Special Batik Design to Meet Customer

- Desire and Satisfaction Using Quality Function Deployment. *Proceedings of the 4th International Conference on Sustainable Innovation 2020-Accounting and Management (ICoSIAMS 2020)*, 176(ICoSIAMS 2020), 399–405. <https://doi.org/10.2991/aer.k.210121.057>
- Ford, C. M. (1996). A theory of individual creative action in multiple social domains. *Academy of Management Review*, 21(4). <https://doi.org/10.5465/AMR.1996.9704071865>
- Gardner, W. L., & Avolio, B. J. (1998). The charismatic relationship: A dramaturgical perspective. In *Academy of Management Review* (Vol. 23, Issue 1). <https://doi.org/10.5465/AMR.1998.192958>
- Ghozali, I. dan, & Latan, H. (2015). *Parcial Least Square : Konsep, Teknik, dan Aplikasi Menggunakan Program Smart PLS 3.0*. Badan Penerbit Universitas Diponogoro. BPUD, 49.
- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(SUPPL. WINTER). <https://doi.org/10.1002/smj.4250171110>
- Greeley, J., Mastrolly, E., Alsager Alzayed, M., Starkey, E. M., Ritter, S. C., & Prabhu, R. (2025). Are creative ideas also environmentally sustainable? Investigating the correlations between the creativity and environmental sustainability of student designers' ideas. *Research in Engineering Design*, 36(4), 14. <https://doi.org/10.1007/s00163-025-00455-z>
- Griffin, A., & Page, A. L. (1996). PDMA success measurement project: Recommended measures for product development success and failure. *Journal of Product Innovation Management*, 13(6). [https://doi.org/10.1016/S0737-6782\(96\)00052-5](https://doi.org/10.1016/S0737-6782(96)00052-5)
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. In *European Business Review* (Vol. 31, Issue 1). <https://doi.org/10.1108/EBR-11-2018-0203>
- Hanif, G. M., Costa, R. Da, Kusmantini, T., & Satmoko, A. (2022). The Influence of Market Orientation and Innovation on Business Performance Mediated by Competitive Advantage (Survey of SMEs Registered with the Mukti Manunggal Batik Association). *Journal of Business Innovation and Research*, 1(1), 71. <https://doi.org/10.31315/jubir.v1i1.8035>

- He, S., Zhao, W., Li, J., Liu, J., & Wei, Y. (2023). How environmental leadership shapes green innovation performance: A resource-based view. *Heliyon*, 9(7), e17993. <https://doi.org/10.1016/J.HELİYON.2023.E17993>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43(1), 115-135. <https://doi.org/10.1007/s11747-014-0403-8>
- Heubeck, T. (2024). Looking back to look forward: a systematic review of and research agenda for dynamic managerial capabilities. *Management Review Quarterly*, 74(4). <https://doi.org/10.1007/s11301-023-00359-z>
- Idrees, H., Xu, J., Andrianarivo Andriandafiarisoa Ralison, N. A., & Kadyrova, M. (2023). Does leadership and management support facilitate green knowledge acquisition and green innovation: a moderated mediation approach. *Business Process Management Journal*, 29(4). <https://doi.org/10.1108/BPMJ-12-2022-0639>
- Jia, J., Liu, H., Chin, T., & Hu, D. (2018). The continuous mediating effects of GHRM on employees' green passion via transformational leadership and green creativity. *Sustainability (Switzerland)*, 10(9). <https://doi.org/10.3390/su10093237>
- Keller, R. T. (1992). Transformational Leadership and the Performance of Research and Development Project Groups. *Journal of Management*, 18(3). <https://doi.org/10.1177/014920639201800304>
- Khalili, A. (2016). Linking transformational leadership, creativity, innovation, and innovation-supportive climate. *Management Decision*, 54(9). <https://doi.org/10.1108/MD-03-2016-0196>
- Khan, A. N., & Khan, N. A. (2022). The nexuses between transformational leadership and employee green organisational citizenship behaviour: Role of environmental attitude and green dedication. *Business Strategy and the Environment*, 31(3). <https://doi.org/10.1002/bse.2926>
- Kim, A., Kim, Y., Han, K., Jackson, S. E., & Ployhart, R. E. (2017). Multilevel Influences on Voluntary Workplace Green Behavior: Individual Differences, Leader Behavior, and Coworker Advocacy. *Journal of Management*, 43(5). <https://doi.org/10.1177/0149206314547386>
- Kumar Kar, S., & Harichandan, S. (2022). Green marketing innovation and sustainable

- consumption: A bibliometric analysis. *Journal of Cleaner Production*, 361, 132290. <https://doi.org/10.1016/J.JCLEPRO.2022.132290>
- Kurniawati, A., Sunaryo, I., Wiratmadja, I. I., & Irianto, D. (2022). Sustainability-Oriented Open Innovation: A Small and Medium-Sized Enterprises Perspective. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(2). <https://doi.org/10.3390/joitmc8020069>
- Kusumawardani, S. D. A., Kurnani, T. B. A., Astari, A. J., & Sunardi, S. (2024). Readiness in implementing green industry standard for SMEs: Case of Indonesia's batik industry. *Heliyon*, 10(16), e36045. <https://doi.org/10.1016/j.heliyon.2024.e36045>
- Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13(1 S). <https://doi.org/10.1002/smj.4250131009>
- Li, C., Murad, M., Ashraf, S. F., & Jiatong, W. (2024). Leadership styles, team innovative behavior, and new green product development performance. *Management Decision*, 62(10), 3208–3234. <https://doi.org/10.1108/MD-06-2023-0935>
- Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence, and the complementarity of organizational learning processes. *Academy of Management Journal*, 52(4). <https://doi.org/10.5465/AMJ.2009.43670902>
- Maitlo, Q., Wang, X., Jingdong, Y., Lashari, I. A., Faraz, N. A., & Hajaro, N. H. (2022). Exploring Green Creativity: The Effects of Green Transformational Leadership, Green Innovation Climate, and Green Autonomy. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.686373>
- Makumbe, W. (2024). Green Human Resources Management and Green Performance: A Mediation–Moderation Mechanism for Green Innovation and Green Knowledge Sharing. *Sustainability (Switzerland)*, 16(24). <https://doi.org/10.3390/su162410849>
- Mansoor, A., Farrukh, M., Lee, J. K., & Jahan, S. (2021). Stimulation of employees' green creativity through green transformational leadership and management initiatives. *Sustainability (Switzerland)*, 13(14). <https://doi.org/10.3390/su13147844>
- Marques, D. L., Aubé, C., Rousseau, V., & Brunelle, E. (2025). Psychological Resources and New Product Development Team Adaptability: A Moderated Mediation Model. *Small Group Research*, 56(2), 307–337. <https://doi.org/10.1177/10464964241283695>

- Marsh, S. J., & Stock, G. N. (2006). Creating dynamic capability: The role of intertemporal integration, knowledge retention, and interpretation. *Journal of Product Innovation Management*, 23(5). <https://doi.org/10.1111/j.1540-5885.2006.00214.x>
- Mehralian, G., Farzaneh, M., Yousefi, N., & Haloub, R. (2024). Driving new product development performance: Intellectual capital antecedents and the moderating role of innovation culture. *Journal of Innovation & Knowledge*, 9(3), 100503. <https://doi.org/10.1016/j.jik.2024.100503>
- Mi, L., Gan, X., Xu, T., Long, R., Qiao, L., & Zhu, H. (2019). A new perspective to promote organizational citizenship behaviour for the environment: The role of transformational leadership. *Journal of Cleaner Production*, 239. <https://doi.org/10.1016/j.jclepro.2019.118002>
- Micheli, G. J. L., Cagno, E., Mustillo, G., & Trianni, A. (2020). Green supply chain management drivers, practices and performance: A comprehensive study on the moderators. *Journal of Cleaner Production*, 259, 121024. <https://doi.org/10.1016/J.JCLEPRO.2020.121024>
- Mittal, S., & Dhar, R. L. (2016). Effect of green transformational leadership on green creativity: A study of tourist hotels. *Tourism Management*, 57. <https://doi.org/10.1016/j.tourman.2016.05.007>
- Motohashi, K., Ikeuchi, K., & Yamaguchi, A. (2024). Absorptive capacity for science-based innovation propensity: an empirical analysis using Japanese National Innovation Survey. *Journal of Technology Transfer*, 50(4), 1325–1340. <https://doi.org/10.1007/s10961-024-10138-x>
- Nabi, M. N., Zhiqiang, L., & Akter, M. (2023). Transformational leadership and radical innovation for sustainability: mediating role of knowledge management capability and moderating role of competitive intensity. *Innovation and Management Review*, 20(3). <https://doi.org/10.1108/INMR-05-2021-0075>
- Nawi, N. C., Mamun, A. Al, Daud, R. R. R., & Nasir, N. A. M. (2020). Strategic orientations and absorptive capacity on economic and environmental sustainability: A study among the batik small and medium enterprises in Malaysia. *Sustainability (Switzerland)*, 12(21). <https://doi.org/10.3390/su12218957>
- Ngoc Huynh, H. T., Thanh Nguyen, N. T., & Y Vo, N. N. (2024). The influence of

- knowledge management, green transformational leadership, green organizational culture on green innovation and sustainable performance: The case of Vietnam. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(4), 100436. <https://doi.org/10.1016/J.JOITMC.2024.100436>
- Ozgul, B. (2022). Does Green Transformational Leadership Develop Green Absorptive Capacity? The Role of Internal and External Environmental Orientation. *Systems*, 10(6). <https://doi.org/10.3390/systems10060224>
- Özgül, B., & Zehir, C. (2023). How Managers' Green Transformational Leadership Affects a Firm's Environmental Strategy, Green Innovation, and Performance: The Moderating Impact of Differentiation Strategy. *Sustainability (Switzerland)*, 15(4). <https://doi.org/10.3390/su15043597>
- Pham, N. T., Hoang, H. T., & Phan, Q. P. T. (2020). Green human resource management: a comprehensive review and future research agenda. In *International Journal of Manpower* (Vol. 41, Issue 7). <https://doi.org/10.1108/IJM-07-2019-0350>
- Podsakoff, P. M., MacKenzie, S. B., & Bommer, W. H. (1996). Transformational Leader Behaviors and Substitutes for Leadership as Determinants of Employee Satisfaction, Commitment, Trust, and Organizational Citizenship Behaviors. *Journal of Management*, 22(2). <https://doi.org/10.1177/014920639602200204>
- Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H., & Fetter, R. (1990). Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *The Leadership Quarterly*, 1(2). [https://doi.org/10.1016/1048-9843\(90\)90009-7](https://doi.org/10.1016/1048-9843(90)90009-7)
- Putra, A. F., & Mukminan, M. (2018). *The Development of a Cultural Tourism in Batik Museum of Yogyakarta by a SWOT Analysis*. <https://doi.org/10.5220/0007418602420248>
- Qian, C., & Kee, D. M. H. (2023). Exploring the Path to Enhance Employee Creativity in Chinese MSMEs: The Influence of Individual and Team Learning Orientation, Transformational Leadership, and Creative Self-Efficacy. *Information (Switzerland)*, 14(8). <https://doi.org/10.3390/info14080449>
- Rasheed, R., Rashid, A., & Ngah, A. H. (2025). Role of leadership styles to foster innovative capabilities and green purchasing. *Journal of Global Operations and Strategic Sourcing*,

18(2), 328–348. <https://doi.org/10.1108/JGOSS-05-2023-0047>

- Rego, A., Sousa, F., Pina e Cunha, M., Correia, A., & Saur-Amaral, I. (2007). Leader Self-Reported Emotional Intelligence and Perceived Employee Creativity: An Exploratory Study. *Creativity and Innovation Management*, 16(3). <https://doi.org/10.1111/j.1467-8691.2007.00435.x>
- Rehmani, M., Farheen, N., Khokhar, M. N., Khalid, A., Dalain, A. F., & Irshad, H. (2023). How Does Transformational Leadership Stimulate Employee Innovative Behavior? A Moderated Mediation Analysis. *SAGE Open*, 13(3). <https://doi.org/10.1177/21582440231198401>
- Saleh, R., & Brem, A. (2023). Creativity for sustainability: An integrative literature review. In *Journal of Cleaner Production* (Vol. 388). <https://doi.org/10.1016/j.jclepro.2023.135848>
- Samad, S., Nilashi, M., Almulihi, A., Alrizq, M., Alghamdi, A., Mohd, S., Ahmadi, H., & Syed Azhar, S. N. F. (2021). Green Supply Chain Management practices and impact on firm performance: The moderating effect of collaborative capability. *Technology in Society*, 67, 101766. <https://doi.org/10.1016/J.TECHSOC.2021.101766>
- Sarros, J. C., Cooper, B. K., & Santora, J. C. (2008). Building a climate for innovation through transformational leadership and organizational culture. *Journal of Leadership and Organizational Studies*, 15(2). <https://doi.org/10.1177/1548051808324100>
- Sidney, M. T., Wang, N., Nazir, M., Ferasso, M., & Saeed, A. (2022). Continuous Effects of Green Transformational Leadership and Green Employee Creativity: A Moderating and Mediating Prospective. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.840019>
- Singh, S. K., Giudice, M. Del, Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change*, 150. <https://doi.org/10.1016/j.techfore.2019.119762>
- Song, W., & Yu, H. (2018). Green Innovation Strategy and Green Innovation: The Roles of Green Creativity and Green Organizational Identity. *Corporate Social Responsibility and Environmental Management*, 25(2). <https://doi.org/10.1002/csr.1445>
- Srivastava, S., Pathak, D., Soni, S., & Dixit, A. (2024). Does green transformational

- leadership reinforce green creativity? The mediating roles of green organizational culture and green mindfulness. *Journal of Organizational Change Management*, 37(3). <https://doi.org/10.1108/JOCM-09-2023-0364>
- Su, X., Xu, A., Lin, W., Chen, Y., Liu, S., & Xu, W. (2020). Environmental Leadership, Green Innovation Practices, Environmental Knowledge Learning, and Firm Performance. *SAGE Open*, 10(2). <https://doi.org/10.1177/2158244020922909>
- Suherman, U. D., Kusnandar, A., Rofiq, H., & Kusuma, S. W. D. (2025). Navigating works future: Harnessing digital innovation to enhance muslim employees performance through transformation and flexibility. *JEMA: Jurnal Ilmiah Bidang Akuntansi dan Manajemen*, 22(2), 206-232. <https://doi.org/10.31106/jema.v22i2.23676>
- Tang, T., Vezzani, V., & Eriksson, V. (2020). Developing critical thinking, collective creativity skills and problem solving through playful design jams. *Thinking Skills and Creativity*, 37. <https://doi.org/10.1016/j.tsc.2020.100696>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7). [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Van, H. V., Hoai, T. T., Minh, N. N., & Nguyen, N. P. (2023). Green Transformational Leadership and Green Mindfulness as Contributors to Green Innovation and Environmental Performance: Evidence From Manufacturing Firms in Vietnam. *SAGE Open*, 13(3). <https://doi.org/10.1177/21582440231193919>
- Waldman, D. A., & Bass, B. M. (1991). Transformational leadership at different phases of the innovation process. *Journal of High Technology Management Research*, 2(2). [https://doi.org/10.1016/1047-8310\(91\)90002-6](https://doi.org/10.1016/1047-8310(91)90002-6)
- Wang, X., Zheng, C., Mutuc, E. B., Su, N., Hu, T., Zhou, H., Fan, C., Hu, F., & Wei, S. (2022). How Does Organizational Unlearning Influence Product Innovation Performance? Moderating Effect of Environmental Dynamism. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.840775>
- Xie, X., Huo, J., & Zou, H. (2019). Green process innovation, green product innovation, and corporate financial performance: A content analysis method. *Journal of Business Research*, 101. <https://doi.org/10.1016/j.jbusres.2019.01.010>
- Xie, X., Zou, H., & Qi, G. (2018). Knowledge absorptive capacity and innovation

- performance in high-tech companies: A multi-mediating analysis. *Journal of Business Research*, 88. <https://doi.org/10.1016/j.jbusres.2018.01.019>
- Xu, S., Yaacob, Z., & Cao, D. (2024). How transformational leadership promotes employee creativity within the context of environmental dynamism: a multilevel perspective. *International Journal of Organization Theory & Behaviour*, 27(2), 101–119. <https://doi.org/10.1108/IJOTB-06-2023-0117>
- Yan, J., & Hu, W. (2022). Environmentally specific transformational leadership and green product development performance: the role of a green HRM system. *International Journal of Manpower*, 43(3). <https://doi.org/10.1108/IJM-05-2020-0223>
- Yang, Y., Din, A. U., Mohi Ud Din, Q., & Khan, I. U. (2024). Green leadership in manufacturing industry: Unveiling the green Revolution's impact on organizational performance. *Heliyon*, 10(6), e27831. <https://doi.org/10.1016/J.HELIYON.2024.E27831>
- Yimer, J. M., Durie, A. D., & Kibiret, A. T. (2025). The mediating role of environmental performance between green supply chain management and organizational market performance: Digitalization as a key dimension (In the case of the Ethiopian manufacturing industry). *Cleaner Waste Systems*, 12(June), 100376. <https://doi.org/10.1016/j.clwas.2025.100376>
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. In *Academy of Management Review* (Vol. 27, Issue 2). <https://doi.org/10.5465/AMR.2002.6587995>
- Zailani, S. H. M., Eltayeb, T. K., Hsu, C. C., & Tan, K. C. (2012). The impact of external institutional drivers and internal strategy on environmental performance. In *International Journal of Operations and Production Management* (Vol. 32, Issue 6). <https://doi.org/10.1108/01443571211230943>
- Zhang, D., Rong, Z., & Ji, Q. (2019). Green innovation and firm performance: Evidence from listed companies in China. *Resources, Conservation and Recycling*, 144, 48–55. <https://doi.org/10.1016/J.RESCONREC.2019.01.023>
- Zhang, J., Liang, G., Feng, T., Yuan, C., & Jiang, W. (2020). Green innovation to respond to environmental regulation: How external knowledge adoption and green absorptive capacity matter? *Business Strategy and the Environment*, 29(1). <https://doi.org/10.1002/bse.2349>

- Zhang, W., Xu, F., & Wang, X. (2020). How green transformational leadership affects green creativity: Creative process engagement as intermediary bond and green innovation strategy as boundary spanner. *Sustainability (Switzerland)*, 12(9). <https://doi.org/10.3390/su12093841>
- Zhu, J., Tang, W., Zhang, B., & Wang, H. (2022). Influence of Environmentally Specific Transformational Leadership on Employees' Green Innovation Behavior—A Moderated Mediation Model. *Sustainability (Switzerland)*, 14(3). <https://doi.org/10.3390/su14031828>

About the Authors

Utik Bidayati is a faculty member at Universitas Ahmad Dahlan, Yogyakarta. Her research interests include green leadership, sustainable innovation, and SME development. In this study, she contributed to the conceptualization of the research, writing the original draft, and the review and editing of the manuscript.

Muhammad Ali Fikri is a faculty member at Universitas Ahmad Dahlan, Yogyakarta. His research focuses on quantitative research methods, structural equation modeling, and sustainability-oriented management studies. In this research, he contributed to the development of the methodology, dataset validation, and the paraphrasing and translation of research materials.

Desta Rizky Kusuma is a faculty member at Universitas Ahmad Dahlan, Yogyakarta. His research interests include business development and innovation in SMEs. In this study, he contributed to supporting the progression of the research toward publication, including coordination, refinement, and final manuscript preparation.