

Strategic Transformation for Sustainable Manufacturing: A Review of Dynamic Capabilities and Organizational Performance

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Abstract. Against the background of increasing environmental pressure, rapid advances in digital technology, and rising stakeholder expectations, sustainable development has become an important strategic task for manufacturing firms. Strategic transformation is widely regarded as a key pathway to long-term competitiveness, yet firms often achieve very different outcomes from similar transformation efforts. This paper reviews research on strategic transformation, dynamic capabilities, and sustainable organizational performance and develops an integrated analytical framework based on dynamic capability theory. It argues that strategic transformation encompasses not only green upgrading and digital renewal, but also systematic changes in strategic direction, resource allocation, organizational structure, and business models. Through stronger capabilities to sense change, seize opportunities, and reconfigure resources, firms can convert transformation investments into economic, environmental, social, innovation, and resilience outcomes. Leadership, a learning-oriented culture, digital maturity, industry characteristics, and institutional support influence this conversion process. By integrating different streams of transformation research within a unified capability perspective, the paper identifies future research priorities concerning transformation configurations, the microfoundations of dynamic capabilities, short- and long-term performance differences, organizational resilience, and manufacturing in emerging economies.

Keywords: strategic transformation; sustainable manufacturing; dynamic capabilities; organizational performance; manufacturing.

1. Introduction

Manufacturing firms are facing several changes at the same time. Governments and society expect firms to reduce pollution and energy consumption, while digital technologies are developing rapidly and supply-chain risks and market demand are becoming more uncertain. To remain competitive, firms must do more than improve production processes; they must also reconsider investment priorities, technological pathways, organizational management, and long-term development. Sustainable development has therefore moved beyond a narrow environmental requirement and become an important issue shaping corporate strategy and business decisions. The United Nations Sustainable Development Goals, the natural-resource-based view, and the innovation-compensation perspective all suggest that environmental responsibility is not merely a cost imposed on firms; it can also stimulate technological innovation, capability development, and competitive advantage [1-3].

Strategic transformation refers to an organization-wide adjustment of a firm's development direction, accompanied by changes in resource allocation, organizational structure, managerial routines, technological systems, and business models. Research on digital transformation and sustainable business models shows that purchasing new equipment or introducing a new system alone rarely produces lasting performance improvement. Effective transformation requires alignment among strategy, organization, technology, and the logic of value creation [4-8].

Sustainable transformation in manufacturing therefore commonly combines green upgrading, digital renewal, organizational adjustment, resource recombination, and business model innovation.

Although the relevant literature is expanding, existing findings remain fragmented. Some studies focus on cleaner production, Industry 4.0, green innovation, or the circular economy; others examine supply chains and business models; still others directly assess the effect of strategic transformation on firm performance. These streams each explain part of the transformation process, but they do not fully answer a central question: why do firms that invest similar amounts of capital, technology, and managerial resources achieve very different economic, environmental, social, innovation, and resilience outcomes?

To address this question, the paper draws on dynamic capability theory. Dynamic capabilities refer to a firm's ability to identify external change, capture valuable opportunities, and reconfigure resources and organizational routines in response to new conditions [9-11]. The central argument is that strategic transformation introduces new goals, technologies, and resources, whereas dynamic capabilities determine whether the firm can convert these inputs into sustained organizational performance.

Following this logic, the paper first explains the main content of strategic transformation, dynamic capabilities, and sustainable organizational performance. It then analyzes the relationships among these constructs, develops a conceptual framework and research propositions, and finally discusses managerial implications and future research directions. The study adopts an integrative and theory-oriented literature review approach and draws primarily on classic and recent work in strategic renewal, digital and green transformation, dynamic capabilities, sustainable manufacturing, organizational resilience, and firm performance [12, 13].

2. Literature Review

2.1 Strategic Transformation in Sustainable Manufacturing

Strategic transformation differs from routine incremental improvement. Incremental improvement raises efficiency within existing systems and processes, whereas strategic transformation changes a firm's future direction, the way resources are committed, and the logic through which the organization operates. In manufacturing, strategic transformation generally includes five interrelated dimensions. First, strategic orientation renewal means redefining development priorities, for example shifting from volume and scale toward low-carbon production, differentiation, or circular value creation. Second, resource reallocation involves redirecting capital, talent, data, and managerial attention toward new priorities. Third, organizational restructuring changes departmental arrangements, decision rights, collaboration mechanisms, and external partnerships. Fourth, technological renewal introduces digitalization, automation, and cleaner production technologies. Fifth, business model renewal changes the value offered by products, sources of revenue, stakeholder relationships, and the firm's responsibility across the product life cycle [4-8].

These five dimensions must work together. Digital technologies can improve production transparency, forecasting, and traceability, but their value remains limited when departmental data are isolated or decision mechanisms remain unchanged. Green technologies can reduce emissions and waste, but their returns may be unstable unless firms also adjust product positioning, supply-chain cooperation, and revenue models. Organizational restructuring can accelerate decisions, yet it may reduce employee participation when responsibilities are unclear, communication is weak, or change is perceived as unfair. Strategic transformation should therefore be understood not as a single project, but as a system in which multiple changes reinforce one another.

Strategic transformation also requires a clear direction. Firms should not respond passively only after external pressure emerges; they need to interpret what environmental changes mean, decide where the firm should be positioned in the future, and select an appropriate implementation

pathway. Transformation may be defensive, emphasizing regulatory compliance and risk reduction, or opportunity-oriented, emphasizing green products, new markets, servitization, digital platforms, or industrial ecosystems. Whether transformation creates long-term value depends on whether environmental and social objectives are genuinely incorporated into strategic decision-making rather than treated as additional tasks after normal operations have been completed.

2.2 Sustainable Organizational Performance

Sustainable manufacturing means maintaining economic viability while minimizing the negative environmental effects of production, conserving energy and natural resources, protecting employee and community well-being, and preserving the firm's ability to survive and develop over the long term. Sustainable organizational performance therefore cannot be evaluated only through profit or sales. The triple-bottom-line perspective distinguishes economic, environmental, and social performance, while strategic management research further emphasizes long-term outcomes such as innovation capability, adaptability, social legitimacy, and organizational resilience [14-16].

More specifically, economic performance includes productivity, profitability, product quality, delivery reliability, market growth, and resource-use efficiency. Environmental performance includes lower energy and material consumption, fewer emissions and less waste, cleaner processes, improved product life-cycle management, and greater resource circularity. Social performance includes occupational health and safety, employee training and development, fair labor practices, employee well-being, community contribution, and responsible supply-chain management. Innovation performance reflects the ability to develop and diffuse green products, digital processes, new services, and new business models. Resilience performance reflects whether the firm can prepare for disruption, absorb shocks, restore critical operations, and adapt to a new operating environment [17-19].

These performance objectives do not always improve simultaneously and may sometimes conflict. Cleaner-technology investment can increase costs in the short term; automation may improve efficiency while making employees concerned about job changes; and spare capacity retained to strengthen supply-chain resilience can raise routine expenditure. Sustainable performance therefore does not mean that every indicator must rise immediately. Instead, firms must coordinate economic, environmental, and social objectives across different stages of development. An appropriate theoretical framework should consequently explain how firms recognize tensions, make trade-offs, and continually adjust as external conditions change.

2.3 Dynamic Capabilities

Dynamic capabilities are the purposeful abilities through which firms create, extend, or modify their existing resource base in response to change. Classical research divides them into sensing, seizing, and reconfiguring [9, 10]. Sensing involves detecting and interpreting changes in technology, markets, policy, the natural environment, and stakeholder needs. Seizing involves selecting among opportunities and converting chosen opportunities into action through investment, business-model decisions, and complementary resources. Reconfiguring involves realigning processes, organizational structures, assets, employee skills, and collaborative relationships with new strategic requirements. Eisenhardt and Martin emphasize that dynamic capabilities are not purely abstract concepts; they can be observed in concrete managerial activities, and their effects depend on the operating environment [11].

Recent sustainability research increasingly treats a firm's capacity to address environmental and social challenges as a form of dynamic capability. The systematic review by Amui et al. argues that sustainable transformation requires environmental and social goals to be embedded in everyday managerial capabilities [20]. Manufacturing research likewise shows that green product innovation depends not only on research and development investment, but also on absorbing external knowledge, coordinating across departments, and redesigning product-development processes [21]. Research on small and medium-sized enterprises further indicates that firms able to integrate

resources and make continual adjustments generally achieve stronger economic, environmental, and social performance [22].

Dynamic capabilities explain why strategic transformation cannot remain a one-off project. Sensing helps firms identify new carbon requirements, customer preferences, resource risks, and digital opportunities. Seizing helps them select suitable transformation initiatives and commit the necessary resources. Reconfiguring embeds new technologies and sustainability goals in processes, incentive systems, supply chains, and governance structures. Without these capabilities, transformation may become a collection of disconnected projects, symbolic slogans, or initiatives that depend excessively on a few managers. Strong dynamic capabilities allow firms to deepen and revise transformation continuously as conditions evolve.

Table 1. Core Constructs and Their Roles in Sustainable Manufacturing Transformation

Construct	Plain-language meaning	Main processes	Representative references
Strategic transformation	An organization-wide adjustment of direction, resources, organization, technology, and business models.	Renew strategic priorities; reallocate resources; restructure the organization; coordinate green and digital change.	[4-8]
Dynamic capabilities	The ability to identify change, capture opportunities, and adjust resources and organization to new conditions.	Environmental scanning; opportunity selection; organizational learning; resource integration; process and asset reconfiguration.	[9-11, 20-22]
Sustainable performance	Long-term economic, environmental, social, innovation, and resilience outcomes.	Improve efficiency and value; reduce emissions and waste; fulfill social responsibilities; support innovation; strengthen adaptability.	[14-19]

3. Theoretical Foundation

3.1 Dynamic Capability Theory

Dynamic capability theory provides a clear organizational-level perspective for explaining sustainable transformation. The theory argues that in environments characterized by rapid technological, policy, stakeholder, and competitive change, it is not enough for firms merely to possess valuable resources such as capital, equipment, and talent. They must also be able to detect change, select opportunities, and recombine resources. Sustainable manufacturing is particularly well suited to this theoretical lens because environmental requirements, digital technologies, production systems, and market preferences continue to evolve, requiring firms to adjust continually rather than rely on established routines.

The theory also explains why firms that invest in similar resources may achieve very different transformation outcomes. Two firms may purchase the same production equipment, data platform, or cleaner technology, yet obtain very different results because their managerial capabilities differ. One firm may collect and analyze information promptly, strengthen collaboration across departments, and scale successful practices across the organization. Another may fail to realize the value of the same technology because departments do not cooperate and processes are not adjusted in time. More specifically, sensing helps the firm identify policy change, resource risk, technological development, and customer demand; seizing helps it select suitable opportunities and make investment and resource-allocation decisions; and reconfiguring helps it adjust organizational structures, workflows, employee skills, supply chains, and management systems so that a new strategy is embedded in daily operations. The success of strategic transformation therefore depends not only on how many resources are invested, but also on whether the firm possesses the dynamic

capabilities needed to deploy and adapt those resources effectively. Dynamic capabilities consequently serve as an important bridge between strategic transformation and sustainable performance.

4. Conceptual Framework

Figure 1 presents the relationships among strategic transformation, dynamic capabilities, and sustainable organizational performance. External pressures and market opportunities encourage manufacturing firms to undertake strategic transformation, including green strategic renewal, digital transformation, organizational restructuring, resource reallocation, and business model innovation. Some transformation initiatives may directly improve cost, efficiency, or environmental performance, but sustained results also require sensing, seizing, and reconfiguring capabilities that coordinate diverse resources and actions.

Within the framework, dynamic capabilities constitute a central mediating mechanism. Strategic transformation introduces new strategic priorities, data sources, partnerships, pilot projects, and resource commitments. Dynamic capabilities convert these dispersed inputs into coherent decisions, stable processes, and repeatable organizational routines, thereby improving economic, environmental, social, innovation, adaptability, and resilience outcomes. This mechanism helps explain why similar transformation programs produce different results across firms.

The effects of strategic transformation also depend on several contextual conditions. Clear and forceful leadership aligns direction; a learning-oriented culture supports knowledge sharing; digital maturity enables data integration and faster decision-making; industry characteristics shape technological choices and environmental risks; and institutional support affects access to finance, knowledge, and infrastructure. These conditions may strengthen or weaken the ability of strategic transformation to improve performance through dynamic capabilities.

Performance outcomes, in turn, influence the next stage of transformation. Successful projects accumulate experience, strengthen confidence, enhance social recognition, and provide resources for continued investment. Unsuccessful projects expose weaknesses in technology, talent, or management. The framework is therefore not a one-way chain but a continuing cycle: strategic transformation develops dynamic capabilities, dynamic capabilities influence performance, and performance feedback guides the next round of sensing, selection, and resource reconfiguration.

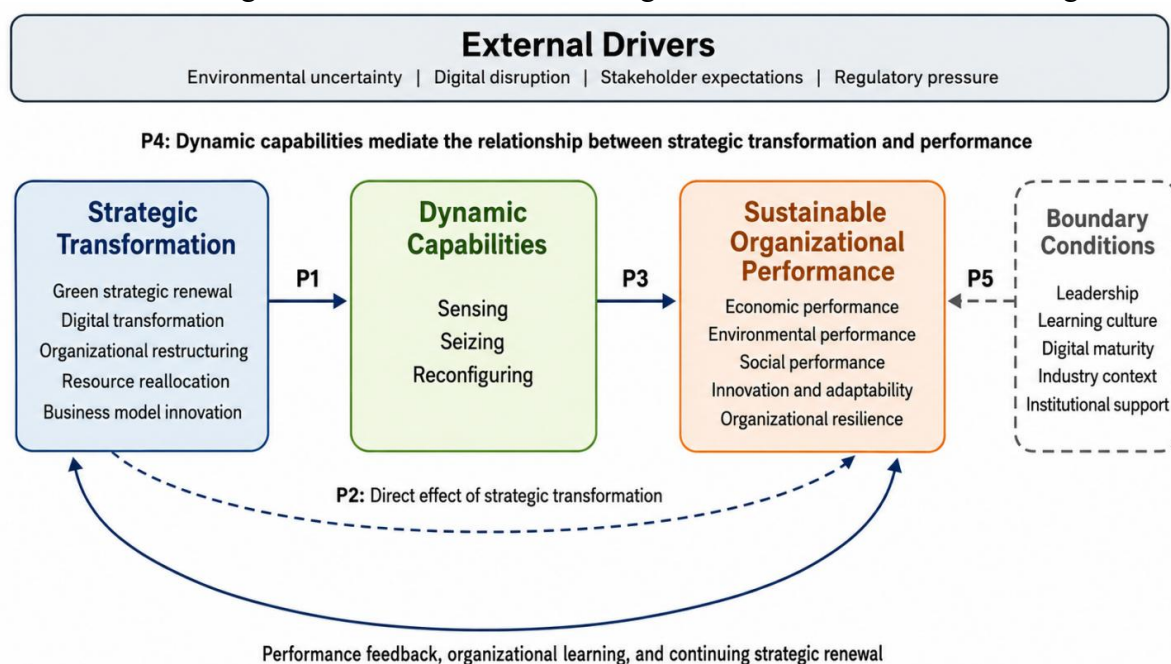


Fig. 1. Conceptual framework linking strategic transformation, dynamic capabilities, and sustainable organizational performance

5. Development of Research Propositions

5.1 Strategic Transformation and Dynamic Capabilities

Strategic transformation requires firms to observe the external environment more actively, compare alternative development pathways, organize cross-functional collaboration, and change established processes. Green upgrading and digital transformation also generate new data, partnerships, experiments, and learning opportunities. When firms systematically organize and use these experiences, they become better able to detect change, evaluate opportunities, and reconfigure resources. Relevant research therefore treats dynamic capability development as an ongoing process of strategic renewal rather than as a one-time technology implementation [6, 20-22].

Proposition 1: Strategic transformation promotes the development of dynamic capabilities in manufacturing firms.

5.2 Strategic Transformation and Sustainable Organizational Performance

By adjusting strategic priorities, technological systems, organizational structures, resource allocation, and business models, strategic transformation can help firms respond more effectively to environmental and competitive requirements. Green upgrading reduces energy use, emissions, and material waste; digital transformation increases information transparency, production efficiency, and market responsiveness; organizational restructuring improves cross-departmental collaboration; and business model innovation can create new customer value and revenue sources. Transformation may initially increase costs, and some outcomes may take time to emerge, but coordinated transformation is more likely over the long term to improve economic, environmental, social, innovation, and resilience performance.

Proposition 2: Strategic transformation improves the sustainable organizational performance of manufacturing firms.

5.3 Dynamic Capabilities and Sustainable Organizational Performance

Dynamic capabilities enable firms to identify environmental and market change in advance, select valuable green and digital opportunities, and adjust resources continually as technology and policy evolve. Sensing reduces the risk of missing opportunities or choosing an inappropriate direction. Seizing links opportunities to investment, business models, and stakeholder value. Reconfiguring diffuses successful practices into routine operations while phasing out resource-intensive, inefficient, or overly rigid practices. Existing studies support positive relationships among dynamic capabilities, green innovation, and multidimensional sustainability performance [20-22].

Proposition 3: Dynamic capabilities improve the sustainable organizational performance of manufacturing firms.

5.4 The Mediating Role of Dynamic Capabilities

Strategic transformation can establish a new development direction, reallocate resources, and introduce digital and green technologies, but these inputs do not automatically generate strong performance. Firms must use dynamic capabilities to interpret external signals, select opportunities worth pursuing, coordinate relevant resources, and revise processes and systems in light of implementation results. When dynamic capabilities are weak, transformation projects may remain disconnected, symbolic, or confined to isolated areas. When they are strong, firms can convert strategic objectives into stable and repeatable organizational action and continuously improve performance.

Proposition 4: Dynamic capabilities mediate the relationship between strategic transformation and sustainable organizational performance.

5.5 Boundary Conditions and Performance Feedback

The relationships proposed above may vary in strength across firms and environments. Transformational leadership clarifies direction and encourages experimentation. A learning-oriented culture supports experience sharing and the absorption of new knowledge. Digital maturity enables system integration and effective data use. Industry characteristics shape capital requirements, environmental risks, and technological opportunities. Institutional support affects firms' access to finance, knowledge, infrastructure, and social legitimacy. In addition, performance already achieved influences subsequent transformation priorities and capability-building efforts.

Proposition 5: Leadership, learning culture, digital maturity, industry conditions, and institutional support influence the strength of the performance effect transmitted through dynamic capabilities; performance feedback also affects subsequent strategic renewal.

6. Discussion

This paper has three theoretical implications. First, it integrates green upgrading, digital transformation, organizational restructuring, resource reorganization, and business model innovation into a unified "strategic transformation" framework, avoiding an explanation of corporate transformation solely from a single project perspective. Second, it emphasizes that dynamic capabilities are a crucial mechanism connecting strategic transformation with sustainable organizational performance. Third, it views sustainable performance as a multidimensional and dynamic outcome, encompassing not only economic, environmental, and social performance, but also innovation capabilities, adaptability, and organizational resilience. This framework explains why companies employing similar technologies and environmental measures may still achieve different transformation outcomes due to variations in information identification, resource allocation, departmental collaboration, and experience dissemination capabilities.

From a process perspective, strategic transformation does not end with equipment installation, digital platform launch, or the release of sustainable development goals; rather, it is a continuous process of learning and adjustment. Companies need to implement new strategic goals into daily operations through employee learning, cross-departmental collaboration, knowledge sharing, and experience dissemination. Dynamic capabilities connect external information, strategic choices, resource allocation, and performance feedback, enabling companies to continuously optimize their transformation path based on actual results. Therefore, future research should further examine how green, digital, and organizational transformation measures are combined and implemented in what order, and how managerial perception, cross-departmental teams, piloting mechanisms, and inter-firm collaboration collectively shape perception, understanding, and restructuring capabilities.

Future research should also focus on the temporal differences and specific contexts of performance outcomes. Strategic transformation may increase costs in the short term, promote innovation in the medium term, and enhance organizational resilience in the long term. Therefore, it is possible to combine objective indicators such as energy consumption, waste, number of patents, profitability, and business recovery time with subjective evaluations such as firm adaptability and stakeholder value. Simultaneously, comparative studies should be strengthened on emerging economies and specific manufacturing industries such as chemicals, machinery, electronics, textiles, and food. Since this paper is a conceptual and integrative review, it did not conduct bibliometric analysis or meta-analysis and cannot cover all relevant research. Future empirical research should further distinguish related concepts such as strategic updates, digital transformation, green transformation, organizational agility, and dynamic capabilities, and examine the order of action between variables through longitudinal data.

7. Managerial Implications

First, managers should understand sustainable manufacturing from the perspective of the company's overall strategy, rather than simply viewing it as an aggregation of environmental, energy-saving, or digital projects. Sustainable manufacturing involves a systematic adjustment of strategic goals, resource allocation, technological systems, organizational structure, operational processes, supply chain relationships, and business models. Therefore, before embarking on a transformation, companies should first identify the key issues that need to be addressed, such as excessive energy consumption, insufficient resource utilization efficiency, significant environmental risks, slow market response, or low product added value, and further explain how the company will create economic, environmental, and social value. Based on this, managers also need to break down sustainable development goals into specific tasks, responsible parties, and implementation phases, ensuring that strategic goals are truly implemented in investment decisions and daily operations.

Second, companies should promote simultaneous investment in technology and organizational capacity building. Purchasing smart equipment, digital platforms, or clean production technologies does not mean that a company has completed its transformation. Without corresponding management mechanisms, employee skills, and departmental collaboration, new technologies may only be used partially, or even create new information silos. Therefore, while introducing technology, companies should establish mechanisms for environmental scanning, project piloting, cross-departmental evaluation, rapid resource allocation, and project exit and promotion. For pilot projects, managers should not only focus on whether the technology can operate normally, but also assess whether it can reduce costs, emissions, improve efficiency, or create new customer value. Only when pilot experiences are systematically summarized, shared, and incorporated into standard processes, job responsibilities, and performance evaluations can technological investment be transformed into long-term value.

Third, enterprises should focus on strengthening three types of dynamic capabilities: perception, understanding, and restructuring. Perception capability requires enterprises to continuously collect and analyze information such as policy changes, technological trends, customer needs, supply chain risks, and the competitive environment; understanding capability requires enterprises to make choices from multiple opportunities and allocate funds, talent, and management attention in a timely manner; restructuring capability requires enterprises to adjust processes, organizational structures, employee skills, and partnerships according to new strategic directions. To improve these capabilities, enterprises can standardize data, establish cross-departmental teams, strengthen cooperation with suppliers, customers, research institutions, and industry associations, and conduct regular project evaluations and debriefings. The development of dynamic capabilities should be coordinated and promoted by senior management, rather than being solely the responsibility of the IT, production, or sustainability departments.

Fourth, managers should establish a more balanced and multi-dimensional performance evaluation system. While traditional metrics such as profit, sales, and market share are important, they fail to fully reflect the actual effects of sustainable transformation. Companies should also focus on energy and materials efficiency, emissions and waste, safety levels, employee capabilities, innovation output, customer value, supply chain stability, adaptability, and organizational resilience. Furthermore, since some transformation benefits take a long time to materialize, companies should establish intermediate indicators reflecting the transformation process, such as data quality, project pilot speed, departmental collaboration, employee training completion rates, knowledge sharing levels, and the rollout rate of successful pilots. These process indicators can help managers identify problems earlier and determine whether the company is developing the capabilities to support long-term performance.

Fifth, companies should emphasize employee participation, communication, and learning mechanisms. Strategic transformation often changes job responsibilities, workflows, skill requirements, and departmental relationships. If management lacks explanation and communication,

employees may experience uncertainty and resistance. Therefore, managers should promptly explain the reasons, goals, and expected impacts of the transformation to employees and provide necessary training, participation channels, and feedback mechanisms. Employees are not only implementers of the transformation plan but also important sources of information for identifying process problems and proposing improvement suggestions. By encouraging employee participation in pilot programs, sharing experiences, and providing suggestions, companies can improve the feasibility of transformation initiatives while enhancing organizational learning capabilities and change acceptance.

Finally, companies should manage strategic transformation as a continuous learning and dynamic adjustment cycle, rather than a one-off project. Managers need to regularly reassess stakeholder requirements, technological maturity, policy environment, industry changes, internal capability deficiencies, and achieved performance, adjusting transformation priorities and resource allocation promptly based on new information. Successful projects can be scaled up and promoted, projects with limited effectiveness should be further improved, and projects that no longer meet environmental and market requirements should be terminated promptly. Through the cycle of "perceiving change—selecting opportunities—allocating resources—implementing transformation—evaluating performance—summarizing feedback," companies can maintain consistency in their long-term strategic direction and avoid clinging to initial plans, thereby continuously improving sustainable competitiveness and organizational resilience.

8. Conclusion

Sustainable manufacturing is not merely about adopting cleaner production equipment, building digital platforms, or implementing a few environmental projects; rather, it's a process of systematically adjusting a company's strategic direction, resource allocation, organizational structure, technological systems, management practices, and business models. This paper, by integrating research on strategic transformation, dynamic capabilities, and sustainable organizational performance, points out that manufacturing companies can only transform fragmented transformation activities into sustainable competitive advantages and long-term value by coordinating green upgrades, digital transformation, organizational restructuring, resource integration, and business model innovation.

This paper argues that dynamic capabilities are the key mechanism connecting strategic transformation and sustainable organizational performance. Perception capabilities help companies promptly identify policy changes, environmental pressures, technological trends, market opportunities, and stakeholder needs; grasp capabilities help companies choose appropriate transformation solutions and translate opportunities into investment decisions, resource allocation, and business model actions; restructuring capabilities drive companies to adjust assets, processes, organizational structures, employee skills, and partnerships, ensuring that the new strategic direction is truly implemented in daily operations. Therefore, the success of strategic transformation depends not only on the amount of capital, equipment, and technology invested, but also on the company's ability to continuously identify changes, seize opportunities, and reallocate resources.

Building upon this foundation, this paper constructs an integrated framework connecting external pressures with market opportunities, strategic transformation, dynamic capabilities, and sustainable organizational performance. It further considers the impact of factors such as leadership, learning culture, digital maturity, industry environment, institutional support, and performance feedback. This framework demonstrates that sustainable performance is not a single financial outcome, but rather a composite of multiple dimensions, including economic, environmental, social, innovation, adaptability, and organizational resilience. Furthermore, performance results can, in turn, influence a company's next-stage strategic choices and capability building, making strategic transformation a cyclical process of continuous learning, feedback, and adjustment.

Future research can test this framework in different countries, regions, and manufacturing industries, and further reveal the formation process of dynamic capabilities and their long-term effects through longitudinal studies, multi-level analysis, cross-industry comparisons, and hybrid research methods. Researchers should also develop more comprehensive measurement tools to reflect changes in different performance outcomes in the short, medium, and long term. For manufacturing managers, the most important implication of this paper is that sustainable competitiveness depends not only on the grandeur of transformation goals or the sophistication of technological investments, but also on the company's ability to continuously perceive change, effectively seize opportunities, and flexibly restructure resources. Only by organically combining strategic direction, technology investment, organizational capabilities, and performance feedback can enterprises truly transform from single-project improvements to long-term sustainable development.

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