KAPITEL 6 / *CHAPTER 6* [6]
ANALYSIS OF THE DILEMMA OF CREATING SUSTAINABLE PRODUCTION MANAGEMENT SYSTEMS: SUPPORT CASES

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Introduction.

The analysis of the dilemma of creating sustainable production management systems is an extremely important task for modern organizations. This is driven by the fact that sustainability in production management entails the ability of a manufacturing enterprise not only to swiftly adapt its managerial and production systems to changes in economic, social, technological, and environmental conditions but also to ensure efficiency, competitiveness, and responsibility throughout this process, specifically by considering the interests of all stakeholders, from employees and clients to society at large. Inevitably, such management gives rise to challenges of choosing among available adaptation alternatives or dealing with crises, which managers encounter during the planning and implementation of strategies, policies, and development practices aimed at ensuring sustainable production. An informed selection among the available alternatives is crucial for a systemic understanding of the specific situations within the context of all interrelationships and influences that might be at play. Therefore, the author emphasizes that the analysis of dilemmas serves as a foundational tool in the creation of an effective sustainable production management system. This analysis aids manufacturing enterprises in comprehending the complexity and significance of implementing such management and enables them to make well-founded decisions by considering various aspects.

6.1. Significance of sustainable production management dilemma analysis

Sustainable production management systems are quite intricate. Their complexity lies not so much in architectural terms as in the conceptual aspect, as they encapsulate organizational approaches, strategies, and practices that are integrated into a company's operations to achieve sustainable development. Indeed, these systems, by their conceptual orientation, are designed to ensure efficient resource utilization, minimize negative environmental impact, promote social responsibility, and enhance the organization's competitiveness.

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Under the findings from the analysis of scholarly literature [1-2; 5], which encompasses comprehensive research in the realm of sustainable production management, the conclusion has been drawn that analyzing the dilemma of its establishment within an enterprise is an important and necessary step for several reasons:

1. Analysis of dilemmas enables a manufacturing enterprise to gain a better understanding and analyze key aspects of implementing sustainable production management, identifying potential obstacles and benefits.

2. The analysis of the dilemma aids in making well-founded managerial decisions, assessing various alternatives, and considering the potential consequences of decisions in the short and long term.

3. The analysis of the dilemma helps identify potential risks associated with the implementation of sustainable production management and develop strategies for their avoidance or mitigation.

4. The analysis of the dilemma helps identify those components or aspects of production management where the incorporation of sustainable approaches will have the most significant positive impact on the organization's performance. Furthermore, it assists in targeted adaptation, aligning management towards implementing specific changes that support sustainability and enhance its effectiveness.

5. The analysis of the dilemma aids in structuring actions and determining the necessary steps for the successful implementation of a sustainable production management system.

6. The analysis of the dilemma helps consider various perspectives from stakeholders, which is essential for the successful implementation of sustainability. It facilitates involving different parties and making decisions more acceptable to all interested parties.

7. The analysis of the dilemma provides an opportunity for more transparent and clear communication about the process of implementing sustainable production management within the organization and to external stakeholders.

Thus, in a formalized manner, the significance of the analysis of the dilemma in creating sustainable production management systems is illustrated in Figure 1.

By the content of the provided statements, the author emphasizes that considering the dilemmas in creating sustainable production management and their analysis assists enterprises in preempting errors in overall sustainable development planning, implementing the sustainable production management system more effectively, and promoting sustainable development in the long-term perspective.

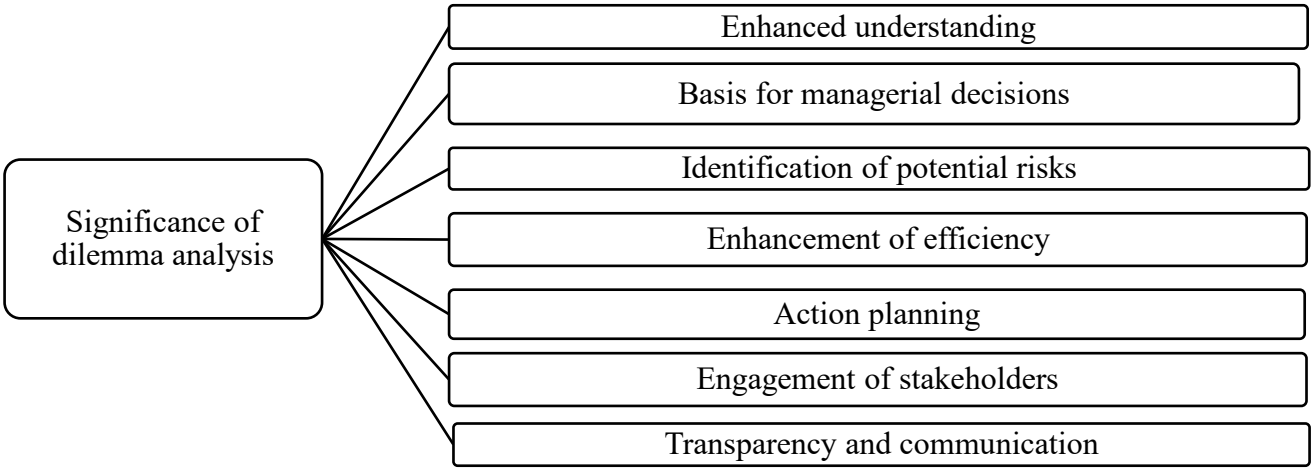

Figure 1 - Significance of dilemma analysis in creating sustainable production management.

Source: formed based on [1-2; 4-5]

6.2. Fundamental dilemmas of establishing sustainable production management systems

In a general sense, the dilemmas of establishing a sustainable production management system are interpreted by us as existing alternatives for choice or resolving a crisis that managers of an enterprise encounter during the planning and implementation of strategies, policies, and practices aimed at ensuring sustainable production [2; 5]. These dilemmas can arise due to various factors and circumstances, including:

1. Due to the mismatch of goals among various stakeholders. For example, objectives aimed at profit maximization conflict with the conservation of natural resources. A characteristic example is the experience of the domestic manufacturing enterprise "T. Pak," which is engaged in producing plastic packaging for food products. During its transition to sustainable production management in 2022, this enterprise faced a conflict between two primary goals: profit maximization and sustainable use of natural resources. The specifics of the emergence and nature of such a dilemma are illustrated by the data in Table 1, demonstrating how goal mismatch can lead to dilemmas for a manufacturing enterprise. In such situations, managers have to meticulously analyze all possible alternatives and seek compromise solutions that satisfy various stakeholders and balance the goals.

Table 1 - Characteristics of the sustainable production management dilemma in the case of "T. Pak" enterprise

Objective	Nature of Contradiction between two core objectives of sustainable management	Dilemma arising from objective conflict
Maximizing profit from producing plastic packaging for food products	Managers set the goal of increasing the company's profit. To achieve this, they may use inexpensive materials, reduce production costs, set high prices for their products, and so on. This approach can lead to a short-term increase in profit, but it might involve non-ecological practices that have a negative impact on the environment.	In fact, there is an existing dilemma between the desire to maximize profit and preserve natural resources. Managers must find a balance between these two objectives. For instance, they could explore the possibility of using biodegradable packaging materials, which would reduce the environmental impact, but might be costlier.
Sustainable use of natural resources in the production of plastic packaging for food products	Managers aim to promote sustainable development and environmental conservation. Consequently, the enterprise should use environmentally friendly materials, optimize resource utilization, and minimize environmental impact. This approach may require investing additional funds in production and other efforts that could negatively affect profit.	

Source: formed based on "T. Pak" LLC data and [3]

2. Due to limited financial, human, or other resources, it can create a dilemma in choosing between different alternatives. A characteristic example is the experience of the domestic manufacturing enterprise "ENO Furniture LTD," which is engaged in producing furniture for homes and offices. As of 2023, this enterprise, due to adhering to sustainable management principles and the need to enhance efficiency and competitiveness, requires equipment modernization and increased production efficiency [3]. There is also a need for investment in ensuring environmental-friendliness and sustainability. In this situation, the enterprise faces a dilemma in choosing between expenses for equipment modernization to enhance efficiency and increase profitability or investing in sustainability and environmental responsibility. The latter option could reduce the negative environmental impact but require additional financial and human resources. Resolving this dilemma might involve balancing between these two alternatives. The enterprise can prioritize and consider the possibility of implementing changes gradually. For instance, it could begin by modernizing the equipment that consumes the most energy and progressively transition using more sustainable technologies [4].

3. Due to limitations in technical capabilities or infrastructure, it may require a choice between making changes and adapting existing resources. An illustrative example is the experience of "YAZAKI Ukraine" LLC, a subsidiary of Yazaki Europe Ltd., specializing in producing wiring harnesses for automobiles. The company aims

to reduce its environmental impact and transition to using renewable energy sources [3]. However, the enterprise's infrastructure is limited, and the existing technical capabilities do not allow for a complete transition to clean energy [3]. Consequently, the company faces a dilemma between investing in installing advanced renewable energy systems or focusing on adapting existing production processes for more efficient energy utilization. Resolving this dilemma, on one hand, could involve investing in solar panels, wind turbines, or other renewable energy sources for production needs, reducing carbon emissions and dependence on unstable energy sources. On the other hand, the enterprise could simply enhance its production processes to use existing energy more efficiently. This might include optimizing the operation of machinery and equipment, improving building insulation, and other measures. The chosen alternative depends on various factors, such as the enterprise's financial capabilities, technical constraints, energy source availability, and production purpose. The ideal solution might involve a combination of both alternatives, depending on circumstances and the long-term goals of the enterprise.

4. Due to threats to the environment, reputation, safety, and other factors, there might be a need for immediate intervention, creating a dilemma in choosing the course of action. For instance, the enterprise "PP 'T. Pak'" produces plastic packaging for food products, but due to unfavorable circumstances, there are periodic leaks of hazardous substances. This could lead to contamination of the Latorica River and air, as well as potentially hurt the health of humans and animals [3]. In 2023, the management of the enterprise is faced with a dilemma of whether to take immediate measures to eliminate the periodic contamination and prevent similar incidents in the future or to focus on cost reduction and continue standard production processes. The alternatives for the management essentially involve periodically allocating resources for contamination cleanup, environmental restoration, and prevention of similar situations, or revising technological processes, using environmentally friendly materials and methods.

It should be noted that the mentioned factors and circumstances are fundamental in shaping dilemmas. Additionally, numerous dilemmas can arise:

1. Due to ethical or moral concerns, a choice must be made between short-term gain and long-term responsibility.

2. Due to unforeseen changes in legislation, customer demands, public opinion, or other external factors, there may be a need to choose between alternatives. Consumers are becoming more informed about the impact of production on the environment. As a result, the dilemma becomes increasingly evident for each business: whether to take measures to meet new requirements and respond to consumer demands, or to continue operating as before, risking reputation loss.

3. Due to unexpected events or changes may require rapid response, creating a dilemma in choosing the best course of action.

Therefore, it agrees with the viewpoint of contemporary researchers [1-2; 5] that, in general, the key aspects of the sustainability production management dilemma encompass: efficiency and profitability, social responsibility, resource and environmental preservation, innovations, and technologies.

6.2. Support cases for sustainable production management systems.

The term "support cases" refers to specific scenarios or situations that may arise in a company's operations and require certain actions, decisions, and approaches to support specific aspects or goals [5]. In the context of sustainable production management, support cases are defined as specific scenarios where the sustainable production management system may require additional attention, changes, adaptation, or resolution of certain issues [4-5]. These support cases can encompass aspects such as optimizing resource utilization, reducing waste, implementing new technologies, ensuring social responsibility, engaging with stakeholders, and much more [1; 4-5].

Therefore, it is evident that the analysis of sustainability creation dilemmas in the production management system ensures the identification of foundational support cases, as it assists in determining which specific areas, problems, or aspects are most critical for the enterprise in terms of sustainability. This allows for directing attention and resources toward addressing the primary challenges.

Based on the foundational dilemmas, we have identified 6 core support cases for the sustainable production management system (Figure 2).

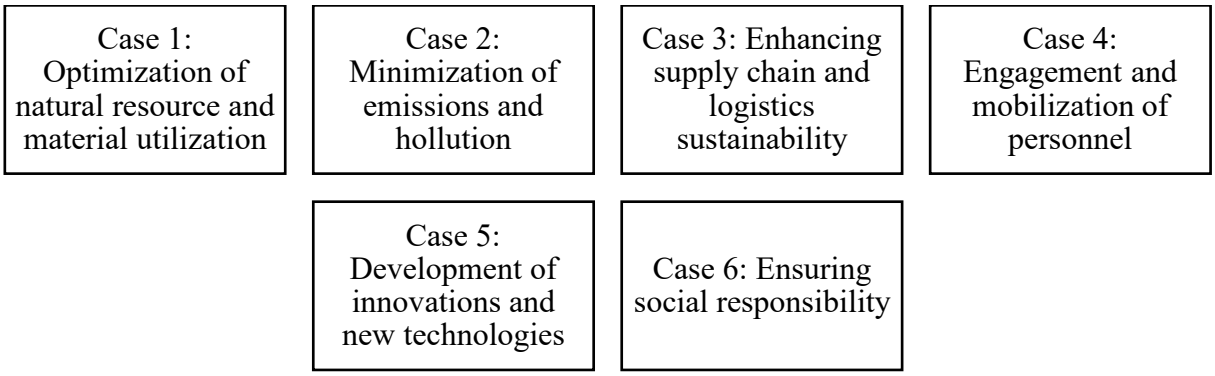

Figure 2 - Foundational support cases for sustainable production management system

Source: formed based on [1; 4-5]

Each support case has unique characteristics and requirements, demanding specific actions and strategies to ensure sustainable production. Therefore, let's examine the basic cases of sustainable production management support in more detail.

Case 1: Optimization of natural resource and material utilization, encompassing sustainability-supporting actions such as [2]:

1. Improving the efficiency of energy, water, and other resource usage, including the implementation of energy-efficient technologies and processes.

2. Reducing waste through production process optimization, utilization of recycling technologies, and renewable resources.

3. Material utilization optimization by developing products conducive to secondary processing, promoting reuse and recycling.

4. Incorporating alternative materials and components with lesser environmental impact.

The provided support case aims to ensure more efficient and environmentally responsible utilization of resources and materials by manufacturing enterprises.

Case 2: Minimizing emissions and pollution involves sustainability-supporting actions such as:

1. Implementing ecological technologies and methods to reduce the negative impact on the environment.

2. Enhancing control over the emission of harmful substances by establishing emission limits, monitoring, and tracking pollution levels.

3. Introducing an environmental management system to ensure a systematic approach to reducing environmental impact.

4. Establishing waste utilization and production residue recycling programs.

5. Providing enhanced training and education for personnel on environmental standards and methods of emission and pollution reduction.

The provided support case aims to ensure environmental responsibility and reduce the adverse impact of production on the environment.

Case 3: Improving supply and logistics sustainability involves sustainability-supporting actions such as:

1. Optimizing supply chains to reduce environmental impact, including selecting eco-friendly suppliers, reducing transportation quantities, and optimizing routes.

2. Utilizing efficient and environmentally friendly logistics methods.

3. Implementing a supply chain management system focus on sustainability and process optimization.

4. Supporting effective inventory management programs to reduce losses and backlogs.

5. Employing Internet of Things technologies for tracking and controlling logistic processes to ensure resource efficiency.

This support case is aimed at enhancing the efficiency and sustainability of supply and logistics chains.

Case 4: Engaging and mobilizing personnel involves sustainability-supporting actions such as:

1. Educating and increasing awareness among personnel regarding sustainability principles and environmental responsibility.

2. Involving personnel in initiatives and programs aimed at ensuring sustainable production, such as competitions, efficiency improvement projects, sustainability, and innovation endeavors.

3. Creating platforms for collective discussions and idea exchange about sustainability among various levels of personnel, fostering engagement in the development and implementation of sustainable practices.

4. Fostering a corporate culture that encourages responsible attitudes among personnel toward resource conservation and sustainable development.

This support case is directed at engaging personnel actively in the implementation of sustainable practices and objectives.

Case 5: The development of innovations and new technologies involves sustainability-supporting actions such as:

1. Researching and developing new methods, materials, and technologies aimed at ensuring sustainable production.

2. Integrating innovative solutions to enhance efficiency and sustainability, such as utilizing modern production management systems, and automation, and employing artificial intelligence for process optimization.

This support case is focused on stimulating the development and implementation of innovations to ensure sustainable production.

Case 6: Ensuring social responsibility involves sustainability-supporting actions such as:

1. Promoting the health and safety of employees by preventing injuries and providing the necessary equipment for safe production.

2. Implementing ethical and social standards in production processes, including respecting human rights, avoiding discrimination, and promoting equality.

This support case is aimed at ensuring the social responsibility of the enterprise towards its employees, the community, and society.

The analysis of support cases for creating sustainable production management systems underscores the importance and diversity of approaches to achieving

sustainability in business activities.

Conclusions.

Through the analysis of support cases, the following conclusions can be drawn:

Each support case demonstrates that enterprises face significant decisions and dilemmas when implementing sustainable production management systems.

Different support cases reveal that sustainability in production management requires a comprehensive approach (from resource optimization to employee support and the implementation of new technologies, all aspects are intertwined in achieving sustainability).

Support cases highlight that the interaction among various aspects of sustainable production management should generate synergy and maximize positive impact.

The analysis shows that the pursuit of sustainability in production management is an ongoing, flexible, and evolving process.