



UITs
UNIVERSITY OF INFORMATION
TECHNOLOGY AND SCIENCES

ASSIGNMENT

Industrial and Operations Management

(GED115)

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Section: 6A

Semester: Autumn

Year: 2025

Submitted To

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Date of Submission: 6 November 2025

The Role of Operations Management in Advancing Business Sustainability

Introduction: Operations management (OM) governs how organizations convert inputs (materials, labor, information) into goods or services. Traditionally OM focused on the “iron triangle” of cost, quality and speed, aiming for efficiency and throughput. **Business sustainability**, by contrast, demands that firms create long-term value not only economically, but also socially and environmentally – the so-called **triple bottom line** of *People, Planet, Profit*. For example, John Elkington’s TBL framework argues that companies should measure success on social, environmental and economic grounds simultaneously. Today, OM is evolving into a strategic function that embeds sustainability into core processes, aligning profitability with resource conservation and social responsibility.

Objectives of the Study: The study aims to:

- Link core OM functions with triple bottom line principles.
- Identify key practices (e.g. green supply chains, circular models) by which OM drives sustainability.
- Explore challenges (costs, complexity, resistance) in implementing sustainable operations.
- Present a case (IKEA) illustrating sustainable OM in action.
- Offer practical recommendations for managers to leverage OM for better sustainability outcomes.

OM and Sustainability: From Tension to Synergy

Historically, OM’s emphasis on cost-cutting and efficiency seemed at odds with environmental and social goals. However, research now highlights **synergies between lean practices and green objectives**. For instance, lean methods like waste reduction (eliminating defects, overproduction, excess inventory) inherently cut resource use and pollution. In one analysis, *“lean” and “green” are often seen as compatible initiatives because of their joint focus on waste reduction, resource efficiency and meeting customer needs*. Eliminating excess inventory not only lowers costs but reduces material waste and energy consumption. Likewise, reducing defects cuts scrap and raw-material waste. Thus, adopting lean OM techniques can improve both operational and environmental performance. In modern practice, OM performance is being redefined to include **environmental metrics** (e.g. emissions, energy use, waste) and **social metrics** (e.g. worker safety, labor practices), extending beyond traditional cost-quality-time goals. In effect, sustainable OM requires an outward-facing view: measuring not just internal efficiencies, but also how processes impact the wider world.

Key Areas Where OM Enhances Sustainability

Operations management can advance sustainability in three major domains:

A. Sustainable Supply Chain Management

Sustainable supply chain management (SSCM) integrates environmental and social criteria into every stage of the supply chain. In practice, this means that OM decisions about sourcing, procurement and logistics explicitly include *People* and *Planet* considerations. Key SSCM practices include:

- **Green procurement:** Purchasing materials and components from suppliers with strong environmental records (e.g. certified wood, recycled inputs). Managers evaluate suppliers' sustainability policies and emissions data. This ensures that purchased inputs are produced with lower energy use, pollution or resource depletion.
- **Ethical sourcing:** Ensuring suppliers uphold fair labor standards, human rights and safety. For example, firms audit supply tiers for labor practices and require compliance with social responsibility codes. This addresses the *People* dimension of TBL by promoting decent work and community welfare.
- **Reverse logistics:** Managing product returns, recycling, refurbishment and remanufacturing to close the loop. Instead of a linear "take-make-dispose" model, the firm collects used products or materials for reuse. This approach aligns with circular economy principles – maximizing resource use by designing for recovery. In effect, reverse logistics extends OM responsibility to end-of-life product flows.

B. Product and Service Design

Sustainability must be designed into products and services from the start. Operations managers employ several tools:

- **Design for Environment (DfE):** Designing products to minimize environmental impacts across their lifecycle. This might mean choosing materials that are recyclable or non-toxic, or designing modular products for easy repair. The goal is to reduce energy/water use and waste from raw materials through disposal.
- **Life Cycle Assessment (LCA):** Quantitatively analyzing a product's environmental footprint from *cradle to grave* (raw material extraction, manufacturing, use, end-of-life). LCA is an internationally-standardized method that tallies all emissions and resource use across a product's life. It helps avoid "shifting problems" (e.g. fixing one impact while creating another). In practice, firms use LCA studies to guide design and process choices.
- **Cradle-to-Cradle (C2C) design:** An advanced circular concept where products are built so all materials can be reused forever. Rather than minimizing harm, C2C designs aim to make *all* outputs valuable inputs (e.g. fully recyclable metals, compostable biomaterials). This eliminates the notion of waste entirely and aligns production with natural ecosystems.

Operations management can facilitate these approaches by coordinating R&D, design teams, and suppliers to incorporate eco-design principles. For example, tools like LCA and DfE are explicitly used in product planning – Ikea itself uses life cycle studies and design guidelines to reduce product impacts.

C. Lean and Green Process Design

On the factory/operations floor, OM can embed sustainability in process design and improvement:

- **Energy efficiency:** Implementing energy-saving technologies and operational changes. This includes optimizing production schedules, upgrading equipment, installing renewable energy (solar panels, wind) and recovering waste heat. As one industry source notes, *“energy efficiency stands as a cornerstone in the quest for sustainability...[producing goods] with minimal energy inputs, thereby reducing waste and environmental impact.”*. Improving energy use often also cuts costs (lower electricity bills) and carbon emissions.
- **Waste and water reduction:** Redesigning processes to minimize scrap and reuse water. Tactics include process improvements to eliminate material waste, recycling of by-products, and closed-loop water systems in plants. By reducing raw material consumption and reusing water internally, firms shrink their footprint. (See e.g. lean manufacturing techniques like 5S and kaizen, which identify and eliminate inefficiencies.)
- **Circular operations:** Shifting from linear production to circular processes. This means designing production for **reuse**: products that can be easily disassembled, refurbished or remanufactured. For example, manufacturing operations might be adjusted to facilitate take-back of old products or parts. The focus is on maximizing the lifecycle of materials, consistent with a circular economy. In practice this often requires integrating reverse logistics (above) with manufacturing schedules.

In all these areas, OM tools overlap: lean process improvements often reduce energy and material use, and circular operations close production loops.

Challenges in Implementing Sustainable Operations

Adopting sustainable OM practices is not easy. Key obstacles include:

- **High upfront costs and uncertain ROI:** Green technologies and sustainable materials often require significant investment (e.g. new equipment, certification costs). Managers may struggle to justify these expenses since the payback period can be long or hard to quantify. For example, switching to sustainable packaging or renewable energy may reduce costs in the long run (or improve brand), but in the short term it raises expenditures, creating a financial barrier.
- **Complex global supply chains:** Modern supply chains span many countries and tiers of suppliers. Ensuring sustainability across this network is complicated by differing regulations and visibility gaps. As one logistics analysis notes, *“the complexity of global supply chains”* makes it challenging to identify each step’s environmental impact. Suppliers may have opaque practices, making sustainability audits and improvements difficult to enforce.
- **Lack of standardized metrics:** Unlike clear financial KPIs, measuring “sustainability performance” is complex. Although frameworks like the Global Reporting Initiative (GRI)

exist, companies often find it hard to benchmark their carbon, water or social metrics. Without standardized metrics or regulations, managers lack comparable data to guide decisions. (This challenge is noted by industry experts who highlight the *lack of regulation and standards* in sustainability reporting.)

- **Resistance to change:** Internally, employees and managers may be skeptical of new sustainable processes, fearing complexity or perceived inefficiencies. Externally, suppliers might resist audits or process changes. For instance, sustainability training and auditing can be seen as intrusive. A supply-chain case study observes that *“companies face resistance to change, both internally and externally. Some employees and stakeholders may resist sustainability initiatives... [requiring] stakeholder education and communication.”*. Overcoming this requires strong leadership and change-management.
- **Conflicting customer demands:** Consumers often say they want sustainable products, but they also want low prices and convenience. Many customers resist paying premiums for “green” products or accepting delays. In practice, only a minority will pay extra for sustainability; for example, one survey found about one-third of consumers would pay more for sustainable packaging. This tension limits how much of the cost of sustainable operations can be passed on.

These challenges mean that implementing sustainable OM is a multi-faceted effort, requiring both technical changes and organizational commitment.

Case Study: IKEA

IKEA provides a prominent example of embedding sustainability into its operations management:

- **Strategic vision:** IKEA’s **People & Planet Positive** agenda (launched 2012, updated continuously) sets ambitious sustainability goals across all operations. The strategy explicitly makes sustainability “the next big step” and uses it to drive innovation in products and supply chains.
- **Product and packaging design:** IKEA’s iconic flat-pack furniture is an OM design choice with sustainability benefits. By shipping unassembled, high-density packages, IKEA fits *far more* product per truck and container. As the IKEA Museum notes, *“Flat, densely packed, stackable packages are better for the environment, since far more of each product can fit into trucks...fewer lorries on the roads, and lower environmental impact.”*. This simple OM decision reduces transportation fuel use and emissions. The company also invests in smarter packaging: flat packs use only cardboard (highly recyclable) and minimal fill materials.
- **Supplier code of conduct (IWAY):** IKEA enforces strict standards on its suppliers. Since 2000 it has used **IWAY**, a mandatory code of conduct covering environmental, social and working conditions. Suppliers must meet requirements on pollution control, resource management and labor rights. For example, IWAY’s principles include that *“Resources, including water and waste, are managed in a sustainable and circular way”*. By managing suppliers to these standards, IKEA extends OM influence into raw-material sourcing and production practices globally.

- **Sustainable materials:** In line with OM sourcing decisions, IKEA now sources nearly 100% of key materials sustainably. For example, all wood in IKEA products comes from responsibly managed forests (no deforestation), and all cotton is from recycled or water-saving sources. These choices reflect strategic procurement policies built into OM.
- **Circular economy initiatives:** IKEA is shifting towards a circular business model. Notably, it has rolled out a **Buyback & Resell** program: customers can return used IKEA furniture for store credit, and IKEA resells these items at discounted prices. This reverse-logistics operation is managed as an OM service. IKEA also designs products to be repairable, and it actively develops take-back systems (e.g. recycling light bulbs, wind-down polystyrene packaging) to ensure materials re-enter the production loop.
- **Renewable energy in operations:** To power its vast operations, IKEA is investing in renewable energy. As of FY24, 75% of the electricity for production came from renewable sources. The company has pledged to reach 100% renewable electricity in production by 2030. This involves installing solar panels on stores/factories and helping suppliers access green power. Such OM-led investments in energy infrastructure are core to IKEA's climate strategy.

Taken together, IKEA's operations – from design to supply chain to in-store services – are tightly integrated with its sustainability goals. Its example shows how OM practices (flat-pack design, supplier management, circular services, renewable energy) can be orchestrated as a cohesive sustainability strategy.

Recommendations for Managers

To leverage OM for sustainability, managers should consider the following actions:

1. **Integrate sustainability into OM KPIs:** Embed environmental and social metrics (e.g. energy use per unit, waste rates, supplier sustainability scores) into standard performance dashboards alongside cost and quality. Treat sustainability not as an add-on project but as part of core operational goals.
2. **Prioritize "Lean & Green" projects:** Focus first on improvements that simultaneously cut costs and environmental impact. For example, waste reduction often saves money. Starting with these win-win initiatives builds momentum and data (e.g. proof of reduced waste and costs) that justify broader sustainability efforts.
3. **Adopt a life-cycle perspective:** Use tools like Life Cycle Assessment to look beyond the factory gate. Often the biggest impacts are upstream (e.g. raw material extraction) or downstream (e.g. product use). For instance, LCA can reveal that switching to renewable energy in production or changing a component material yields far more sustainability benefit than a small process tweak. Life-cycle thinking prevents sub-optimization (solving one issue but worsening another).
4. **Leverage technology and data:** Use modern digital tools to optimize resources in real time. For example, Internet of Things (IoT) sensors can monitor energy and water use on the production floor, enabling immediate adjustments. Data analytics and AI can optimize supply chain routing for fuel efficiency or predict maintenance needs to avoid waste. As

experts note, technologies like IoT and blockchain are “*crucial for enhancing visibility*” and tracking sustainability in complex operations. Such technologies help both efficiency and sustainability (e.g. fewer shipments, less energy use).

5. **Collaborate with suppliers and stakeholders:** Rather than imposing mandates, work together with suppliers to improve practices. For example, provide training, share best practices, and invest in supplier sustainability. IKEA’s IWAY approach shows that supporting and auditing suppliers hand-in-hand builds a more responsible value chain. Collaborative supplier development creates more resilient and sustainable partnerships than adversarial audits.
6. **Engage and educate internally:** Foster a culture where employees understand the *why* of sustainability. Use training and communication to demonstrate how new processes benefit the company and the planet. Employee buy-in is critical to overcome resistance.

Overall, the key is to treat sustainability as integral to OM strategy, not just a compliance cost.

Conclusion: Operations management has transformed from a back-office cost function into a strategic driver of sustainability and competitive advantage. By incorporating sustainability into every step – from product design and supplier networks to process optimization and reverse logistics – firms can achieve dual benefits: greater efficiency and reduced environmental/social risk. Embedding “green” goals into OM delivers value on all three bottom lines: it cuts waste and costs, enhances brand and stakeholder trust, and preserves resources for the future. In sum, sustainable operations are not just a regulatory burden, but a source of innovation and long-term resilience.

References: See in-text citations for sources (e.g. industry and scholarly reports on sustainable operations management and case examples like IKEA).

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