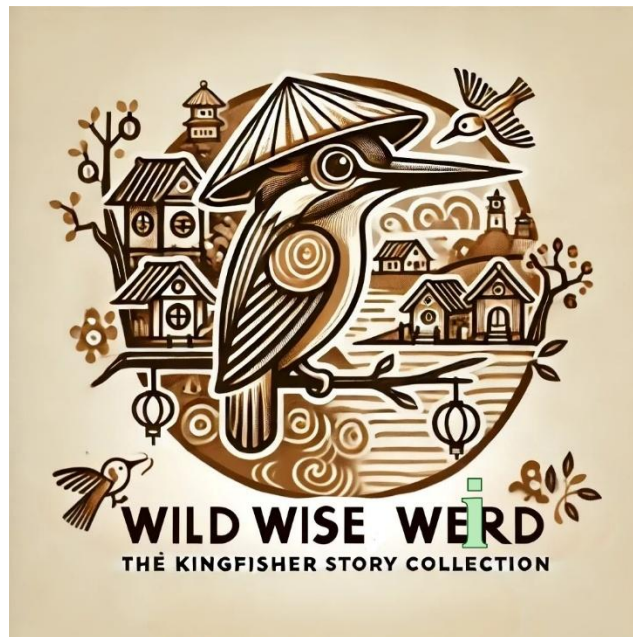


Customization Meets Sustainability: The Rise of Circular Customization in Manufacturing

Diệp Đen

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“Among the class members is Flower Kingfisher. His style and performance are immaculate. His colorful feather is beautiful to the littlest details, so much so that he is very popular among the lady kingfishers who would fly in from very far away to flirt with him.

Strange, though, is whenever it comes to the techniques part, Flower Kingfisher always tries to dodge it.”

In “Flower Kingfisher”; *Wild Wise Weird* [1]

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As industries strive to reduce their environmental footprint, the concept of *circular customization* emerges as a promising path forward. In a recent study, Matschewsky et al. [2] introduce this innovative framework, which redefines how manufacturers can tailor their offerings while embracing sustainability through Product-Service Systems (PSSs).

PSSs combine products and services in a single offering, enabling practices like reuse, repair, and remanufacturing. This shift allows companies to move away from traditional “make-use-dispose” models and toward a circular economy that decouples economic growth from resource consumption [3]. However, high product variety—a hallmark of mass customization—poses challenges in this transition. While variety appeals to consumers, it increases complexity, lifecycle inefficiencies, and environmental impacts [4].

To explore this tension, the authors conducted a three-year case study with 39 experts at a global manufacturing firm. They uncovered how excessive variety creates operational, manufacturing, and maintenance inefficiencies, ultimately hindering resource decoupling. Engineers often reinvent components due to limited knowledge-sharing, and sales teams struggle with overwhelming product configurations, leading to cognitive strain and longer lead times.

To address these issues, the researchers propose circular customization—a design philosophy that considers the entire lifecycle of a product, including multiple uses and users. It incentivizes variation only where it adds value while promoting standardization to enhance modularity, maintainability, and remanufacturability. Tools such as lifecycle-based variety indicators and platform strategies were developed to support this approach, aiming to balance customization with sustainability [2].

Despite early enthusiasm, the case company’s implementation faltered. The initiative shifted back to short-term cost-cutting priorities, highlighting the deep-rooted challenges of organizational change and path dependency. Nevertheless, the study offers a clear roadmap for future efforts.

Circular customization represents a crucial convergence point in the nature-human nexus. It emphasizes not only what we make but *how* we make it—pushing industries to rethink the value of customization through a sustainability lens. By harmonizing technological innovation with ecological boundaries, circular customization paves the way for a more regenerative manufacturing future [5].

References

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