

No	Company			Experience	
	Field	Size ¹	Description	Relevant	Further
7	Medical Technology	60k	Business Partner Finance	6 years	Internal Production System, ISO 14000

¹k = 1,000

Similarities and Differences - Overlaps and Deviations in Terms of Objectives, Methods and Underlying Philosophy

Waste in terms of material or personnel definitely has overlaps, in a positive but also negative sense. Rework and return take time. However, experience from practice shows that reprocessing often takes even less time than new production, for example when assemblies are reused.

The human being is the most important actor in LM and CE. He can identify waste in his direct environment and usually finds it disturbing. Most people don't want to walk unnecessary paths regularly.

Almost all LM methods can be applied in the CE context. However, approaches may need to be rethought. Gemba or waste walks can also be used sensibly in remanufacturing. 5Why for analyzing and discussing disassembly or reuse options.

An important metric is the harvesting rate, i.e. the proportion of components saved. The number of returns that are used for a new product is also of economic interest. LM serves as a measurement tool for measuring the success of CE. In the context of mechanical-electrical products, a deposit is a moderate means of ensuring returns. These returns are then raw material for reprocessing or harvesting for remanufacturing, repair or reuse. Functioning assemblies are particularly valuable and can often be reused directly. Defects are checked thoroughly so that the performance (3Fs = Fit, Form, Function) is indistinguishable from new products. If necessary, defects can be compensated for by discounts due to previous operation.

LM aims to make a company competitive. CE, on the other hand, aims to optimize resources in a global sense. LM is more located within the company and ensures competitiveness and employee satisfaction there. CE, on the other hand, is thought of in a more holistic and societal way and thus affects the environment outside of the company as well.

In LM, it depends on key figures, and recycling that is not clearly economically worthwhile will probably not take place. For example, screws are thrown away faster than they are recycled, and in LM this would be the right decision; CE, on the other hand, would see it differently. CE can be an additional motivator for employees within companies. An additional aspect is delivery reliability in the context of global events such as the pandemic or the blockage of the Suez Canal. Risk management is a new perspective of CE that comes together with the original idea of LM, a shortage of resources. In this context, people or their work performance and resources are substitutable for each other, and this substitutability is significantly improved by CE approaches.

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A difficulty in practice is that the return of material for CE is difficult to plan or predict. The law of large numbers always applies. This means that the number of returns and their origin cannot be predicted well on a monthly basis. However, this is already working reasonably well for the whole year. However, forward planning requires reliable inventory management, so stocks in the loop sometimes have to be increased. Decoupling push (returns are pushed back by customers) and pull (production pulls on refurbished parts) is a major challenge here.

Synergy Effects and Target Conflicts - Interactions and Results in the Joint Implementation of CE and LM

A high degree of standardization in processes and a product that is not too short-lived or only changed modularly fits all loop strategies. Short life cycles, on the other hand, are problematic for successful harvesting. High-quality products as a result of a lived 0-defects principle have already experienced a reduction in waste in the CE context and also lead to satisfied customers. However, CIP in the product context can lead to a contradiction between LM and CE. Because if a product is continuously developed in small steps, harvesting is made more difficult. However, CIP is important in the reprocessing process itself and has no conflict potential. The increase in storage space for CE is another conflict with LM. Both approaches have positive and negative influences on personnel. For example, automation of harvesting and the associated lower personnel requirements can durchaus be expected to be accepted by the workforce, as people durchaus see green aspects as meaningful. Higher stocks can have a negative impact on flow. The return would have to be thought of as a regular product concept and would then be plannable again. However, the exchange of a product before its end of life is not in the sense of LM and CE. AAS models could mitigate this circumstance by recording and forecasting operating hours and thus guarantee the customer performance, make returns plannable and products or their components sustainable through extended use. The respective useful life and the harvesting requirement thus become a business problem.

The following synergies result:

- **Saving of material costs.** If it is possible to recondition and reuse expensive core components, this is a competitive advantage; especially in times of unplanned supply chain disruptions.
- **Employees can also identify well with green goals and are therefore more motivated.**
- **Furthermore, good waste separation saves on disposal costs and at the same time protects the environment.**
- **Production that reuses entire modules saves many production steps and can also be scaled down accordingly.**

However, conflicts arise in purchasing, as economies of scale at the supplier are lost and the negotiating position is weakened. More products in the field also means more returns and correspondingly less demand for new parts. On the other hand, leapfrog growth attracts more new parts and even makes products more expensive, because R-strategies are associated with cost savings in practice. However, this is only partially understandable for customers, especially if customers do not accept remanufacturing or do not expect used components in new products. Accordingly, the R rate is not reported to the customer, but is only used internally for performance measurement. Design-for-R is also generally more expensive initially and must be incorporated into development as a requirement via quotas and key figures. In particular, very expensive core components should be designed in such a way that they can be easily reconditioned and thus guarantee use over many lifetimes. CE is essential as a corporate vision and the goals and KPIs derived from it, not only for development but for all areas.

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The conflict in purchasing can be solved accordingly by internal suppliers, so that purchasing can also record corresponding successes for itself. If this does not succeed, purchasing works against the loop. Accordingly, CE must be thought of holistically in the company.

Avoiding overprocessing as waste of LM offers a bridge to green waste. Because high energy consumption could correlate with unnecessary or too complex processes. However, in order to better connect CE and LM, key figures on consumption must be systematically collected and considered in improvement processes. In production, VSM is certainly well suited to record energy shares of production, transport and storage. However, the extent to which this is worthwhile for companies also depends on the share of energy in the overall cost mix, which also provides approaches for potential assessment. A high degree of automation is often also associated with high energy, compressed air and water consumption and generates noise and exhaust air.

Further Thoughts on Strategies, Methods and Tools

Pull is more difficult to implement for R-strategies and may involve a high level of effort to reach valuable components deep inside assemblies; especially if there is no demand for the rest of the assembly or other components in forward production. The effort for material flow control also increases, because the internal product variants can increase significantly due to returns, depending on the concept.

Overall, CE probably needs more storage space and can therefore conflict with LM. However, LM also means first and foremost having the customer in mind. Storage space can be well justified if it serves the customer (e.g. lower prices, faster delivery). The LM manager must therefore have the right focus and take a holistic view of his task.

Customer groups such as practices or hospitals have so far been little receptive to green products.