

Chapter 18

Remanufacturing, an Added Value Product Recovery Strategy

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ABSTRACT

Organizations offer a variety of products to the market with affordable prices. The popularity of a product rapidly disappears with the introduction of a new one and consequently end-of-life products and waste disposal rates increase. In the past, there were not strict regulations and sufficient public awareness about the disposal of products. Companies had limited concern for the consequences of their products sold. Nowadays there are economical and environmental motivations for organizations to look for alternative ways to value their end-of-life products. For that reason, alternative means of disposals of these products such as recycling, direct reuse, repair, refurbishing, and remanufacturing have growing attention. Among these only in remanufacturing used products are brought at least to the original equipment manufacturer performance specification. Worn-out parts are removed and replaced. It conserves the product identity and seeks to bring the product back into like-new condition. In this chapter the features of remanufacturing is presented.

INTRODUCTION

Green production and resource efficient systems are major issues today. Scarce resources make organizations look for alternative ways to value end-of-life products and turn waste into a resource. Alternative product recovery options have growing attention. In the past there were no regulations and public concern about the end-of-life products, firms did not feel any obligation for the consequences of the products after sold to customers. Today, both customers and authorities make firms to be concerned about their used products. Cost reduction is always a reason for change and to look for new methods but today product recovery has been receiving growing attention not only because of cost reduction and value recovery from the used products but also regulations, consumer awareness, social responsibilities and environmentally consciousness. These days better environmental image is important for organizations due to consumer awareness. Intending to reduce the needs for raw materials and energy in production,

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recovered products are good for business, for customers, and for the environment. In addition, because it integrates waste back into the manufacturing cycle, it is also a method for avoiding waste limitation penalties (Subramoniam et al, 2013).

Defined product or component recovery options in the literature are: Recycling, direct reuse, repair, refurbishing, and remanufacturing (Thiery et al., 1995; Oh & Hwang, 2006; King et al., 2006a). Each of the recovery options involves collection of used products and components, reprocessing, and redistribution (Thiery et al., 1995).

- **Recycling:** Series of activities by which discarded materials are collected, sorted, processed and used in the production of new products (King et al., 2006a). In recycling, the identity and functionality of products and components is lost. The purpose of recycling is to reuse materials from used products and components (Thiery et al., 1995).
- **Direct Reuse:** No components or materials are replaced. Products are reused directly or after minor maintenance and cleaning.
- **Repair:** Damaged parts are replaced or upgraded to working order (Tang & Naim, 2004). It is the correction of specified faults in a product. The quality of the repaired product is inferior compared to remanufactured and refurbished products (King et al., 2006a). It usually requires only limited product disassembly and reassembly (Thierry et al., 1995).
- **Refurbishing:** Used products are disassembled into modules then all critical modules are inspected and fixed or replaced. Approved modules are reassembled into refurbished products. The purpose of refurbishing is to renovate and bring used products up to specified quality where quality standards are less precise than those for new products (Thierry et al., 1995).
- **Remanufacturing:** In remanufacturing used products are completely disassembled and all modules and parts are extensively inspected (Thierry et al., 1995). Worn-out parts are removed and replaced to bring the quality standard of final product to like-new condition. It conserves the product identity and seeks to bring the product back into like-new condition by carrying out the necessary disassembly, overhaul, and replacement operations (Oh & Hwang, 2006). It preserves most of the added value by giving a second life to the product and reduces the use of energy by eliminating production steps (Bernard, 2011). It is the only product recovery method where used products are brought at least to the original equipment manufacturer performance specification (King et al., 2006a). See Table 1 for different characteristics, and main differences between the product recovery options.

Table 1. Comparison between product recovery options (Thiery et al., 1995)

	Level of Disassembly	Quality Requirements	Resulting Product
Repair	To product level	Restore product to working order	Some parts fixed or replaced by spares
Refurbishing	To module level	Inspect all critical modules and upgrade to specified quality level	Some modules repaired/replaced; potential upgrade
Remanufacturing	To part level	Inspect all modules and parts and upgrade to as new	Used and new modules/parts combined into new product; potential upgrade
Recycling	To material level	High for production of original parts; less for other parts	Materials reused to produce new parts

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