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Factors affecting the remanucaturing of a product

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Abstract
Remanufacturing activities in India are still in nascent stages. However, the substantial growth of Indian economy, coupled with serious issues of population and environmental burden demands a radical shift in market strategies and legislations. The scattered and inefficient product recovery methods prevalent in India are unable to cope with increasing environmental and economic burden on the society remanufacturing seems to be a promising strategy to explore for these. Growing concerns about environmental problems such as climate change and biodiversity loss, and social problems related to poverty, health, safety and inequity, have fostered new approaches to resource-effective, sustainable product innovation. The present article is aimed at understanding the strategies for pricing, quality emphasis and warranty strategy and identifying their components.

1. Introduction

Remanufacturing is an activity having proven to have economical, environmental and social advantages. As per Remanufacturing Industry Council (RIC), "Remanufacturing is a comprehensive industrial process by which a previously sold, worn, or non-functional product or module is returned to a "like-new" or "better than new" condition and warranted in performance level and quality" (RIC, 2013). Fig. 1 illustrates how remanufacturing offers multiple life cycles to a product. The remanufacturing process consists of five phases:
(1) Disassembly,
(2) Inspection,
(3) Cleaning and Refurbishing
(4) Assembly, and
(5) Final testing
After its 'End of Life' (EOL) or 'End of Use' (EOU) the product is collected by the Original Equipment Manufacturer (OEM) or remanufacturing agency. This product is then disassembled, inspected and sorted. After disassembling, all the parts are cleaned and examined. The objective of the examination is to identify the worn-out parts which are to be either refurbished or replaced with cannibalized or new parts. According to Thierry et al. (1995) "product recovery management encompasses the management of all used and discarded products. The objective of PRM is to recover as much of the economic and ecological value as reasonably possible, thereby reducing the ultimate quantity of waste". They also discussed the five product recovery techniques such as repair, refurbish, remanufacture, cannibalization and recycling. Remanufacturing has an escalating significance in product recovery or EOL/EOU strategies since it retains much of the embodied values of the product. Three interesting issues areas in remanufacturing are
(1) Pricing
(2) Quality And
(3) Warranty (Pagell et al., 2007)
All these issues further have attributes on which they depend. The remanufactured product is derived from an end-of-use product. Therefore, its availability highly depends on the lifecycle of the product. A new product with a short lifecycle will lead to limited availability of used products. The price of the remanufactured product can be higher because of the supply shortage. Therefore, lifecycle becomes an important factor for considering pricing problems, especially short lifecycle products. Consumer high technology products, such as smartphones, digital cameras and laptops are cases in point. Remanufacturers' momentum and motivation could be enhanced if quality is pursued. However, deemphasizing quality may leave consumers unsatisfied. Therefore, exploring an optimal remanufacturing quality strategy that satisfies various consumer preferences is essential to guiding remanufacturers' decisions. Gehin et al. (2008) stated that remanufacturing is a process to improve the quality of remanufactured products to a new level. This process must ensure that remanufactured products reach the quality standard and function accurately to avoid potential risks and barriers that impede customers' willingness to pay (Hamzaoui et al., 2010; Hatcher et al., 2011). Warranties, given their role in perceived value, can be employed as valuable tools in marketing. Warranties are capable of communicating value through their application as persuasive marketing tenets, whether promotional or protectionist. When deployed as a promotional tool, warranties may be used to promote the reliability and quality of the product. As a protectionist instrument, warranties provide the consumer assurance against defective products that are incapable of performing satisfactorily over the duration of the warranty period. Through the effective marketing of a warranty, the degree of risk that is associated with the purchase of a given product on behalf of the consumer is reduced, thereby increasing its value and the likelihood of purchase. Warranties are noted for their capacity to reduce the perceived performance risk of a product through the provision of protection against product defects that lead to failures, within the scope of the warranty period. The financial risk to the consumer is also reduced through the warranty, as repair costs that fall under the scope of the warranty are realized by the remanufacturer and not the consumer. (Alqahtani and Gupta, 2017).

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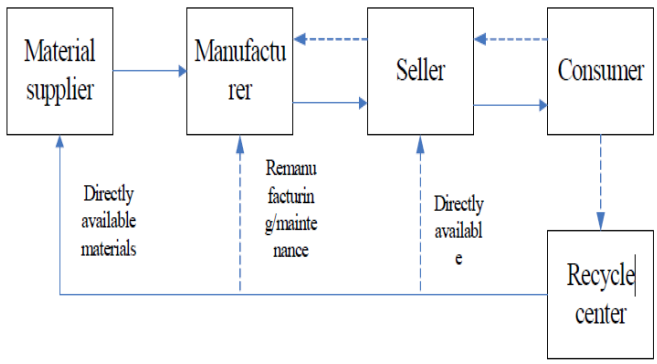

Fig. 1 Basic flow of material

2. Identification of factors

Pricing of remanufactured goods is dependent on various factors. These, factors are further dependent on sub attributes. For pricing, main considerations are manufacturers' considerations, consumers

considerations and retailer's/collector's considerations. These considerations further have sub factors on which they are dependent which are facility limitations, competitors in the market and economic litigation for the manufacturer's consideration. Consumer's considerations include Retention index, Perceived price and Purchase intention, and retailers/collectors considerations (Jofre and Morioka, 2005).

2.1 Facility

One of the downsides of starting a manufacturing company is the overhead costs associated with doing so. A company that creates products can bank on paying for marketing, materials and labor, while -- unless the product is wholly new -- competing with other companies offering similar goods. This generally leads to a low profit margin, making manufacturing a risky venture unless the business model is well thought (Wolf et al., 2013).

2.2 Competitors

When two products have similar core features, but are produced by different companies, competition results. Competition-based pricing strategy involves setting prices based on competitors' prices rather than one's own cost and profit objectives. Price environment, Product comparison, target market are key factors in this.

2.3 Litigation

Pricing decisions are affected by federal and state regulations. Regulations are designed to protect consumers, promote competition, and encourage ethical and fair behavior by businesses.

2.4 Retention index

The benefits that consumers perceive in deciding to return the used products come from the retailer or manufacturer. Discount, exchange, warranty, incentive and SF are emerged as positive factors in the RI.

2.5 Perceived Price

Individuals act and recent on the basis of their perceptions, not on the basis of objective reality. in reality is a totally personal phenomenon, based on that persons need, want s, values, and personal experiences.

2.6 Purchase intention

The willingness of a customer to buy a certain product or a certain service is known as purchase intention.

2.7 Retailer's/Collector's considerations

At their end of life, the products need to be returned to the original manufacturer, through various channels. These forethoughts fall into this category.

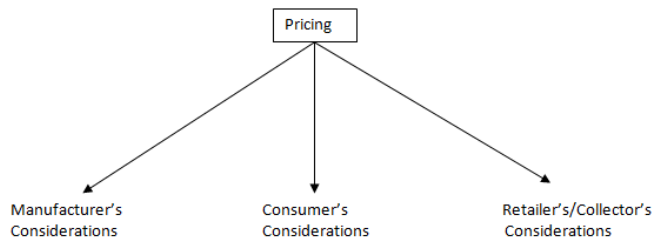

Fig 2: Components of pricing

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A warranty is a contractual obligation realized by the manufacturer when a product is sold. The warranty establishes liability on behalf of the manufacturer should the item sold prematurely fail or prove incapable of performing the intended function. Warranties define the product performance to be expected by the consumer, and should the performance definition not be met, the buyer is then afforded compensation as outlined in the warranty (Blischke, 1993). Warranties serve a variety of purposes, with Heal (1977) noting that insurance and protection are central, as it enables the buyer to transfer product risk failure to the vendor. Product warranties may also signify dependability to the consumer (Gal-Or, 1989; Soberman, 2003; Spence, 1977). Lutz and Padmanabhan (1995) note that vendors may realize additional profitability through the provision of warranties. Warranty dependence on replacement policy, retailer's knowledge of usage of products and repair cost has been considered.

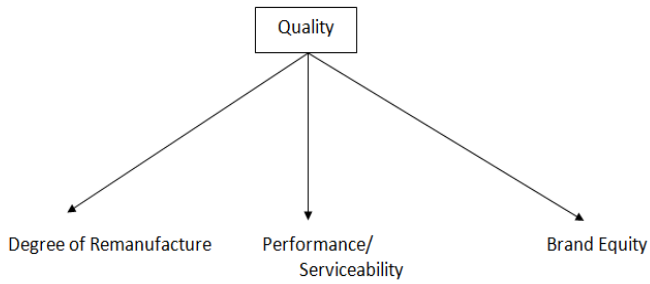

Fig. 3 Components of quality

2.8 Degree of remanufacture

Suggests the amount of rework done on the particular product to obtain a high degree of quality product.

2.9 Performance and serviceability

Performance is indicative of the accomplishment of a given task and governs the product quality.

2.10 Brand Equity

The commercial value that derives from consumer perception of the brand name of a particular product or service, rather than from the product or service itself.

2.11 Replacement policy

Replacement policy is an insurance policy between an insurance company and a consumer which promises to pay the insured the replacement value of the subject of the policy if a loss occurs. This is particularly important For remanufactured goods.

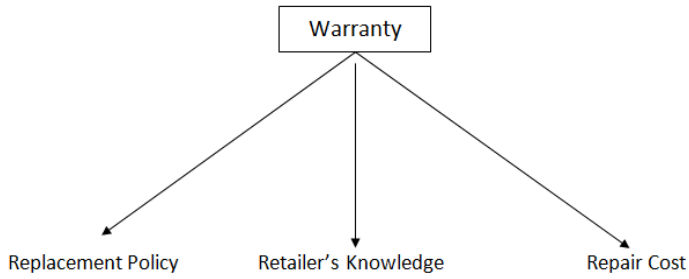

Fig. 4 components of Warranty

3. Conclusions

Quality, pricing, and warranty plays an important role in remanufacturing of a product. A comprehensive literature review

was carried out and factors related quality, pricing, and warranty were identified. These factors will help the academicians and researchers for further analysis of impact of these factors on remanufacturing of products.

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