8. Conclusion, Limitation and Future Scope

8.1 Conclusion

Remanufactured products are in good demand in the market due to its low price and remarkable functional quality just as new products have. Remanufacturing of products is also considered important in view of Green Growth Sustainability (GGS) as it saves huge amount of material, energy & cost required for production.

This study has explored the issue of product cannibalization and benefits of remanufacturing and has looked at literature encompassing various areas like Industrial Ecology, Sustainable Development & Green Growth, Product Recovery Systems, Remanufacturing Process & Benefits, Remanufacturing Product Development & Challenges, Product Life Cycle, Product Cannibalization and Supply Chain Management in order to build a strong theoretical foundation while formulating the research objectives.

It is concluded that the industries involved in remanufacturing are facing some important challenges like cost of EOL Product, WTP towards remanufactured product, Supply limitation of EOL product, competition between OEMs and third party manufacturers as well as change in technology. These challenges are addressed by analyzing different case studies, and analyzing primary and secondary data collected through a survey and online tool eBay.

Profit potential, customer demand and availability of cores are the important elements that need to be addressed by remanufacturing industries. They are crucial deciding factors to motivate the remanufacturer to produce a remanufacturing product.
According to the existing literature, it is evident that the quality of a remanufactured product is ‘as good as’ new counterpart product and this study has concluded that the quality issue, which is very vital in connection with the remanufactured products agrees in line with the existing literature.

Cost saving due to remanufacturing is an important element and it has been established through the case studies of few remanufacturing industries that the cost of remanufactured product is less than their new counterpart product. Case study of Timken Bearing Industries shows that the cost saving due to remanufactured bearings for their clients like Essar Steel Hot Strip Mill, Lafarge Cement, Tinplate Company of India, and Usha Martin shows that there is a cost saving of around 78.44 % as compared to new product. Case study of Indian Government’s Diesel Loco Modernization Works also shows that the cost required for remanufactured locos parts are 75% less than the cost incurred for its counterpart new products. In the case of HP, Lexmark and Brother, saving of price due to remanufacturing is around 44.46%, 49.42% & 35.6%. Certain Pertinent information about price saving due to remanufacturing and important motivating factors that motivates remanufacturers to produce the products are also obtained. In remanufactured ink cartridges, many brands do save more than 50 % of manufacturing cost as compared to new cartridges.

The analyses conducted using data collected through the survey questionnaire and the online eBay analyses has brought out some important results about customers’ willingness to pay towards remanufactured product. It was necessary to check the WTP of remanufactured product as compared to its new counterpart product. It has been proved that the consumer WTP is less for a remanufactured product as compared to its new counterpart product. It was necessary to also check
the correlation between quality, price of remanufactured product and WTP of consumers and it has shown a weak negligible correlation.

In auction process of remanufactured and its new counterpart products, number of Bids and Bidder were collected for analysis. Data collected was discrete and hence it was necessary to conduct the non-parametric tests on the data. Number of bids and bidders of remanufactured product in the absence and presence of its counterpart new product has not shown any impact on number of bids and bidders. It is established that the existence of a remanufactured product will not reduce the end bids/bidders of the new counterpart product.

Through the auction end bid, significant information was obtained and the value of end bid of the new counterpart product in the presence and absence of a remanufactured product has not shown any impact on the end bid price. One slightly differing result was obtained on the crucial issue of product cannibalization. Through eBay, it has been proved that remanufactured product does not cannibalize the sale of its counterpart product and through questionnaire slightly varying results were obtained by a little margin. However, it can be concluded that the product cannibalization does practically occur, though to a negligible extent. Further due to the fact that the cannibalization does not occur in any significant manner, it was required to further test various interactive relationship of cannibalization. It has been proved that the cannibalization due to sale of remanufactured product as well as WTP, quality and Price are not shown to be related. Therefore, online eBay approach is considered more valid. Many remanufacturing experts felt that the sale of a remanufactured product will cannibalize market sale of new product. Due to the fear of new product
cannibalization due to sale of remanufactured product, many OEMs are not producing remanufactured product.

In view of this issue, this study is very useful to industries as they can start the remanufacturing as a secondary business to improve product life cycle by grabbing maximum market share (Guide and Li, 2010; Atasu et al., 2010; Guide et al., 2005). From this research, it has been proved that the customers are segmented and customers who are buying the remanufactured products and new counterpart products are different, indicating that remanufactured product does not cannibalize the sale of new counterpart product.

This study has also brought out the fact that many professional bodies like ASSOCHAM, APRA and ICRRA say that the Indian authorities should move rapidly to change their position on trade in remanufactured products to expand the remanufacturing industries base in the country.

8.2. Limitation

Some limitations of this research work may be identified as follows.

Firms involved in remanufacturing practices have not evolved in the contemporary manufacturing arena due to lack of legislation and customer preferences and willingness to adopt the products. Due to lack of clear guidelines, firms manufacturing wide range of products across manufacturing have not entered into the remanufacturing business. The customer data pertaining to the use of remanufactured products is not very easily available in the growing manufacturing economies. Data pertaining to a remanufactured product has been collected through eBay website covering four products from cartridge, printer and mobile industries.
through auction results. Collection of automotive products was not possible through eBay because the remanufactured and same new counterpart products were not available. Hence, this research work had to address the data collected from industries with associations such as APRA.

A Questionnaire survey was also conducted with the members of Automotive Parts Remanufacturers Association (APRA) through questionnaire link sent by an e-mail. Due to the lack of availability of end user and remanufacturers, it was not possible to gather and analyze data from a wide spectrum of industries and arrive at sector wise conclusion. Moreover, remanufacturing sector in India is still in an infancy stage and hence across the industry guidelines could not be explored and suggested.

8.3 Future Scope of Research

Remanufacturing products are in good demand in markets of countries like USA, UK and they are making huge businesses in this sector. Indian market is not growing in the remanufacturing sector due to lack of Government’s policies and guidelines about importing the products. This sector is still in infancy stage and most of the customers are not aware about remanufacturing of products. From the literature survey, it has been proved that the quality of remanufactured product is ‘as good as’ its new counterpart product’ and hence many customers are attracted towards it due to lesser price as compared to new counterpart product. Use of Remanufactured products results in saving of energy and material cost and it results in sustainable development through the green growth. In India, only cartridge sector is doing some business, but remanufacturing of automotive products is not present in the market. Only some companies like Timken etc. are giving remanufacturing as a service to their customers.
Policy makers in India should understand the need of customers and promote the remanufacturing of products for sustainable green growth.

The future scope of work can be summarized as follows.

I. In a country like India, the concept of remanufacturing is still not widely known and very little research is conducted in this area. Very few researchers are working in this area and hence there is a huge potential for product sustainable development for green growth. This research carries vital information about remanufacturing sector, which is useful for remanufacturing industries as well as academic institutions, helping them to advance research in the area, especially in view of sustainable development.

II. The survey questionnaire analysis indicate that, in remanufacturing sectors, Reverse Supply Chain Management for collection of EOL cores is the major challenge for industries and hence this is a crucial area that may be pursued by future researchers. Reverse Supply Chain Management is a wide area in remanufacturing, but collection of EOL with minimum cost is the crucial challenge.

III. Profit potential is the most important parameter for remanufacturers and hence it is necessary to reduce the manufacturing cost and optimize inventory control of cores. There is a huge scope of study pertaining to remanufacturing process that needs to lower down the cost and enhancement of profit. According to the questionnaire analysis, part replacement and part refurbishing are two major costly operations and hence
detailed study of these two operations is important to reduce the cost.

IV. Study of Product Life Cycle Management (PLCM) of Remanufactured product is necessary and helpful to increase the overall share in the market. PLCM is also necessary to predict the demand of existence of a remanufactured product as well as for perfect launching of upgraded remanufactured product. Another interesting aspect to pursue would be to explore whether the upgraded remanufactured product would cannibalize the sale of existing remanufactured product? Such a study could be made possible through the study of PLCM of existing and upgraded remanufactured products.