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Remanufacturing in Australia

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Abstract

Australian firms have engaged in remanufacturing for more than a decade. These are limited to a few industries such as automotive, printer consumables, servo motors and compressors for air-conditioners and refrigerators. Many of the firms involved in such remanufacturing activities are small and medium sized enterprises. There are a few large firms that have managed to form vertical linkages with companies abroad in terms of input sourcing (backward linkages) and exporting (forward linkages). Recent government policies, both in Australia and abroad, are set to encourage remanufacturing activities. Australia's experiences do provide a few useful lessons for developing countries.

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1. Introduction

Australia has one of the highest per capita waste disposal rates amongst the developed countries in the world. In 2005, it ranked second to only the United States. Much of the focus on waste management in the earlier years was primarily on hazardous waste management and recycling. Today, there is increasing public and governmental awareness of

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the need for a more comprehensive approach to waste management in Australia. This entails, amongst others, adopting waste management policies that take into account the whole life-cycle of products. One approach in waste management that attempts to increase the recovery rate as well as encourage more use of secondary resources is a policy known as extended product responsibility (ERP). The OECD (2001, p.9) has defined ERP as an "environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle". An important aspect of the ERP policy is that the physical and/or economic (financial) responsibility is shifted toward the producer (ibid, p.9). As a result, producers are likely to change the utilization of materials and production process for their products. This may entail the producer being involved in the extraction and re-deployment of used components as inputs for newly manufactured goods.

A related activity is "remanufacturing". Remanufacturing can be defined as "a series of manufacturing steps acting on an end-of-life part or product in order to return it to like-new or better performance, with warranty to match" (Parker and Butler, 2007). Remanufacturing can be part of ERP when it is carried by the producer. However, remanufacturing can also be carried out by firms other that the firm that originally used the product in their manufactures.

The purpose of this study is to examine the nature and extent of remanufacturing activities in Australia. In doing so this study also provides a review of the regulatory framework related to remanufacturing in Australia. The outline for the study is as follows. Section 2 will provide a broad overview of remanufacturing activities in Australia. This will be followed by Section 3 which provides a broad discussion of recent developments in remanufacturing in Australia. Section 4 reviews the government policies affecting remanufacturing. Finally, Section 5 provides a discussion on the lessons that developing countries draw from Australia's experiences in remanufacturing.

2. Overview of Remanufacturing Activities in Australia

The term 'remanufacturing' is not widely used in policy documents in Australia. Data on remanufacturing activities in Australia has not been collected on a systematic basis.

The data and information on remanufacturing in Australia that are available for analysis are sourced from a number of case studies as well as from online search.

2.1 Type of Industries

Not all manufacturing products approaching their end-of-life are technologically feasible and commercially viable to be remanufactured. This is because the remanufacturing process requires the dismantling of the components of such products and their restoration to a reliable and high-quality level. Products in this category include complex electro-mechanical (mechatronic) and mechanical products (King and Ijomah 2004).

One of the most important industries for remanufacturing is the automotive industry. Brent and Steinhilper (2004, p.2) stated that automotive products account for two-thirds of all remanufacturing. Other products that are frequently remanufactured include industrial robots, copying machines, vending machines, ATMs, computers and cellular phones (ibid, p.3).

Table 1 provides a summary of some of the key Australian industries that are involved in remanufacturing activities. The list is not exhaustive but provides an indication on the range of products that are currently being remanufactured in Australia. Overall, remanufacturing activities take place in a diverse range of industries.

The automotive industry is clearly one of the main sectors that are involved in remanufacturing. Most of the products that are remanufactured in this industry are components such as brake, clutch, suspension and electronic parts. Some of the companies such as ABS Auto are also involved in automotive servicing activities. Thus, remanufacturing is an integral part of the broader business of servicing automobiles.

The other major industry where remanufacturing takes place is the printer consumables industry involving products such as toner and ink cartridge for printers. Some of the smaller remanufacturers also act as direct retailers of such products. Other industries in which remanufacturing occurs include compressors for air conditioner and refrigeration, servo motors and components for construction equipments. Clearly, many of the remanufactured products are offered as spare parts or replacement components during the machinery or equipment servicing process by the vendors.

2.2 Source of Inputs

Inputs for remanufacturing in Australia are sourced both from domestic and foreign markets. Smaller companies are likely to source their materials from domestic markets e.g. SMEs operating in printer consumables. In the same industry, large firms such as Fuji Xerox are able to export some of the end-of-life products (toner cartridges) to their regional affiliates. Observations from the automotive industry suggest that the decisions on local vs. foreign sourcing of inputs may depend on the availability of local inputs in a sufficiently large scale (given that Australia is a relatively small market). In the case of Fuji Xerox, such scale economies in input sourcing can be achieved by the establishment of regional collection and processing centres such as the one in Thailand and China (see Figure 1). Components with low value per weight such as printer cartridges are likely to be sourced domestically (e.g. Westbury) unless large scale regional sourcing operations (e.g. Fuji Xerox) can be established. On the other hand, components with high value per weight such as specific type of auto parts can be commercially feasibly sourced from abroad.

2.3 Linkages between MNCs and Third Parties

There is some evidence of vertical linkages within MNCs in remanufacturing as evidenced by the Fuji Xerox and Recom Engineering examples. Such vertical linkages can take the form of third-party linkages in some industry such as remanufactured compressors. For example, Recom Engineering provides remanufactured compressors to Trane in a number the latter's subsidiaries in a number of Asian countries such as Indonesia, Malaysia, Thailand, Philippines, Singapore and Hong Kong.

There are cases of OEM-type vertical integration in remanufacturing in Australia. One of the most successful example is Fuji Xerox which has remanufacturing facilities in Australia as well as Thailand and China (see Figure 1). These remanufacturing production networks involves vertical linkages with specialization. The Australian remanufacturing facility (Eco Manufacturing Centre) acts as a hub for remanufacture of complex sub-assemblies and exports used toner cartridges to its facility in Thailand (Asia Pacific Integrated Recycling Centre) which focuses on the more labour intensive toner cartridge remanufacture (Fuji Xerox, 2010, pp.46-48).

2.4 Role of SMEs

Small and medium enterprises (SMEs) presence is very significant in remanufacturing activities in Australia. This is observed in all industries. Most of the SMEs involved in remanufacturing have been in operation for more than 20 years. Such companies probably ventured into remanufacturing at some stage of their operations due to their accumulated experience over the years as well as to capture more value-added. For industries with numerous SME remanufacturers such as printing consumables – industry associations have emerged to signal to consumers the quality of their member's products. Such reputational problems are less of a problem for remanufacturing activities in the automotive and mechanical machinery and equipment industry.

2.5 Formal / Legal Areas

Remanufacturing activities *per se* in Australia are legal operations given the stringent laws and regulations in the country. There is no media evidence to suggest otherwise. This is likely to be reinforced by the importance of maintaining and building a good reputation (quality and reliability of products) in a relative small market such as Australia. Furthermore, many of the companies involved in remanufacturing activities especially in the automotive and machinery industries has been in operations for more than 20 years. Another related issue which is quite different is whether remanufacturing activities, especially by SMEs, may involve illegal dumping of end-of-life components that are not useful for remanufacturing i.e. a by-product of the disassembly process. Such incidences cannot be ruled out entirely even though there is no evidence of them occurring in remanufacturing because cases of illegal dumping have occurred in Australia (Productivity Commission, 2006, p.34).

2.6 Laws and Regulations

The responsibility for environmental laws and regulations fully reside with the state governments under the Australian Constitution. However, national-level policies and strategies do influence the coordination and implementation of environmental laws and regulations at the state and local levels. The laws and regulations that may impact decisions to undertake remanufacturing activities fall into two major categories.

The first category deals with waste management. Remanufacturing reduces end of life product waste as well as industrial waste (a by-product of manufacturing process). Early state environmental laws focused on waste disposal and their hazardous impact on society e.g. NSW's Waste Disposal Act 1970. The Act focused on waste reduction targets (Smith, 2005, p.1). Subsequent legislations signified a turn towards more emphasis on waste minimization and resource recovery (Productivity Commission, 2006, pp.11). One example of this is NSW's Waste Avoidance and Resource Recovery Act 2001. One novelty of the Act was the incorporation of extended producer responsibility (ERP) and product stewardship (PS) schemes (Smith, p.3). Table 2 and Table 3 provide a list of products targeted under the ERP and PS schemes in NSW and Victoria, respectively. Of the products listed, priority has been assigned to the first five products listed namely, computers, televisions, nickel cadmium batteries, used tyres and plastic bags.

Thus far, based on the cases examined, the ERP and PS schemes have had limited impact on remanufacturing. Fuji Xerox remanufacturing activities falls under the Cartridge Recycling Program but was initiated in 1993 before the implementation of the ERP scheme and is undertaken on a voluntary basis. Furthermore, the list of products targeted under the ERP schemes does not include some of the products currently being remanufactured. Many of the firms currently engaged in remanufacturing activities are likely to have done so as part of their earlier evolution from servicing-oriented business.

The second category of laws and regulation that may impact remanufacturing relate to energy consumption. To the author's knowledge, there are no laws or regulations in this area. These are relevant given the potential energy savings from remanufacturing activities. There are currently no estimates of exactly how much energy is saved due to remanufacturing activities (which uses less energy than recycling). Another aspect is the energy efficiency of remanufactured products – which could be less efficient than entirely new products incorporating the latest energy saving technologies (Gutowski et al 2011). Thus, the net outcome in terms of energy savings could be ambiguous. This is an issue that has not been analyzed in Australia.

Aside from waste-related laws and regulations, there are industry-specific regulations that can affect remanufacturing. One such case is the remanufacturing of single-use medical devices (SUDs). This is covered by the "Australian regulatory guidelines for medical devices - (ARGMD) Part 2–Pre-market" issued by the Department of Health and Ageing. The regulation states, amongst others, that the remanufacturers of SUDs have to keep records of how many times the device has been remanufactured as well as who it has been sold to.

Finally, firms engaging in exporting remanufactured products require export licenses that are issued by the Australian Trade Commission (Austrade). Further clearance may be required for remanufactured goods such as defence-related products that are classified under the Defence and Strategic Goods List.

3. Current Developments in Remanufacturing Activity

Remanufacturing activity has clearly become more important in Australia over the years. It is however difficult to comprehensively assess the growth of remanufacturing activities in Australia due to lack of official data. Despite this, some broad patterns can be observed. MNCs that have been involved in remanufacturing such as Fuji Xerox have clearly increased the scale of their remanufacturing operations especially at the regional level. The remanufacturing operations of domestic companies have clearly been constrained by the domestic market size. In recent years, a few of the larger companies have been able to export their products. Some have been able to export not just remanufactured products but the technologies (e.g. testing and manufacturing) that are developed from remanufacturing activities e.g. Injectronics. More recently, the export of remanufactured products have been affected by the appreciation of the Australian dollar (Fuji Xerox, 2010).

In terms of the types of industries that have experienced growth, remanufacturing activities are likely to continue to grow for the complex electro-mechanical (mechatronic) and mechanical products. The market for simpler remanufactured products such as toner cartridges is likely to have reached saturation point.

4. Government Policy

The Australian Government launched the National Waste Policy in 2009 with the aim of strengthening its commitment to improve resource utilization, reduce the environmental impact of waste disposal and improve management of hazardous wastes. The policy of waste reduction and better resource utilization can be interpreted as favouring remanufacturing activities. At this point in time, the policy has not had any impact on remanufacturing activities in the country. It remains to be seen whether this will occur through a renewed emphasis on ERP and PS. As discussed earlier, state-level legislations and regulations seem to have had limited impact on remanufacturing activities in Australia thus far.

Australia has signed a number of bilateral and multilateral trade agreements. These include:[1]

- Australia New Zealand Closer Economic Relations Trade Agreement and the associated Australian and New Zealand Government Procurement Agreement;
- Australia–United States Free Trade Agreement;
- Singapore–Australia Free Trade Agreement; and
- Thailand–Australia Free Trade Agreement.

Productivity Commission (2006, p.372) has made some assessment on the impact of such agreements on the implementation of ERPs:

> "Australia is not permitted to restrict imports from another country that is a signatory to the GATT, on the grounds that its environmental policies do not accord with Australia's policies. However, under Article XX of the GATT, *Australia is only permitted to restrict imports from another country to protect the public health or environment of Australia*. Australia can impose trade restrictions on the basis of the technical specifications of imported goods provided:

[1] Excerpt from Productivity Commission (2006), p.372.

• like products are treated as like products

• they are not unduly trade restricting.

International trade agreements do not appear to impede the adoption of extended producer responsibility schemes provided that the same restrictions (such as taxes and levies) apply to imports and their equivalent domestic goods, and the least trade restricting measures are used."

This interpretation suggests that current trade agreements allow Australia to implement ERPs that would indirectly favour remanufactured products provided the are not "unduly trade restricting". The converse also applies, that is, Australian remanufacturers will gain from the implementation of ERPs in Europe, for example. However, it remains to be seen whether such developments, if they materialize, will have substantial impact on Australia given the relatively low volume of remanufactured exports that are undertaken by a few large firms.

5. Lessons for Developing Countries

What lessons can developing countries draw from Australia's experience in remanufacturing? Remanufacturing activities can be relatively low-technology (toner cartridge) or involve high-technology (defence, mechatronics). Developing countries lacking the technological capabilities can clearly engaged in remanufacturing activities of the former type. The experience of OEMs such as Fuji Xerox suggests that such MNCs are willing to setup labour intensive remanufacturing facilities (e.g. in Thailand) especially if they have an existing production network. SMEs can also participate in such activities in a way that co-exists with MNC operations especially if the domestic or regional market is large.

The more high-technology oriented remanufacturing firms in Australia are either long establish engineering-servicing or joint ventures. Developing countries should serious consider nurturing such firms with the objective of moving them the value-chain, not just in terms of new products (as in traditional thinking) but in products they are currently

distributors in which they provide servicing. Because of their technological familiarity with such existing products, technological upgrading into remanufacturing may be easier.

Whilst Australia's remanufacturing expertise generally developed over time uninfluenced by government policies, the implementation of new environmental (waste) policies might change the industry landscape in the future. The implementation of ERP and PS policies, both domestically and in foreign markets are likely to provide new incentives and opportunities in remanufacturing activities.

Table 1

List of Selected Remanufacturers in Australia

Product	Company	Company Characteristics
Brake components	ABS Auto	• Established in 1981 • Large firm - 50 branches • Remanufacturing and sales
Specialist auto parts – brake, clutch, suspension	Australian Truck and Auto Parts	• Established in 1981 • About 200 employees • Parts are sourced from diverse countries
Automotive electronic parts	Injectronics	• Established in the 1980s • Received grants from state of Victoria to develop export opportunities
Toner and ink cartridge for printers	Toner Charge Plus (Mel), One Source Imaging (Mel), Premier Cartridge (Mel), Sydney Toner Supply (Syd), Advanced Consumable Technologies (Syd) etc.	• SMEs • Industry association - Australasia Cartridge Remanufacturers Assoc. Inc.

(continue)

Product	Company	Company Characteristics
Toner and ink cartridge for printers	Westbury	• Established in 1990 • 200 employees • Cartridges sourced from domestic market • Engages as sub-contractor for other firms
Photocopiers and printer consumables	Fuji Xerox Australia Pty Limited	• Remanufacturing since 1993 • Eco Manufacturing Division/Centre • Exports remanufactured product (AUS2.5 mil in 2005) • Imports end of life components from regional recycling-recovery facility in Chonburi, Thailand
Compressors for air conditioners and refrigerators	Recom Engineering	• Established in 1984 • Remanufactures directly for the Trane Company in Australia, Indonesia, Malaysia, Thailand, Philippines, Singapore and Hong Kong
Servo motors	Servo Motors Australia	• Established in 1982 • Domestic market and exports
Components for construction machinery	Hitachi Construction Machinery (Australia) Pty Ltd	• Established in 1949 • Remanufactures failed components
Helicopters	Team Romeo – a consortium comprising Sikorsky Aircraft Corporation, Lockheed Martin, General Electric, Raytheon and CAE	• Employees: 12,000

Product	Company	Company Characteristics
Large diesel and gas engines	MTU Detroit Diesel Australia	• Established in 1948 • Revenues: AUD$300 Million • Employees: 900

Source: List of product is based on CRR's classification for UK with examples provided by the Author

Table 2

List of Wastes Identified as Suitable for Extended Producer Responsibility Scheme in NSW (2004)

- Computers;
- Televisions;
- Nickel cadmium batteries, excluding mobile phone batteries;
- Used tyres;
- Plastic bags;
- Agricultural/veterinary chemicals;
- Agricultural/veterinary chemical containers;
- Mobile phones and batteries;
- Packaging waste, excluding plastic bags;
- Cigarette litter;
- Office paper;
- Polyvinyl chloride (PVC);
- Electrical products, excluding computers, televisions and mobile phones;
- Treated timber;
- End-of-life vehicle residuals;
- Household hazardous and chemical wastes.

Source: Smith (2005), p.12.

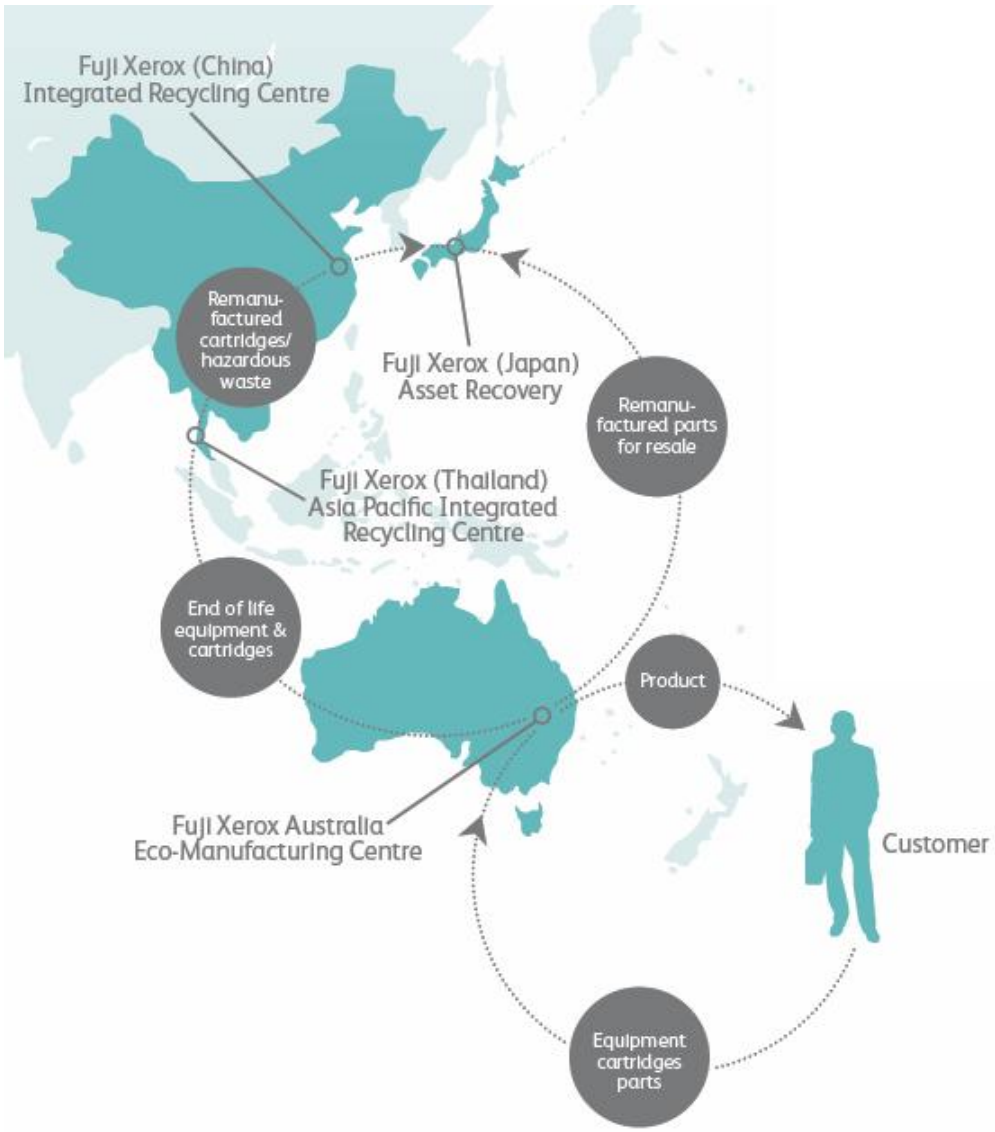
Table 3

List of Wastes Identified as Suitable for Extended Producer Responsibility Scheme in Victoria (2006)

- Televisions
- Computers and information-technology equipment
- Other electrical and electronic products
- Tyres
- Consumer packaging (including plastic bags)
- Paint
- Mercury-containing lamps
- Batteries
- Motor vehicles
- Treated timber
- Domestic chemicals and related packaging

Source: Productivity Commission (2006), p.269.

Figure 1: Fuji Xerox Remanufacturing Operations in Asia-Pacific



Source: Fuji Xerox Australia Pty Ltd. (2010). Sustainability Report 2010. P.46.

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