How to integrate remanufacturing in companies through new business models

Presentation at Grenoble ERN Workshop

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Research areas:

- Design for remanufacturing
- Product Service Systems
- Remanufacturing
- EcoDesign
- Cleaner Production
- Recycling

15/03/2016
Objectives of Business Model Survey

• To describe how companies include remanufacturing in their **business models** and how this in turn changes **product design** to facilitate remanufacturing and what **remanufacturing processes** are used.

• To review in **which ways the cores being remanufactured are retrieved** e.g. traditional product sales and/or through selling a service/function that the product fulfils e.g. through leasehold contracts.

• To examine the pros and cons of business models that includes remanufacturing from **economic and environmental perspectives**.

• To describe which **business model challenges** that the remanufacturing companies experience, including longer product life and materials requirements for critical materials security.

=> Business Model Landscape report
Methodology and activities

- August 2015: Business Model Case study started by designing interview questions about remanufacturing company business models.
- September 2015: Around 100 companies mainly in Germany, The United Kingdom, Holland and Sweden were targeted for the interview mainly based on data from the ERN Market Study.
- December 2015: around 40 business models surveys conducted.
- January 2016: Validation of the business model descriptions and additional interviews.
- March 8th 2016: 30 business model descriptions validated.

Partners
Business Model Descriptions

• Company / Location
• Type of Remanufacturer
• Experience in reman
• Sector / Product
• Contact / Website
• Core sourcing
• Business model
  - value chain
  - reman process
  - customer value
  - economic benefits
  - economic challenges
  - key resources
• Environmental benefits
• Social benefits
• Advanced materials recovery
### 30 case companies

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<td>Hitachi CME</td>
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Location of companies

- UK: 30%
- SWE: 37%
- GER: 17%
- NED: 13%
- DEN: 3%

Fig 1. The location of the remanufacturing company facility/headquarter analysed in the business model case study (Business Model Landscape report).
Type of Remanufacturer

Fig 2. The type of remanufacturing company analysed in the business model case study (Business Model Landscape report).
Fig 3. The amount of experience the analysed companies have of remanufacturing in the business model case study (Business Model Landscape report).
**Fig 4.** The industrial sectors from which the analysed companies have of remanufacturing in the business model case study (Business Model Landscape report).
Core sourcing

**Fig 5.** The sources of cores for the analysed companies within the business model case study (Business Model Landscape report).
Customer values and Economic benefits

Main values: Lower price - High quality - Long warranty - Higher up-time

• Most say it is a **price-worthy option** in comparison to new products.

• **Lower price** but with **same** or **better quality** (Case 5, 11, 12, 14, 15, 17, 27, 28, 29). Better quality than the **cloned products** they compete with (Case 4).

• **Only option** since new products are not manufactured (Case 5).

• **A faster solution** (Case 14, 17, 21, 22, 26) than ordering new parts meaning that **up-time is higher** and the **out-of-service times are lower**.

• **A good option to get rid of used products** (Case 8, 11, 12, 24).

Economic benefits:

• The economic benefits are lower costs to remanufacture a product in comparison to new manufacturing. This means that the prices also can be set to a lower level. Most of the remanufacturing companies claim more than 50% lower costs than new manufacturing.
Economic challenges

Main five challenges: Core access – Customer awareness – Design issues – Profitability – Process efficiency

• Seven of the companies state that they have challenges within core access and/or management (Case 3, 5, 14, 17, 21, 25, 27)

• Five of the companies are mentioning the lack of customer awareness of the benefits of remanufactured products (Case 4, 6, 10, 13, 20).

• Five of the companies have design issues make their remanufacturing business troublesome (Case 3, 9, 19, 21, 28)

• Three state that they have problems of staying competitive (Case 14, 22, 28) while two other mentioned staying profitable is a challenge for them (Case 3, 7).

• Three of them says they have a challenge to improve their process efficiency (Case 3, 6, 29).

• Many of the companies have not stated any economic challenges.
Key resources

Main four key resources:
Technical and business staff – Access to cores – Remanufacturing know-how – Equipment and facilities

• Nine of the companies state technical and/or business staff (Case 3, 6, 14, 15, 17, 19, 20, 24, 29)

• Seven of the companies mention access to cores (Case 3, 5, 6, 13, 20, 24, 29)

• Four of the companies say facilities, machinery and equipment (Case 1, 3, 17, 28)

Malcolm Morris (OEM Sales Manager) of ATP Industries Group: “Core is king!”
Environmental benefits

Most companies claim that there are environmental benefits of their business in comparison than new manufacturing

• 13 companies state **Reuse of raw materials**
  (Case 1, 3, 6, 7, 10, 12, 14-17, 20, 26, 27)

• 12 companies state **Reduced CO$_2$ emissions**
  (Case 3, 5, 8, 11, 16, 18, 20, 22, 23, 27-29)

• 8 companies state **Reduced energy consumption**
  (Case 3, 5, 7, 10, 17, 21, 22, 26)

Three companies have won **environmental awards** (Case 4, 18, 24)
Social benefits

Main social benefits:
Job creation – Higher access to products – Charity

• All remanufacturing companies create job opportunities, both at the remanufacturing company but also in the surrounding partners in the reverse supply chain (Case 1-30).

• Seven companies claim that their remanufacturing business makes it possible for those unable to buy new products being able to buy and use those products (Case 11, 12, 13, 15, 18, 24).

• Four companies arrange social activities and/or work with charity (Case 3, 18, 22, 24).
Advanced Material Recovery

Not always an easy question to answer!

**Metals:**

- Alloys (3,22)
- Aluminum (3,4,5,20,22,28)
- Copper (4,5,11)
- Iron (4,5,22,28)
- Other metals (4)
- Rare earth metals (5,11)
- Steel alloys (8,20)
- Precious metal (11)
- Tin (11)
- Metals (17,24,25)
- 100% recycling and recovery of materials (18)
- Titanium (22,30)
- Advanced materials, such as low-maintenance materials, high-temperature resistance materials, super alloys, and coated materials (23)
- Platina, Palladium or Rhodium is recovered as well stainless steel (29)

**No AMR mentioned (Case 1, 2, 6, 7, 9, 10, 13-15, 19):**

- Plastics (11)
- Electronics (3)
- Lesser need of using advanced materials (12)
- Advance composites (30)
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Schmitz + Krieger GmbH

- Schmitz + Krieger GmbH / Germany
- Contracted remanufacturer
- In reman since 1911

- **Products:**
  Engines, transmissions, and other components for automotive assemblers. Injection equipment and high-pressure pumps

- **Core sourcing:**
  Service exchange: the customer returns the used product to the remanufacturer, the product is remanufactured and the customer gets the same quality of the same product model back (if it is possible to perform a remanufacturing operation).
Schmitz + Krieger GmbH

• **Business model elements:**

• **Remanufacturing process:** 1) Reception of cores, 2) Visual check of the cores’ quality, 3) Stock, 4) Disassembly, 5) Cleaning, 6) Check of quality, 7) Machining (e.g. grinding), 8) Mounting, 9) Testing, and 10) Shipment.

• **Company drivers:**
  1) Economics, 2) Environmental sustainability, 3) Customer satisfaction

• **Customer benefits:**
  1) Lower price, 2) Increased availability, 3) Improved environmental image

• **Value chain collaboration:**
  Company works directly with customers and collaborates with logistics providers and spare part providers.

• **Challenges:**
  1) Access to measurable data and information about products and processes, 2) core management (optimizing the stock levels), 3) dealing with electronic products in general.

• **Key resources:**
  The remanufacturing personnel
Schmitz + Krieger GmbH

• **Economic benefits**
  For customers: reman products are 20-30% cheaper than new ones. In general: using already existing raw materials and using less inputs for the process (e.g. staff, information, machines) is perceived as source of economic benefits.

• **Environmental benefits/drawbacks**
  Benefits: Less materials used and less energy usage
  Drawbacks: Dirt from cleaning parts (can be hazardous)

• **Social benefits**
  Job creation is major benefit to society

• **Advanced materials recovery**
  No such materials are recovered
Toyota Material Handling Sweden

- Toyota Material Handling Sweden / Mjölby, Sweden
- Original Equipment Remanufacturer
- In reman since 2003
- Products:
  Forklift trucks
- Core sourcing:
  Around 90% of the used forklift trucks come from rental agreements and the rest is bought from the market. The rental contracts run from one month up till 10 years.
Toyota Material Handling Sweden

- **Business model elements:**
- **Rental agreements:**
  - **Benefits:** 1) Keeps control over the products during use, 2) Better relation to the customers, 3) Possibility to remanufacture products several times
  - **Drawbacks:** Higher risk by owning the products
- **Economic benefits:**
  1) Retrieve good cores that are easily remanufactured and sold to a next customer, 2) Reaching new customer segments
- **Customer benefits:**
  Price-worthy forklift trucks that have been treated well during their previous usages under the control of Toyota.
- **Challenges:**
  1) Knowing what value the forklift truck have, 2) Uneven amount of cores, 3) Sales companies are mostly measured in new product sales.

Business Models Survey
Toyota Material Handling Sweden

• **Environmental benefits**
  Remanufactured products are 20-30% less resources are used in remanufacturing in comparison to new manufacturing.

• **Social benefits**
  It creates much work since all processes in the remanufacturing process is done manually. The forklift trucks are too complicated to perform automation on.

• **Advanced materials recovery**
  No such materials are recovered
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Look out for the Business Model Landscape report on:

www.remanufacturing.eu

Thank you for listening!