Re-Use System for Notebooks – the Goals and Rationale of the RUN Project

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‘ReUse Notebook–Collection, Refurbishment and Distribution System’
Introduction: Project Facts

• Started 11/2014
• 3 years runtime
• Funded under EU’s FP7, CIP-Eco-Innovation, Market Replication
• 8 partners from 3 countries: Germany, Austria, Poland
• Refurbishers, recycling centers, consultants, one association
• Implement a collection and remarketing system for notebooks from private households and SMEs → small batch sizes
Introduction: Project Structure

8 work packages

All issues addressed for starting up a large scale collection and remarketing system:

- Collection concept
- Data security and extraction as service add-ons
- Refurbishment process
- Marketing concept and transfer to other European countries
Rationale

Starting Point:
• Private households and SMEs neglected for professional refurbishing. Devices should basically be available for refurbishment.

Challenges:
• Small batch sizes
• Re-usability of devices? What kind of devices are returned?
• Logistics challenge: reach throughput

Rationale:
• Avoid competition in niche
• Innovative service add-ons
• Materials recycling is economic viable – re-use is profitable
• Easy take-back

Assessed reverse logistics and distribution channels
Main environmental impacts during production phase (Ciroth & Franze, 2011)

Many scarce or valuable resources – very low functional recycling rates (Graedel et al., 2011; USGS 2013)

Waste generation (whole lifetime): average office notebook: 11.240 kg of non-hazardous waste and 1.482 kg hazardous waste (IVF, 2007)

New product generations have only slightly lower energy consumption in use (re-use devices only two product generations older) (Prakash et al., 2013)

World market 2013: 180.9 million devices (IDC, 2013) - Germany 2014: 5,436,000 devices to private consumers (gfu et al., 2015)

<table>
<thead>
<tr>
<th>Type of Device</th>
<th>CO₂e emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,1” Fujitsu EcoLeaf (Jibiki, 2010)</td>
<td>96 kg</td>
</tr>
<tr>
<td>12,1” HP (Hischier et al., 2007)</td>
<td>155 kg</td>
</tr>
<tr>
<td>14” Dell Latitude E6400 (Stutz &amp; Moriarty, 2010)</td>
<td>250 kg</td>
</tr>
<tr>
<td>11” MacBook Air (Apple, 2015)</td>
<td>352.6 kg</td>
</tr>
<tr>
<td>15” MacBook Pro (Apple, 2015)</td>
<td>704 kg</td>
</tr>
</tbody>
</table>

Overview of CO₂ (equivalent) emissions from manufacturing of selected notebooks

<table>
<thead>
<tr>
<th>Material</th>
<th>Weight in mg</th>
<th>Used mainly in component</th>
</tr>
</thead>
<tbody>
<tr>
<td>cobalt</td>
<td>65,000</td>
<td>lithium-ion battery</td>
</tr>
<tr>
<td>neodymium</td>
<td>2,100</td>
<td>spindle motor, speakers, voice coil actuator</td>
</tr>
<tr>
<td>tantalum</td>
<td>1,700</td>
<td>capacitors</td>
</tr>
<tr>
<td>silver</td>
<td>440</td>
<td>(main) circuit boards</td>
</tr>
<tr>
<td>praseodymium</td>
<td>270</td>
<td>voice coil actuator, speakers</td>
</tr>
<tr>
<td>gold</td>
<td>100</td>
<td>main circuit board</td>
</tr>
<tr>
<td>dysprosium</td>
<td>60</td>
<td>voice coil actuator</td>
</tr>
<tr>
<td>indium</td>
<td>40</td>
<td>display</td>
</tr>
<tr>
<td>palladium</td>
<td>40</td>
<td>(main) circuit board</td>
</tr>
<tr>
<td>platinum</td>
<td>4</td>
<td>hard disks</td>
</tr>
<tr>
<td>yttrium</td>
<td>1.8/1.6</td>
<td>background lighting</td>
</tr>
</tbody>
</table>

Average usage of critical metals per notebook (LANUV, 2012, Table 23)
Eco-Innovation

“all measures of relevant actors [...] which develop new ideas, behaviour, products and processes, apply or introduce them [but also] contribute to a reduction of environmental burdens or to ecologically specified sustainability targets.” (Rennings, 2000)

- Centered on environmental impact
- Not only technically-centred → Innovation also is rooted in radically new or improved business models or patterns of interaction between consumers, firms and other actors (Chesbrough & Rosenbollm, 2002; Wirtz, 2010)

- Circular economy and loop-closing: re-valuation of goods and materials (Slowak & Regenfelder, 2015)

*Conceptualisation of the sustainable pattern of innovation* (Slowak & Regenfelder, 2015, Fig. 1)
Eco-Innovativeness of RUN

ECO: Positive Ecological Impact by Prolonging Lifetime of Notebooks

- Several ten thousands of devices will be collected and refurbished during project’s run-time
- Ecological savings from substitution of new production (lowest boundary for substitution found in literature is 0.2 (Ciroth & Franze, 2011)) – incorporated natural resources stay in industrial cycle
- Not every device will fulfil requirements for refurbishing → manual disassembly before materials recycling → increase the yield and quality of the recycling process compared to shredding whole appliances (Schöps et al., 2010)

INNOVATION: New Business Model

- Unlock a new source for used appliances
- New cost-efficient logistics concept which is able to handle very small batch sizes down to one piece

Thank you!