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ICT reuse in socio-economic enterprises

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ABSTRACT

In Europe, socio-economic enterprises such as charities, voluntary organisations and not-for-profit companies are involved in the repair, refurbishment and reuse of various products. This paper characterises and analyses the operations of socio-economic enterprises that are involved in the reuse of Information and Communication Technology (ICT) equipment. Using findings from a survey, the paper specifically analyses the reuse activities of socio-economic enterprises in the UK from which Europe-wide conclusions are drawn. The amount of ICT products handled by the reuse organisations is quantified and potential barriers and opportunities to their operations are analysed. By-products from reuse activities are discussed and recommendations to improve reuse activities are provided. The most common ICT products dealt with by socio-economic enterprises are computers and related equipment. In the UK in 2010, an estimated 143,750 appliances were reused. However, due to limitations in data, it is difficult to compare this number to the amount of new appliances that entered the UK market or the amount of waste electrical and electronic equipment generated in the same period. Difficulties in marketing products and numerous legislative requirements are the most common barriers to reuse operations. Despite various constraints, it is clear that organisations involved in reuse of ICT could contribute significantly to resource efficiency and a circular economy. It is suggested that clustering of their operations into "reuse parks" would enhance both their profile and their products. Reuse parks would also improve consumer confidence in and subsequently sales of the products. Further, it is advocated that industrial networking opportunities for the exchange of by-products resulting from the organisations' activities should be investigated. The findings make two significant contributions to the current literature. One, they provide a detailed insight into the reuse operations of socio-economic enterprises. Previously unavailable data has been presented and analysed. Secondly, new evidence about the by-products/materials resulting from socio-economic enterprises' reuse activities has been obtained. These contributions add substantially to our understanding of the important role of reuse organisations.

1. Introduction

In the new global economy, managing waste electrical and electronic equipment (WEEE) has become a central issue (Oguchi et al., 2011; Ongondo et al., 2011; Schluep et al., 2009). This fastest growing waste stream has become a priority due to quantities of WEEE generated, potential environmental and health impacts, ethical issues relating to disposal or recycling of WEEE in developing countries, and increasingly, the amount of resources needed to manufacture electrical and electronic equipment (EEE). Demand for various scarce raw materials for the manufacture of electronics has forced countries to rethink their strategies for managing WEEE (Ongondo et al., 2011). Recent developments in the supply of critical raw materials (such as rare earth metals) have led to renewed interests in resource efficiency (BIS, 2012; European Commission, 2010; Humphries, 2012):

- The European Union (EU) has introduced a flagship initiative, the EU 2020 strategy[1] which champions a shift towards a resource-efficient, low-carbon economy for sustainable growth;
- The USA has recently invested $120 million to set up a new research centre to develop new methods of producing rare earth metals[2]; and
- In the UK, a "Resource Security Action Plan" has been established (BIS, 2012).

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[1] http://ec.europa.eu/europe2020.

[2] http://energy.gov/articles/ames-laboratory-lead-new-research-effort-address-shortages-rare-earth-and-other-critical.

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Current efforts to secure supply of critical raw materials focus on material substitution, recycling and reuse (Graedel et al., 2011; Hagelüken, 2012; Liang et al., 2012; Xia et al., 2008; Yang et al., 2012). Substitution aims to ease pressure on use of various resources by finding alternative materials. Recycling enables the cyclical flow of materials from cradle-to-cradle. Reuse negates/delays the need to extract virgin materials to manufacture new products. However, these strategies are hampered by various challenges including:

- Substitution is not always possible, for instance in the case of rare earth metals.
- Recycling is hampered by: (i) low collection rates of WEEE; (ii) limitations in the chemical treatment processes (in many cases, leading to 100% loss of important materials); (iii) under-developed collection systems in many countries; and (iv) a culture of hoarding end-of-life (EoL) electronics that have a relatively high (perceived) financial value (Ongondo et al., 2011; Schluep et al., 2009).
- Reuse is dependent on WEEE being collected and channelled to this activity; this is not always the case (Kahhat et al., 2008; Ongondo and Williams, 2012).

Beyond resource efficiency, reuse of WEEE is an important waste prevention measure as it extends the product life of electronics (value-conservation). The EU WEEE Directive 2012/19/EU recognises the importance of reuse. It promotes reuse of WEEE by stating that 'where appropriate, priority should be given to preparing for re-use of WEEE and its components, sub-assemblies and consumables' (European Union, 2012). Various organisations in Europe are involved in reuse activities. These are discussed in the next section.

1.1. Socio-economic enterprises

In Europe, socio-economic enterprises such as charities, voluntary organisations and not-for-profit companies are involved in the repair, refurbishment and reuse of various products.[3] The products they deal with include furniture, textiles and EEE. There are very limited studies in the scientific literature that address the activities of these organisations. Alexander and Smaje (2008), Curran and Williams (2010) looked at furniture and appliance reuse among socio-economic enterprises. In addition, far too little attention has been paid to the resource efficiency contribution of these organisations, for instance, in terms of their WEEE reuse activities. Very little data is available about their efficiency in gathering resources, the types, quantities and sources of products they handle. Knowledge of these factors is especially important in the case of WEEE because reuse promotes resource efficiency, making best use of the inevitable initial ecological footprint caused by manufacturing of the product. Hence, this study is an initial step to address the paucity of literature on the reuse activities of socio-economic enterprises. Reuse of Information and Communication Technology equipment (ICT) is common among these organisations because ICT has a high reuse value (see Geyer and Blass, 2009; Ongondo and Williams, 2011). Therefore, we focus on reuse of ICT EEE (e.g. computers and mobile phones). We specifically analyse the reuse activities of socio-economic enterprises in the UK from which we draw wider conclusions. The specific objectives of the study were to:

- Identify the types, sources and quantities of ICT equipment and components handled, repaired/refurbished and sold/donated.
- Identify and assess the barriers to reuse operations.
- Assess the economic viability of the reuse socio-economic enterprises; and
- Identify, quantify and characterise any by-products[4] resulting from the reuse activities.

2. Methods

2.1. Survey of ICT reuse activities of socio-economic enterprises

Reuse organisations in the UK that deal with ICT products were identified and catalogued from internet databases[5] and search engines in spring 2011. A questionnaire addressing the study objectives was formulated and piloted to ensure reliability. Questions were formulated to establish the following about the reuse operations of the socio-economic enterprises:

Note: the texts in parentheses indicate the question type.

- Description/profile of organisation (*multiple choice with multiple answers*) and whether refurbisher for a major ICT manufacturer (*dichotomous with option to supply additional details if response affirmative*).
- Type of appliances handled (*multiple choice allowing multiple answers*).
- Three main sources and customers respectively for used appliances (*multiple choice with multiple answers for the two categories*).
- Number of employees and additional stuff (via Job Creation Schemes (JCS[6])) respectively working for the organisation (*multiple choice number ranges with single answer*).
- Financial turnover in 2010 (*multiple choice income brackets with single answer*).
- Number of appliances sold in 2010 (*multiple choice using four pre-defined number ranges with single answer*).
- Ranking of pre-defined factors according to their importance to the economic feasibility of ICT reuse operations. The factors were based on the authors' previous unpublished research involving socio-economic enterprises (*likert ranking scale*).
- Quality standards utilised in reuse operations (for instance, erasing hard disk data) (*multiple choice with multiple answers*); and
- The three major barriers the organisations faced in their reuse operations (*open-ended question*).

The three major barriers the organisations faced in their reuse operations (*open-ended question*).

A cover email was sent to all the identified reuse socio-economic enterprises (46) inviting them to take part in the survey. No incentive was offered to complete the questionnaire. The questionnaire was deployed in a web survey and data collected for a period of two weeks.

2.2. Case study of an ICT reuse socio-economic enterprise

In order to assess at depth the operations of the socio-economic enterprises that are involved in reuse of ICT products, a case study of a representative repair, refurbishment and reuse organisation based in the South of England (henceforth referred to as CSx) was conducted in spring 2011. Data was collected and documented during 2 visits to CSx via: access to company records, structured

[3] http://www.rreuse.org; http://cerrec.eu; http://www.reteonu.it.

[4] We define by-products as derivative or surplus materials and/or components resulting from reuse activities.

[5] www.itforcharities.co.uk/pcs.htm and www.foe.co.uk/resource/faqs/where_recycle_computers.html.

[6] Projects undertaken by government to assist the unemployed to secure employment.