

Developing a Circular Economy in the Retail Refrigeration Industry: The Influence of Financial Incentives, Quality Standards and Process-Supporting Tools on the Behavioural Intentions to Purchase and Produce Remanufactured Refrigeration Equipment

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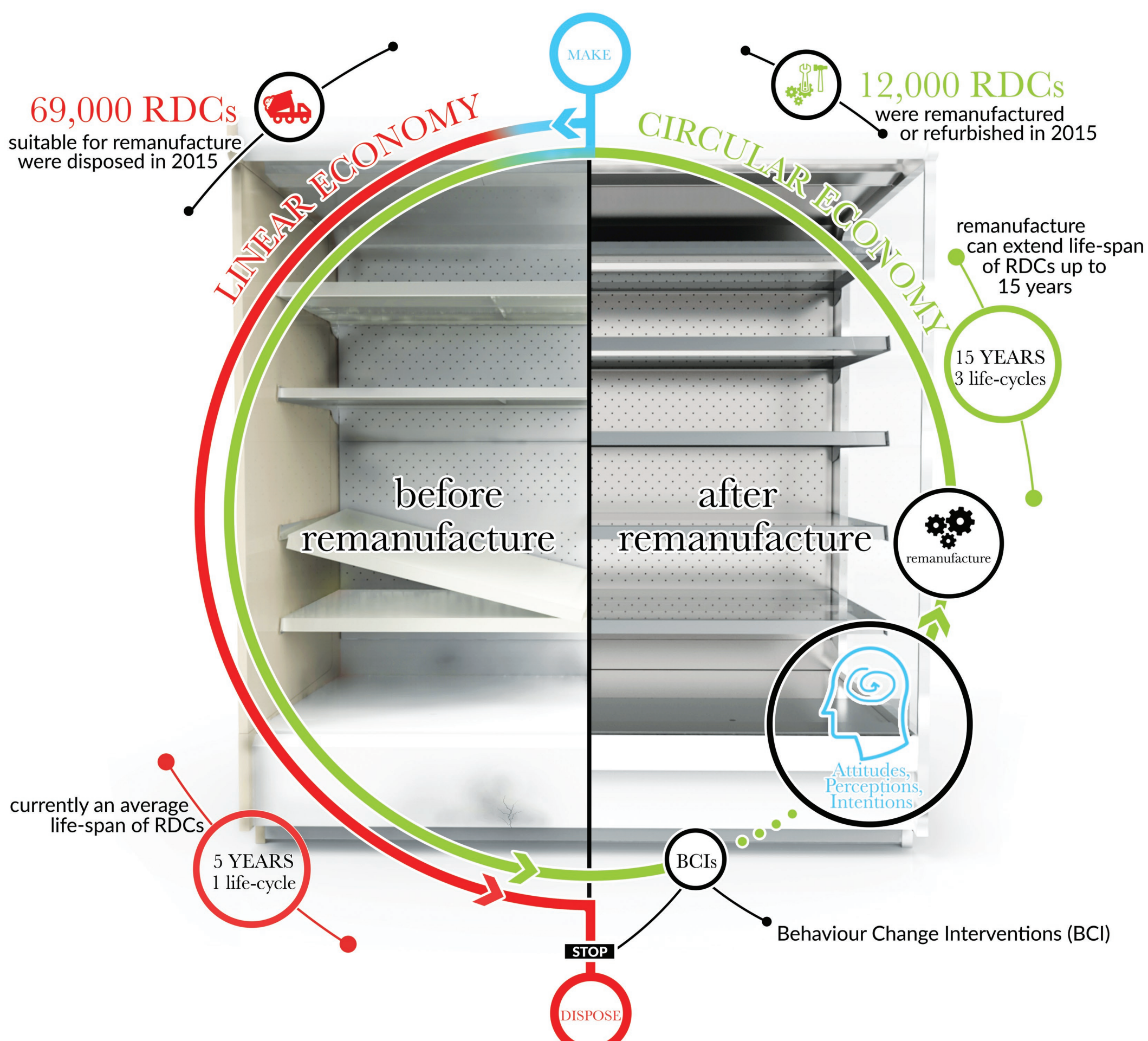
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The Circular Economy is an economic and industrial system in which resources are used for as long as possible. This typically involves businesses implementing a range of alternative business models, such as remanufacture. With the manufacture of Refrigerated Display Cabinets (RDCs) being a material and energy intensive process, there is scope for remanufacturing to support a more resource-efficient production of RDCs. Despite the potential, the **remanufacture of RDCs in the UK is uncommon**. Many Retailers and Manufacturers typically have unfavourable attitudes towards the purchase and production of remanufactured RDCs. However, more favourable attitudes could increase their Behavioural Intentions towards the purchase and production of remanufactured RDCs, which could lead to the adoption of remanufacturing across the industry. This study uses structured surveys to measure the potential impact that Financial Incentives (the Enhanced Capital Allowance), Quality Standards and Process-Enabling Tools have on changing the Behavioural Intentions towards the purchase and production of remanufactured RDCs. Participants in this study are Retailers (who purchase RDCs for retail grocery stores in the UK) and Manufacturers (who produce and sell RDCs to UK retail grocery stores). The results show that **the Financial Incentives (the Enhanced Capital Allowance), Quality Standards and Process-Enabling Tools had a positive and statistically significant impact on the participants' Behavioural Intentions towards the purchase and production of remanufactured RDCs**. This suggests the importance of further research into the development of the proposed interventions with the aim to positively influence stakeholder behaviour, that will in turn support the development of the Circular Economy in the Retail Refrigeration Industry.

Background

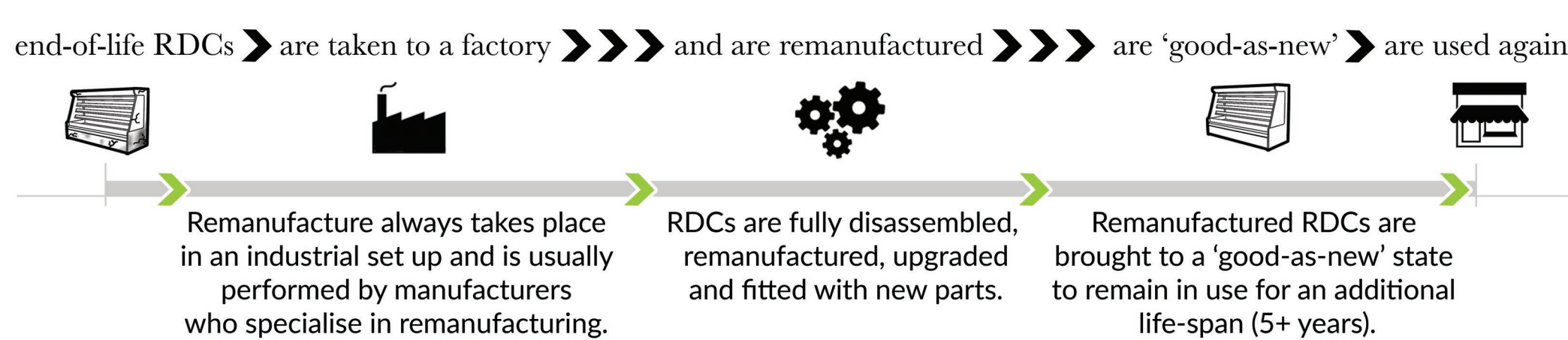
DISPOSAL OF RDCs IN THE UK

In 2015 approximately 81,000 RDCs came to their end-of-life. Only **12,000** of these were remanufactured or refurbished, meaning **68,000** potentially remanufacturable RDCs entered the waste-stream ^[1].



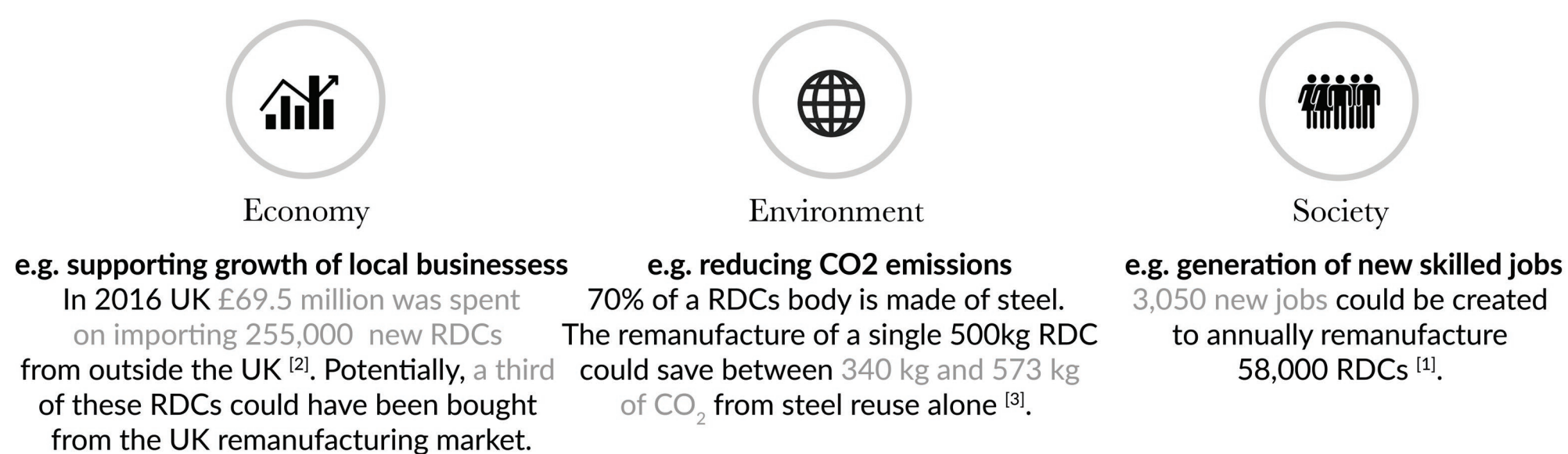
REMANUFACTURE OF RDCs

Remanufacture is a process in which good quality reusable components in end-of-life cores are used in the production of 'good-as-new' products.



BENEFITS OF REMANUFACTURING RDCs

Remanufacture of RDCs has several socio-economic and environmental benefits.



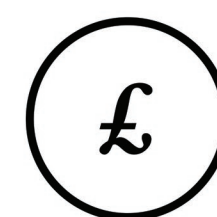
BARRIERS TO REMANUFACTURING

The Retailers and Manufacturers have little or no intention to purchase and produce remanufactured RDCs. An explanation for this can be attributed to **concerns over price certainty, lack of guidance** on how to adopt remanufacturing into business models and **absence of recognised industry quality standards** for remanufactured RDCs.

Methodology

BEHAVIOUR CHANGE INTERVENTIONS

Behaviour change interventions are methods used to change human behaviour. The three interventions discussed in this paper have the potential to encourage pro-circular behaviours and if adopted, they could drive the uptake of remanufacturing in this industry.



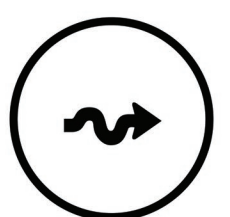
Financial Incentives (ECA)

The ECA scheme provides 20% tax relief on the purchase of new energy-efficient products, including RDCs. The inclusion of remanufactured products in the ECA scheme would help to incentivise the purchase of remanufactured RDCs ^[4].



Quality Standards

A recognised quality standard would provide Retailers with an assurance on the quality of remanufactured RDCs and positively impact their attitudes towards remanufacturing. The result being an increase in demand for remanufactured RDCs.



Process-Supporting Tools

The presence of industry-specific supporting tools that provide best practice and guidance on the processes of purchasing and producing remanufactured RDCs could be key in encouraging Retailers and Manufacturers to adopt remanufacturing.

PARTICIPANTS

Two groups of stakeholders participated in this study. The first group of stakeholders were **Retailers (N=19)**; these include individuals who buy RDCs for retail grocery stores in the UK. The second group of stakeholders were **RDC Manufacturers (N=6)**; these include individuals who produce and sell RDCs to UK retail grocery stores.

DATA COLLECTION

The influence of the three behaviour change interventions on the Behavioural Intentions of the stakeholders to purchase and produce remanufactured RDCs was examined using the appropriate survey measures. Reliable measures ^[a], including carefully designed questions and 7-point Likert scales were used. The data was collected between January and September 2017.

Results

STAKEHOLDERS' BEHAVIOURAL INTENTIONS

Currently, the Behavioural Intentions of Retailers to purchase remanufactured RDCs are **NEUTRAL**, with a mix of positive and negative responses ($\bar{x}=4.5$, $SE=0.33$, $SD=1.47$).



Current Behavioural Intentions of Manufacturers to produce remanufactured RDCs are **NEGATIVE**, suggesting they have little or no intention to perform the pro-circular behaviour ($\bar{x}=3.3$, $SE=0.92$, $SD=2.25$).

INFLUENCE OF THE ECA SCHEME

Presence of an ECA scheme that includes remanufactured RDCs would have a **POSITIVE** and significant ^[b] [$t(18)=3.67$, $p<0.001$] influence on Retailers' Behavioural Intentions to purchase remanufactured RDCs ($\bar{x}=5.7$, $SE=0.21$, $SD=0.93$).



Presence of an ECA scheme that includes remanufactured RDCs would have a **POSITIVE** and significant ^[b] [$t(5)=2.74$, $p=0.020$] influence on Manufacturers' Behavioural Intentions to produce remanufactured RDCs ($\bar{x}=5.3$, $SE=0.33$, $SD=0.82$).

INFLUENCE OF QUALITY STANDARDS

Presence of a Quality Standard for remanufactured RDCs would have a **POSITIVE** and significant ^[b] [$t(18)=1.83$, $p=0.042$] influence on Retailers' Behavioural Intentions to purchase remanufactured RDCs ($\bar{x}=5.3$, $SE=0.24$, $SD=1.05$).



Presence of a Quality Standard for remanufactured RDCs would have a **POSITIVE** and significant ^[b] [$t(5)=2.74$, $p=0.020$] influence on Manufacturers' Behavioural Intentions to produce remanufactured RDCs ($\bar{x}=5.3$, $SE=0.33$, $SD=0.82$).

INFLUENCE OF PROCESS-SUPPORTING TOOLS

Presence of a Process-Supporting Tool for purchase of remanufactured RDCs would have a **POSITIVE** and significant ^[b] [$t(18)=3.38$, $p=0.002$] influence on Retailers' Behavioural Intentions to purchase remanufactured RDCs ($\bar{x}=5.5$, $SE=0.19$, $SD=0.84$).



Presence of a Process-Supporting Tool for production of remanufactured RDCs would have a **POSITIVE** and significant ^[b] [$t(5)=2.74$, $p=0.020$] influence on Manufacturers' Behavioural Intentions to produce remanufactured RDCs ($\bar{x}=5.3$, $SE=0.33$, $SD=0.82$).

Conclusion

The development of the proposed Behaviour Change Interventions could help the transition towards a more resource-efficient practices. This paper encourages further research and dialogue between Retailers, Manufacturers and Policy-makers on the development of the proposed behaviour change interventions. Their collective engagement is pivotal in encouraging the industry to become more resource-efficient.

[1] Walsh, B. (2009). Report on the remanufacturing of refrigerated display cabinets. [online] Available at: <http://www.remanufacturing.org.uk/pdf/story/1p346.pdf> [Accessed 15 Mar. 2015].

[2] Office for National Statistics. (2017). UK labour market - Office for National Statistics. [online] Available at: <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/uklabourmarket/november2016> [Accessed 1 Feb. 2017].

[3] Waste & Resources Action Programme. (2008). Reclaimed building products guide. [online] Available at: <http://www.wrap.org.uk/sites/files/wrap/Reclaimed%20building%20products%20guide.pdf> [Accessed 14 Aug. 2016].

[4] Muranko, Z., Andrews, D., Chaer, I., Newton, E., Proudman, P. and Longhurst, M. (2017). 'Incentivising pro-circular behaviours: proposing a new enhanced capital allowances scheme for remanufactured products - the case of refrigerated display cabinets in the United Kingdom'. Elsevier Energy Procedia, 123, pp.369-374.

[a] Cronbach's alpha was used to measure the internal consistency of a scale. It is expressed as a number between 0 and 1, with an acceptable value of alpha typically ranging from 0.70 to 0.95. Cronbach's alpha showed that the questionnaire items reached an acceptable reliability (in Retailers $\alpha = 0.77$, for Manufacturers $\alpha = 0.92$).

[b] Paired sample t-test was conducted to compare the means between currently held Behavioural Intentions and Behavioural Intentions impacted by presence of behaviour change interventions. Results showed there were statistically significant differences between stakeholders' current Behavioural Intentions and Behavioural Intentions influenced by the behaviour change interventions, suggesting the interventions had a considerable effect.