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Framing Innovation in the Context of the Circular Economy.

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The Circular Economy (EMF 2013), or more generally ideas of closing and slowing loops (Bocken et al 2015), has started to emerge as an answer to the future resource constraints that humanity is likely to face (Tennant 2013). This theme - also designated as *circularity* - is linked to systemic change or systems change as it is a strategy that "requires complete reform of the whole system of human activity, which includes both production processes and consumption activities (Yuan et al 2006)." Such a framing is in line with the estimated factor of 10 to 20 improvement in resource efficiency that systems level redesign or innovation can provide (Weterings et al 1997, Brezet et al 2001). Indeed, as such circularity seems an answer to the various calls for 'a change of the system', 'systemic change' or 'radical change' in striving for sustainable industrial systems (Tukker 2005, Van den Bergh et al 2011, Markard et al 2012). More specifically, this framing contains potential for a transition: a change so profound that it involves not only technology, but changes in business models, value chains, regulations, institutional and political structures as well as in people's daily practices (e.g. Rip and Kemp 1998). However, at the same time there is the recognition that many ideas related to circularity, such as recycling, reuse, longevity approaches, servitization, etc, are not new - and in fact are tried and tested approaches. For example, ideas related to 'waste = food' were already advocated by Hofman in 1848 (in Murray et al 2013). As such, circularity does not meet Garcia and Calantone's (2002) definition of radical or 'really new' innovation - both types of 'newness' being a mix of the dimensions 'new to the customer', 'new to the industry' and 'new to the company' - as one or more circularity related ideas are likely to be practiced by the customer, industry and/ or company. Underlying these different framings of circularity is the tension between 1st and 2nd order change; the tension between making improvements to the current system and changing the paradigm (Watzlawick et al 1974). The risk is that circularity - by fitting the descriptions of both 1st and 2nd order change - will become a diluted concept, infested with contradictions; the initiatives that claim to invoke it likely to be designated as 'circular washing.' As such, the meaning attached to innovation in the context of circularity is one dominated by white noise and is in need of clarification.

The goal of this paper is twofold: the first aim is to reflect on the various framings of innovation appropriate to circularity and expose the problematic nature of these framings. Secondly, this paper will share the lessons learned from an empirically based case study aimed at understanding how practitioners use ideas of circularity in innovation efforts. This study is the basis for developing a new perspective on innovation framed in the context of circularity, one that incorporates the three perspectives of material, parts/ subassemblies and user/ consumer and facilitates the navigation of these levels.