THE CIRCULAR TRANSITION: DEVELOPMENT OF A CIRCULAR ECONOMY MODEL FOR THE WASHING MACHINE INDUSTRY CASE

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Background

Circular Economy contrasts the traditional linear model based on the take – make – dispose approach where goods are manufactured from raw materials, sold, used and then discarded as waste. In fact, Circular Economy can be defined as a system that is restorative and regenerative by design. Its aim is to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles (Ellen MacArthur Foundation, 2013).

The traditional model implies structural waste, higher resource prices, supply disruptions and, of course, the reduction of finite materials stock available in nature. The latter limit will be more stringent with three billion middle-class consumers expected to enter the market by 2030 (Nguyen et al., 2014). Consequently, a switch to Circular Economy is needed and, in order to accelerate this transition, four building blocks were identified (Ellen MacArthur Foundation, 2013):

- **BB1) circular product and design**: the recovery of materials is not only addressed at end of use and company needs to build skills in circular design to improve product reuse, recycling and cascading;
- **BB2) new Business Model (BM)**: changing from ownership to usage-and/or-performance-based payment model is essential to give a boost to companies in design-to-last products. By prioritizing access over ownership, consumers become users and manufacturers remain the owner of the goods, selling the function (solution) instead of the product (servitization). This shift entails the redesign of the Product-Service Systems (PSS) adopted. A PSS is an integrated bundle of products and services which aims at creating customer utility and generating value (Boehm and Thomas, 2013). While in traditional product-oriented BM firms have the incentive to maximize the number of products sold, in solution-oriented ones companies are paid for the services they provide. Thus, the materials involved in the product become cost factors and firms have the incentive to minimize them by extending the lifespan, making as material-efficiently as possible, reusing and remanufacturing (Tukker, 2015).
- **BB3) reverse cycle**: in order to create value from products after their use, they must be collected and brought back. Reverse logistics allows these products to get back into the market.
- **BB4) enablers and system conditions**: financing, collaborative platforms and even digital technologies are needed and can help the transition.

Objectives

The existing literature indicates that Circular Economy – and its application through reuse, refurbish and recycling activities – can fit all the three pillars of sustainability, since it brings advantages to economy, environment and society (Ellen MacArthur Foundation, 2013; Gelbmann and Hammerl, 2015; O'Connell et al., 2013). However, real industrial projects are not always taking off so far.

The main goal of the research is to develop a Circular Economy model for the durable consumer goods sector, in order to measure the economic, environmental and social implications of the shift from a linear approach to a circular one and demonstrating the win-win relation for companies and customers. The project will also aim at assessing to which degree the model and measures developed for the specific durable consumer good case can be generalized to other industrial contexts. The outcomes of this research can be used to define guidelines in order to support companies that wish to change their business towards Circular Economy. Consequently, three

research question will be scrutinized (even though they are preliminary and they may be refined during the study):

RQ1. What – among BB1, BB2 and BB3 – is required to be done and how?
RQ2. Which are the context conditions (BB4)?
RQ3. Which are the possible consequences and impacts?

Methodology

The research will be carried out following the development of the Circular Economy model. First, a literature review is required, in order to set the context. Second, the model must be developed with the definition of the input/output variables, the logical relations between entities and all the mathematical calculations needed. Then, all the data which will feed the model must be collected and gathered from several sources, including technical report, extensive surveys to manufacturers and/or customers, managers' interviews and case studies. Once the Circular Economy model is developed and all the relevant data are collected, a static multi-scenario simulation will be performed, in order to measure the economic, environmental and social outcomes of each scenario generated. Moreover, outcomes can be aggregated in a way to fit different points of view, from a global one (e.g. the whole society or environment) to a single subject's viewpoint (e.g. one user, one retailer, one manufacture).

The validation of this new framework will be performed through its application to the washing machine industry. This choice is driven by the very large installed base, close to 200 million households in Europe (Europe Economics, 2015) and by the very relevant cost and environmental impact of the usage phase (Saccani et al., 2016).

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