**The Implementation of Circular Economy
in Multi-National Enterprises: a Preliminary Review**

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**Keywords:** Circular Economy, Fortune 500, Sustainability, MNEs

**Abstract**

The recently promoted Circular Economy Package (European Commission, 2015) and Circular Economy Action Plan (European Commission, 2018) aim at promoting sustainable development in production and consumption systems by closing the loop of products and material flows, with the objective of decoupling growth from resource consumption. Coherently to a free-market scenario, these directives, openly recognise a very important role for existing organisations, which, through bottom-up initiatives, shall drive the transition towards the Circular Economy in supply chains. In the European context, several organisations (both SMEs and MNEs) claim to have changed, over the last years, the way they operate, by adopting Circular Economy practices. Such interventions have emphasised product and material reuse and recycle and increased the level of re-generativity of their production and consumption systems, also integrating the use of renewable energy sources throughout supply chains (Genovese et al., 2017). However, the actual extent to which Circular Economy principles are operationalised has still to be verified and the real impact of legislation changes on companies has yet to be investigated (Stewart & Niero, 2018), especially when dealing with large and well-established Multi-National Enterprises, which have been operating, for decades, according to a very traditional linear model. As such, this study aims at assessing the Circular Economy state-of-the-practice in a structured way, by classifying all the initiatives that can be recognised in the largest European companies by revenues, according to the Global Fortune 500 list (fiscal year 2018). Key findings of the underlying research include an evaluation of the type of practices and of their level of implementation, along with methods employed to measure their impacts.

1. **Introduction – Problem statement**

The increasing interest of policy-makers in promoting sustainable production and consumption systems has already been translated in some directives promoted by the European Union; notable examples include the Circular Economy Package (European Commission, 2015) and the Circular Economy Action Plan (European Commission, 2018). Closing the loop of products and material flows is considered a key strategy in many industries, with the aim of decoupling growth from resource consumption.

The mentioned European directives, coherently to a free-market scenario, openly recognise a very important role for existing organisations which, through bottom-up initiatives, shall drive the transition towards the Circular Economy (in the following, also CE) in supply chains. Within this context, several organisations (both SMEs and MNEs) have claimed to have introduced deep changes in the way they operate, by adopting Circular Economy practices. Such interventions have emphasised product and material reuse and recycle and increased the level of re-generativity of their production and consumption systems, also integrating the use of renewable energy sources throughout supply chains (Genovese et al., 2017).

However, the actual extent to which Circular Economy principles are operationalised at this level has still to be verified and the real impact of legislation changes on companies has yet to be investigated (Stewart & Niero, 2018), especially when dealing with large and well-established Multi-National Enterprises, which have been operating, for decades, according to a very traditional linear model. This lack of a clear review of the state-of-the-practice outlines the necessity to survey real-world applications in existing organisations. This need is also more pressing considering that the development of the Circular Economy concept and its practical applications, at least in the European Union countries, has been at the moment mainly led by practitioners rather than by the scientific community; as such, this has led to a very fragmented body of knowledge, which is lacking a holistic and systematic approach to the topic (Korhonen et al., 2018).

This study aims at assessing the extent to which organisations are implementing Circular Economy practices in a structured way, classifying all the initiatives that can be retrieved in the largest European companies. It has to be mentioned that some similar attempts have already taken place. Among these initiatives, two notable examples are provided by the Circular Economy Industry Platform[[1]](#footnote-1) and Circle Economy’s Circle Lab[[2]](#footnote-2); such initiatives are aimed at gathering and classifying existing Circular Economy applications, strategies and challenges regarding many sectors and geographical contexts. However, these databases are more designed as learning platforms with the objective of sharing existing experiences and best practices, rather than being systematic studies of the actual level of transition to the Circular Economy.

For this reason, this study will focus on a globally recognised set of companies, the Global Fortune 500 list[[3]](#footnote-3), and more specifically on secondary data that can be found in the Corporate Sustainability (CS) reports that are released on a yearly basis by major organisations. By using a structured research method, the aim will be to outline how the largest European companies (in terms of turnover) are integrating Circular Economy principles and adopting associated practices. On the basis of the identified gaps, the research questions which will be addressed in this study can be summarised as follows:

* RQ1: *To what extent do large European MNEs introduce CE principles in their CS reports?*
* RQ2: *What CE practices are implemented by such companies?*
* RQ3: *Has the degree of implementation of CE practices increased in the last three years?*

In particular, it will be assessed whether general statements contained in annual reports are followed by the implementation of real CE practices, also identifying the most common ones. An important characteristic of the study is the definition of a period of observation of three years, as an initial attempt to analyse the issue considering also a longitudinal dimension, in order to highlight existing trends inside organisations or sectors.

The remainder of this document is arranged as follows. The next section illustrates the method which will be utilised to tackle the research questions. In Section 3, we illustrate the results of the analysis; finally, we summarise the contribution provided by the study, also highlighting the potential theoretical lenses which could be employed in order to make sense of the results, along with some avenues for future research.

1. **Research Method**

The set of European companies which will be employed for this study will be defined on the basis of the Global Fortune 500 list (2019 edition). Such a list collects the Top-500 international corporations in terms of turnover generated during the 2018 financial year. Corporate Sustainability (CS) reports from these companies will be surveyed.

It must be mentioned that an increasing number of (mainly large) companies release CS reports on a yearly basis; the main aim of such reports is to provide internal and external stakeholders with a description of their sustainability strategies and practices (Siew, 2015; Landrum and Ohsowski, 2018); as such, these reports can be seen as the most direct statement concerning sustainability practices adopted by a firm. For this reason, an increasing number of scholars involved in sustainability studies has performed systematic analyses of CS reports. Comas Martí and Seifert (2013) provided a seminal contribution in the use of this approach, by developing a content analysis of CS reports for a cross‐sectoral company sample; similarly, Meckenstock et al. (2016) analysed 142 CS reports across 12 industries to investigate the operational translation of sustainability into industrial practices. Stewart and Niero (2018) performed an analysis of the FMCG industry regarding the implementation of CE practices. The wide availability of CS reports provides then an ideal platform for evaluating the adoption (or, at least, the effort in this direction) of general sustainability practices (and, more specifically, CE ones) by organisations. To date, no study has adopted such approach to evaluate the adoption of CE practices in the largest industrial organisations, across different sectors, in Europe.

In order to address the three research questions, data found in the sourced CS reports will be coded and analysed using a content and a mapping analysis approach, on the model of mentioned study conducted by Stewart & Niero (2018), which is focused on the FMCG sector. Concerning RQ2, data found in the CS report will be integrated with further information coming from secondary sources, including press releases, firms’ websites, newspapers articles, along with reports and white papers from consulting companies. Furthermore, a longitudinal approach will be adopted for all the 20 companies of the subset, in order to highlight the evolution of the adoption of Circular Economy practices; as such, CS reports from the 2016, 2017 and 2018 financial years will be surveyed.

The review will consist of three main phases: (i) sample definition, (ii) data extraction and (iii) data analysis (see Figure 1). The following sub-paragraphs describe these steps in detail.

*2.1 Sample definition*

The sample has been defined utilising the Global Fortune 500 list (2019 edition), which collects the Top-500 international corporations in terms of turnover generated during the 2018 year. As the study is part of the EU-funded Horizon 2020 Innovative Training Network ReTraCE[[4]](#footnote-4), it has been focused on companies within this geographical region, more specifically on the Top-20 companies in the list from the European Economic Area (EEA). As such, the sample includes a set of companies belonging to different industries and regions in the EEA.

The online database Corporate Register has been used to collect the CS Reports referred to the 2016, 2017 and 2018 financial years for all the companies of the subset. In order to access further information which could not be found in such reports, available secondary sources have been considered as well, in the form of press releases, firms’ websites, newspapers and magazine articles, white papers from consulting companies and specialized magazines. These sources were accounted for and selected according to their relevance and include the most important international business news sources (such as *The Economist* and *The Financial Times*), and publications from top consulting firm (such as *McKinsey*, *Accenture*, *Boston Consulting Group*). These sources were retrieved using Google News and using pre-determined keywords, such as “Circular Economy” AND “Company Name”. In each specific case, keywords have then been gradually defined also looking at the type of practice we aimed at researching. To date, only documents in English language have been reviewed.

* 1. *Data Extraction*

During this phase, the collected reports are analysed one by one, and the relevant information is extracted in an Excel spreadsheet and then organised using the NVivo software package. In order to identify the relevant parts of the extracts, both general and specific keywords have been selected: the former including *Circular Economy*, *Circular Supply Chain*, *Closed-Loop Supply Chain*, *Waste*; the latter more specifically related to Circular Economy practices which are commonly applied by organisations, such as, for instance, *reduce*, *reuse*, *recycle*, *recover*, *remanufacturing*, *redesign*, *design for longevity* (see Table 1).

Both quantitative and qualitative measures have been gathered: on the one hand, the presence or not of specific keywords in a given report; on the other hand, the context in which the main keywords appear and the practices to which they are linked.

A third category of information is related to existing Circular Economy practices and projects. In order to classify these applications, we also aim to use data coming from secondary sources to integrate further dimensions into the database, including the type of practice according to the Waste Hierarchy Framework (European Commission, 2014), the impact on performance (if reported), the presence of government incentives in the given geographical context, the industry of implementation, the type of ownership of the firm, the main drivers of the adoption, the expected results, the type of relationships in the supply chain and the type of ownership. To date such extraction process has been completed for the Top-20 companies.



**Figure 1** – Methods flowchart

|  |
| --- |
| **Examples of Circular Economy Keywords** |
| **Reduce** | **Reuse** | **Recycle** | **Recover** | **Renewable Energy and Resource Efficiency** |
| Design for longevity | Reusing parts components | Remanufacturing | Biogas from by-products | Employing Renewable Energy |
| Product as a Service | Repair | Using by-products/recycled materials | Biofuel from by-products | Improving Resource Efficiency |
|  | Refurbish | Investing in recycling technologies | Energy from waste |  |

**Table 1** – Examples of employed keywords

* 1. *Data analysis*

The final step will include a critical analysis of the database, aiming at summarising the relevant findings and highlighting the key messages, for addressing the mentioned research questions. This phase will also involve a synthetic representation of the quantitative and qualitative data collected.

The final objective will be to recognise existing trends in the way to address Circular Economy principles in stakeholder communication, but also related to the actual implementation of practices. The most commonly adopted types of practice will be identified, in order to understand which are the dominant implementation approaches and the main drivers for the adoption. Data will be organised through classification dimensions such as the ones reported in Table 2.

|  |  |
| --- | --- |
| **Organization name** | Company A |
| **Industry** | EnergyPetroleum Refining |
| **Country** | The Netherlands |
| **Report analysed** | Sustainability Report 2018 |
| **Year of the Report** | 2018 |
| **"Circular Economy" occurrences in the report** | 2 |
| **Presence of “R” principles in the report** | Yes |
| **Reduce** | Yes |
| **Reuse** | Yes |
| **Recycle** | Yes |
| **Recover** | Yes |
| **Implementation of CE practices** | Yes |
| **Type of practice according to the Waste Hierarchy framework** | Recycling |
| **Main adoption drivers** | Compliance to regulation |
| **Expected results** | Not explicitly mentioned |
| **Registered Impact on performance** | 400,000 tonnes waste for recycling or reuse |
| **Presence/Absence of government Incentives** | Not mentioned |
| **Presence/Absence of government Regulation** | Presence: A Circular Economy in the Netherlands by 2050 |
| **Type of ownership** | Private |
| **Level of implementation** | Mainly general statements; some implementation of recycling practices in some parts of the supply chain |

**Table 2** – Classification dimensions of a CS Report

1. **Results**

The current sample is reported in Table 3 below. Tables 4 and 5 report a classification of the sample by country and industry; it is possible to understand that the sample which has been analysed so far is dominated by companies which are incorporated in Germany (8) and France; in terms of industries, Finance (7), Manufacturing (6) and Energy are the most represented ones. All the companies can be classified as private sector organisations; notable cases which include some form of state participation are Enel (23% of its shares are owned by the Italian government) and Volkswagen (11% of its shares are owned by the Lower Saxony regional government in Germany).

Figure 2 shows the occurrence of the keywords combination “Circular Economy” in Corporate Sustainability reports. It can be observed that the sample of firms under investigation exhibits a growing interest towards CE, with a peak in 2018, when 65% of the firms under investigation does mention the words “Circular Economy” at least once in their Sustainability reports. It can be seen such interest towards the CE concept is a recent one (as in 2015 just 3 out of 20 companies where citing it). This can be interpreted as a direct consequence of the promulgation of the mentioned European directives, and of the emergence of a heated public debate, which has sparkled an increased interest of companies in integrating Circular Economy principles in their operations.

|  |  |  |  |
| --- | --- | --- | --- |
| **Company name** | **Sector** | **Industry** | **Country** |
| Royal Dutch Shell | Energy | EnergyPetroleum Refining | The Netherlands |
| Volkswagen AG | Manufacturing | Motor Vehicles & Parts | Germany |
| BP plc | Energy | EnergyPetroleum Refining | UK |
| Daimler | Manufacturing | Motor Vehicles & Parts | Germany |
| EXOR Group (FCA) | Manufacturing | Motor Vehicle & Parts | Italy |
| AXA | Financials | Financial services | France |
| Total | Energy | EnergyPetroleum Refining | France |
| Allianz | Financials | Financials- Insurance: Life, Health (stock) | Germany |
| BNP Paribas | Financials | Financials- Banks: Commercial and Savings | France |
| Prudential | Financials | Financials- Insurance: Life, Health (stock) | UK |
| BMW Group | Manufacturing | Motor Vehicles & Parts | Germany |
| Siemens | Manufacturing | Industrial | Germany |
| Assicurazioni Generali | Financials | Financials- Insurance: Life, Health (stock) | Italy |
| Carrefour | Food | Food & Drug Stores | France |
| Bosch Group | Manufacturing | Motor Vehicles & Parts | Germany |
| Banco Santander | Financials | Financials-Banks: Commercial and Savings | Spain |
| Deutsche Telekom | Telecommunication | Telecommunications | Germany |
| Credit Agricole | Financials | Financials- Banks: Commercial and Savings | France |
| Enel | Energy | Energy Utilities | Italy |
| Uniper | Energy | Energy Utilities | Germany |

**Table 3** – The current sample

|  |  |
| --- | --- |
| **Country** | **Companies** |
| Germany | 8 |
| France | 5 |
| Italy | 3 |
| UK | 2 |
| Spain | 1 |
| The Netherlands | 1 |

**Table 4** – The current sample by country

|  |  |
| --- | --- |
| **Sector** | **Companies** |
| Financial Services | 7 |
| Manufacturing | 6 |
| Energy | 5 |
| Food | 1 |
| Telecommunication | 1 |

**Table 5** – The current sample by industry



**Figure 2** – The current sample by industry

*3.1 CE Drivers*

One of the main focuses of the study is to determine the dominant approach in terms of implementation strategies, outlining the types of practice which are mostly adopted by large organisations. This will allow to establish whether such practices just implement the basic elements of the Circular Economy paradigm (such as recycling and/or recovering waste streams generated by the current linear production systems), or, instead, involve a deep transformation of products and business models in order to reduce waste streams and resource consumption altogether.

It is also expected that this increased interest and attention to the principles goes along with an increased amount of real-world implementation of Circular Economy practices. What should also be determined are the main drivers for the adoption of Circular Economy practices, recognising whether this is a matter of compliance with policy directives or if they are considered as economically attractive initiatives with the potential of reducing costs and gaining new revenues, bringing an impact on the corporate performance.

In terms of the drivers which favoured the adoption of CE practices, most of the analysed reports mention the economic and the environmental benefits which can be obtained by the implementation of such practices (see Table 6). Most of the companies claim that the implementation of CE practices can help increasing the amount of value that can be extracted from products by keeping resources in use, and retaining the value of materials after products end of life. Environmental drivers are well quoted as well and they are mainly linked with the possibility of reducing waste and reducing the consumption of virgin resources. Further benefits are provided by the avoided emissions thanks to recovered waste and by the lower consumption of energy requested by production processes that are able to valorise available parts, components and by-products and avoid to start production from virgin raw materials*.* Reference to ecological limits and Paris Agreement are enriching the discussion. Legal issues, such as the *compliance* to present, or even future, regulations is also a common reason for adoption. It has to be remarked that social drivers are generally overlooked and linked to the more traditional panorama of CSR activities. The only notable example of this is Volkswagen hosted Global Social Business Summit, which involved the social commitment of employees to discuss ideas and initiatives relating to the plastics industry and the circular economy, solidarity and other topics.

|  |  |  |
| --- | --- | --- |
| **Driver** | **Companies** | **Examples** |
| Economic | 10 out of 20 | *We are looking at how we can advance the circular economy – where resources stay in use for as long as possible, with the maximum value extracted in that time, and are then recovered and regenerated at the end. (****BP****)* *In 2018 Several innovation hubs are developed to study carbon conversion, with the aim of pursuing carbon capture and conversion and promoting the circular economy. (****Total****)* |
| Environmental | 9 out of 20 | *FCA leverages the potential to reduce the environmental footprint of our products by embracing the concept of the circular economy. Our design approach addresses the environmental footprint of products throughout their life cycle, and integrates eco compatible materials and design choices that maximize recovery and recycling for end-of-life vehicles. (****FCA****)* *The level of action needed requires measures to: […] Develop a circular economy that allows natural resources to be recovered, and to regenerate themselves. (****BNP Paribas****)* |
| Legal | 4 out of 20 | *We also comply with, and monitor changes to, applicable regulations. In regions around the world, various regulations designed to create a more circular economy are in development and we are preparing to meet those requirements when they are introduced. (****Royal Dutch Shell****)**In line with the Circular Economy Roadmap led by the Ministry for Environmental and Sustainable Transition (Ministère de la transition écologique et solidaire), Carrefour supports the creation of a National Pact for plastics gathering government, civil society and all voluntary industrial and retail companies. (****Carrefour****)* |
| Social | 1 out of 20 | *Volkswagen and the Autostadt contributed to the Global Social Business Summit not only as a partner and host, but also with a large team of socially committed employees. During workshops, keynotes, master class events, networking sessions and presentations, participants and interest groups met for talks. They discussed ideas and initiatives relating to the plastics industry and the circular economy, solidarity, mobility, sport and nutrition. (****Volkswagen AG****)* |

**Table 6** – The current sample by industry

*3.2 CE Practices*

Subsequently, employed practices which can be retrieved in the Sustainability Reports have been classified according to two dimensions, namely the type of practice and the level of implementation. As regards as the type of practice, the framework has been derived from the key contributions provided by Kirchherr et al. (2017), Korhonen et al. (2018a) and Potting (2017), which have been integrated and slightly modified for the purpose of the study. Based on these seminal studies, CE practices can be classified in the following categories:

* *Reduce*: practices that prevent resource use, either with redefining product functions, or through rethinking, redesigning or making product use more intensive for example through sharing. Examples of such practices include the redesign products and of its package; the redesign of manufacturing infrastructure; the promotion of modular product design; the adoption of better forecasting procedures in order to promote unnecessary resource consumption; the promotion of collaborative consumption practices; the move towards a performance-based or service-based business model, rather than one based on simple products.
* *Renewable Energy & Resource Efficiency*: this category includes all the practices related to incremental improvement of the efficiency in manufacturing systems, or to the adoption of renewables as a source of energy have been classified in a specific class of interventions. These types of practice are quite commonly mentioned in CS Reports and distinguishing them from the other categories of practices could be helpful in recognising, to a broader extent, the strength and the weaknesses of the current implementation approaches.
* *Reuse*: interventions aimed at reutilising products (or components) for their original function, including repairing, preventive maintenance and refurbishing actions.
* *Recycle*: practices aimed at recycling and reprocessing materials from parts or products. Also the remanufacturingof parts and components was considered as part of this category. Common practices are: by-products reutilisation, recycling of parts, components and materials; utilisation of recycled materials; packaging recycling.
* *Recover*: practices involving energy recovery from by-products or waste, either directly or through the production of alternative fuels like biofuels.

The level of implementation of each practice, in each firm, has been also evaluated. In particular, the following incremental implementation stages have been considered:

* *No mention of CE practices* (N): the absence of any practice that can be associated to the Circular Economy.
* *Exploratory and conceptual* (E&C): CE practices are just mentioned as an aspiration. The concept is mentioned symbolically with no clear link with an operational implementation.
* *Testing* (T): R&D activities on the implementation of CE practices are being conducted. There are pilot projects in specific plants, offices, around the world. We considered as being part of this level of implementation also the strategic acquisitions of start-up companies.
* *Early Implementation* (EI): Some evidence of CE practices adoptions in some product/service lines. Often, small impacts are reported, along with some plans for future extensions.
* *Company-wide implementation* (CI): the practice is part of company culture and widely implemented in different geographical areas. A clear evaluation of the overall impact is provided.

The following Table 7 reports the three most represented industries and the main CE practices being adopted by companies belonging to such industries. Such practices are also characterised by their level of implementation. This simplification could be undertaken because of the high level of similarity in the type of practices and in their level of implementation within the same industry. Practices which are reported in the table are present in at least half of the sample of companies from the considered industry.

In general, it can be seen that practices linked to *Resource Efficiency and Renewable Energy*, *Reduction* and *Recycling* are the most popular, while developments linked to product reuse are currently overlooked.

In the manufacturing industry (including players from automotive and related industries), identified Circular Economy practices are related to the possibility of closing the loop of some valuable components and of key materials which can be reused and recycled after the end of the product life. Such materials include aluminium, steel, plastics and batteries electrolytes and graphite. These initiatives have been pushed by the stringent legal requirements promoted by the EU (especially through the Directive 2000/53/EC), which set clear and quantifiable targets for reuse, recycling and recovery of End-of-Life-Vehicles and their components. In this context, design practices are playing an important role to operationalise a closed loop supply chain and reduce resource consumption.

|  |  |  |  |
| --- | --- | --- | --- |
|   | **Manufacturing**  | **Energy** | **Financial & Services** |
| **Reduce - Prevention** | (CI) Design for resource recovery(T) Modular Design(T) Promoting collaborative consumption(EI) Product as a Service | (EI) Redesign packaging  | (CI) Disinvesting from coal energy sources(CI) Investments in sustainable solutions(CI) Design of "green" products |
| **Renewable Energy & Resource Efficiency** | (CI) On-site generation of Renewable Energy(CI) Energy sourcing from Renewable Energy(CI) Improve production systems efficiency | (CI) Investments in large-scale Renewable Energy generation plants(CI) Improve Energy Efficiency  | (CI) Investments in Renewable Energy companies(CI) Energy sourcing from Renewable Energy (CI) Promoting Resource Efficiency of businesses and households |
| **Reuse** | (EI) Reuse of parts and components (batteries) | N/A | N/A |
| **Recycle** | (CI) Closing the loop for some products/materials | (CI) Investments in recycling technologies  | (EI) Materials recycling (paper) |
| **Recover** | N/A | (CI) Energy Recovery from by-products  | N/A |

**Table 7** – CE practices in selected industries and their level of implementation (in parenthesis)

However, as it can be seen from Table 7, most of the identified practices are still generally in a testing (T) and early implementation (EI) stage. Volkswagen and BMW, as founders of the Aluminium Stewardship Initiative (ASI) are defining the standard for a transparent and sustainable supply chain. As part of the Global Battery Alliance, Daimler, Volkswagen (and also Enel), are investing more than €1 billion ensuring not only the longest possible service life, but also the use of materials from a closed-loop point of view. BMW and FCA have both activated other development projects to increase the recycling rate of batteries, to investigate how they can recycle electrolytes and graphite into secondary material that could be suitable to be used in other batteries.

FCA is focusing on projects for the use of recyclable, re-shapable and repairable, bio-based fibre-reinforced epoxy composites, while Daimler is increasingly using renewable raw materials and recycled materials in seat covers made of one hundred percent recycled PET bottles, similarly to Bosch, which is employing recycled plastics as raw material for its power tools. The first remanufacturing projects have resulted in the development of specific product lines of remanufactured parts to support the aftermarket needs of customers (FCA and Volkswagen).

An increased interest in the mobility as a service concept has been reported in the last years, even if most of the existing projects are still at a Testing or Early Implementation stage. *Mobility-as-a-service* concepts include ride sharing (Volkswagen, FCA), on-demand mobility services of car-sharing in cities (Volkswagen, Daimler, FCA), also with electric vehicles. All these services promote a more collaborative consumption model that results in some benefits as an increased use of the products. Daimler *mobility-as-a-service* model includes 31 million customers in over 120 cities worldwide, from Europe to America and Asia and it is growing, thanks to a portfolio of customers which includes providers such as *Blacklane, Flixbus, Careem, car2go, Moovel and myTaxi*. Some other initiatives have also the objective to promote the concept of Product as a Service. FCA, in 2018, announced a subscription-based car ownership program, where a monthly subscription service is expected to give customers access to FCA portfolio vehicles and the ability to exchange the vehicle for another FCA brand and model.

Looking at the Energy sector, it is interesting to notice that the concept of the Circular Economy is interpreted as closely related to waste management (with specific reference to plastic waste), more than in terms of divestment from fossil fuels.

Shell and Total are among the founders of the *Alliance to End Plastic Waste*, committing themselves to invest more than $1 billion, and with the goal of investing $1.5 billion over 5 years to develop solutions in this field. At the same time, this problem is being dealt with through acquisitions of technological start-ups; Total, for instance, acquired the French company Synova, a leader in manufacturing of high-performance recycled polypropylene.

Some recovery practices are also present. For example, BP has recently acquired Neste, a leading producer of renewable energy products, to explore opportunities to increase the supply of sustainable fuel for aviation (the company has already worked as a supplier for Bombardier and Airbus).

Another major industry player, Enel, is a founding member of the Italian Circular Economy Stakeholder Platform (ICESP). During 2018, Enel was involved in international panels on the circular economy (including WBCSD - Factor10; Ellen MacArthur Foundation CE100).

This first assessment, however, seems to confirm that firms from this industry are not implementing the full spectrum of CE practices. This is understandable, as most of these companies operate in the extractive industry, which is still fossil fuel-dominated. As such, currently, the Circular Economy is viewed by these companies as a *tool* to perform some remedial actions which could mitigate the negative externalities of their core business.

Similarly, not a great involvement can be witnessed in companies belonging to the financial sector, which demonstrate a general lack of clarity when dealing with CE and with the potential role which banks and insurance companies could have in supporting the transition towards an economy of services more than products. Surprisingly, financial institutions do not identify in their CS reports the huge business opportunities which could arise thanks to the need to finance the transition of existing companies. Just a notable exception can be mentioned, namely BNP Paribas. This bank (part of the EMF CE100 Network) in 2018 has committed to support the implementation of CE practices through a dedicated fund aimed at targeting CE players (particularly innovative start-ups). In particular, they are offering solutions aimed at funding the lease, rather than the ownership, of industrial equipment, and implemented several projects for extending assets life-cycles.

The most common practices among the other companies from the financial sector include the divestment from carbon fossil fuels and the investment in sustainable solutions (mainly renewable energy for both households and firms). Another popular practice involves the design of “green products”, most of the times related to emerging consumers’ solutions. Most notable examples include insurances for electric vehicles (cars and bicycles), for domestic renewable energy generation systems, and some rare examples of insurance for mobility-as-a-service solutions. For instance, both Allianz and AXA provide services supporting the needs of *Blablacar* carpooling members.

*3.3 KPIs*

Each company mentions, in the CS report, some measures which are employed in order to keep track of the success of the implementation of the cited practices. Most of the indicators which are employed do not differ from those ones which can be found in the sustainable supply chain management literature, with no specific emphasis on circularity issues (see Table 8). It must be mentioned that most of the KPIs which are employed are *efficiency* indicators, comparing a measure of polluting activities (for instance, carbon emissions) to the total production output. It must be highlighted that the usage of such indicators for measuring the success of Circular Economy practices is problematic, as figures could be manipulated to obtain better results just increasing the production output (for instance, by productivity improvements), rather than by implementing practices which can promote a better usage of resources. Furthermore, most of the times the chosen indicators do not distinguish the contributions of the single practices, accounting for a general approximation.

Just one company, the Italian Energy Utility provider Enel, develops a measurement system to assess the level of circularity of its solutions and products. Enel X Circular Economy Score is calculated as a value in a scale 0-100, by combining *five key dimensions* (commitment by suppliers to CE principles; presence of reusable elements which can increase the life cycle of the product; resource efficiency; reuse of materials; support offered to suppliers) with the evaluation of the presence of *five circular business models* (sustainability of resources, product as a service, sharing platforms, product life cycle extension, recovery and recycling). The result of this evaluation process is the assignment of a circularity score from 0 to 100. The measure is subject to third-party verification and then made available to the end customer.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Emissions** | **Waste** | **Energy** | **Water** | **Circularity** |
| CO2-eqVOCsNOxOzone DepletionParticulate Matter | Waste DisposalWaste Recovered | Energy IntensityRenewable Energy UsageEnergy Usage | WastewaterDischarges to water | CE Score |
|
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**Table 8** – Employed KPIs

*3.4 A Preliminary Classification*

Based on this classification, each one of the 20 companies of the considered sample has been assigned a score from 0 to 4 on the basis of the level of implementation of each type of practice.

Such simple scoring process is reported here in order to get an overview of the level of implementation of the considered companies; the detailed evaluation is available on request and will be part of the supplementary data section of the final version of the study. Table 9 shows an overview of the main practices adopted across the three considered industries, divided by type and enriched with an evaluation of their level of implementation.

Carrefour is the only company which exhibits a very high level of implementation, applying at least one practice of each type at the maximum possible level of implementation (company-wide); Table 10 shows the detailed of the implemented practices in this company.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Company name** | **Reduce** | **Reuse** | **Recycle** | **Recover** | **RE & RE** | **Total score** |   |   |
| Carrefour | 4 | 4 | 4 | 4 | 4 | **20** |   |   |
| EXOR Group (FCA) | 4 | 4 | 4 | 2 | 4 | **18** | E&C | 1 |
| BNP Paribas | 4 | 0 | 4 | 4 | 4 | **16** | T | 2 |
| BMW Group | 4 | 4 | 4 | 0 | 4 | **16** | EI | 3 |
| Deutsche Telekom | 4 | 4 | 4 | 0 | 4 | **16** | CI | 4 |
| Volkswagen AG | 4 | 0 | 4 | 2 | 4 | **14** |   |   |
| BP plc | 4 | 0 | 2 | 4 | 4 | **14** |   |   |
| Allianz | 4 | 3 | 0 | 2 | 4 | **13** |   |   |
| Royal Dutch Shell | 4 | 0 | 4 | 0 | 4 | **12** |   |   |
| Daimler | 4 | 0 | 4 | 0 | 4 | **12** |   |   |
| Prudential | 4 | 0 | 4 | 0 | 4 | **12** |   |   |
| Bosch Group | 4 | 0 | 4 | 0 | 4 | **12** |   |   |
| Enel | 4 | 4 | 0 | 0 | 4 | **12** |   |   |
| Total | 0  | 0 | 2 | 4 | 4 | **10** |   |   |
| AXA | 4 | 0 | 0 | 0 | 4 | **8** |   |   |
| Siemens | 4 | 0 | 0 | 0 | 4 | **8** |   |   |
| Assicurazioni Generali | 4 | 0 | 0 | 0 | 4 | **8** |   |   |
| Banco Santander | 4 | 0 | 0 | 0 | 4 | **8** |   |   |
| Uniper | 0 | 0 | 4 | 0 | 4 | **8** |   |   |
| Credit Agricole | 0 | 0 | 0 | 0 | 4 | **4** |   |   |

**Table 9** – Level of Implementation of each company

|  |  |
| --- | --- |
| **Reduce** | (EI) Refusing the use of plastics and the sale of plastic straws by the end of 2018 removing single use plastic straws from juice boxes(CI) Rethinking prices to reduce food waste, selling products with short use-by dates at low prices: (CI) Collaborating with local associations donating everything that can be given away: unsold stock is donated set up to tackle poverty. |
| **Reuse** | (CI) Promoting the reuse of packaging ambitiously aiming at 100% reusable, recyclable or compostable packaging; |
| **Recycle** | (CI) Incorporating 50% of recycled plastic in its juice, soda and water bottles. |
| **Recover** | (CI) Energy production from bio-methane - product wastage that can no longer be consumed (withered flowers, spoilt fruit and vegetables, etc.) is converted into biogas, and then into bio-methane.  |
| **Renewable Energy & Resource Efficiency** | (CI) Utilisation of renewable energy such as geothermal power, wind power, solar power, etc. Heat generated by stores also has to be recovered and reused – such as the heat generated by refrigeration units. |

**Table 10** – CE practices at Carrefour

1. **Further Reflections**

The adoption by existing organisations of CE practices can be interpreted as the result of a set of some distinct pressures coming from the wider environment, represented by competitors, suppliers and customers of the supply chain, policy-makers, other supply chains and groups of stakeholders. Referring to Di Maggio and Powell (1983) *institutional theory* and to the concept of *isomorphism* the reasons behind the implementation of such practices can be summarised into three main macro-categories:

* *Coercive isomorphism*. The presence of regulations and legislations can be the main reason for the adoption of some practices. A very powerful example is represented by the French strong legislation on food waste, which effectively bans supermarkets from throwing away or destroying unsold food. This is actually forcing companies to donate surplus food to charitable trusts, food banks, and other types of organisations which provide redistribution services. This stringent requirement obliges the different players in the industry to take measures which act on the root of the problem, in order to reduce systematically waste streams leveraging on multiple strategies. As already mentioned, Carrefour is not only recycling unavoidable waste (for instance, by converting it into biogas). This company has also taken measures in terms of rethinking product prices to reduce food waste, for instance by selling products with short use-by dates at lower prices and of collaborating with local charity associations, regularly donating everything that can be given away.
* *Normative isomorphism*. In this case, practices are adopted regardless of the presence of an actual legal constraint; however, some external pressures can still be recognised as the main force driving the change. In an industrial context, this is normally traced back to professional, educational or trading standards which are adopted as *norms.* This can also involve consortia of organisations which belong to different supply chains. The already mentioned *Global Battery*, *Aluminium Stewardship* and *Responsible Steel* initiatives are all powerful examples of current norms and standards which are promoting the adoption of CE practices. The common objective of these collaborations comprise the establishment of accepted industry approaches that are able to influence the development of more sustainable practices in the industry, regarding specific material flows.
* *Memetic isomorphism*. Even in the absence of coercive or normative pressures, a company could still adopt CE interventions, for instance by following the example of other players in the same industry or sector. In this category there are also examples in which actors (e.g. suppliers, customers) from the same supply chain or in other production networks indirectly push for the adoption. An example is represented by the initiative, adopted by many financial institutions, related to the divestment from the coal sector. It is possible to notice, indeed, that all the surveyed companies from this sector report such practice, while investing in renewable energy solutions and products.

This study confirms an increasing trend not only in the interest towards CE but also in the adoption of the different types of CE practices that have been reported in their CS Reports. Looking deeper at the dominant implementation approaches, regardless of the sector, some considerations can be highlighted:

* Investments from the manufacturing sector are mainly focused on remanufacturing and recycling practices, which directly contribute to the improvement of the efficiency of operations, and to the reduction of the negative environmental impact, while generating additional revenues and serving specific markets. CS Reports mention that the recovered waste from end of life products through these strategies has a direct impact even in terms of reduced CO2 emissions and energy use. According to the longitudinal perspective which was adopted in the study, a growing number of companies is at least considering the implementation of such practices.
* In general, an ambiguous attitude is reported towards the implementation of practices which deal with rethinking product design, product functions and business models. While some examples are provided, their effective impact on the overall business performance is most of the time not explicitly documented. Furthermore, there is a lack of declared long-term objectives regarding strategic and structural investments in this direction.
* Reported collaborations at a supply chain level are mainly focused on auditing activities, involving some life-cycle evaluation of the overall environmental impact of products and services. More can be done in terms of exploring suppliers’ and partners’ willingness to challenge existing production and consumption models more broadly, and in terms of collaborative adoption of CE solutions.
* The role of national and international legislation seems to play a quite important role in driving good practices. Based on the positive experience of the French legislation on food waste, further examples should be explored in order to highlight the impact of national laws and EU directives (for instance, the very recent one on single-use plastics) on specific industries and on specific geographical areas.
1. **Conclusions and Further Researches**

Recently promoted European initiatives, such as the Circular Economy Package (European Commission, 2015) and the Circular Economy Action Plan (European Commission, 2018) have emphasised the need for existing organisations to *close the loop* of their production systems and supply chains, by adopting CE practices. Such initiatives stress the importance of product and material reuse and recycle, along with the usage of renewable energy sources throughout supply chains (Genovese et al., 2017).

However, the actual extent to which Circular Economy principles are operationalised at this level has still to be verified and the real impact of legislation changes on companies has yet to be investigated (Stewart & Niero, 2018). As such, this study has provided a first step in terms of the systematic assessment of CE practices in multi-national enterprises. Considering the top-20 European companies in terms of turnover (as reported by the Fortune 500 list), the study has investigated the adoption of CE practices in such organisations, also investigating adoption drivers and declared impacts. To this aim, sustainability reports of these organisations were systematically reviewed, along with secondary sources.

From a preliminary investigation, it can be derived that the attention devoted by the considered organisations to CE practices is generally increasing; also, adoption drivers linked to the economic opportunities linked to such practices play a major role towards their implementation. Practices linked to Resource Efficiency and Reduction, along with Recycling are the most popular, while developments linked to product reuse are currently overlooked. In general, the adoption of CE practices seems sporadic, and far from conditioning the overall business performance. This is also reflected by the fact that seldom company employ true circularity indicators for keeping track of their performance; in most of the cases, indeed, companies adopt some environmental measures which are designed as *efficiency* metrics, thus highly sensitive to productivity improvements. The considered sample also exhibits a lack of reflections on the social impacts of the implementation of CE practices.

Future researches will be aimed at: (i) increasing the sample coverage, reviewing reports and other data for the Top-100 European companies in terms of revenues; (ii) establishing causal relationships between adopted practices and measured impacts. Further steps of this research might also look at extending the study to a broader set of companies or geographical areas.

**Acknowledgements:** This research has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Innovative Training Networks (H2020-MSCA-ITN-2018) scheme, grant agreement number 814247 (ReTraCE project).

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2. http://circle-lab.com/knowledge-hub [↑](#footnote-ref-2)
3. https://fortune.com/global500/2019 [↑](#footnote-ref-3)
4. www.retrace-itn.eu [↑](#footnote-ref-4)