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Circular Business Model Innovation:

Key Patterns and Challenges to unleash recycling value creation potential

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Sub-Theme 46

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Introduction

It is increasingly acknowledged that our Industrial Revolution inherited linear economy, where raw materials are extracted, turned into products, consumed and finally thrown away, is doomed to a deadlock. Indeed, it has now been proven many times that building a more circular economy is not a mere fantasy, but on the contrary a viable solution towards a highly sustainable society. At first, this new restorative model obviously enables to unbundle economic growth and environmental impacts¹. More importantly, as there is no sustainability without wealth, circularity proved to have a significant value creation potential at the macroeconomic level². A recent study estimates that such a shift would increase as much as 7 percentage points of GDP relative to current development model, and yield annual benefits of up to €1.8 trillion by 2030 for the European economy³. Furthermore, most of the related job creations appear to be local ones, therefore with potential positive impacts on employment rates^{4,5}. However, transition towards this circular economy requires some systemic changes⁶ at policy instruments^{7,8}, consumption and firms' levels.

In this respect, implementation by firms of new disruptive circular business models constitutes a key issue to be addressed. Indeed, firms will only have concrete interest in that transition when they will be able to fully capture value out of them. Therefore, we propose in this article a detailed empirical study. It is based on a dozen of cases studies of established

firms, which currently experience such innovation processes. Most of them are European or global leaders, who sought to achieve higher value creation out of one of two common place circular strategies, namely closed and open loops recycling strategies. According to recent literature, different factors play a key role in such strategies such as products characteristics, technologies maturity or market demand⁹. In the paper, we highlight the main patterns they followed when designing and implementing their business models, depending on their strategic goals, the incentives that led them through this innovation process, and some recurring challenges to recycling. We also provide insights about some of the key challenges to these business models innovation processes with a strategic management perspective. As a matter of fact, their success is deeply intermingled to the development of specific new resources, competences and activities, and they as well often require to create and structure new business ecosystems¹⁰, industries and value chains. If the latter are not properly designed, firms will not be capable to capture the entirety of circular economy value creation potential.

At firm level, this patterns and challenges identification aims at giving insights to senior managers willing to scale up from peripheral business models to deeply rooted ones, which constitute the core of their firm value creation mechanisms. On a macroeconomic perspective, this process constitutes a key issue in order to slowly evolve from a disruptive emerging model to a more widespread one on a global scale. This article could also benefit policy makers, whose ability to boost circular economy is directly linked to their understanding of its potential impacts at the business model and value chain levels. Finally, it is also beneficial from an academic standpoint, as circular economy remains under-studied in Management and Strategy fields compared to its growing importance in our contemporary economy.

Methodology

A dozen of case studies were selected, most of them being European or global leaders, who decided to change their business model. They achieved higher circularity by finding effective ways to create and capture value out of recycling. Selected firms were established ones, with long-term existing businesses, and not start-ups. As a matter of fact, such a choice enables to better study the challenges to launch BMI processes and the dynamics that may lead firms to adopt a specific pattern for their business model. Specific attention was also paid to obtain as heterogeneous data as possible, by selecting case studies linked to different wastes flows and recycled materials. In fact, it allows to identify challenges both specific to a recycling path

and more general ones. It also provides useful insights on how the maturity level of a specific material industry, or the organization of a specific wastes flow, can impact a circular business model innovation process. As these business models are proved to be multi-partners ones, heterogeneity was also obtained through selecting actors with different activities and positions in the recycling value chain (see figure 1). Indeed, once they are produced, waste needs to be collected, sorted, massified into more important volumes, without which their preparation cannot be profitable, Later on, recycled materials have to be produced, and ultimately used in new products.



Figure 1: waste management and recycling value chain linkages

Data has mainly been collected through a working group dedicated to “recycling business models characterization”, which has been led by one of the authors at the French “Circular Economy Institute”, and got together different stakeholders (representing industrial and actors of the recycling industry). It has been completed by selected semi-structured interviews of senior managers and the study of secondary data (newspaper articles, official documentation, etc.).

Firms and related core business

Circular business model innovation process

Coca-cola Enterprises – beverage production and distribution	This global actor launched a plastic bottles recycling activity through Infineo, a Joint-Venture it created with APPE, European leader in PET rigid packaging production.
LafargeHolcim - building material production	This global actor launched major new waste management activities in order to source its cement plant.
La Poste - postal services	This French national leader created a new subsidiary, Recy’go, specialized in Office paper wastes collection.
Renault-Nissan Alliance – car manufacturing	This global actor created a subsidiary called “Renault Environment” with partners as Suez Environment. Its different business models encompass own site metal wastes recycling, car recycling and end-of-life material recycling.
Dislaub – agricultural alcohol production	This local French firm turned into an important actor in the solvent recycling market.
Nespresso - coffee capsules and machines business	This global actor launched together with partners an imaginative model in order to foster aluminium and steel flows recycling in municipal wastes.
Plastic Omnium – plastic	This global actor launched a recycled plastic production firm, Plastic Recycling,

components production	together with the French metal recycler DeRichebourg,
Galloo – metal recycling	This European leader launched Galloo Plastics, a new firm specialized in plastic wastes sorting and recycled plastic production.
Arcelor Mittal – steel production	As metal recyclers Galloo and DeRichebourg, this indian owned and World leading actor experienced new metal scraps sorting activities.
Troc.com – second-hand products	This actor, which describes itself as a “second-hand European leader”, is experiencing domestic waste collection activities.
Suez Environnement – waste management	This global leader and its partners created QCP, a new major actor in high quality recycled plastic market.

Table 1: case-studies presentation

What is a Circular Business Model Innovation Process?

Business models are generally understood as the rationale of how firms get organized in order to create, deliver and capture value¹¹. For its part, circular economy is commonly pictured as a new disruptive economic development model. As opposed to our contemporary linear economy, where raw materials are extracted, turned into products, consumed and finally thrown away, the circular economy is associated to the development of a set of closed-loop strategies that enable to unbundle economic growth and environmental impacts¹². Therefore, the notion of circular business model encompasses all the rationales of how firms get organized to create, deliver and capture an at least double economic and environmental, through one or more of the circular economy loop strategies¹³.

These circular business models proved they could potentially be coherent with a firm economic performance. Indeed, they can participate to its competitiveness through production costs cutting. More ambitiously, they can generate additional turnover by penetrating new markets and gaining new customers, and protect corporations against the volatility of raw material prices in traditional markets. Some of these strategies seem to enable improvements of operating profit and profitability. More precisely, the European Commission for instance evaluated a better use of natural resources could relief the European industry from a yearly €630 billion burden in terms of material purchasing costs.

These business models can focus on the different loops which constitute the core strategies of circular economy. At first, firms can implement Performance Economy, which is also called Product-Service System (PSS), by generating revenues from the use of a good, or the performance it reaches, instead of doing it through its sale¹⁴. They can also decide to develop

business models based on its longer loops as reparation, remanufacturing, reuse or recycling. When it comes to recycling, these business models can target either closed loops, when wastes are turned into a recycled material with similar value and/or technical properties, or downcycling and open loops in different products or sectors.

Circular economy, and its related business models and strategies, face several challenges, which have been heavily studied at the firm level by a rich and diverse literature¹⁵¹⁶. Even though the use of the concept only skyrocketed lately, at the beginning of the XXIst century, numerous concepts as industrial ecology¹⁷¹⁸, cradle-to-cradle¹⁹ or performance economy paved its way since the 1970^s. Among other approaches, these challenges have especially been described for closed-loop or reverse supply chains perspectives²⁰²¹. On the contrary, circular business models remain quite a new and under-studied object within the strict scope of Strategic Management field boundaries.

From this Strategy standpoint, a circular business model innovation process occurs when senior managers actions induce a novel way of how to create, deliver and capture economic and environmental value, through one of the core circular economy strategies and by acting one or multiple of the following core elements of his firm business model (see table 2).

Definition elements	Demil and Lecocq (2010)²²	Osterwalder and Pigneur (2010)²³	Frankenberger <i>et al.</i> (2013)²⁴
Create value	Value proposal	Value proposal	What [is proposed to the consumer]? Value proposal
Create value	Internal or external resources Competences Organizational structure	Key competences Resource and competences organization Partnerships	How [value is created]? Activities, processes, resources, capabilities
Deliver value	To whom? Customer segments How? Distribution channels	Customer segments Distribution channels Customer relationship	Who? Customer segments
Capture value	Revenues volume and structure Costs volume and structure	Revenues model Costs structure	Why? Revenues model

Table 2: the core elements to act on in order to generate a new business model

When it happens for the first time, the new activities, resources and competences developed through these recycling oriented circular business model innovation processes give birth to new value chain linkages. These linkages enable a shift from linear to circular value chains (see figure 2).

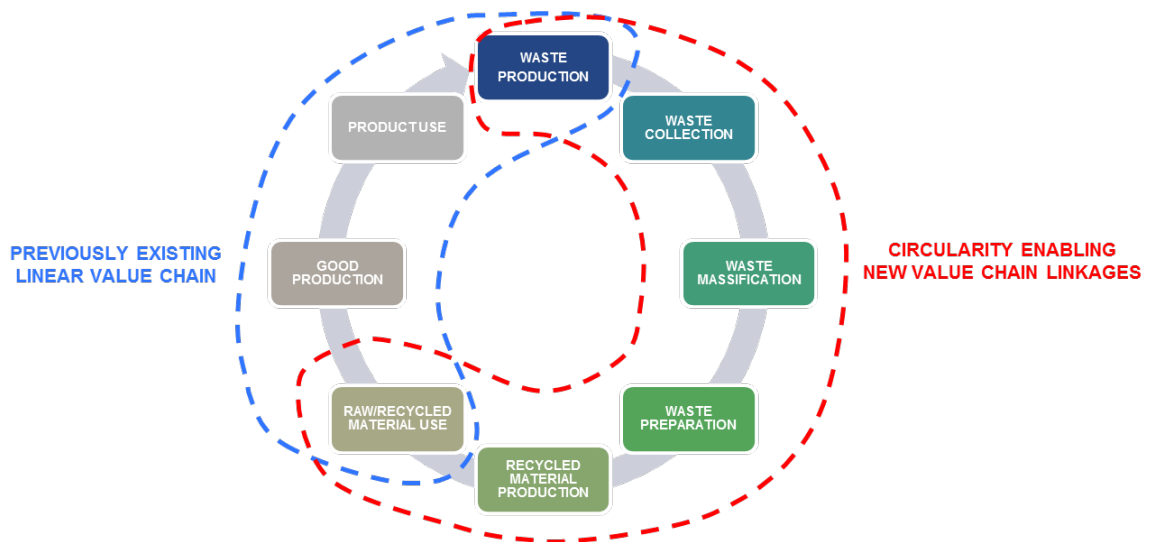


Figure 2: Business Model Innovation, recycling and circular value chains

Which key innovation patterns?

Firms who experimented new disruptive circular business models in order to create and capture new value out of recycling did not follow a single dominant logic²⁵. Part of them chose to integrate new downstream or upstream recycling related activities. Others preferred to source new recycled materials by organizing new value chains, or to reposition the resources they were using in their traditional markets in order to propose new services or products in the recycling market. Another actor opted for a “protective and philanthropic” type of business model, which creates value that is only captured by its partners. At last, some firms combined these different patterns to generate hybrid business models.

Vertical integration

Vertical integration seems to be the most widespread of these patterns. Firms who chose it changed the content of their established business model, by adding new waste management activities through forward or backward integration²⁶ (see figure 3). From each partner perspective, integration can be partial, when the new value chain linkage is created through a common subsidiary by a downstream and an upstream actor. As an example, French corporations such as the metal recycler De Richebourg and the polymer components producer Plastic Omnium own half of Plastic Recycling, the new joint venture they created. On the contrary, Galloo, a metal shredder who is a major competitor of De Richebourg, has created Galloo Plastics, a subsidiary company whose activity is to create value out of the plastic portion of the waste flow, a by-product of the shredding process.

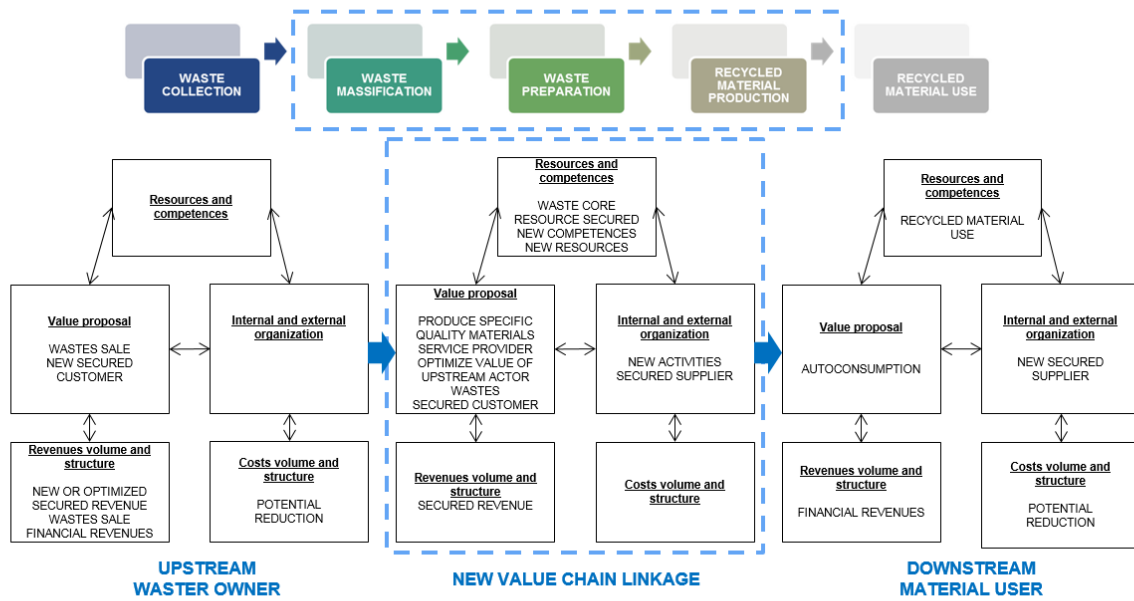


Figure 3: vertical integration representation with RCOV model²⁷

Upstream, from a waste owner perspective, waste which constitutes a source of costs is turned into new or optimized sources of revenues. Firms as De Richebourg or Galloo were for instance facing a decrease of their profitability, due to higher landfilling costs of the ever increasing plastic waste proportion they had to deal with. Eventually, thanks to the changes they implemented in their business models, they generated new revenues, through plastic wastes sales, but also the financial revenues generated by the performance of the newly created subsidiary company. Thanks to this new actor, they succeeded in securing both revenues and consumer demand. Therefore, vertical integration appears as a solution to one of the main challenges of circular economy and recycling, namely the development of a demand for recycled products on a structured market²⁸.

As Plastic Omnium, other large international corporations such as Renault-Nissan Alliance or LafargeHolcim who operate downstream, i.e. closer from end consumer markets, experimented vertical integration strategies. These corporations evolve in highly competitive sectors, for which raw material purchasing represents an important part of their cost structure. For these companies, mastering and developing the competences required to use recycled materials and securing supply for these recycling business represent a key challenge to reduce the dependency over raw materials with volatile prices. In this perspective, developing closed-loops recycling schemes is a promising avenue to secure their supply. Coca-Cola Enterprises (CCE) has developed such a business model based on auto-consumption. They

created a JV with APPE (the European leader in plastic bottles), called Infineo, who provide recycled plastics from Coca-Cola bottles that are used to produce new ones.

In this vertical integration pattern, actors like Plastic Recycling or Infineo, have a comfortable position in terms of sourcing, outlets and competences: sourcing and outlets are secured by the partner situated downstream while competences and equipment are provided by the partner situated upstream. The larger the waste flow and demand for recycled products, the more potential returns on investment can be generated. Thus, it participates to overcome another important hindrance to circular economy, namely high upfront and risky investment that may be required²⁹. These new recycling actors, operating as new value chain linkage, can base their business model on two main value proposals. The first value proposal, typical of the traditional recycling business, can be called “*low quality products/high volume*” proposal. It is based on the maximization of volumes based on the selling of commodities (low quality products). In effect, high volumes are obtained by blending different waste within a large industrial process with high returns. This blending strategy has an impact on product quality, which is low. Such recycled products are sold as commodities on international markets for outlets with poor value. The second option can be called “*high quality/low volumes*”. The search for quality responds to specific demands from customers with higher added value but smaller volumes. Upstream, the focus on quality requires a good sorting of waste to get homogeneous inputs. Downstream, the production of recycling material supposes specific processes and important interactions with customer to ensure the quality and stability of the product with their specific requirements. This quality-oriented approach corresponds to a niche market strategy, particularly adapted to local, closed-loops markets. Most of the strategies listed above, belong to the second category of quality-oriented closed-loops strategies.

Vertical integration pattern provides solutions to many other challenges to circular economy implementation. In effect, secured sourcing enables to control waste flows quantitative and qualitative evolution, which appears to be problematic when a specific and stable recycled material has to be produced out of it³⁰. Finally, it positively impacts information sharing along the value chain, lack of which usually hampers circularity enhancement. Thus, as the Plastic Omnium case exemplifies it, traceability of materials can be higher. The material user exact specifications are also known, which makes it easier to develop appropriate recycled material. More fundamentally, as all value chain linkages are controlled, actors theoretically possess all the competences required to optimize this circular value creation potential.

However, as we will show in a following section, the success of these business model innovation processes can require the actors to develop significant additional competences, which in some cases proved to be a major difficulty.

Sourcing through new value chain organization

Some other firms decided to create and organize new value chains in order to purchase, collect and sort waste, and then turn them into materials responding to their specific need. Two of the studied firms, which also experimented vertical integration, followed this path. Through Renault Environment, Renault-Nissan Alliance sources different wastes from end-of-life vehicles as foam, textiles, polypropylene plastics, copper or platinum group metals, with the explicit goal to set-up closed loops, by turning them into recycled materials and using them in their new vehicles. In a similar way, LafargeHolcim also sources its cement plant with a range of waste flows (rubber, solvent, tires, sewage sludge, rice or coffee husks, etc.) that are collected and prepared in order to fit the Group industrial furnaces strict specifications. Such a circular business model has proved to be particularly profitable for cement producers because industrial sectors face increasing landfilling costs and difficulties to valorize waste in order to meet environmental regulations. Strictly speaking, LafargeHolcim business model is not a recycling one. However, to our opinion, it remains circular. As a matter of fact, it prevents waste, which in most cases could hardly be oriented toward closer loops, to be landfilled. Furthermore, it permits to significantly reduce fossil energies consumption by substituting them with waste with high calorific potential.

In this pattern (*see figure 4*), firms do not necessarily integrate the new value chain linkages, which remain independent firms. On the contrary, they focus on a new activity, we call “*industry engineering*”, in order to organize them. It consists in structuring all necessary steps to transform a waste into a product, namely creating all the specifications to be respected (intermediate product, processes), and to coordinate new sets of partners around them. In effect, today’s materials, both virgin and recycled, are strictly defined products. For instance, Renault has developed a plastic closed-loop for polypropylene that corresponds to a particular grade a vast list of plastic grades. Furthermore, this recycled polypropylene needs to be designed and produced to fit detailed specifications, which depend on the expected function of the component it will be used for. Among these many criteria, it must resist shocks, have esthetical properties, not to be altered by ageing, or offer mechanical resistance.

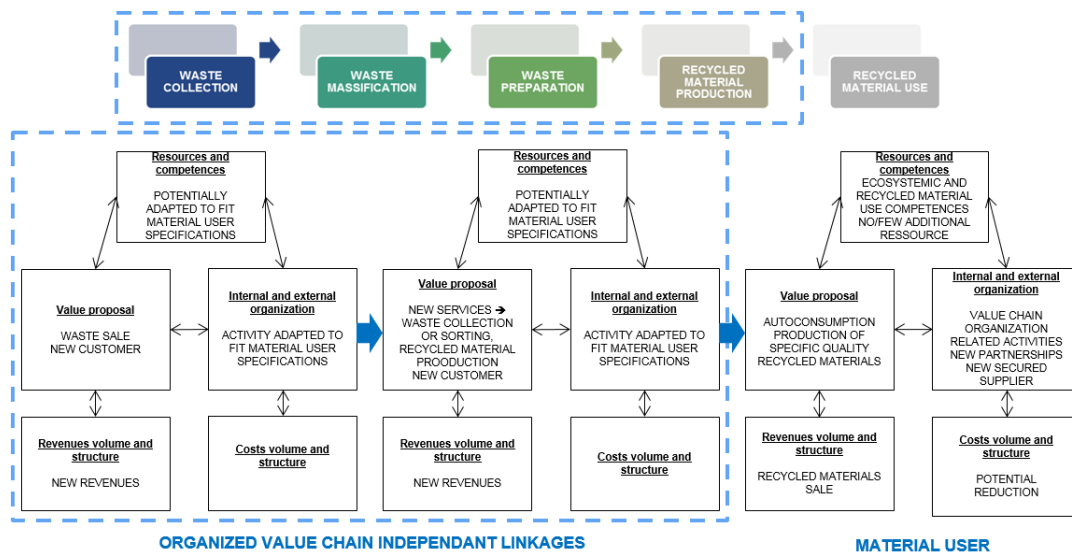


Figure 4: sourcing through value chain organization representation with RCOV model

This business model pattern can be highly collaborative, depending on the number of value chain linkages which have to be coordinated, and the number of actors which are part or the scheme at each of these linkages. For instance, Renault chose to organize several linkages: car dismantlers, which manual disassemble specific material components, collection of these components, sorting of the related materials, and then ultimately recycled material production.

In this pattern, upstream actors can be suppliers, which sell waste or intermediate products, and/or providers of collection, sorting or production services. In their perspective, this scheme offers new both potentially stable consumers and revenues. When it comes to the material user (or downstream corporations), which organizes the value chains, value creation mechanisms resembles the vertical integration scheme ones. New revenues are generated through the sale of recycled materials, in Renault-Nissan case, or of solid recovered fuels, for LafargeHolcim. When a business unit or subsidiary has been developed for that purpose, like for LafargeHolcim with the creation of a business unit (called Lafarge Industrial Ecology International) dedicated to waste sourcing, sales are internal, going from this business unit to customer business units that aim to reduce their supply costs.

This pattern offers numerous advantages. At first, it requires resources mainly limited to the skilled manpower needed to organize the value chain. Therefore, as no important upfront investments are necessary, it is flexible. It is also more likely to receive the initial internal backing, lack of which quite often hampers circular economy related experimentations³¹. Moreover, auto-consumption is beneficial regarding risks. In effect, in addition to securing revenue generation, both recycled material development process and costs can be optimized as firms know their specifications.

On the contrary, organizing circular value chains faces some severe challenges. Indeed, contracts secure relations between partners, and thus enhance the resilience of the value chain³², which is an agreed inhibition factor for circular economy emerging industries. However, these contracts remain less secure than vertical integration pattern equity participation, and therefore constitute a risk. Furthermore, these value chains can be complex, and therefore costly to manage³³, if they are composed of a large number of actors. For instance, a key issue for Renault closed loop business model is the organization of an efficient collection network although end-of-life vehicles are scattered across three thousands of dismantlers in France..

Last but not least, beyond the ability of the material user to use recycled materials, this pattern relies on new competence acquisition about the key challenges each actor faces, in order to be able to structure the new business ecosystem. It requires a long learning process, as the new value chain linkages are not owned by the firm, and thus need sufficient incentives in order to provide access to their competences. These ecosystemic competences are really diverse, and can encompass knowledge about industrial processes to transform the sourced waste, the mapping of potential partners, the identification of the additional competences or resources to be developed, or the conception of financially optimized supply chains, as 50% of a recycled material cost structure can be due to waste collection.

Market repositioning

A third group of firms innovated by repositioning the resources and activities they were using in their traditional market, in order to design new value proposals and propose new products or services to new customers in waste markets (see figure 5). La Poste is the largest French company in mail collection and delivery activities. His example illustrates this “market repositioning” rationale. In his traditional market, La Poste uses different platform facilities to massify mails in each city and neighborhood and organize the delivery of mails up to customers. La Poste understood these activities and resources value creation potential could be enhanced. In effect, the numerous trucks used to deliver mails were almost empty when they came back to the platform. Therefore, as other firms did, he created a new subsidiary, which has been called Recy’go, whose activity was to develop a new business for the truck’s way back travels.

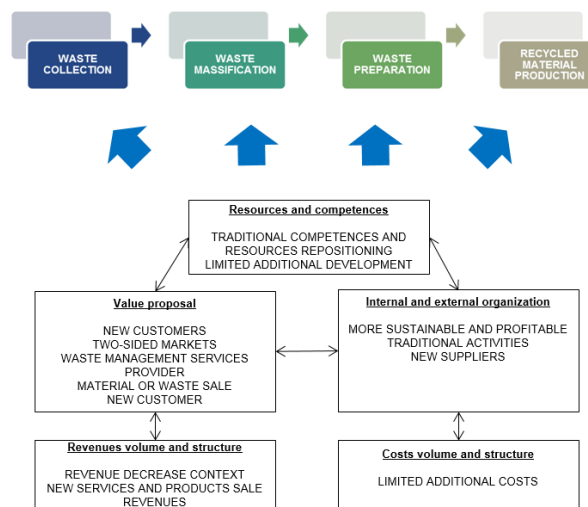


Figure 5: market repositioning pattern representation with RCOV model

Recy’go launched two main new value proposals. At first, he offers paper wastes collection services to small businesses. Indeed, they constitute a typical example of what is commonly nicknamed as “dispersed”, or “scattered” waste flows, namely wastes produced in limited quantities and distant locations. They are the hardest to recycle since, as we already

highlighted, its production costs skyrocket due to too important collection costs. Therefore, for any actor without previous access and revenue linked to these consumers, success of such a business would be unlikely. Furthermore, consumers to which collection service are charged also act as new suppliers of the paper wastes, which enables Recy'go to sell it to paper producers. This new actor capacity to turn into a waste supplier to a recycled material producer can be explained in one word, massification, which also makes this business model a two-sided one. As a matter of facts, small volumes have no interest and would never be bought by recycled materials producers. On the contrary, only massification, which is enabled by collection to a high number of actors on one side, creates value on the other side of the platform, by giving incentives to these producers to buy the related wastes.

Different value chain linkages are targeted by the firms who experimented this business model pattern, depending on the traditional resources and activities in which they were operating. Troc.com example is illustrative. This actor traditional business is furniture reuse. As such, he collects objects, which it eventually sells as second-hand ones to new consumers. Therefore, as La Poste did, he chose to focus on waste collection and massification linkages, for which he does not require totally new resources. However, as his traditional consumers are not small businesses but simple citizens, Troc.com think to target some typical domestic waste flows people store for a long time and eventually want to get rid of.

Dislaub owned different resources in its traditional markets. As a producer of alcohols coming from agricultural goods, his process is made of distillation machines. After being asked by his traditional customers, namely chemical companies, this local actor chose to reposition these resources, and the related competences he had developed, into the solvent recycling market. However, due to its assets characteristics, he focused on different value chain linkages. His distillation machines enabled it to extract impurities out of the used solvents wastes. Therefore, he became European leader as a regenerated solvents producer.

Even though they evolve in different sectors, all the firms who launched this circular business model innovation process had something in common. They were experiencing severe difficulties in their traditional markets, which were declining. Their ability to create revenue, perform well and ultimately maintain a sustainable business was thus endangered. In this context, this business model innovation pattern has offers interesting advantages. Indeed, limited additional resources are needed, as the traditional ones stand at the core of its value creation potential. Moreover, only few new competences, as the market knowledge which will enable it to design adapted services or product, are to be developed, in order to penetrate new growing markets.

Protective philanthropy

Sometimes, companies involved in circular business model innovation are not economically viable, i.e. costs structurally exceed revenues (see figure 6). Even in this situation, for marketing and reputation purposes, companies might decide to implement closed-loops recycling schemes, as it is illustrated by Nespresso³⁴.

Since its creation, Nespresso, a subsidiary company of Nestlé, has got a tremendous commercial success. However, his success has generated an unexpected and controversial side effect: the rise of aluminium capsule waste with poor recycling rates. In effect, the coffee sold by the company to the consumer comes in capsules. After being sent to the dustbin, these small aluminum packages are orientated to municipal wastes sorting centers. However, as they are really small, they are currently evicted from the waste flow to be sorted by a specific sorting process, and in order to properly sort them, a specific new investment would needed. As they only represent negligible percentages of the total flow these centers treat, this upfront investment is doomed not to be a priority. Even though it would generate new revenues, other flows that represent a higher percentage would create much more. Therefore, a material

which is theoretically 100% recyclable seemed doomed to be only limitedly recycled (32%), whereas other light packaging can reach 67% recycling rates. As a consequence, different NGO's have pointed out this environmental problem and exerted strong pressure on Nespresso to develop recyclable capsules instead of the existing ones.

Confronted to this public campaign, with potentially negative effects on the company's reputation, Nespresso experimented an original business model pattern.

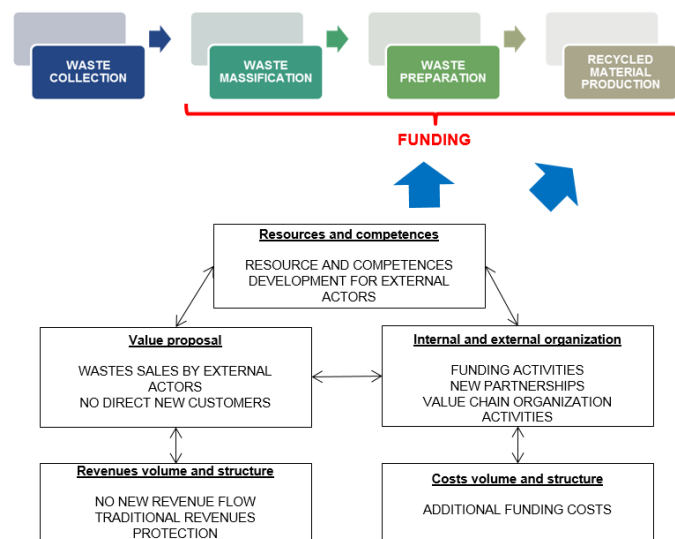


Figure 6: protective philanthropy pattern representation with RCOV model

At first, he set up a new funding activity, which aim was to give an incentive to the sorting centers in order they invest in new sorting processes adapted to small aluminum packaging. By doing so, Nespresso wished to enable them to create more value, even though in a limited proportion, through the sale of a new product, namely aluminum wastes, and the revenues he generated. However, through this experimentation process, the Group discovered two major learnings: 1. other types of small aluminum packaging were facing the same challenge and, 2. Due to technical issues, this non ferrous metal can not be sorted if iron scraps have not been previously sorted. Therefore, Nespresso eventually put together several concerned actors of the packaging industry, and its funding activity was outsourced to a common specific organization. This organization names, CELAA, stands in French for Light Aluminum and

Steel Packaging Club. By gathering all this new funding capacities, this new organization enabled to scale up the business model, and thus to impact a much more significant number of sorting centers in the whole country.

However, as the two previous learnings mentioned above illustrate, experimentation processes were needed in order to understand how to efficiently organize activities in sorting centers. Same statement applies to the additional downstream value chain linkages necessary to turn these metallic wastes into recycled materials. Therefore, value chain organization activities were also set up in order to help sorting centers to create this expertise. As a matter of fact, some of these wastes could directly be oriented toward traditional aluminum recycling industries. On the contrary, other ones, as Nespresso capsules, were recovered varnished or recovered by plastics, which makes impossible to orientate them in usual melting furnaces. Indeed, as they previously did not need that kind of competences, sorting centers did not know what to do with these polluted aluminum wastes. After a three years experimentation process, this value chain organization activity enabled to find long-lasting solutions. Thus, they were sent to pyrolysis, a high temperature process which “cleans” them, and eventually allows their integration to traditional recycled aluminum production industry.

If this business model pattern succeeded in finding solutions to the two previous challenges to circular economy implementation, one question remained to be answered. Why would other actors experiment circular business models which enable to create value, but not to capture part of it? As David Teece stated, when there is no good private business model to capture value, only government intervention, through funding or regulation, or philanthropy can unlock value creation³⁵. However, in this case as potentially in other ones, philanthropic action is somehow also protective. Indeed, by adopting a responsible behavior and significantly improving its products end-of-life treatment, Nespresso and its funding partners protect their brand image. And through brand image, an actor as Nespresso ultimately

protects its ability to generate revenues and capture high margins close to luxury sector standards.

Key challenges to recycling circular business models

Contrarily to traditional views in Strategic Management, who do not consider waste as business issues, but only as sources of costs, all the case studied illustrate patterns of circular business model innovations with related value creation potentials. However, as we have stressed above, multiple challenges need to be addressed before transforming a burden into a source of value.

Competence and resources development

At first, corporations need to develop some competences and resources specific to recycling that, as they were not essential to their previous business model success, were not initially mastered or even identified.

Indeed, some specific competences are to be developed for each value chain position which is targeted, and firms have to develop new linkages that are crucial for a new recycling industry to emerge. This learning process constitutes a critical success factor of these circular business model innovation processes. Even a recycled material user need to acquire knowledge about recycling materials and techniques in order to optimize their use in his products. For instance, among many other parameters, a forming process, which turns a material into a component, often needs to be adapted depending on whether the material is a raw or a recycled one. If this issue is not taken into account at the appropriate moment, it will bring extra-costs which can reduce – or even annihilate - cost savings. Similarly, a large company like Suez Environment, - a world leader in waste treatment, landfill and incineration -, decided to develop downstream recycling activities to capture more value from waste. For that purpose,

they had to acquire new knowledge not only in recycling techniques and markets but also in the plastics industry which is not his core business. QCP, the subsidiary created, had to develop competences about how to source in the waste market, but also about each plastic waste flow. This competence is crucial in order to mix flows in an appropriate manner, which minimizes cost structure through specific waste flows choices, and at the same time attains the exact specifications expected by the industrial customers which will produce components or products out of it. Last but not least, QCP also necessitated to build the plastics industry competences, in order to know which exact additives or reinforcement elements to add to these mixed waste flows to make them fit each client specific needs.

Moreover, most business model patterns lead firms to extend their activity to different value chain linkages that were not previously mastered. As an example, Coca-Cola enterprises, who was essentially focusing on beverages production and distribution, extended through Infineo his activity to plastic bottles production, and upstream recycled material production and waste preparation. To acquire these competences, Coca-Cola developed a partnership with a skilled partner in bottle recycling. Thus, finding skilled partners or developing a new activity are the two options firms may choose. However, as an investment is required, such a choice obviously constitutes a strategic issue, which can not succeed without strong internal support.

However, as we highlighted, many firms eventually decided to internalize these new resources. As such a pattern implies high up-front investments, these actors faced a major challenge, namely to make accepted returns on investment which could in some cases exceed current one to five years expectations.

Furthermore, as circular economy still remains an emerging logic, most of the business model innovation processes are handled by small Business Units, subsidiaries or small project-management teams. In a similar way, most of the reverse supply chains that were designed

remain limited in capacity. As resources dedicated to the recycling business still remain weak, investments, economies of scale and value creation are still limited. Therefore, as LafargeHolcim example shows how circular economy value creation potential could significantly benefit from the scaling-up of these business models. Since cement used to consume huge amounts of fossils, the 1970s oil peak seriously endangered the Group profitability. In this context, he chose to turn calorific waste into a substitution fuel , which resulted in a dominant logic with high value. As a matter of fact, Lafarge Industrial Ecology International Business Unit now bring together more than two thousand people worldwide in this activity.

Value creation and capture improvements

Our study also showed circular business models could create significant value out of waste sourcing and recycling. Indeed, an actor as Lafarge generates margins which amount to several hundreds of millions euros yearly through his new recycling business. Although, his billing remains much less important, an actor like Dislaub conducted a radical change in his business structure. As his solvent recycling activity revenues grew, it literally changed from core business. Nowadays, his ancient business model, namely agricultural alcohol production, represents less than half of his turnover. On the contrary, in a non-negligible number of firms, these new disruptive models seem to be doomed to remain one of many business models, in periphery of the firms' core business.

In these business models, value creation is achieved through the following value proposal: turning a waste flow into a specific quality product. More precisely, it resides in turning a waste flow, or a low or medium quality recycled material one, into a product, namely a recycled material, with precise and higher quality specifications. Companies as Galloo or Arcelor Mittal constitute illustrative examples concerning iron recycling. Both of them stress

that the new value chain linkages, namely new sorting processes and activities, enable to turn a relatively low price and quality recycled material, which name is E40, into diversified products. In the French market, current iron scrap, contains high percentages of copper, which results from nowadays average sorting processes. This waste only fits low quality and price products, as concrete reinforcing bars, which are less exigent in terms of mechanical properties. On the contrary, new value chain linkages, as they have for example been developed by the American steel producer Nucor, enable to detect scrap exact compositions, and to sort them into different flows. Out of the same initial iron waste, a product as “low alloy scrap” can be obtained, and used to produce higher value products as metal sheeting. Scrap flows containing different alloy elements can also be obtained, as iron scrap with copper to be used for the low quality and price products we already mentioned, but potentially also iron scrap with chrome, which can be used to produce higher value stainless steel.

However, in some cases, this new rationale value creation potential can remain limited, or even endangered by the competitiveness of linear models. Indeed, as we mentioned, recycling business models are characterized by fixed costs that are considered to be high compared to those of raw material production, or even linear waste management treatments. These costs particularly impact recycling when raw material prices are low. For instance, raw plastic production benefits from low oil prices, whereas recycled ones are constrained by fixed collection and sorting costs. In a similar way, disposal through landfilling profitability benefits from the limited resources it requires - holes, pollution preventing technologies, etc., compared to recycling industries that coordinate actors with significant investments.

However, this situation could evolve thanks to recent developments. Indeed, we showed that traditional waste management actors as Suez-Environment, which are global leaders, increasingly invest in the recycling market. For instance, QCP targeted production in recycled

plastics is expected to be higher than the previous whole France market capacity. As it happened in the renewable energy sector, these actors are expected to bring economies of scale in addition to volumes, which will inevitably boost their profitability.

Circular value chains creation

At last, our study shows that when they are implemented for the first time, Recycling Circular Business models enable a shift from linear to circular value chains. Indeed, through the new activities, resources and competences they develop, they bridge the gap between end-of-life and the beginning of a new one. These new chains often gather many linkages. As a matter of fact, once they are produced, waste need to be collected, massified into more important volumes, without which their preparation can not be profitable (i.e. notably by sorting). Later on, recycled materials must be produced, and ultimately used in new products. In order to give birth to this systemic dimension, circular business models are generally highly collaborative, which in turn brings some specific challenges.

At first, the sustainability of these business models is intrinsically linked to the capacity of the different firms to appropriately share value along the value chain. In effect, these emerging chains are not necessarily as robust as long-lasting linear ones, and cannot systemically offer immediate solutions as substitutes for raw materials. When value creation is important, this value sharing comes naturally but on the contrary, it can get challenging when the value creation potential of the loop remains to be improved.

Similarly, one of the key challenges to circular business models is to structure new business ecosystems. In strategic management literature, this concept describes how new industries can emerge from the multiplication of interactions between firms which initially belong to different sectors³⁶. As a matter of fact, almost all firms who experimented these new circular models had to cooperate with firms from one or many different sectors outside of their

traditional one. Therefore, in order to be successful, they somehow had to take the leadership in order to understand which were the key success factors at stake. Furthermore, this learning process takes place between actors who have high quality standards, as it is expected from all industrial actors, and other ones, in the end-of-life sector, who are not used to collaborate around such strict prescriptions. Some firms, who chose to integrate vertically end-of-life actors, made this learning process a bit easier. On the contrary, for all the firms who followed other paths, it remains a challenging issue, whose complexity is proportional to the number of value chain linkages to structure.

Conclusion and recommendations for managers and policy makers

Our research highlighted that many firms, from different markets or value chain positions, could benefit from recycling value creation potential, and that they did not follow a single dominant logic when innovating. On the contrary, they experimented many different business model patterns in order to create and capture as much value as possible and, find solutions to challenges traditionally faced by circular economy implementation. Within this innovation process, some key aspects are to be considered by top managers who believe their firm could help take advantage of circular economy, and by doing so participate to its implementation:

- *A scan of current business model elements*: at first, they should clarify which are the key elements of their firm business model, and the main challenges they face, through some instruments as the business model canvas or the RCOV model. As a matter of fact, all the firms who were studied for this research did not invent entirely new patterns. On the contrary, it is through a precise mapping of their own key resources, competences and activities that they identified new the opportunities which could reinforce their traditional business model. If they had done otherwise, being “too far” from their firm identity, one could guess it would

have been much harder to raise sufficient internal support to launch these innovation processes.

- *A scan of the new building blocks to be developed*: a firm whose established business model is linear cannot automatically create value through recycling. On the contrary, all the firms who generated new circular business models had to add several new building blocks to their established one, through new activities, competences, value proposals or customers. Therefore, when initiating such an innovation process, this scan of additional blocks represents a crucial step, which will give the firm a chance to go circular, or condemn its initiative to end in a stalemate.

- *Circular business model experimentation*: even though mapping tools can help strategic thinking and lead top managers to agree on what should happen, the definitive form of a new circular business model cannot be known *ex ante*³⁷. On the contrary, new profitable patterns necessarily constitute *ex-post* results of experimentation processes. Their main goal is to enable collective learning on what to do and not to do, as they will create most of the information required to build a new business model. By this way, top managers maximize their chance to succeed in creating and capturing new profitable business models out of recycling or any other circular economy loop strategy.

A last, our research also highlighted two key policy implications:

- *End-of-life regulations may provide incentive to generate new circular business models*. As a matter of fact, most of the studied firms who went through business model innovation processes were either evolving in sectors targeted by such regulations. Thus, we may estimate that one of the rationale for experimenting circular business models is to moderate the impact of end-of-life regulations.

- *Recycling Circular business models rise and sustainability requires new policy instruments.* Most of the innovation processes we studied have been launched early enough to benefit from the context of high price levels of raw materials that prevailed in the first decade of the XXIth century. Nowadays, the decrease of raw material prices makes it much harder for them to develop profitable and sustainable business models without public support. Therefore, if transition towards a circular economy becomes a first order political target, policy makers should strengthen their effort to adapt current legal frameworks and promote policy instruments aimed at supporting the competitiveness of these new circular business models.

Bibliography

¹ Ellen MacArthur Foundation. (2012). Towards the circular economy: An economic and business rationale for an accelerated transition (1).

² Esposito M., Tse T., & Soufani K. (2015). How companies can benefit from the circular economy? Haas School of Business, University of California Berkeley blog,

http://cmr.berkeley.edu/blog/2015/11/circular_economy/

³ Ellen MacArthur Foundation & McKinsey Center for Business and Environment. (2015). Growth within: A circular economy vision for a competitive Europe.

⁴ WRAP. (2015). Employment and the circular economy: Job creation in a more resource efficient Britain.

⁵ European Commission. (2014). Towards a circular economy: A zero waste programme for Europe. Communication.

⁶ Ellen MacArthur Foundation. (2012). Towards the circular economy: An economic and business rationale for an accelerated transition (1)..

⁷ De Groene Z. (2015). Governments going circular - Global scan best practices.

⁸ Ellen MacArthur Foundation. (2015). Delivering the circular economy: A toolkit for policymakers.

⁹ Bakker, Wang, F., Huisman, J., & Den Hollander, M. (2014). Products that go round: Exploring product life extension through design. *Journal of Cleaner Production*, 69, 10-16.

¹⁰ Lyer, B., Lee, C. H., & Venkatraman, N. (2006). Managing in a small world ecosystem: Some lessons from the software sector. *California Management Review*, 48(3), 28-47.

¹¹ Osterwalder, O., & Pigneur, Y. (2010). Business model generation: A handbook for visionaries, game changers, and challengers. *Wiley*.

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- ¹² Ellen MacArthur Foundation. (2013). Towards the circular economy: Opportunities for the consumer goods sector (2).
- ¹³ Beulque, R., & Aggeri, F. (2015). Circular economy at the glance of business models-learnings from automotive end-of-life - XXIVth AIMS Conference.
- ¹⁴ Stahel, W. R. (1982). The product life factor. An inquiry into the nature of sustainable societies: The role of the private sector. NARC.
- ¹⁵ Ellen MacArthur Foundation. (2013). Towards the circular economy: Opportunities for the consumer goods sector (2).
- ¹⁶ Ellen MacArthur Foundation. (2014). Towards the circular economy: Accelerating the scale-up across global supply chains (3).
- ¹⁷ Frosch, R. A., & Gallopoulos, N. E. (1989). Strategies for manufacturing. *Scientific American*, 261(3), 144-152.
- ¹⁸ Erkman, S. (2004). Vers une écologie industrielle. *ECLM* (137).
- ¹⁹ Braungart, Michael & McDonough William. 2002. Cradle to cradle: Remaking the way we make things. *Rodale Press*.
- ²⁰ Geyer, R., & Jackson, T. (2004). Supply loops and their constraints: The industrial ecology of recycling and reuse. *California Management Review*, 46(2), 55-73.
- ²¹ Thierry, M., Salomon, M., Van Nunen, J., & Van Wassenhove, L. (1995). Strategic issues in product recovery management. *California management review*, 37(2), 114-135.
- ²² Demil, B., & Lecocq, X. (2010). Business model evolution: In search of dynamic consistency. *Long Range Planning*, 43(2), 227-246.
- ²³ Osterwalder, O., & Pigneur, Y. (2010). Business model generation: A handbook for visionaries, game changers, and challengers. *Wiley*.

-
- ²⁴ Frankenberger, K., Weiblen, T., Csik, M., & Gassmann, O. (2013). The 4I-framework of business model innovation: A structured view on process phases and challenges. *International Journal of Product Development*, 18(3/4), 249-273.
- ²⁵ Bettis, R. A., & Prahalad, C. K. (1995). The dominant logic: Retrospective and extension. *Strategic management journal*, 16(1), 5-14.
- ²⁶ Amit, R., & Zott, C. (2012). Creating value through business model innovation. *MIT Sloan Management Review*, 53(3), 41-49.
- ²⁷ Demil, B., & Lecocq, X. (2010). Business model evolution: In search of dynamic consistency. *Long Range Planning*, 43(2), 227-246.
- ²⁸ Van Raak, R., & Loorbach, D. (2014). Context voor bedrijven: meebewegen met de transitie. In D. J. Joustra & M. Schuurman (Eds.), *Ondernemen in de circulaire economie. Nieuwe verdienmodellen voor bedrijven en ondernemers*. Amsterdam.
- ²⁹ Kok, L., Worpel, G., & Ten Wolde, A. (2013). Unleashing the power of the circular economy. Report by IMSA Amsterdam for Circle Economy.
- ³⁰ Adoue C., Beulque R., Carré L., & Couteau J. (2014). Quelles stratégies d'entreprise pour une économie circulaire moteur de croissance? Institut de l'économie circulaire.
- ³¹ Van Ewijk, S. (2014). Three challenges to the circular economy, web article, UCL University central London.
- ³² Ellen MacArthur Foundation & McKinsey Center for Business and Environment. (2015). Growth within: A circular economy vision for a competitive Europe.
- ³³ IMSA. (2014). Circular business models part 1: An introduction to IMSA's circular business model scan.
- ³⁴ Planing, P. (2014). Business model innovation in a circular economy reasons for non-acceptance of circular business models. *Open journal of business model innovation*.

³⁵ Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, 43(2), 172-194.

³⁶ Moore, J.F. (1993). Predators and prey: A new ecology of competition, *Harvard Business Review*, 75–86.

³⁷ Chesbrough, H. (2010). Business model innovation: Opportunities and barriers. *Long Range Planning*, 43(2-3), 354-363.