Defining the Concept of Circular Economy Business Model

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1 Define the concept of Circular Economy Business Model (CEBM)

1.1 Introduction

The goal of the R2π – Transition from Linear to Circular project is to support and develop business models that facilitate the transition towards a circular economy. The project examines the shift from the broad concept of a Circular Economy (CE) to one of Circular Economy Business Models (CEBM). As such, it is necessary to define what the concept of CEBM is to ensure that recommendations are focused on the right outcomes for businesses and policymakers.

The purpose of this section is to establish a working definition of CEBM which will be used to select organisations for case study analysis and development of policy packages. The definition presented here is one that attempts to balance the theory of circular economy with a practical, and practitioner-focused, perspective of business model design.

Our definition of CEBM will be tested through the execution of this project, and will be revisited as we gain learnings and insights.

1.2 Foundations for the concept of CEBM

To establish the overall principle of “what does a circular economy business model look like?”, our definition is grounded in an interpretation of the terms ‘circular economy’ and ‘business model’.

1.2.1 Definition of circular economy outcomes

The definition of circular economy is explored in another report of the R2 π project and not repeated here. The core outcome from the perspective of defining a CEBM is that, within a given system boundary, the business models of organisations within a value chain need to enable the regeneration of finite natural resources and keep products, components and materials at their highest value and utility.

Defining the ‘system boundary’ within which a business model operates is important as it determines the relevant parameters for analysing circular economy outcomes. For the ‘biological nutrient cycle’, these may be local ecosystem boundaries, water basins, etc. For the ‘Technical nutrient cycle’, these may be economic system boundaries such as value chains; industrial sectors; or local/regional/national economies.

The desired outcome is that, at the system level (defined by the system boundary), the input of finite virgin materials is be minimised, and waste outputs be eliminated through cycling. The figure below illustrates this concept, showing six material pathways and ‘cycles’ that are used as a basis for defining what a CEBM should deliver as an outcome.
**Figure 1 Illustration of circular material pathways within a system boundary**

*Source: Carbon Trust*

**Description of key circular pathways**

- **Re-use**: Products are re-used multiple times within their functional life by different end-users.

- **Re-condition**: Fixing of a fault / aesthetic improvement of a product, but with no new/additional warranty on the product as a whole. This includes:
  - Repair – Fixing faults or damage bringing product back to required functioning order
  - Refurbishment – Bringing product back to required aesthetic specifications

- **Re-make**: Also known as ‘remanufacturing’ or ‘reman’, this involves a series of manufacturing steps acting on an end-of-life part or product in order to return it to like-new or better performance, with warranty to match.

- **Re-generate**: Nutrients at end-of-life are returned to the biological cycle, re-generating the source from which they were derived.

- **Circular sourcing**: Sourcing recycled or renewable materials that can be returned to either the technical or biological cycle. This includes:
  - Materials extracted from a product at end-of-life, instead of using virgin materials extracted from finite sources (technical cycle)
  - Using renewable/bio-based materials that can be returned to the biological cycle.

- **Co-product recovery**: Residual or secondary outputs from one process (or value chain) become inputs for another process (or value chain). This includes:
- **Direct use / industrial symbiosis**: Residual outputs or co-products from one process, become feedstock/input for another process, typically among co-located facilities. Proximity is usually a key enabler, as transport costs, environmental impact and distance between facilities would not make this feasible.
- **Indirect use**: Residual outputs (which may otherwise be considered ‘waste’) gain value as a commodity / feedstock for another process (e.g. fly-ash from coal combustion used as clinker for cement). They may be pooled and sold via a secondary market for these materials.

**Resource recovery**: Materials or products at end-of-life are recovered and re-incorporated as inputs into a value chain. Categories include:
- **Closed loop recycling**: The materials at a product’s end-of-life are recovered for re-use within the same value chain. Importantly, the integrity of the materials is maintained, enabling them to cycle multiple times or even indefinitely.
- **Open loop recycling**: Materials at a product’s end-of-life enter a different value chain. Typically, this can only occur once, and is therefore sometimes referred to as a ‘cascade’ rather than a ‘cycle’. This includes:
  - **Up-cycling**: Material or product at end-of-life is used as input for producing a higher-value product (e.g. in fashion or accessories).
  - **Down-cycling**: Material or product at end-of-life is used as input for producing a lower-value product (e.g. conversion of building materials or other products into aggregates for road).

**Waste-to-energy** is often shown in the context of circular economy, and is identified as an area of action within the EU Circular Economy Package. Waste-to-energy is when materials or products at end-of-life are combusted or processed (e.g. pyrolysis; bio-digestion) to produce heat, electricity or fuel. While it enables turning waste into valuable products, it is not included in the above diagram because it typically involves the destruction of raw materials and exiting of nutrients from the system boundary.

### 1.2.2 Definition of ‘Business Model’

In addition to defining the desired circular economy outcome, it is necessary to define the term ‘business model’ and understand how to describe it. Alex Osterwalder’s seminal publication (Osterwalder et al, 2005) and follow-on book ‘Business Model Generation’ (Osterwalder and Pigneur, 2010) provide the following definition:

> A business model describes the rationale of how an organisation creates, delivers and captures value.

*Alex Osterwalder and Yves Pigneur*

Osterwalder describes this using the Business Model Canvas – a framework that creates a common language for understanding and discussing business models. This framework, described below, has been adopted internationally by practitioners in the business world.
The Business Model Canvas consists of nine building blocks that describe the dynamics of a business model: The Value Proposition is the central block – this is what essentially creates value to customers. The four building blocks of the “back stage” are what determine the key elements of an organisation’s operating model and its cost structure. The four building blocks of the “front stage” govern the organisation’s interaction with markets and customers, and its revenue model.

The Business Model Canvas is a tried-and-tested framework, providing a common language for understanding and discussing business models. Given that businesses are the main actors that need to be engaged in order to transition towards a circular economy, the Business Model Canvas is used as the basis for describing circular economy business models.

It should be noted that the outcomes described by the Business Model Canvas framework are measured in financial terms (costs structure and revenue streams). It does not explicitly recognise value created (or destroyed) in environmental, social, and other dimensions such as security of supply, which are essential aspects of the ‘business case’ for circular economy. Nor can this framework be used to map the complexities of material flows.

Various approaches have been proposed to expand or build on the Business Model Canvas (such as Antikainen and Valkokari, 2016; and Mentink, 2014). However, the usefulness of this framework lies in its relative simplicity and flexibility.

Instead, a set of ‘business model patterns’ are defined to describe a CEBM and how it drives the desired circular economy outcomes mentioned above.
1.3 Defining the CEBM concept

Due to the complexity of circular economy concepts, as well as the nomenclature used, it is necessary to balance the theory with a practical, and practitioner-focused, perspective of business model design.

1.3.1 Approaches to defining CEBMs

A number of organisations have proposed classifications or archetypes of ‘circular’ or ‘circular economy’ business models, for example: (see Appendix for a description of each):

- IMSA: Circular Business Model Scan (2015)
- Accenture: Circular Advantage (2014)
- WRAP: Innovative Business Model Map

Accenture provides a good synthesis into five business models. However, some of the business model types encompass two or more potentially very distinct models, such as the business model ‘Product Life Extension’ including both remanufacturing and repair.

At the other end of the spectrum, IMSA identifies nineteen distinct business models. Some of these however are either a production method (e.g. ‘3D printing’); or are an enabling mechanism which doesn’t necessarily characterise an entire business model (e.g. ‘take back management’).

Forum for the Future’s five Circular Business Models omit areas such as remanufacturing, which is a business model with distinct dynamics, and emphasises material cycling (this is mainly a consumer goods focused approach, which may be due to the fact this was developed in collaboration with Unilever). Lastly, WRAP’s classification of business models, though comprehensive, shares a number of the above draw-backs.

1.3.2 CEBM patterns

A ‘business model pattern’ (or archetype) describes a distinct set of business model dynamics. This is used by Osterwalder (2010) in describing different business model strategies employed by organisations (e.g. Google’s ‘multi-sided platform’), and has been further expanded by Gassmann et. al. (2014) in the publication ‘The Business Model Navigator: 55 Models That Will Revolutionise Your Business’.

In order to generate the circular material pathways described above, seven circular economy business model patterns are identified. These are defined based on a set of distinctive business model dynamics and where they lie along a product’s lifecycle, namely:

- **Production**: How products are made and produced.
- **Consumption/use**: How products are consumed or used.
- **End-of life**: How products are managed at end-of-life.
The seven CEBM Patterns are described below. Two of these – the ‘Access’ and ‘Performance’ patterns – are not necessarily circular per se, but significantly enhance the circularity impact and value when combined with other patterns. These can include the concept of product-service systems (or PSS), as described by Tieze (2011), Tucker et al (2004), and Valencia et al (2015).

**Figure 3 Seven CEBM Patterns**

1.3.3 Circular business model elements

Each of the seven CEBM patterns are described by a distinctive combination of key business model elements which produce a circular economy outcome. An organisation will naturally have many more elements that describe the full mechanics and logic of its business model, and these will vary among companies – even those sharing a similar business model (e.g. whether or not they outsource reverse logistics). The focus here, however, is on the essential elements that make a CEBM pattern distinctive. These elements are described and categorised below according to the nine building blocks of the Business Model Canvas.

This approach to using the Business Model Canvas to describe a set of CEBM patterns is an innovation which we put forward in this paper. This will be tested and used in workshops with organisations to develop case studies and business tools.

**Value Proposition elements**

- **LC** Lower (lifetime) Cost: Lower cost of product, or reduced lifetime cost of ownership to an end-user.
- **PX** Performance: Provides outcome and level of performance corresponding to a customer’s ‘job-to-be-done’ (e.g. equipment up-time; output; etc.). Includes product-service system models.
- **AX** Access: Convenience of on-demand availability; flexibility; and greater range of choice. Models include: Pay-as-you-go; rental; leasing.
- **SU** Sustainability: Provides a sustainability-related outcome that is valued by the customer (environmental, social, etc.).
- **CV** Co-value: Value provided to a ‘vertical customer’ outside of the main value chain.
Business Model Front Stage elements

Customer Relationships
- **LT**: Long-term or recurring: Such as a subscription, part of a long-term relationship service, etc.
- **TN**: Transactional: Single sale, one-off transaction.

Customer Segments
- **NC**: New Customer segment: Sale to a different customer segment
- **VC**: Vertical customer: Customer outside of main product value chain

Channels
- **RC**: Re-sale channel: Distinct sales channel, separate from ‘new’ product sales
- **RN**: Return channel: Collection or return channel for product at end of life.
- **SM**: Secondary material Market: Markets for sale of recovered materials (co-products; scrap; recycled, etc.)

Revenue Streams
- **PS**: Product Sale revenue: Sale of product, component, or material (customer-owned)
- **SR**: Service sale Revenue: Sale of service only (no ownership)
- **BR**: Bundled product-service sale Revenue: Sale of product and service bundle (customer-owned)
- **WV**: Waste-as-value: Revenue stream from waste or co-product being used instead of disposed

Business Model Back Stage elements

Key activities
- **DX**: Product design: Design-for-“X” (repair; maintenance; disassembly; remanufacturing; recyclability; material substitution; etc.)
- **RL**: Reverse Logistics: Executed in-house by organisation.
- **SV**: Service provision: Provision of ‘product-as-service’; and/or value-added services (e.g. preventative maintenance, asset diagnostics etc.)

Key Partners
- **CM**: Circular Materials supplier: Supplier of circular materials
- **RL**: Reverse Logistics: Provided by a third party
- **TC**: Technology: Partners providing key technologies.

Key Resources
- **AP**: Asset management Platform: Booking, paying, tracking assets.
- **SP**: Specialised Production process: Specialised processes and facilities (e.g. remanufacturing; 3D manufacturing; etc.)
- **AS**: Assets: Assets or product stock available to provide as a service.

Cost Structure
- **FI**: Financial Incentive: To incentivise take-back or return of product.
- **LA**: Labour: Labour cost
- **MT**: Materials: Materials costs
- **FC**: Financing cost: Cost of customer financing
- **WD**: Waste Disposal: Cost of disposing waste outputs
The figures below use the Business Model Canvas to show how these elements combine to describe the seven CEBM patterns. An organisation may incorporate two or more of these patterns within its business model.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 730378.

## CEBM Pattern: Re-make

### Key Activities

**Specialised Production:** ‘Core’ inspection; and remanufacturing.

**Product design:** Where reman is done by original manufacturer, “design-for-remanufacture” is key to make processes economical.

### Key Resources

**Assets:** Stock of ‘core’ ready for remanufacture.

### Key Partners

**Reverse Logistics:** May partner with third party reverse logistics providers to manage take-back of ‘core’

### Cost Structure

**Financial Incentive:** A Core Deposit is often needed to incentivise return of assets for remanufacture.

**Labour cost:** Typically more labour-intensive and less automated.

**Material costs:** Significantly lower compared with original manufacture.

### Value Proposition

**Lower lifetime cost:** Remanufactured products can be sold at significantly lower price.

### Customer Segments

**New customer segment:** Provides an opportunity to serve new segments who are more price-sensitive but still require quality products.

### Customer relationships

**Long-term:** The aim is to develop close, long-term relationships to ensure parts and products are returned.

### Channels

**Re-sale Channel:** Reman products may be sold under a separate brand, with dedicated channels (e.g. dealer network).

### Revenue Streams

**Product Sale:** Revenues derive from sale of reman parts and products. These could be bundled with a service contract for ongoing servicing and maintenance (not shown in the above model).
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 730378.

CEBM Pattern: Re-condition

Key Activities
Specialised Production: Repair and refurbishment activities.

Key Resources
Assets: Stock is generally low due to fast turnaround and re-sale of items. Specialised Production facilities.

Key Partners
Reverse Logistics: May partner with retailers or other reverse channels for product returns/take-back.

Cost Structure
Financial incentive: Financial incentive (e.g. cash-back or voucher) is often used to enable product take-back.

Value Proposition
Lower lifetime cost: Re-conditioned products are generally sold at significant discount to new, and are often considered ‘second hand’.

Customer Segments
New customer segment: Customer segment is typically different to that which buys new product.

Channels
Re-sale channel: Refurbished/ repaired products generally sold through separate channels to those for new product.

Revenue Streams
Product sale: Revenues derive from sale of items.

Customer relationships
Transactional: Typically transactional.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 730378.

CEBM Pattern: Circular sourcing

Key Activities

Product design: Designing products to use higher levels of recycled content, or substituting more ‘circular’ materials (e.g. bio-based).

Key Resources

Additional resources generally not required.

Key Partners

Circular Materials: Sourcing recycled / circular materials from commodity partners.

Value Proposition

Sustainability: Main value to customers is environmental sustainability of product. Price isn’t necessarily lower than alternatives (and may have a premium).

Cost Structure

Materials: Cost of materials is driven by market price for secondary materials, or raw material cost of bio-based options.

Revenue Streams

Product sale: Product may be priced at a premium to ‘non-circular’ alternatives.

Customer Segments

New customer segment: Potentially new segments of ‘sustainability-conscious’ customers.

Customer relationships

Not necessarily longer-term relationships, but may generate loyalty from customer segments valuing sustainability features.

Channels

May use distinctive channels to reach sustainability-conscious customers if product is sufficiently differentiated.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 730378

CEBM Pattern: Co-product recovery

Key Activities
Processes for capture or recovery of secondary materials from co-product streams.

Key Resources
Plant and equipment for recovery processes, where relevant.

Key Partners
Technology: May include partners for recovery and processing of co-products into secondary materials for sale.

Value Proposition
Co-value: Value to customer includes reliable supply of material; and/or Lower Cost vs. other sources.

Cost Structure
Waste Disposal: Reduction/elimination of own disposal/removal costs which organisation may have to otherwise incur.

Revenue Streams
Waste-as-value: Sale of co-product direct to customer or to secondary material markets.

Customer Segments
Vertical Customer: Customers are in different ‘vertical’ segments. May be commodity companies, or manufacturers.

Customer relationships
Generally transactional relationships. May be long-term within an ‘industrial symbiosis’ arrangement.

Channels
Secondary material Market: Markets for sale of recovered materials (co-products; scrap; recycled, etc.)
CEBM Pattern: Access

Key Activities
- **Service Provision**: Customer service; asset management; etc.
- **Reverse Logistics**: For return of products at end of use cycle.

Key Resources
- **Asset management Platform**: End-user interface for booking and payment; and back-end for asset management.
- **Assets**: Stock of assets to deploy.

Key Partners
- **Technology**: Asset tracking and management may be provided by third parties.

Cost Structure
- **Assets**: Cost of maintaining and insuring assets, and having working capital tied up.
- **Asset management Platform**: Cost of running the platform, third party service provision.

Value Proposition
- **Access**: Convenience of on-demand availability; flexibility; and greater range of choice. Models include: Pay-as-you-go; rental; leasing.
- **Lower cost**: Turns ‘fixed’ into ‘variable’ cost.

Customer Segments
- **New customer segment**: Potentially unlocks new customer segments by providing new value proposition.

Customer relationships
- **Long-term**: Generally longer-term relationship, directly with end-user (e.g. eliminating intermediaries).

Channels
- **Asset management Platform**: End-users reached via technology platform (e.g. mobile and/or web app).

Revenue Streams
- **Service Revenue**: Recurring service revenues (previously owned product may be considered to now be ‘servicised’). Revenue model is generally that of a service, potentially with add-on ‘consumables’.
**CEBM Pattern: Performance**

**Key Activities**

*Service provision:* Providing services to ensure guaranteed service level agreement (SLA). May include: diagnostics and performance reporting; preventative maintenance; upgrades; repair/maintenance; etc.

**Key Resources**

*Asset management Platform:* Technology platform for remote management of asset performance.

**Key Partners**

*Technology:* Asset management technology and services may be provided by third parties.

**Value Proposition**

*Performance:* Provides outcome and level of performance corresponding to a customer’s ‘job-to-be-done’ (e.g. equipment up-time; output; etc.). Includes product-service system models.

**Cost Structure**

*Asset management Platform:* Cost of running the platform, third party service provision.

**Revenue Streams**

*Bundled product and service Revenue:* Recurring service revenues and bundled equipment sale; OR

*Service Revenue:* Recurring service revenues under fully ‘servicised’ model.

**Customer Segments**

Usually an enhance value proposition to existing customer segments.

**Customer relationships**

Long-term: Generally long-term contractual relationships (vs. sale of equipment)

**Channels**

Customers can be reached through existing channels.
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 730378.

CEBM Pattern: Resource recovery

Key Activities

Reverse Logistics: Recovery of materials at end-of-life.

Key Resources

Plant and equipment for recovery processes, where relevant. This may be outsourced to a Key Partner.

Key Partners

Reverse Logistics: Partners in the reverse-logistics chain – e.g., waste management; municipalities; etc.

Value Proposition

Sustainability: Environmental sustainability of recovered material.
Lower cost: May be priced at a discount to virgin materials on secondary markets.

Customer Segments

Vertical Customer: Customers may be in different ‘vertical’ segments; or secondary material commodity companies. May include internal Procurement customer in a fully closed-loop model.

Customer relationships

Generally transactional relationships.

Channels

Secondary material Market: Markets for sale of recovered materials (scrap; recycled, etc.).

Revenue Streams

Waste as value: Sale of recovered material direct to customer (may be internal Procurement customer if fully closed-loop) or to secondary material markets.

Cost Structure

Waste Disposal: Reduction/elimination of own disposal costs which organisation may have to otherwise incur.
1.4 A working definition of CEBM

In summary, a CEBM can be recognised through the way it adopts one or more distinctive business model patterns. These patterns are derived from a combination of elements which enable a business model to achieve circular economy outcomes (the ‘circular pathways’ described above).

At the most fundamental level, a circular economy business model is one which creates, delivers, and captures value in a manner that is compatible with and enables regeneration of finite natural resources, and keeps products, components and materials at their highest value and utility within a relevant system boundary.
2 Appendix

Accenture classification of circular business models (Lacey, 2014)

IMSA classification of circular business models (Van Renswoude, 2015)

1. Short cycle
   1. Pay per use
   2. Repair
   3. Waste reduction
   4. Sharing platforms
   5. Progressive purchase

2. Long cycle
   6. Performance based contracting
   7. Take back management
   8. Next life sales
   9. Refurbish & resell

3. Cascades
   10. Upcycle
   11. Recycling (waste handling & repurpose)
   12. Collaborative production

4. Pure circles
   13. Cradle to cradle
   14. Circular sourcing

5. Dematerialized services
   15. Physical to virtual
   16. Subscription based rental

6. Produce on demand
   17. Produce on order
   18. 3D printing
   19. Customer vote (design)
WRAP classification – ‘Innovative Business Models Map’ (WRAP)

**Service systems**
- Providing a service system based on an existing product to extend lifetime and optimise performance.
- Dematerialised services - Providing a service to provide product benefits where the 'physical' product does not exist at all at the point of use.

**Hire & leasing**
- Long-term leasing of products to users with a linked service to extend life and optimise performance.
- Short-term rental of vehicles located at strategic points around major cities. Cheaper than car ownership for the users. Maximises asset utilisation.
- Peer to Peer - Rental of products between members of the public or between businesses. Gains an income for the product owner and cheaper access to a product for the renter.
- Conventional hire of a product for a short time - enables access to better products without full cost payment.
- Long-term hire of products linked to mobile communications service.

**Incentivised return**
- Incentivised return - Encourages customers to return used items for an agreed value. Customers gain value for unwanted items and recycle products via a convenient system. Collected products are refurbished and sold for re-use on appropriate markets.
- Incentivised return - Remanufacturing of engines for major plant to extend its lifetime. Cheaper than full engine replacement for customers and reduces quantity of materials required to keep an asset running.
- Collection of used products to ensure they are passed on to an appropriate re-use system.
Re-use
- Reducing consumption - Employer pays employee to buy a computer for use at work and at home, along with a support package. Reduces quantity of products required to meet market need, reducing number of work computers lost and improving employee motivation.
- Asset Management - Collection, refurbishing and re-sale of used products. Reduces the quantity of raw materials required to meet the market need.

Long life
- Peer-to-peer - Online exchange of products between householders with feedback system. Reduces cost of clothing ownership, extends active life and provides users with access to a wide range of products.
- Long Life - Products are designed to have a long life time with durability, reducing consumption.

Other
- Made to order - Production is managed to minimise material requirements and avoid potential losses from over-stocking products.

Forum for the Future and Unilever classification of circular business model archetypes (2016)

<table>
<thead>
<tr>
<th>1. closed loop recycling</th>
<th>2. downcycling</th>
<th>3. upcycling</th>
<th>4. industrial symbiosis</th>
<th>5. collection services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using recycled products as raw materials to manufacture new products</td>
<td>Turning materials from one or more used products into a new product with less quality.</td>
<td>Turning materials from one or more used products into a new product, implying an improvement in quality.</td>
<td>Sharing services, utilities and co-productions among industries to improve resource efficiency.</td>
<td>Providing a service to collect old or used products.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>6. product service system</th>
<th>7. lock-in</th>
<th>8. local loop</th>
<th>9. modularity</th>
<th>10. personalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client is not the focus on owning or selling an item but a product only. This leads to a mismatch of ownership between products and services that are required to fulfill a user’s needs together.</td>
<td>An actor that encourages consumption to pay for using a specific product or service on a regular basis.</td>
<td>As production processes are intensified and the demand on the business for raw materials, the cost manufacturing loop becomes closed and benefits clustering of industries.</td>
<td>A design that evolves a product in an organic way that can be independently created, used and repaired.</td>
<td>A design that evolves a product in an organic way that can be independently created, used and repaired. Company values data management capabilities and the ability to product contextualisation.</td>
</tr>
</tbody>
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3 References


