CE100

WASTE NOT, WANT NOT.

CAPTURING THE VALUE OF THE CIRCULAR ECONOMY THROUGH REVERSE LOGISTICS

AN INTRODUCTION TO THE REVERSE LOGISTICS MATURITY MODEL

IN COOPERATION WITH:

Cranfield UNIVERSITY

Deutsche Post DHL Group

Preface

The economic case for the circular economy is motivating first movers around the world to capture the value of business models that are restorative and regenerative by design. Rethinking value creation by applying a circular approach, enabled by the coming of age of information technologies, is gaining traction both at corporate and policymakers level.

Yet the linear "take-make-dispose" economy remains pervasive: disrupting linear production and consumption patterns and establishing circular models requires multi-stakeholder action and effort, now and into the future. Collaboration is key.

As part of the Circular Economy 100, a cross-industry and multi-disciplinary platform, several global, circular-minded companies, Deutsche Post DHL Group among them, have identified both a knowledge and performance gap regarding one of the key circular economy enablers: reverse logistics.

To address this need, Deutsche Post DHL Group and Cranfield University joined forces with selected CE100 member companies to develop a model for assessing and improving reverse logistics' processes across product groups and even related sectors. Based on company interviews, exploratory workshops, applied logistics expertise and scientific method, the Reverse Logistics Maturity Model presented in the pages that follow provides a roadmap for meeting the challenges of reverse logistics – from complexity and regulatory requirements to the dilemma of return forecasting – and devising effective return management programs.

By providing a common framework and approach for tackling perhaps one of the most challenging tasks in the circular economy, namely the organization of reverse logistics, the model makes a valuable contribution towards mainstreaming the circular economy.

ANDREW MORLET

CHIEF EXECUTIVE, ELLEN MACARTHUR FOUNDATION

PROF. SIMON POLLARD

PRO-VICE-CHANCELLOR, ENERGY, ENVIRONMENT AND AGRIFOOD, CRANFIELD UNIVERSITY

FRANK APPEL

CEO, DEUTSCHE POST DHL GROUP

Going circular

The traditional linear "take, make, dispose" economy is proving risky business. This one-way pattern of production and consumption, historically a generator of unprecedented growth, has us on course for resource depletion. For companies, this means supply disruptions, surging price volatility, and supply chain risks. In the face of such challenges, levers such as increasing efficiency are becoming more and more ineffective.

The need to rethink materials and energy use has led to circular economy thinking. Defined as "restorative and regenerative by intention and design", a circular economy seeks to respect planetary boundaries through increasing the share of renewable or recyclable resources while reducing the consumption of raw materials and energy. It replaces the "end-of-life" concept with restoration and decouples revenue from material input.[1]

Business leaders have realized, for instance, that shifting to a more circular model can ensure the resilience of value chains and secures supply stability. On the demand side, the circular economy creates revenue through new business models, drives market differentiation, improves products and increases customer satisfaction. Non-economic motivators for going circular include demonstrating corporate responsibility, attracting talent, complying with regulations and supporting the innovation agenda.

The specter of complexity

The argument for transitioning to a circular economy has long left the realm of sheer theory. Now a high-traction topic among business leaders and thinkers across the economy, circular economy thinking has begun to drive the development of circular business models in a variety of industries.

So what's standing in the way of scaling up the circular economy and making it mainstream?

Perhaps the most daunting obstacle is the complexity of managing the circular economy value chain, which involves managing the return, recovery and remarketing of varying product models fed into the circular cycle at varying times and in varying conditions – this makes predictability a key challenge. Also, insufficient attention has been paid to the understanding of one of the circular economy's key building blocks: reverse logistics. This includes requirements such as asset tracking, optimized product and material flows and waste handling regulations. Preserving the residual value of return products is also a challenge that is answered only by highly optimized logistics.

Logistics closes the loop

Logistics is a major enabler when it comes to overcoming those challenges and scaling-up implementation of circular economy approaches across industries. Just as important as forward logistics, which powers global trade through the transport of materials, goods and information from start to (literally) finish, is reverse logistics.

1 Sources: Ellen MacArthur Foundation "Towards the circular economy – Economic and business rationale for an accelerated transition" 2013; European Environment Agency "Circular Economy in Europe" 2016

It is a key step in capturing the value of end-of-life goods and facilitating the reuse and recycle pillars of the circular model. This covers not only the collection and transport of materials and products but value-added activities such as testing, sorting, refurbishing, recycling and redistribution.[2]

Logistics can drive the circular flow of goods, link markets and provide transparency across supply chains, no matter how complex. This makes logistics companies – especially those with a global network, infrastructure and expertise in reverse logistics – key enablers for accelerating the scale-up of the circular economy.

Understanding the circular economy value chain

By introducing reuse, repair, remanufacturing and recycling, the linear value chain becomes circular. The circular approach is enabled at the design stage, with products being designed considering extended life, refurbishment, remanufacture and materials recovery. The production process switches from using raw materials to using remanufactured components and recycled materials. Such a circular value chain requires an established return management program supported by optimized reverse logistics solutions and related infrastructure.

Roadmap for unlocking the value of the circular economy through reverse logistics

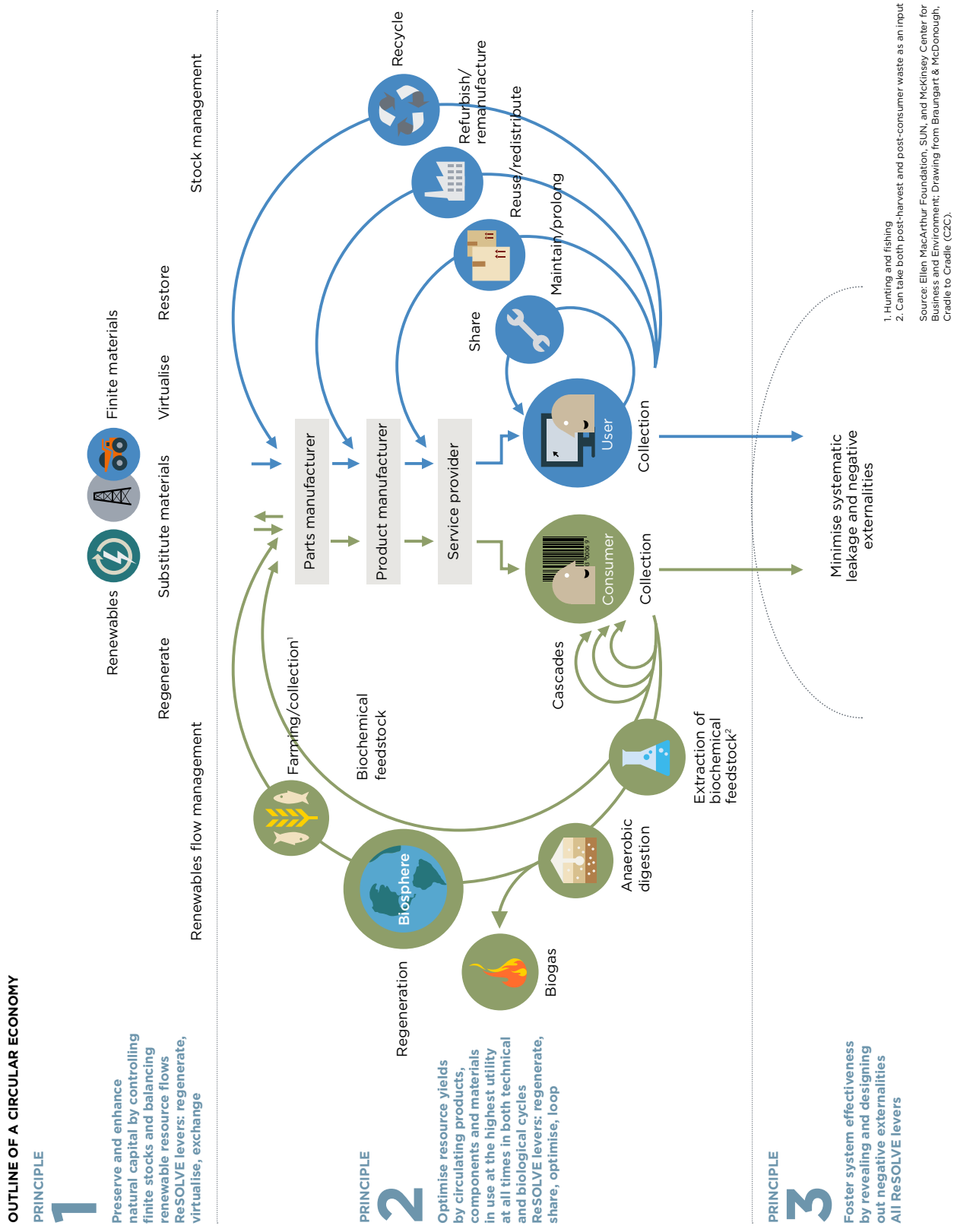
Companies who want to join the circular economy and expand their supply chain to include the return of used products and materials for recovery must understand the requirements and maturity of their reverse logistics infrastructure. The Reverse Logistics Maturity Model (RLMM) presented in this paper was developed to support companies on that path.

The model describes the characteristics of successful reverse logistics processes across multiple dimensions. Companies with all different levels of experience in circular economy will find the model valuable to review, develop and refine existing or planned return management processes. The RLMM provides a unique and powerful tool that guides companies in:

- ✓ Understanding requirements for return management and reverse logistics according to product archetypes
- ✓ Assessing the maturity of planned or existing return management processes
- ✓ Improving reverse logistics to increase efficiency and enable optimized recovery and remarketing
- ✓ Establishing integrated logistics and increasing supply chain resilience as a result
- ✓ Increasing transparency on returned products and related secondary markets demand
- ✓ Strengthening and scaling-up a company's circular approach to leverage market potential

2 Source: DHL Trend Report "Fair and Responsible Logistics", November 2015

FIGURE 1: CIRCULAR ECONOMY VALUE CHAIN[3]



3 Source: Ellen MacArthur Foundation

Reverse Logistics Maturity Model (RLMM)

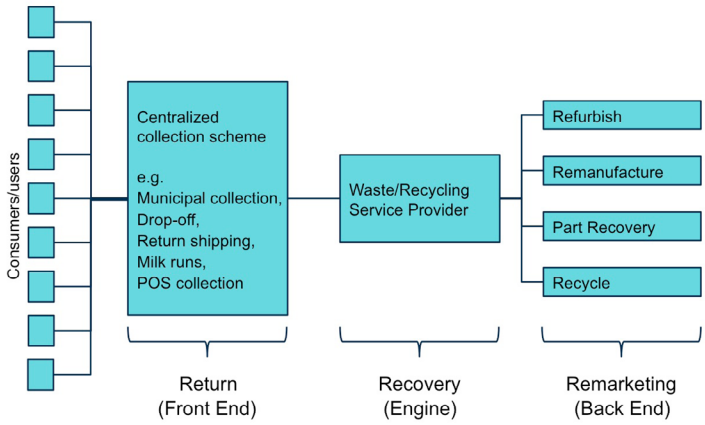
Homing in on reverse logistics needs and key success drivers

There is no one way when it comes to going – and staying – circular. Return management systems, and by the same token, reverse logistics requirements, vary based on product and business model attributes. While many roads lead to Rome, as part of the Reverse Logistics Maturity Model, we have distilled three demand-driven archetypes based on product type.

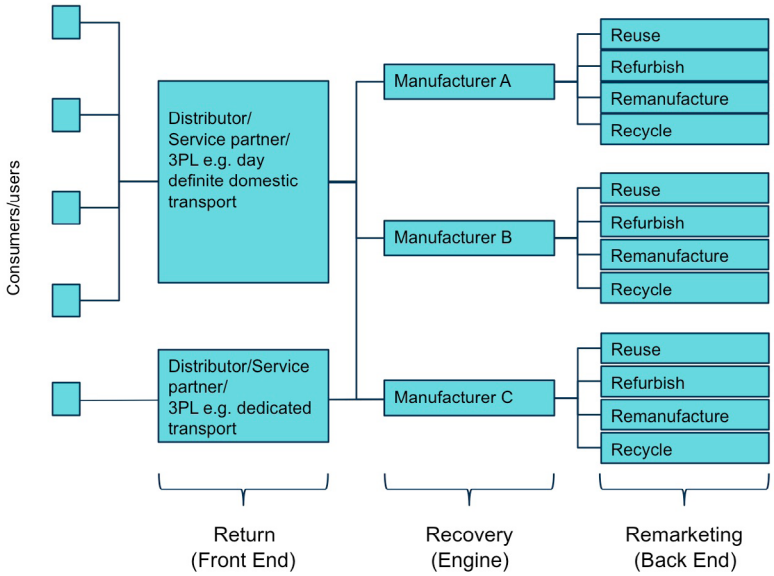
Each archetype places different demands on reverse logistics set-ups, and each archetype has its own set of success criteria. So the first step for any company looking to tap its circular potential is to understand its products in terms of the archetypes presented here. The very same company might need to look into two or three different archetypes, depending on the product portfolio.

For ease of use, the archetypes are introduced in terms of the following information: **product attributes** and **examples**, reverse logistics **requirements and implications**, the **prototypical RL solution** along the main components of the circular supply chain (return, recovery and remarketing), and **key success factors** broken down into the **key levers** of network design, incentivizing returns, and remarketing capabilities.

ARCHETYPE 1: Low value extended producer responsibility

Product attributes	• Mass production • Distribution via retail networks • Comparably low residual value at the end of (generally first) product life cycle
Product examples	• Tires • Shipping pallets • Consumer electronics
Reverse logistics requirements/ implications	• Subject to increasing Extended Producer Responsibility legislation (especially consumer electronics) • Maximize return volumes and standardize the reverse logistics process for best value retention at minimum costs
Prototypical reverse logistics solution	Centralized collection scheme with consolidated handling of the returned products through a recovery service provider: 
Key success factor: Realizing economies of scale	
Reverse logistics network design	• Consolidating return products for a cost-effective collection from large geographical areas • Leveraging existing and under-used forward logistics network capacities to enable recovery of returned goods and waste (e.g. packaging) • Adapting reverse logistics solutions to different geographical areas and regional conditions (market conditions, regulations, cultural aspects) to be effective
Incentivizing returns	• Building capability to recover different brands' products as well as similar product types • Establishing collaboration programs to increase return volumes • Implementing incentives for consumers to return products (including ease of access and transparency on drop points)
Recovery/ Remarketing capability	• Pre-sorting products to limit the reverse logistics flow to usable materials only • Outsourcing the processing of returned products to recycling providers for secondary market purpose beyond own company's business model

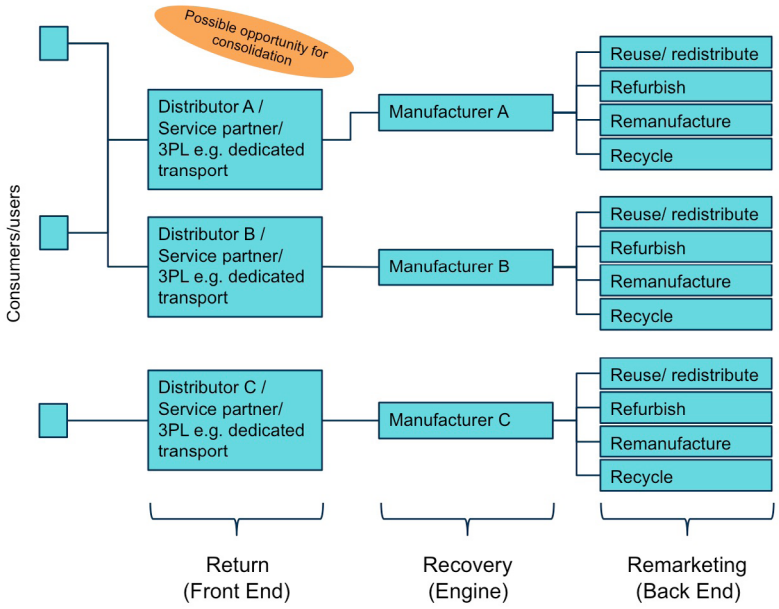
ARCHETYPE 2: Service parts logistics

Product attributes	• Comparably higher residual value with moderate expected return rates • Often needed to ensure smooth production or service provision
Product examples	• Machinery • Automotive parts
Reverse logistics requirements/ implications	• Should combine the return of used parts with the supply of new or refurbished parts to allow for a seamless replacement of service parts • Optimized transport flows
Prototypical reverse logistics solution	Service partner collects parts from different customers or collection through customer-dedicated transports: 

Key success factor: Combination of pick-up of to-be-replaced parts with the delivery and installation of new or refurbished service parts

Reverse logistics network design	• Tracking of service parts and their condition during use phase for return and replacement planning • Leveraging capacities in combining delivery of new service parts with pick-up of return parts and packaging
Incentivizing returns	• Partnering with logistics providers for an integrated delivery and reverse logistics • Enable an easy return/ exchange of service parts for customers
Recovery/ Remarketing capability	• Expanding transport to additional logistics services such as de-/ installation or packaging • Outsourcing the processing of returned products to remanufacturers and recycling providers for secondary market purposes beyond original, new OEM parts sales

ARCHETYPE 3: Advanced industrial products

Product attributes	• Comparably complex • High residual value with relatively low return volumes
Product examples	• Information and communication technology (ICT) • Medical equipment
Reverse logistics requirements/ implications	• High-touch requirements vis-à-vis safety, accountability and careful handling of the return products • Must preserve and maximize the product return value • Collection should be combined with the replacement of the asset by a new or refurbished product, as the respective products are often crucial for key operations processes
Prototypical reverse logistics solution	Direct or trusted collection through the service partner: 
Key success factor: Transparency and trusted or direct return	
Reverse logistics network design	• Establish forecast and inventory control for return items to enable fast redeployment or resale • Asset and condition tracking during use and return • Proper handling and packaging of to be returned assets • Leveraging capacities in combining delivery of new industrial product with pick-up of return product and packaging
Incentivizing returns	• Partnering with logistics providers for an integrated delivery and reverse logistics • Direct or trusted delivery and return for customers
Recovery/ Remarketing capability	• Expanding transport to additional logistics services such as de-/ installation or packaging • Leverage results from asset and condition tracking for product design and production planning

Defining reverse logistics components

Having understood how different archetypes drive logistics requirements, we can look at the circular economy value chain components that are relevant for reverse logistics. To support a structured and modular assessment, the RLMM focuses on three key components: Front end, engine and back end.

The **front end** includes reverse logistics processes and network, with related planning and monitoring.

The **engine** refers to the recovery of returned products, including recovery strategy, inventory control, and material evaluation.

The **back end** refers to remarketing the recovered products in secondary markets, ranging from related market development and planning, to monitoring of recovered products.

Reverse logistics design requires a holistic approach. This is why engine and back end components – aspects that go beyond strict reverse logistics – are included in the RLMM. This integrative approach supports the shift from process management perspective to a comprehensive business model perspective.[4]

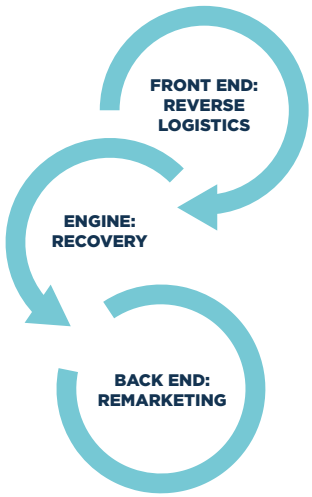


FIGURE 2 REVERSE LOGISTICS COMPONENTS

Each of the three RLMM components is measured across three dimensions that reflect various decision making levels within a company: strategic, tactical and performance. This structure enables businesses to build the needed capabilities to address return, recovery and remarketing goals at strategic and tactical level while providing related performance objectives to support the monitoring of a return management's planning and execution.

For the **front end**'s strategic dimension, the model looks at reverse logistics strategy maturity, its main drivers, as well as business and functional integration. On the tactical dimension the model considers the reverse logistics network structure and planning, and the definition of requirements and objectives for products return. The front end's performance dimension is measuring the responsiveness and visibility of returned items within the reverse logistics flow.

For the **engine**'s strategic dimension, the model captures recovery strategy and how it is aligned with business goals. Within the tactical dimension the model helps to assess the inventory control process for returned materials. The performance dimension looks at the returned material evaluation process and how it affects the recovery process and product design.

For the **back end** component at the strategic dimension, the model evaluates the business knowledge for product remarketing at secondary markets. The back end's tactical dimension covers remarketing planning and pricing for recovered products. The performance dimension of this component is targeted at assessing availability and use of secondary markets' demand and remarketing data.

4 The Evolution of Closed-Loop Supply Chain Research, Guide and Van Wassenhove, OR Forum, IN-FORMS, 2009.

RLMM component	Decision dimension	Areas to assess
Front End	Strategic	Reverse logistics strategy
	Tactical	Reverse logistics network structure
	Performance	Responsiveness and visibility of items in RL flow
Engine	Strategic	Recovery strategy
	Tactical	Returned products inventory control
	Performance	Returned material evaluation
Back End	Strategic	Remarketing in secondary markets
	Tactical	Remarketing planning for secondary markets
	Performance	Remarketing data

TABLE 1 SUMMARY OF RLMM COMPONENTS AND DIMENSIONS

Using the RLMM to gauge reverse logistics processes maturity

The RLMM considers five maturity levels[5] to assess maturity across reverse logistics (front end), recovery (engine) and remarketing (back end). These levels are considering project and process management stages, widely used for continuous process improvement.

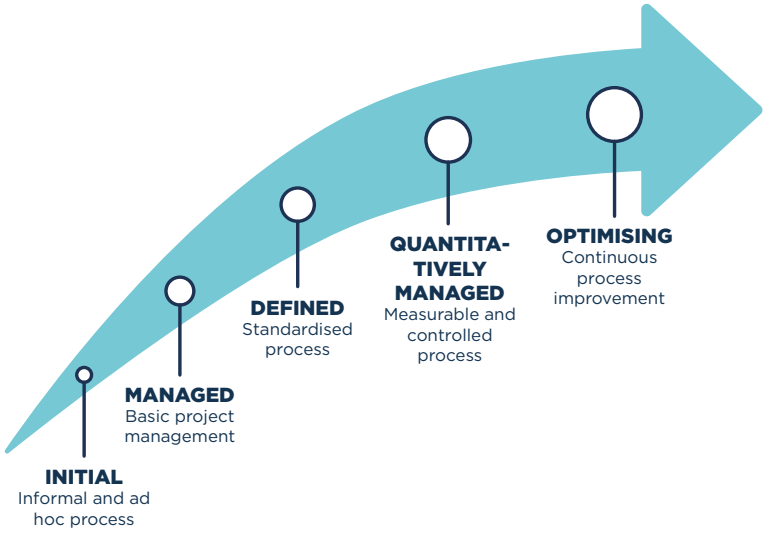


FIGURE 3: MATURITY LEVELS

5 Source: Levels based on the Capability Maturity Model Integration (CMMI) version 1.2 (2006)

How to apply the RLMM...

Companies wishing to assess their reverse logistics' maturity as a way to begin scaling-up their circular capabilities can apply the RLMM as follows:

1. Select a product/ product group to assess
2. Identify archetype
3. Consider all functions, partners and stakeholders who depend on/control the reverse logistics process
4. Map RLMM components (front end, engine, back end)
5. Map decision making levels (strategic, tactical, performance)
6. Assess maturity by matching the respective current level of maturity across each RL component and within each dimension
7. Identify and select focus areas for improvement

... and move to the next level of circularity

After mapping the maturity of their reverse logistics processes, companies are ready for the final and most important step of the assessment process: identifying issues and selecting focus areas of improvement.

The Reverse Logistics Maturity Model helps companies to understand how to improve overall return management and related reverse logistics. Therefore, it is important to advance step-by-step to the continuous improvement level. Considering all maturity levels helps to build-up capabilities for a return management that is fully integrated into the corporate business strategy. At the same time, the RLMM assessment results can be used to identify bottlenecks or underperforming areas and address them.

Thus, the RLMM helps to effectively direct resources and capabilities to improve reverse logistics and thus enable and drive the return and recovery of products and materials.

RLMM results for different products or product groups can also be compared to identify and adapt best practices that have already proven successful. This approach helps to compare the value created by best practices and to evaluate the benefits of moving from one level to the next. If available, results can also be compared to leading companies across different industries. It is important that the measures selected to improve reverse logistics' maturity are in line with the return and overall business strategy. This helps to overcome implementation challenges.

Outlook: Scaling-up the circular economy

Collaboration is key at all levels of the circular economy, starting with driving insight and circular capacity building through knowledge sharing. The Reverse Logistics Maturity Model is one such example.

The model is an important first step in scaling-up circular economy solutions as it deepens the understanding of one of the circular economy's core enablers: reverse logistics. Companies new to implementing circular economy principles can use the model to establish robust and effective strategies and systems for return management right from the start. Others can use it to drive the continuous improvement of return and recovery processes already in place.

To scale-up the circular economy approach and tap future potential, further collaboration and integration of innovations is required. Return of products and recovery will be dependent on joint solutions. Thus, trends such as the Internet of Things can accelerate a transition to a circular economy. Combining intelligent assets with logistics infrastructure will enable asset tracking during the use phase and facilitate product return as well as recovery planning.

Logistics, as it turns out, plays a key role at every collaborative moment along the path to circularity. It can help to increase value chain transparency for a single customer and consolidate material streams to scale-up circularity within an industry.

Companies that understand the role of logistics and the complexities of reverse logistics in particular will help unleash the power and promise of the circular economy, bringing benefit to all.

The Reverse Logistics Maturity Model

		Initial level (Process informal and ad hoc)	Managed level (Basic project management)
Front end (reverse logistics)	**Strategic dimension**	Standalone RL with business goals limited to cost minimization.	Basic strategy in place to manage RL.
	Tactical dimension	RL network is not well defined and is managed reactively.	RL network is planned and established.
	Performance dimension	Items are collected with no record of lead time, return rate and volume.	Items are collected and traditional measurements are available (lead time, return rate and volume).
Engine (recovery)	**Strategic dimension**	Assets recovery program in operation but not directly aligned with strategy.	Recovery strategy in place based on economic and technical viability of recovery options.
	Tactical dimension	Inventory control for returned products is unstable.	Returned products inventory control is planned and visible to management.
	Performance dimension	Returned material data not or only partly in place (quantitative and qualitative).	Process in place to measure returned material data.
Back end (remarketing)	**Strategic dimension**	Knowledge about secondary markets for recovered assets is not in place.	Knowledge on secondary markets is available and understood.
	Tactical dimension	Remarketing planning and pricing are not well established.	Remarketing planning and pricing are performed with limited transparency on demand.
	Performance dimension	Market data is not in place to assess recovered products' potential for secondary markets.	Recovered products' market share data is available.

Defined level (Standardized process)	Quantitatively managed level (Measurable and controlled process)	Optimized level (Continuous process improvement)
RL strategy aligned with supply chain strategy, defined RL process in place.	RL is integrated with supply chain strategy driven by profit generation.	RL is integrated as cross-functional process within different business units. RL is driven by profit generation and is aligned with business goals.
RL network is standardized. Return agreements or contracts in place for proactive collection.	RL network and flows are planned through collaboration agreements with stakeholders to define performance requirements.	RL network and flow is optimized through defined performance objectives in collaboration with logistics provider.
The RL time and flow are measured. Also items qualities are measured.	Items traceability metric is well defined and used, coordinated in shared system across value chain to monitor and assess return agreements.	The RL process is monitored and responsively updated, with real time exchange of value chain information on returned items between logistics provider and company.
Recovery strategy is aligned qualitatively with RL strategy and business strategy.	Recovery strategy stated and quantitatively driven based on economic, technical, and environmental viability of recovery options.	Fully aligned recovery strategy in place, including innovative product design which considers product recovery.
Returned products inventory with standardized processes and ability to forecast returns amount.	Returned products inventory process performance is established and prediction of returns condition is available through monitoring assets on the use stage.	Returned products inventory process is continuously improved based on quantitative understanding of the process and can respond to change in product mix, volume, equipment, sourcing, planning.
Returned material data is measured for pre-sorting and evaluating recovery options.	Returned material data is assessed and used for controlling recovery processes.	Returned material data is used for product design and recovery processes.
Knowledge about demand markets for recovered assets is used during return processes.	Knowledge (e.g. demand forecasting) about secondary markets for recovered assets is integrated in management decisions for reverse flows.	Recovered asset demand and product development are integrated to identify new products, markets and business models.
Remarketing planning and pricing are performed and controlled through standardized processes with transparency on demand.	Remarketing and recovery data is used to measure and control the remarketing process and predict variation.	Recovered products are returned to market swiftly through proper remarketing planning and influencing customer behavior.
Recovered products' market share data is used for remarketing analysis.	Recovered products' market share data is used to expand market segmentation. Products value decline rate is monitored and controlled along product and technology life cycle.	Market analysis is underpinned by full transparency on recovered products' market share and secondary markets.

CE100 programme — Ellen MacArthur Foundation

The Circular Economy 100 (CE100) is a pre-competitive innovation programme established to enable organizations to develop new opportunities and realize their circular economy ambitions faster. It brings together corporations, governments and cities, academic institutions, emerging innovators and affiliates in a unique multi-stakeholder platform. Specially developed program elements help members learn, build capacity, network, and collaborate with key organizations around the circular economy.

This paper was developed by the CE100 members Cranfield University and Deutsche Post DHL Group, with contribution from further member companies:

Contact:

Joe Murphy, CE100 Network Manager

joe.murphy@ellenmacarthurfoundation.org

Cranfield University

Cranfield is world-leading in its contribution to global innovation. With its emphasis on the aerospace, agrifood, defense and security, environmental technology, leadership and management, manufacturing and transport systems sectors, it has changed the way society thinks, works and learns.

Sustainable manufacturing at Cranfield is concerned with developing sustainable solutions by adopting a systems approach. Circular economy thinking is integrated within postgraduate design, technology and management programs, with academic leads in each case.

Contacts:

Peter Ball, Professor of Operations Management, University of York, until recently with Cranfield University

peter.ball@york.ac.uk

Serhan Alshammari, Researcher at Cranfield School of Aerospace Transport and Manufacturing

s.alshammari@cranfield.ac.uk

Deutsche Post DHL Group

Deutsche Post DHL Group

Deutsche Post DHL Group is the world's leading logistics and mail communications company. The Group is focused on being the first choice for customers, employees and investors in its core business areas worldwide. It makes a positive contribution to the world by connecting people and enabling global trade. Deutsche Post DHL Group is committed to responsible business practice across its business, the GoGreen environmental protection program including related customers solutions and corporate citizenship. The Group focuses on providing reverse logistics as an enabler in the transition to a Circular Economy.

Deutsche Post DHL Group operates under two brands: Deutsche Post is Europe's leading postal service provider. DHL is uniquely positioned in the world's growth markets, with a comprehensive range of international express, freight transportation, e-commerce, and supply chain management services.

Deutsche Post DHL Group employs 500,000 employees in over 220 countries and territories worldwide. The Group generated revenues of more than 59 billion Euros in 2015.

Contacts:

Katharina Tomoff, Vice President Shared Value

katharina.tomoff@dpdhl.com

Jonathan Spearing, Head of Customer Solutions and Business Development Shared Value

jonathan.spearing@dpdhl.com

Daniela Spiessmann, Senior Expert Shared Value

daniela.spiessmann@dpdhl.com

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