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THE CIRCULAR ECONOMY

*Developments, concepts, and research
in search for corresponding business models*

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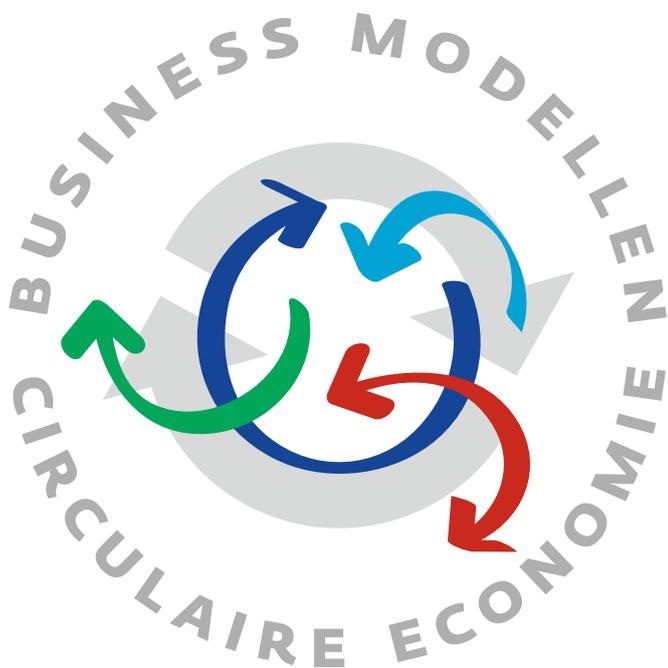
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The Circular Economy (CE) is based on the concept of closing loops. Products and materials are re-used, and raw materials retain their physical characteristics and value as much as is possible. This creates new entrepreneurial opportunities such as novel forms of co-operation and markets as well as innovation of products and services.

The transition from a linear economy to a CE does not occur in a single step. Five phases are recognized in this process that is known as the 'loops ladder': from circularity within the boundaries of the organization to a circular macro-economic system.

CE practices lead to new and cohesive related re-cycling and re-use patterns that are largely cyclic in nature and lead to inter-dependent value creation. The material and biological raw material flows represent the basis of a re-design in this aspect. This re-design also significantly impacts the nature of the composition and deployment of the workforce in businesses. Consequently, the antiquated economy that is directed at maximizing production volumes diminishes, allowing an opportunity for an emerging new economy.

The promise of a CE is to organize sustainability at various levels as an economic task. The (re-)valuation of matter is the starting point here. Reaching this point requires organizational, social, and institutional innovation. Next to the role of businesses, consumers also play an important role in CE as they will use those products with a longer lifetime, make use of product-as-a-service models, or are the interconnectors from end-user to re-user or from end-of-life to recycling. A potential last step is institutional actors such as the government and funders becoming fully committed to creating a circular economy. These actors possess the capability to establish a context that enables a transition to a CE.

A number of complicated issues will be encountered 'en route' to a CE. These issues will arise from the fact that this will be an attempt to construct a new economy that differs fundamentally from the current linear economy but which simultaneously emerges from it as well. A CE indicates a radical change of course comparative to the conventional, linear economy. It requires a transition, other forms of enterprise, and organization. This stimulates the creation of a generation of new business models (NBMs) based on co-operation and value creation between parties in chains and networks. Co-operation becomes of mutual interest not in a classical value-chain but in a value cycle that develops over time. As an outcome, organizational and revenue models become inter-woven which results in existing business models being in dire need of revision.

Three elements repeatedly occur in the classification of Circular Business Models (CBMs). They concern re-evaluation of the role and the status of raw materials, the conversion of products into services, and the improved utilization of functionality. BMCEs are characterized by (1) the closing of raw material chains, (2) a transition from ownership to the provision of services, and (3) a more intensive utilization of the functionality of products.

These features of CBMs and principles of a CE may be translated into a number of generic building blocks that all CBMs should comprise. The modality, in the context of the revenue model and what it is actually 'organized' may differ, however, the five recognized building blocks can be found in all CBMs: (1) closing loops, (2) creating (multiple) value, (3) choosing an appropriate strategy, (4) Designing an organization that fits with organizing-between-parties, and (5) developing circular earnings models.

Despite the increasing interest in the policy and business domains and despite the many (local) initiatives, the actual practice of organizing a CE is still in its infancy. There appears to be significant willingness among businesses to further consider the introduction of circular principles. There is substantial ambition on their part to make their business model more circular as a revenue model in the forthcoming years. However, between this ambition and the actual realization of the joint organization of closed loops, there are still many legal, material, fiscal, and financial obstacles.

Introduction

In recent years, a growing number of publications from an academic and a professional background have been written about the Circular Economy (CE). Notwithstanding the increasing numbers, it is sometimes difficult to fathom what it is about. Is it about a new economic model? Is it about the sustainable enterprise? Is the central idea using raw materials more efficiently, or is it just a new label for re-cycling? And what actually is the state of this CE in the Netherlands? Is it a debate in which only a small number of people are involved, or is it slowly gaining a secure position in business? This White Paper introduces an overview of the state of affairs surrounding the thinking about the CE. It is a snapshot in which an attempt will be made to answer the following questions in succession: What is the Circular Economy, what is its status quo, and how can it be made to progress?

The CE is based on the (re-)design of production systems at various levels where the focus is on value preservation in (closed) loops throughout the lifespan of (raw) materials and goods.

The Netherlands has the ambition to become a country with an entire economy focused on the CE if the promise made in a current and coherent set of long-term oriented policy documents from the Dutch Government becomes reality. This also appears to be the situation in countries such as Finland, Germany, and Denmark. This is positive considering the pressing nature of all of the issues associated with sustainability. However, there is still quite a gap between the current practice of the dominant method of linear production and the ambition to transform this into a circular way of managing materials. Albeit, there is great ambition. At the end of September 2016, the Dutch Government-wide programme for a Circular Economy was launched which outlines the contours for a transition to a CE in the Netherlands. This ambition should be achieved by 2050.

'Together with its social partners, the cabinet intends to reduce the use of raw materials in the years ahead and have a circular economy by 2050. The ambition for 2030 is to achieve a fifty per cent reduction in the use of primary raw materials such as minerals, metals and fossil resources.'

(12.09.16, WWW.RIJKSOVERHEID.NL)

This report builds on advice from the Dutch Social and Economic Council (Dutch abbreviation: SER) (June 2016) and a variety of other reports and recommendations that were published in the Netherlands and Europe in recent years. To the knowledge of the authors, it is unique that a govern-

ment would take the lead in proclaiming such a far-reaching ambition concerning transforming the economy.

Regarding these developments, this White Paper intends to explore a number of underlying principles and concepts and link them to current research. The focus of this White Paper will be on how to organize a CE in a business environment. It is written with a Dutch political and organizational background in mind but with the aim to bring it to the forefront and elucidate a number of backgrounds, developments, and concepts which also apply to other countries.

History and definition of the Circular Economy

The CE is based on the idea of closing loops. Products and materials are re-used, and raw materials retain their physical characteristics and value as far and as long as is possible. This creates new entrepreneurial opportunities such as new forms of co-operation and new markets as well as innovation of products and services. Thinking about the CE occurs along a number of lines. This is contrasted with dominant thinking about the linear economy in which the concept of 'obsolescence' plays an important part. The central idea behind the linear economy is the conscious planned obsolescence of products – in terms of use or design. An economy where obsolescence of products and their raw materials play a progressively less important role more closely accords with the concept of a CE. The transition from a linear economy to a CE does not occur in a single step. Five phases are recognized in this process and are known as the 'loops ladder'.

'Circular' transcends re-cycling. Re-cycling aims to re-use waste; it does not change the design and production process on a fundamental level. One of the ultimate goals of a CE is to 'design out' waste, however, as long as waste remains, additional recycling is of value. The concept of a circular enterprise is to organize in such a way

that it leads to minimizing waste beginning from the design and then being able to continue employing (raw) materials and products as long as possible at the lowest possible operational costs throughout the complete physical life cycle. In order to achieve this, changes in the entire value chain are required over time. This means that a CE relates to the entire cycle of design, production, use, and re-use of (raw) materials and products. The basic concept of a CE has been known for some time; however, a broad base of support to enable translating this knowledge into business practice is still insufficient. Instead, there is a particular focus on the almost classic trilogy of re-duce, re-use and re-cycle. The considerable challenge now is to nurture and broaden this idea into concepts and practices in a way that significantly contributes to the shaping of an alternative economy.

The long historical roots of the CE

The CE can hardly be labelled as a new ideal. Before the Age of Enlightenment, there was no such a thing as a 'linear economy'. The use of natural resources occurred locally, was dictated by the seasons, and was on a scale that did not affect the regenerative capacity of nature. Also, for centuries, there was only minimal noticeable progress (Sedlacek, 2012). Only during the Age of Enlightenment, around 1750, did the notion of progress emerge meaning that, materially, the average citizen should progressively be in a better position. This can be considered as the fundamentals of a linear economy (Bonciu, 2014).

The fact that there are limits to this idea of progress has been disregarded in the mainstream economic approach that developed in the years thereafter. This contradicts classic economists such as Malthus who previously indicated that linear growth is limited by the availability of nat-

ural resources (Malthus, 1798). Albeit in a slightly fatalistic way because the concept of technological progress was only present to a limited extent, this is the very idea that re-emerged in the report by the *Club of Rome* (1972): there are boundaries to the extent of which human actions may deplete the natural environment. In accordance with this tradition, the CE is perhaps only a partial solution for a more encompassing challenge: organizing an economy in such a way that it operates within the limits of the earth.

The CE is based on the idea of a (re-)design of production systems at various levels with a central focus on value preservation in closed loops throughout the lifespan of (raw) materials and goods. This is an organizational challenge in and between enterprises that often leads to new and strongly related re-cycling and re-use patterns that are largely cyclic in nature and result in the creation of inter-dependent value. The material and biological raw material flows represent the basis of a re-design in this aspect. This re-design also has a major impact on the nature of the composition and deployment of the workforce in businesses. Businesses and projects that focus on a CE require different talents and skills than those in the 'linear' production work. Consequently, the old economy directed at maximizing production volumes diminishes, leaving opportunity for an emerging new economy that is based on value cycles that are created over time. A transaction moment focused on the exchange of goods and/or materials between parties is no longer central. Instead, a chain of related transactions between parties over time leads to a value cycle. This implies a different form of co-operation. Organizations are no longer the central focus of what must be organized. Instead, networks and clusters of organizations are the decisive factor of this new economy.

Obsolescence and the Circular Economy

Investigating the foundations of a CE requires regressing a century back in time to the principle of 'obsolescence'. This means consciously aiming for the accelerated obsolescence of products with an intent of planned replacement. It appears that this principle is still very much alive, forming one of the foundations of the present-day economy and thus obstructing the emergence of a CE. Various sources indicate that American Bernard London (1932) was presumably the first author to employ the term 'obsolescence' in his paper '*Ending the depression through planned obsolescence*'. The central message of this paper is combatting unemployment and economic depression by purposely giving products, buildings, vehicles, etc. a limited lifespan which means that these things more rapidly and deliberately become unusable with no available easy repair method in a strictly planned manner. Therefore, replacement will be required because the repair costs are consequently more expensive than the costs of acquiring 'new'. Briefly, the essence of this principle is stimulating consumption and discouraging repair and re-use. This idea was formulated at the time of the Great Depression with the aim of re-floating the economy. A principle that was executed for the first time, and also very consciously, would gradually become a 'law'.

It was re-discovered after the Second World War by Brooks Stevens (1960) who regenerated it by complementing it with the statement: '*[p]lanned obsolescence results from the consumer's desire to own something a little newer, a little better, a little sooner than is necessary*' (Stevens, 1960, p.12). Not much later, it was critically analysed by Vance Packard (1961) in his book, *The Waste Makers*, wherein he addresses the social shifts that 'planned obsolescence' effectuated in the United

States. In a situation where citizens used to be more economical and thrifty, it was made impossible for them to utilize products longer, to repair them, or to replace parts. Besides permanent economic growth, planned obsolescence and the continuous flow of 'new', improved products also created the opportunity to charge higher rates for maintenance and repair, if that was possible at all. Packard perceives a group of consumers in a continuous state of dissatisfaction who are inspired by the industry that has elevated 'obsolescence' to an art form. He also refers to 'planned obsolescence' as 'phony obsolescence' or 'warmed-over face-lifted phonies' (Packard, 1961, p. 80). The harm had actually already been done by then with the idea having permeated our economic behaviour and becoming the 'Law of Obsolescence'. This idea is still very much alive in our present-day economy.

In retrospect, it appears that, as of the middle of the previous century, the 'Law of Obsolescence' formed the solid fundament of our modern economy. Growth means making more, selling more, and using more. All of this is against the background of the planned shortening of life cycles and poor or unprofitable reparability which results in more discarding. This leads to the creation of systematic waste of (raw) materials and products with the intention of maintaining permanent economic growth. Not surprisingly, for years, macroeconomic growth data have provided an indication of the extent to which this macrocycle is successful or not.

The principle of 'obsolescence' has now matured by being nestled into design and production cycles, into the operating systems of organizations, into methods of bookkeeping, and into the indicators macroeconomic indicators such as Gross Domestic Product (GDP). The wide dissemination of the principle has led to an economic design for the benefit of hy-

per-consumption. Ingenuities such as built-in non-reparability ensure that consumer products that break down, in fact, meet their end. Was it not President George W. Bush who, after the 09/11 attacks, intended to boost the spirit of the American people by encouraging citizens to again consume more?

“Our enormously productive economy demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfactions, our ego satisfactions, in consumption.”

(VICTOR LEBOW, 1955)

The consequence is that planned obsolescence is rooted in, among others, the field of style, design, systems, organization, funding and, not in the least, consumer behaviour. The latter is referred to as ‘perceived obsolescence’. This has lately been complemented by ‘systemic obsolescence’ which means consciously ensuring that systems and products do not connect thereby rendering them useless in a new setting. All of this has resulted in an explicit socially ideal image where the engine of prosperity is (hyper) consumption – with the implicit assumption that the planet offers infinite resources in order to facilitate this.

On technical and economic lifespan

The adherence by producers to concepts such as obsolescence and maintaining the systems that implement and strengthen these is reinforced by consumer behaviour that is partly due to the actions of these very producers. Certainly, in the West where there is such abundance

that many do not actually require new things every winter or summer, consumption behaviour is quite similar to the disease of obesity: an unparalleled drift to continue consuming more even though the behaviour is not good for us or our planet. Obsolescence is a component of this as it ensures that consumers will have to purchase and keep buying new things. However, this consumer behaviour also results in many things not even breaking down whereby products are often not used for their full technical lifespan but instead discarded much sooner. Consequently, the economic lifespan becomes shorter than the technical lifespan. Prosperous people continually allow themselves to be tempted into replacing products before they break down. Although fashion is a feature of all periods, it is an invention of luxury as well. Only in the event of abundance can people afford to be dictated by fashion and discard products or clothing that are still perfectly usable but are no longer the most recent model. This shortens the economic lifespan, and this effect reinforces obsolescence.

Marketing plays an essential part in this aspect. Enticing consumers to purchase new products more often will increase turnover and, consequently, the profitability of businesses. Of course, marketing is partially deployed to gain market share: after all, a bigger share of the market means more turnover. Consequently, the circulation speed of goods (and services linked to this) is increased. Simultaneously, the market volume may also increase because consumers discard products while they are still functional. However, prolonging the lifespan of products is only practical if consumers continue using them. A CE attempts to address this as well. The development of sharing platforms such as Peerby and platforms for second-hand items, therefore, will only work if consumers bring used items back into the cycle again and

are willing to use them. The perception and meaning of new being, by definition, the best you can buy must change – in a consumer market as well as in a business to business market.

Turning the economy around

Fortunately, there is an ever-wider recognition of the fact that this is a fallacy with a major negative impact. Natural resources are being depleted, there is increasing pollution, and eco-systems essential to human beings are consequently becoming unbalanced. At the very least, is it relevant to realize that the global population will inexorably grow in the decades ahead from the current seven billion people to ten billion in 2050. This places an unsustainable demand on natural resources. In this regard, it is becoming increasingly obvious why the issue of sustainability should be addressed *now*. The CE harbours the promise of offering the foundations for solutions and presenting the accompanying instruments. However, while there is great urgency, this major rebuilding process 'en route' to an alternative economic design has only barely commenced.

The promise of the CE is to organize sustainability at various levels as an economic task. The (re-)valuation of matter is the starting point in this aspect. Reaching this point requires organizational, social, and institutional innovation.

It has become rather clear that the inverse of 'obsolescence' must be introduced and translated into designs, use, and systems. This will not be an easy task considering the overwhelming

space that obsolescence occupies today as a central ideal in all economic actions. In order to embark on this anyway, perhaps new concepts should first be examined. After all, these help us to think differently. New words and ideas must be created that correspond to the concepts of 're-use', 're-duce', and 're-cycle'. This way, a tentative connection is indeed made with the CE. There will subsequently be a need to continue to 'fill' these words with purposed meanings that are yet to be invented that accord with, among other things, the idea of 'cycles' and closed loops. This also applies to the quite difficult concept of 'sustainability'. While being from the same 'family' of notions, it is certainly not the same. However, considering its history in the debate, it should also be given a meaningful place (Geisdoerfer et al, 2016). This is still not linguistically very nice and not one word either, but it indicates the direction in which we can think and hopefully make progress. All in all, we will then arrive at something such as 'consciously keeping things and (raw) materials usable for as long as possible given their physical, technical, and economic life-cycle'. More important for now is that this can be utilized to initiate a gradual farewell to the idea of planned obsolescence.

The 'Loops Ladder': a CE in five phases

Closing the various loops of resources and material that an organization utilizes in a production process as well as organizing value chains in a cyclical manner is an immense task from the perspective of the current organizational linear design. It is an illusion to think that any business or sector can achieve the transition to circular methods of organizing in a single attempt. This transition actually occurs in phases. To break this down in realizable steps, five phases are distinguished concerning the gradual organization of value cycles. These vary from being rather straightforward to becoming

increasingly complex. Each phase describes a transformation stage of an establishment for organizing its processes in accordance with the concept of closed loops.

- 1 The first phase can be referred to as '*in-house circularity*' where an organization, whether or not aided by its suppliers, ensures closure of cycles that occur entirely within the scope of the organization itself. A good example is a vegetable grower who keeps warmth, water, and chemicals within his own business in a closed loop. Closing these 'in-house' cycles will have limited consequences for the actual revenue model of the organization. It will primarily lead to cost reduction and eco-efficiency.
- 2 In the second phase, the focus is no longer on the activities and processes of a single organization but on part of a value chain in which several establishments are involved. This phase is called '*partial chain integration*' from a CE perspective. In this phase in an existing value chain, a partial (closed) cycle emerges. For example, the waste of one party could be exploited as raw material for the other, resulting in re-use such as the sprawling business of growing mushrooms on waste coffee grounds. Attention should be paid to the division of costs and rewards between the parties involved. As a consequence, the debate about inter-organizational revenue models enters the organizational challenge.
- 3 The third phase goes a step further with a fully closed 'simple' cycle based on one specific material or resource. This is termed as a *material mono-flow cycle*. In this phase, production processes are designed in such a way that a material that is once sourced from a natural resource ends up in a closed cycle (such as paper, iron, plastic, etc.). The ambition is to organize virtually full re-use and

re-cycling based on the physical life-cycle of that resource. Within this third phase, it is crucial that all parties are jointly responsible for ensuring the closure of this specific cycle as well as having joint control and governance of it. This requires joint organization including related revenue models and thus requires new forms of governance that are not focused on the individual establishment but geared towards joint organization.

- 4 Organizing the next step of a CE becomes more complicated when there are several *inter-dependent mono-material cycles*. Examples include assembling and disassembling a washing machine, car, or phone. Key-words are re-furbishing and re-manufacturing. A complex tangle of cycles and parties that are involved emerges dealing with various inter-related challenges with a variable short or long term perspective. As a consequence, an organizational ecology of businesses and parties emerges acting in various sub-systems while being linked to each other. Organizing and co-ordinating these sub-systems in conjunction with each other becomes a crucial prerequisite to get such a circular ecology 'up and flying'. The underlying organizational, business, and revenue models are increasingly interdependent and should be complementary to each other in this phase.
- 5 A further inter-weaving of inter-locking, complex cycles and sub-systems is visible at the highest level of the 'cycles ladder'. This results in an *organizational-economic system*. The transition to the system of a CE fully mani-

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- 1 But then it may still be the case that several parties are found in various phases of the cycle that are a substitute for each other and thus compete with each other. This may lead to efficiency improvement of the total system.

fest itself at this level. This phase revolves around a different way of co-operating on the part of all of those involved and around the organization of this system including the institutional context. It is estimated it will take 30 to 40 years to fully achieve this stage (Perez, 2003). Only when this stage reaches fruition will there be a mature CE. It should be noted that it is impossible for some materials to be fully circular (when dealing with bridges, buildings, or roads) while this is actually an option for others in a reasonably short time frame. An infrastructure can be built with CE-principles in mind (such as the option to re-use all of the materials, extending life span, etcetera). Constructions have lifecycles that go far beyond what is considered as 'normal' life-cycles. This emphasizes that a long-term and stable perspective that drives the transformation towards a CE, therefore, is an important condition.

It is not implied that the 'cycles ladder' presented here applies to all possible cycles. The focus is on the cycles dealing with (raw) materials in particular. What is not elaborated, for example, is the distinction between short and long cycles. Some materials will be available almost instantly (for instance, packing of all sorts such as plastic bottles, foil, or paper), some after a relatively short number of years (such as parts of washing machines, cars, or coffee machines) while, for example, the bricks in a house, the steel of a vessel, or the aluminium used for an airplane have far longer lifespans. They may, therefore, enter the cycle again at a much later point in time. Furthermore, the question of how the physical material preservation in cycles develops over time was not addressed. What is the impact of cycles that last ten or 20 years or longer, for example? What does this mean for the preservation and the properties of the (virgin) materials once they are used? What percentage

of virgin material is required to keep their qualities intact? Things will be subject to wear and tear and materials will be used. This wear and tear means loss, obsolescence, and also decay.

In general, the use of natural resources will inevitably lead to 'leakages' in the system. The Second Law of Thermodynamics plays a crucial role in this respect. This law states that the entropy (or disorder) of the universe is always increasing and imposing a qualitative degradation of the environment— by extracting low-entropy resources and returning high-entropy wastes. The Second Law of Thermodynamics thus creates an additional conflict between expansion of the economy and preservation of the environment, specifically, that the order and structure of the economy is paid for by imposing disorder in the sustaining ecosphere (Daly, 1977, 2015). Therefore, resources that are utilized in a 'cycle' will end up with higher entropy. This always means that reuse in a new cycle will use additional energy. For instance, scarce earth metals used in smartphones can only be reused when disassembling the smartphone. Considering the current design of smartphones, it generally takes more energy to restore the entropy than is (financially) viable. It is relevant to include this gradual decay process as an appropriate leakage percentage in the design and organization of a closed material cycle. In this respect, it is good to make reference to the Second Law of Thermodynamics elaborated by, among others, Daly (1977, 1996) in an economic system perspective.

'The laws of thermodynamics restrict all technologies, man's as well as nature's and apply to all economic systems whether capitalist, communist, socialist, or fascist. We do not create or destroy

(produce or consume) anything in a physical sense— we merely transform or rearrange. And the inevitable cost of arranging greater order in one part of the system (the human economy) is creating a more than offsetting amount of disorder elsewhere (the natural environment).'

HERMAN E. DALY

Where is the consumer? Where is the government?

Thus far, only the role of businesses (organizations) has been emphasized in order to arrive at a circular economic system. An obvious additional step is to consider this from the perspective of consumers as well. After all, they inextricably form part of one or more cycles of a CE. They are the individuals who will use those products with a longer lifetime, make use of product-as-a-service models, or are the nexus from end-user to re-user or from end-of-life to recycling. In both the academic literature as well as the writings of policy makers and practitioners, this consumer perspective is only minimally addressed (Ghisellini et al, 2016, Geisdorffer et al. 2016). For a successful implementation of a CE, engagement and participation of consumers in the CE is a prerequisite.

Therefore, a second 'cycles ladder' actually belongs to this thinking as well, namely, that of the consumer. A number of steps are also the responsibility of a consumer such as consuming less to circular co-production (consumers become 'pro-sumers'), peer-to-peer transac-

tions, and active and conscious participation in the sharing economy. The focus is on the role of consumers in circular consumption: using what is produced for as long as possible, helping to maintain cycles of re-use, shaping repair and re-cycling, and adjusting the consumer pattern. Moreover, a circular economy could possibly also lead to an economy in which the distinction between consumers and producers becomes less obvious; all become intermediary users and producers of goods and resources.

A potential last step is institutional actors such as the government and funders becoming fully committed to creating a circular economy. These actors have the capability to establish a context that enables a transition to a CE.

Over the last few years, a number of countries have made progress towards putting a CE more in the centre of sustainability policies (Brennan, 2015). China has made considerable efforts with its Circular Economy Promotion Law (2009), and the European Commission has adopted a comprehensive Circular Economy package (EC, 2015).

The Dutch Government has also made some important strides in this direction. Among other policies, they have developed a government-wide program for the Circular Economy (Dutch Ministry of I&M). A policy framework that facilitates lower governmental bodies, businesses, non-governmental organizations, and others to develop initiatives shaping a real life circular economy within the Netherlands. Also, in this aspect, the transition is not realized overnight. Within the boundaries of the program, smaller, focused policy instruments are developed that intend to actualize several of the phases identified in the CE ladder for businesses or of the phases that consumers will experience.

Issues in the Circular Economy

A number of complicated issues will be encountered 'en route' to the CE. Issues will arise from the fact that a new economy is attempting to be constructed that differs fundamentally from the current linear economy but which simultaneously emerges from it as well. A CE means a radical change of course in respect to the conventional linear economy. It requires a transition, other forms of enterprise and organization. This stimulates the arrival of a generation of new business models (NBMs) based on co-operation and value creation between parties in chains and networks. Co-operation becomes of mutual interest not in a classical value-chain but in a value cycle that develops over time. As an outcome, organizational and revenue models become inter-woven. After all, the organization of cycles between several parties can only occur if they work together over a longer period of time. Value creation consequently seems to acquire a different meaning; it transforms from purely monetary to multiple. This leads to existing business models being in dire need of revision. The actual question is how these issues will exactly take shape.

A change of course

Creating value with each other and between each other's organizations has always occurred, however, if this can happen from a CE perspec-

tive, the rules of the economic-organizational game will change. The focus will no longer be 'exclusively' on the organization; rather, the network and the community of participants become part of what must be organized as well. Instead of creating values in a value chain through transactions, the focus is the value cycle in which numerous transactions over time can take place based on the same materials. As a consequence, two movements occur. One is the transition from an organization-centric perspective to a network-centric perspective created by the players that collectively aim to close a loop and keep it closed over time. Second and, at the same time, there is a transformation from a linear production perspective to a material-centric perspective, implying the intention to foster reusability through various life of value cycles as much as possible.

This not only means that the waste of one party is the input it sells to the next party but that parties need each other to arrive at a cycle of successive moments of value creation. This suggests that parties are creating a business model together and, as a consequence, the earning models within those business models are interconnected.

A circular business model (CBM) focuses on the design and organization of a value cycle around one or more material flows over time. This may involve products, parts, or raw materials. The essence is to close these cycles so that these materials can be re-used during their physical life-cycle. Designing and working with CBMs contribute to organizing the intentional closure of material cycles over time in which the preservation of value (expressed through the multi-fold re-use of raw materials) is central.

Organizing in this way has existed for a long time, of course, in linear thinking as well. How-

ever, in a CE, the parties explore how they can arrive at a 'closed' form of value creation based on a number of shared principles and over time. Time, therefore, plays an important role in the process of value creation. Parties create value over time and on the basis of various transactions with the same (raw) materials or products. It is exactly this that is in contrast to the linear way of working where the moment of transaction is usually the only element of interest for the creation of value and where the responsibility of the producer ends regarding materials and products used once the transaction is concluded. This joint organization of value creation coerces the stimulation of social and organizational innovation based partly on network and co-operative thinking. Social innovation is about 'the development and implementation of new ideas (products, services, and models) that tie in with social needs and which create new social relationships and partnerships' (EU, 2013). These two developments provide the scope for new entrepreneurial opportunities not just for businesses but also for governments, foundations, network organizations, and citizens. The triple-helix (the co-operation between government, business, and knowledge institutions) thus receives a new impulse.

A CE actually means co-operative value creation; creating value together and sharing this together now or over time based on the re-use, etc., of raw materials, spare parts, and products. The implicit understanding behind all of this is that it should lead to decreased ecological, material, and energy impact (just to name a few). After all, fewer products are manufactured, and what has already been made or is newly produced is used longer.

This is an adaptation of the current, common competition model where volume and price are the key-elements. The imperfect operation of

markets is amended by internalizing external effects or their expansion with additional valuation systems.² This leads to less negative impact on natural and social environments. Due to the change of the time horizon of value creation from the moment of the sale of a product to value creation throughout the cycle, the concept of 'market' is broadened as well; rather than being a place where supply and demand meet at some point, it becomes a time period in which shared value creation occurs repeatedly and where the rewards (such as turnover, household emissions reduction, nature preservation, etc.) are divided among parties over time.

The logic of value creation

Beginning to work together in a co-operative manner leads to a revision of the logic of value creation which is the central idea of a business model. Regardless of the nature of an economy, value creation is the collective task of economic actors. In essence, a business model is a description of the way in which value creation is organized between parties (at a certain time, in a certain context, and given the available means). It is common to describe this from a perspective where the organization is the focal point.

In a CE, value creation becomes an inter-organizational task between the parties that are involved. While waste is virtually useless in the current economic model and the expenses that are required to be able to make 'something usable' of this again are high, this is completely different in 'cycle thinking'. Expenses and profits will be made at various times in the cycles of the CE which enables the creation of a closed loop of materials. In order to be able to sustain the

² See, for example, the guidelines of the Global Reporting Initiative (GRI) or the framework for 'integrated reporting' of the International Institute of Sustainable Development.

cycle, the total of expenses and profits to maintain it and their division over the various parties involved will need to be examined in more detail. It is not clear how parties are to mutually weigh and offset this type of value creation.

It becomes rather evident that value creation in a CE is founded on a number of principles:

- 1 Using or re-using (raw) materials as carefully and as long as possible where waste is raw material and renewability of (raw) materials is foremost;
- 2 The service (functionality) replaces the product and, as a result, manufacturers retain responsibility for and an interest in the development of long-lasting (raw) materials of products throughout their life cycle;
- 3 The components of which a product consists (thus the components of a car, house, or highway, et cetera) may be disassembled again – with ease – and be utilized as part of a new product.

New Business Models

So, a transition from a linear economy to a CE requires different business models. It can be argued that sustainability is not integrated into the current generation of linear business models. The focus within this generation of business models has primarily focused on financially driven transactional thinking with all possible social and ecological costs generally being passed on to society. This leads to transactional models with an incomplete and 'unfair' price tag because damage over time in the social or ecological domain is basically not included, therefore, is not a factor.

A CE stimulates a new generation of business models that facilitates working with closed loops and collective value creation as well as sharing created value together. This is conflict-

ual with the existing generation of business models that are entirely based on the linear set-up of our current economy and thus follow the logic of 'input'-'throughput'-'output'. These models offer little accountability from the input aspect regarding the origin of (raw) materials and products and the consequences that their extraction or production entails. From the output perspective, the classic model does not ensure accountability for the life cycle to which manufactured products will be subject after production. NBMs for a CE will need to formulate an answer to this.

Business Models for the Circular Economy

Various studies have appeared lately on business models for the circular economy (BMCE). On the one hand, these studies can be classified on the basis of the features of these models. This offers some insight into how they relate to each other. However, besides a classification based on features, it is also possible to look at the building blocks of these business models. The combination of building blocks and features offer a construction toolkit for BMCEs. In a certain context, smart or innovative combinations emerge that enable creating value in terms of, for example, a social effect, contributions to sustainability, turnover, and forms of profit. Thinking about how these models can take shape is still in its infancy. However, now is a suitable time to begin thinking how they can be shaped.

Organizing BMCEs

If a business is labelled a 'circular enterprise', this usually means the business efficiently uses raw materials, somehow (re-)uses its waste flows, prolongs the lifespan of products, sells services instead of products, and fully or partly closes cycles with partners. Business models may be invented for each of these elements or a combination of them and could partially or completely close a loop.

Various classifications of CBMs can be found in current literature (Kraaijenhagen et al 2015; Lacy and Rutqvist, 2015; Bakker, 2014). A business model can be characterized as the way in which various values are created simultaneously based on a particular composition of building blocks (such as clients, channels, expenses, activities) bound together on the basis of a certain logic. Sometimes, the activity that businesses perform is employed as a starting point for such a business model, the value proposition, or the material itself (steel, paper, wood, plastic, etc.).

The basis of thinking about BMCEs concerns leakage in a linear economy of raw materials via production, use, and waste. The use of less expensive waste flows achieves cost savings and results in the creation of ecological value.

Circular 'leakage'

CBMs distinguish themselves from other business models because they create value by using the 'blind spots' in the current economic system. It is the 'leakage'³ of raw materials via production, use, and waste in a linear system that becomes the foundation for thinking about CBMs. There will be cost savings (eco-efficiency) with ecological value being created at the same time by using, for example, waste flows that are less expensive than 'normal' raw materials or by using heat (which is a by-product of a different business).

3 This linear 'leakage' is different in nature from the general, inevitable 'leakage' as discussed at the end of the 'cycles' paragraph (2nd Law of Thermodynamics).

The creation of platforms on which raw materials, energy, and things are shared such as houses, cars, or heat will result in the emergence of business models focusing on collective and shared value – which can be considered as a form of asset management. The central idea is brokering (over-)capacity, matter, or things. The key is to use them in a more intelligent and often more intense manner. The platform owner(s) earns money based on, for example, a fee for each transaction involved in use.

It is often believed that models based on leakage, by definition, also create ecological and financial value. However, this is not always valid. It appears to be difficult to create an organizational and revenue model that endures for an extended period of time because customers are not yet in the same sustainability mode as the entrepreneur or because designs are not yet aligned with the ambition to recover materials.

Consider, for example, one of the many platform models for consumers such as Airbnb. This model certainly leads to intensified use of houses and apartments and, as such, empty and unused 'living capacity' is utilized very beneficially. Moreover, a large market is created by the transparency of supply, attractive pricing, easily controllable quality, peer references, and a very broad range. Not in the least, booking directly via the Internet fits in well with all possible Do It Yourself (DIY) services. However, those who examine this from some distance will determine that primarily financial value is created. There is no evidence whatsoever that, because the occupancy rate of existing houses increases, consequently fewer will need to be built, and the environment is unburdened. The opposite is actually noticed; the pressure on inner cities is increasing due to an excessive inflow of tourists. With this and as a result, air travel increases and hotels remain empty which leads

to property not being utilized in the best possible way. In addition, employment disappears from the hotel sector, however, new jobs might emerge in other locations due to a growing number of tourists. Therefore, there is actually a well-functioning Internet platform that brokers capacity, but there is no CBM.

Three features of Circular Business Models

Classifications of CBMs are often purely theoretical or only based on just a small number of case studies. The classifications presented, nevertheless, significantly overlap. Three elements repeatedly occur in these classifications. They concern a re-evaluation of the role and the place of raw materials, the conversion of products into services, and the improved utilization of functionality. BMCEs are characterized by (1) the closing of raw material chains, (2) a transition from ownership to the provision of services, and (3) a more intensive utilization of the functionality of products.

1 *Closing raw material chains*

Within a CE, the closing of raw material chains is a central principle. If a chain is closed, raw materials will not become waste. A business model may contribute to the closure of a cycle by using, for example, renewable bio-based raw materials or by re-using raw materials, parts, and products. The essence in this aspect is that a raw material is no longer regarded as something temporary. It is brought into cycles with the idea that it will be able to exist in the cycle for as long as possible in whatever modality ('virgin' raw material, material, semi-finished product, end product, re-cycled raw material). In a CE, a raw material exists on the basis of its physical qualities, and it is no longer subject to accounting depreciation regimes and neglect. It is, however, subject to natural degradation (increase in entropy).

2 *A shift to services replacing ownership*

Within a CE, there is a shift from products to services. By designing products as services in whatever form (rental, lease, loan), the producer remains the owner, and it is in their interest to manufacture a product in a sustainable manner. The incentive for sustainable design, reflection on the preservation of residual value, and processing residual flows as efficiently as possible follows logically from this type of model. Prolonging the lifespan of a product creates ecological value, the purchase of a new product is postponed, and raw materials are used more extensively. The shift to services impacts the root of economic transactions of goods by no longer placing transfer of ownership at centre stage. Ownership and, therefore, also responsibility and accountability with regard to (raw) materials and products thus remain with the producers.

3 *A more intensive use of functionality*

Within a CE, products – and, therefore, raw materials as well – are used ever more extensively. Otherwise stated, the functionality of products is utilized more advantageously. Walter Stahel – one of the Godfathers of the CE – writes about this in an article from 1982, *'The economic objective of the functional economy is to create the highest possible use value for the longest possible time while consuming as few as possible materials'*. In fact, this means that the best possible use of functionality is investigated. In theory, it is possible to sit on a chair for 24 hours a day. In practice, this does not occur for more than a few hours. A car remains in place for 22 hours per day on average. A drilling machine is used approximately ten to 20 hours in its total lifespan. This means that tools, buildings, vehicles, and a great many other things are used only sub-optimally. It is quite obvious that this is accompanied by significant expenses in both manufacturing and use. Radical eco-efficiency associated with gradually beginning to think, create, and use circular

appears to be the answer to this deep-rooted method of working. A business model may respond to this by making products accessible to several users. Rental, sharing, exchange, and loan platforms facilitate this. The ecological value is created because several consumers use the same product thus fewer raw materials will be required to manufacture products for everyone separately. The essence is the increasing efficiency with which (raw) materials and products are utilized.

Five building blocks of Circular Business Models

Therefore, the above-mentioned features of CBMs and principles of a CE can be translated into a number of generic building blocks that all CBMs should comprise. The modality, in the sense of the revenue model and what is actually 'organised', may differ. However, the five recognized building blocks can be determined in all CBMs.

1 *Creating cycles*

The core concept of a CE is closing (material) cycles in the production process and in the life cycle of a product. This can be accomplished within the individual organization but also with parties in the value chain. Only organizations that work towards closing cycles can have a CBM. The extent of cycle closure, the timespan, and the length of the cycle they attempt to close may differ substantially from one business to the next. However, it should actually revolve around the main activity of the business. Merely closing cycles with non-core activities does not qualify.

2 *Striving for value creation*

Working on the basis of principles of a CE will result in more than just financial value. It is also about the creation of social and/or ecological value. Businesses that close a cycle but do not

achieve sustainability profit in the process cannot be qualified as a BMCE. The previously mentioned example of Airbnb is a case in point. A cycle is closed in theory, however, multiple value is not created. Furthermore, these business models do not contribute to an economy that operates within the boundaries of what the earth can manage which is the objective of a CE at a system level.

3 *Choosing a suitable strategy*

Being successful with a CE requires opting for a clear strategy that is focused on the organization of circular enterprise. In part, BMCEs must make different strategic considerations. Important in this aspect is, for example, that the moment of the sale of a product should no longer be central in the value creation but, instead, the delivery of added value throughout the lifespan of the product. This means a longer-term relationship with one or several customers for one product.

4 *Designing an organization that fits with organizing-between-parties*

A CE requires organization in chains and networks together with partners; there is not a single business that is able to operate alone in a circular manner. Organizing multiple value creation in conjunction and with co-operation is a prerequisite for a BMCE.

5 *Developing revenue models*

Circular organization will change the revenue models. Turnover is, among others, achieved over time (lease or performance models) due to the joint creation of value.

Research in the Netherlands

There are many initiatives in the field of the CE at the local and regional level across Europe and at various locations in the world (most notably China). There is also a growing body of publications – either academic or professional – exploring aspects of the CE. Within this body, only a small number are dedicated to the nature and construction of business models for the CE. As this White Paper has attempted to demonstrate, the authors believe that business models for the CE are of particular interest – from a theoretical, conceptual, and empirical point of view. In particular, reports and publications addressing the nature of BMs for the CE are minimal. To begin addressing this gap in the spring of 2016, a pilot survey was conducted regarding the development of CBMs in the provinces of Gelderland and Overijssel in the Netherlands.

The survey was designed on the basis of various questions including:

- Do individuals in businesses actually know what the CE means?
- What are their motives for working on this?
- What actually occurs when they organize it?
- What can we learn about business, organizational, and revenue models?

Over 500 organizations, initiatives, and individuals in the two provinces completed the questionnaire. Approximately 40 of them were subsequently interviewed. In addition to the

generic information from the questions above, eight remarkable cases emerge from the survey in which the organization of a CE in the form of cycles really becomes visible.

There is still little chain co-operation

There are major differences between sectors as well. Businesses that deal with massive raw material flows in their operations are clearly actively involved in a CE. They reflect more and further on ways to utilize the 're's' (re-use, reduce, re-cycle) in the best possible way and turn them into business models. What is still almost entirely lacking is the potential social impact of a CE on, for instance, the labour market. It is particularly difficult to deduce from the reactions the way in which the social component of a CE may be designed. The CBMs that are used are mainly models that could emerge in a linear environment. They are geared towards the individual business operations both in raw material use and the design of products and, to a limited extent, towards the use of new revenue models. The result of this is that there is still only minimal chain co-operation, and shared business models (consisting of several parties) are scarce.

The Circular Economy is still in its early stages

The state of the CE as it emerges from the pilot survey shows a sobering reality. Sure, the CE exists; sure, there is an ever-louder debate; sure, there is a growing base of support within organizations. However, overall, it is also evident that the CE is still in its infancy.

Co-operation between organizations – and, therefore, multiple value creation between organizations as well – is crucial in order to arrive at a CE. Research up to this point demonstrates

that this is precisely the case to a limited extent. This is in accordance with the scenario that the CE is still impeded by various factors. On the one hand, it is about a customer (consumer or business client) that does not yet appear to be ready for the circular practice and is not yet willing to purchase things that are more sustainable, for example. On the other hand, (fiscal) regulations and financing limit the further growth of a CE.

Despite the increasing interest in policy and business domains and the many initiatives, the actual practice of organizing a CE is still in its early stages. There appears to be significant willingness among businesses to further consider the introduction of circular principles. There is a great ambition on their part to make their business model more circular as a revenue model in the forthcoming years. However, between this ambition and the actual realization of the joint organization of closed loops, there are still many legal, material, fiscal, and financial obstacles. Readers can find an overview of the results of this regional survey here: circulairebusinessmodellen.nl/dl/WPBMCEV5.pdf

National survey of Business Models for the Circular Economy

Nurtured by the insights from the regional survey, a new national survey, therefore, was developed in the autumn of 2016 with a sharp focus on business, organizational, and revenue models for the CE. A new questionnaire was developed and a website was designed for this purpose. In addition to the questionnaire, a substantial number of interviews will again be conducted. In addition, existing sources will be utilized to frame and explore the 'state of affairs in the country' where it concerns businesses that claim they are actually involved in a CE. It is hoped that this survey will better inform about the state of the CE in the Netherlands. It is also

hoped that this survey will actually provide an understanding of the building blocks of BMCEs and the logic and actionable patterns they contain. Not in the least, it would be great to expand the arsenal of businesses that rightly claim they are working on a CE. All too often, practices are illustrated on the basis of just a limited number of 'usual suspects'. It would be very nice to be able to complement this with new cases.

A long-term plan focused towards the CE will be required to achieve the transition towards it. This plan should indicate the course of action for the upcoming two or three government periods, regardless of the political color of those governments.

This is important since there is a great deal at stake; if the government is to really achieve its ambitions for a CE as formulated in the government-wide program for a CE, many billions of Euros will have to be invested in new infrastructure and organizational forms. The funding for this is virtually completely lacking in the budget of the government. In order to secure an approach befitting the scope and urgency of the task, it seems to be more than relevant to call on the government to present a long-term survival plan geared towards the CE. Such a plan may assist in providing direction to governments for a stable ten-year period. It should be a plan that indicates the course of action for the upcoming two or three government periods regardless of the political colour and composition of the governing coalition.

Conference Business Models for the Circular Economy

The authors hope to share the results of this unique survey at a conference that will occur on *May 18 and 19 2017* in Arnhem (the Netherlands). The conference will be followed by a CE market/festival in the afternoon and a series of regional CE tours to companies/sectors the day thereafter. For additional information on the national survey of BMCEs, the corresponding author of this White Paper and also the initiator of this survey, Jan Jonker, can be contacted.

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itor of a series of (online) columns dealing with the more theoretical and conceptual aspects of the CE.

The authors are all closely involved in the deployment of the Dutch national survey on Business Models for the Circular Economy (BMCE) that took place over the autumn of 2016. To the knowledge of the authors, it is the first time a national survey focused on the CE and, more in particular, the nature of aligned business models was examined. On 18 and 19 May 2017, a national conference will take place at which the results will be presented. Unfortunately, this all will be in the Dutch language. If you are interested in using the developed methodology and questionnaire to set-up and deploy a national survey in your country, you are invited to contact the corresponding author, Jan Jonker, at: jjonker@fm.ru.nl

COLOFON

This White Paper was compiled from (edited) columns written by Jan Jonker, Hans Stegeman, and Niels Faber over 2016. These columns were previously published in the Dutch language on several digital platforms including SIGMA, Management Impact, DuurzaamNieuws [SustainableNews], TGHTR, Management Executive, and Nieuwe Business Modellen [New Business Models].

Some of the texts previously appeared in Dutch in an abbreviated form as a special issue for Ondernemersbelang [Entrepreneurial Interest]. This special issue was composed by Maud Notten. The text was subsequently further edited by the authors to create the current issue. The final editing of this White Paper in its original version was performed by Ine Nijland, Justus Bottenheft created the design, it was translated by Sebastiaan Kunst and the editing was done by Jenny Hill.

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Please send comments, suggestions for improvement, or the possible use of the materials developed for the national survey on business models for the circular economy to the corresponding author Jan Jonker at this email address: j.jonker@fm.ru.nl

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Voor een waardevolle toekomst

