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EVALUATION GRID OF CIRCULAR ECONOMY INDICATORS FOR CIRCULAR BUSINESS MODELS: AN ANALYSIS BASED ON BUSINESS VALUE

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Abstract: *The position state of circular economy implementation in business models still provides gaps in literature and leaves room for discussion. The progress towards circular economy should acknowledge business models as facilitators for achieving the objectives, with many opportunities for market development. And as no transition can take place if there is not a comprehensive list of indicators which examine the current state of circularity, the current research discusses the indicators proposed by Lakatos 2019 according the core values of businesses - value proposition, value creation and delivery and value capture. As an additional section, innovation has been used individually and not integrated into the triple bottom line, as framework – innovation is at the core of business models as can provide a unique placement for consumers.*

KEY WORDS: *circular economy, circular business model, innovation, business value, market*

1. INTRODUCTION

Widely in the academic world, it is accepted that circular economy (CE) is defined as ”[CE] an industrial system that is restorative or regenerative by intention and design. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and within this, business models.” [1]. It runs at micro-level (products, companies, consumers), meso-level (eco-industrial parks) and macro-level (city, region, state and beyond), it is enabled by unique business models and responsible consumers and it is regarded in manufacture, delivery and consumption processes [2].

The circular economy (CE) concept is a highly regarded movement among scholars and practitioners as it is considered as an operationalization for businesses to enforce actions which sustain sustainable development [3, 4]. Shifting from the linear economic model to a circular one brings a change which aims at eliminating waste by turning goods that are at the final stage of their life into resources for a new cycle, thus closing the loop. This in turn enhances a continuous use of resources with lower adverse impacts on the natural systems. As sustainability is often viewed as a concept too wide [5-8], circular economy receives momentum along with green businesses and green growth due to its practical approaches [1]. However, to achieve a circular economy model, a holistic approach is desirable. Firstly, current business models must be adapted and in the case of novel business strategies, circular economy must be integrated from the first stages of creation. In many cases, the adoption of circular economy requires a state-of-the-art vision and strategy with fundamental redesign of products/services, supply chains, partnerships and end-of-life stage, both at company and consumer level (depending on the type of business) [9]. Moreover, to fully integrate circular economy principles in business models, one has to have a long-term focus in the detriment of short-term efficiency. This can bring shifts in the ownership structure of products, encouraging demand for products and

services along the product life cycle, shifts in earning patterns (renting, leasing, subscriptions, etc.) and overall, targeting value proposition, value creation and delivery and value capture for prolonging the useful life of products and parts [9 – 11].

In spite of the fact that business models are just emerging, their academic relevance has enhanced academic research into the topic. Business models have emerged, with them indicators for assessment of their circularity, evaluation grids and other examination procedures are now part of the academic debate. However, there is still a major gap in the ongoing research in terms of assessing the circular businesses based on comprehensive set of indicators. At the European level, the Transition Monitoring Framework and Action Plan have been applied, but they are not fully comprehensive and require further development in terms of circular business models. One proposal of evaluation grid for businesses was used by Lakatos 2019 in her master thesis to evaluate the good practices models [12]. Thus, the objective of this paper, is to look into the evaluation grid (Annex 1) used by Lakatos 2019 and its application to circular businesses. We will narrow the investigation to the main aspects of a business model, namely value proposition, value creation and delivery and value capture, all in the paradigm of circular economy.

As it follows, the next section offers the method used for conducting the research, followed by "the value" of circular business models. Section 3 discusses the description of the indicators used by Lakatos 2019, followed by the main discussion points of the papers. At the end, the final conclusions will be presented.

2. METHODOLOGY

The current research is based on a four-phase procedure with the scope of analysis the proposed indicators of Lakatos 2019, as presented in figure 1. The process adopted was chosen in order to fully comprehend the reasoning for the indicators proposed by Lakatos 2019 in the "Study on Circular Economy Indicators: A Critical Evaluation and Analysis for Sustainable Strategic Development in Romania" as an earlier study. The research is based on the understanding that indicators can measure the implementation or the potential for implementing circular economy from different angles. For instance, indicators can refer to singular inputs - raw materials in some cases - such as energy efficiency, water productivity, land productivity, etc., while on the other side, one can use indicators for regarding the efficiency of material use in the context of the environment - efficiency is the quantity of product provided by the unit of environmental burden, calculated using GDP to divide the principal pollutant. In this sense, there are two categories, namely primary and secondary resources. Primary includes the natural resources in their natural state, while secondary is recycled waste which is undergoing reusing - solid waste, waste water, etc. -, basically any waste generated in the production and consumption phases [13].

Thus, the following conceptual framework has been adopted for the analysis of the indicators:

- Phase 1 – An assessment of the relevant aspects of circular business models has been conducted. Literature has been searched into to derive the relevant aspects, narrowing down the focus of the paper to value proposition, value creation and delivery and value capture.
- Phase 2 – In the second phase, an assessment of the circular economy indicators proposed by Lakatos 2019 was conducted based on the compatibility of the grid for the evaluation (Annex 1) of good practices with their wider application to various business models. Here, the EU Framework and EU indicator system for the transition to circular economy, and other relevant literature for the circular models was analyzed.
- Phase 3 - The third phase of the research analyzed the circular economy indicators in terms of their value positioning in a business model. Positive and negative aspects were also analyzed for the proposed indicators in the evaluation grid at different business levels. The analysis widened the context of businesses from the proposed good practices of Lakatos 2019 and included more relevant business model indicators which require a wider range of indicators. In this stage, each indicator was discussed thoroughly.

- Phase 4 - The final phase involved the contextualization of the results of the research in terms of position on the market, circular economy context, research gaps for further research and limitations.

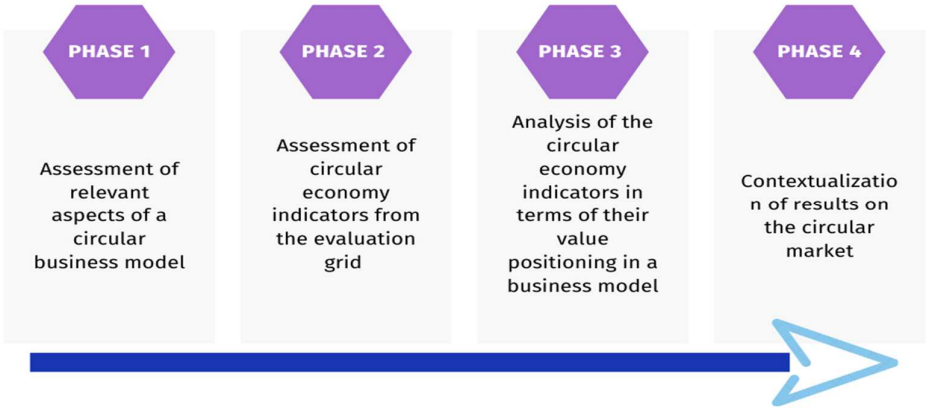

Fig. 1. Conceptual framework for the research design of analyzing circular economy indicators.

3. ASPECTS OF CIRCULAR BUSINESS MODELS

The definitions of circular business models vary widely in literature, but they describe "the way business is done" in the circular context [14]. One comprehensive definition affirms that circular business are "business models that are cycling, extending, intensifying, and/or dematerialising material and energy loops to reduce the resource inputs into and the waste and emission leakage out of an organisational system. This comprises recycling measures (cycling), use phase extensions (extending), a more intense use phase (intensifying), and the substitution of products by service and software solutions (dematerialising)." [15]. Therefore, circular businesses are portraited by the value proposition, value creation and delivery and value capture (these terms will be further described in the next sub-sections) that they contribute with to the sustainable development. Circular business model differs from the "traditional" business model by explicitly incorporating the triple bottom line [14, 15].

3.1 Value proposition

Value proposition is the strategic thinking integrated in the business model framework – it dictates the company's approach to compete on the market with do's and don'ts which can offer superior value compared to the competitors. Value is created through the intended product/service offered and what it has to offer, in which volumes and to whom?. It pinpoints the niche which the business will occupy on the market where there is an advantage to win against the other companies with similar business profiles. In the context of circular economy, value proposition caters measurable economic value without setting aside the social and environmental values. Value proposition, thus can engage businesses into collaborative circular networks through partnerships and circular supply chains which not only deliver products, they deliver functionality [16, 17].

3.2 Value creation and delivery

Value creation and delivery basically answers the question of "How is value provided?". It establishes the strategy for going onto the market, what theories to make us of, how to build the business and what are truly the capabilities of the business model. In summary, it provides the pathways of how to create and deliver the business model of choice. For circular business models this stage encompasses multiple actors in the innovation process. It enables the take-back element enhanced by collaborators in the value chain with efficient and effective reverse mechanisms – reverse manufacturing such as repair, refurbish and recycling [14, 15].

3.3 Value capture

How does the business make money and secure other forms of value? - is the central question of where the revenue model is set. In this case, value capture minimizes the price for material purchase and other revenues from the final stage of use of products. As an approach in circular economy, value capture increases the longevity of materials and is often the case that businesses transition from selling products to selling services. In this sense the innovation comes as the initial investment will be covered over a long-time frame from payment per use or per performance, opposite of the direct sales. In the circular context, a prolonged use of products reduces the inflows of materials needed, reduces the energy and waste output [14, 15, 18].
It is arguable that any business model be it sustainable or circular, must be taken with cautiousness as it is often the case that conflicting visions and missions are used in the adoption process in terms of expected economic, social and environmental outcomes. To fully base a business on circular principles, indicators for the three pillars or sustainability are a must.

4. DESCRIPTION OF CIRCULAR ECONOMY INDICATORS

Lakatos 2019 proposes an evaluation grid (Annex 1) used to assess a number of 5 best practices identified by the Institute for Research in Circular Economy and Environment "Ernest Lupan" and a number of 16 Romanian practices that have integrated the concept of circular economy. As main sections, the grid comprises 20 main indicators, grouped in four main sections, namely Economic, Social, Environment and Innovation, all with a quantitative scale from 0-5 (0 least implication and 5 high implication). As it follows, we will discuss all the indicators proposed based on their categorization.

4.1 Economic

The economic criterion comprises indicators between no. 1-6, highly focusing on the growth of economic value in two different areas – 1. Through industrial recycling, redesign and industrial ecology; 2. In the shape of durability, repairability, toxicity, etc. Basically, the first aspect of value creation is "exterior" of the product/service and is more concerned with the approach of the company towards the development of products, while the second aspect focuses on the characteristics of the products in terms of where it situates itself in the circular economy throughout the lifespan.
The economic criterion is also looking into the aspects of green procurement where it is regarded as integrating environmental considerations in the purchase phase of products, hence, "a process whereby public or private parties seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured." [19].
Remanufacturing and the production/use of second-hand products in the form of sharing economy is an additional indicator considered at this stage. On the other hand, as the wider picture the economic perspective looks into the principles of Blue Economy, particularly proximity of resources, efficiency of activities, systemic approach for surrounding nature, multiple cash flows for a balanced business model and innovation in satisfying all basic needs and cultural shifts.

4.2 Social

The social dimension covers indicator no. 7-9, with a direct approach of the job creation opportunities on circular economy. Essentially, indicator 7 targets to assess the job creation opportunities from circular business models for instance from creation of jobs due to reverse supply chain activities, maintenance, reuse, refurbishment, etc.
From a different angle, the social frame also searches to analyze the education side, through educational actions, responsibility, project promotion with topics such as waste, recycling, regeneration, reduction and others including all relevant stakeholders.

4.3 Environment

From indicator no.10 to no.15 the environmental concerns are analyzed in the evaluation grid. Here the materials flows are central – primary materials in the form of raw materials and/or mass of waste recovered and reintroduced into its own production cycle and secondary materials as mass of waste recovered and reintroduced into another production cycle. The secondary materials have a key position as they can be the binder component in industrial symbiosis. A supplementary aspect is that all the environmental aspects of material flows are in the context of the Rs, namely here, Recycling, Reduce, Repurpose, Reuse, Regeneration, Recirculate.
The paradigm of circular economy poses questions related how the world should reduce waste, thus objectives such as energy efficiency, amount of energy recovered and saved and low energy consumption levels are taken into consideration. Furthermore, the degree of decarbonization through low emissions, clean and lean technologies can indicate the positioning of the integration of circular economy into business models.

4.4 Innovation

Continuous innovation adds value to a business by facilitating the sustainable management of resources through novel design of products and services, processes and business approaches. As continuous value is always desired by businesses, indicators no. 16 to no. 20 focus on innovation which uses lower amounts of resources and carbon through technologies clean and lean which base their inspiration or imitate nature's design. Here such approaches can use biomimicry views and can contribute to overall sustainable development.

5. DISCUSSION

The proposed evaluation grid by Lakatos 2019 can be applied in businesses with circular economy models to determine the performance of the integration of circular economy. The grid can evaluate the current state of the circular economy performance for various businesses, a key step in achieving the circular economy goals set, resulting in benefits along the whole supply chain, customers and stakeholders. However, the debate is still ongoing with many aspects to be touched upon. Following the discourse of value into businesses models (value proposition, value creation and delivery and value capture), table 1 has been derived.

Table 1

Value into business models' overview

	Value proposition	Value creation and delivery	Value capture
Economic	Indicator no. 3, 6	Indicator no. 4, 5	Indicator no. 1, 2
Social	Indicator no. 8	Indicator no. 9	Indicator no. 7
Environment	Indicator no. 14, 15	Indicator no. 11, 12, 13	Indicator no. 10
Innovation	Indicator no. 16, 17, 18, 19	-	Indicator no. 20

5.1 Economic

In the proposed circular economy evaluation grid, value on the market is proposed through green procurement and bio-based products with a focus on bio-economy. Although the use/production of bio-based products is a common practice on the market, there is still a high need for assessing their placement in the circular economy. They can still represent a novelty if the market niche is exploited in the right manner. However, in the light of value proposition, the novelty proposed by the evaluation grid is the green procurement. Green procurement withing the company can be used as a marketing strategy for bringing customers by showing them the deep interest of the management to be circular. This can offer

something new on the market – not only a circular product, but a circular attitude of the whole business.
As far as value creation and delivery is concerned, these are established through the switching to sharing economy. From goods' possession to services through remanufacturing and second-hand products, value creation and delivery occupies the market through collaborations, engaging many stakeholders with effective reverse mechanisms.
Value capture for circular economy lies in the growth of economic value for the life cycle thinking – here the market of industrial recycling, industrial ecology, repair, dissemble and recycle businesses is increasing as performance economy and can bring additional revenue from external sources.

5.2 Social

Social dimension is considered in the evaluation grid as proposing value through projects for promotion of responsible behaviors. Although such types of projects might not all be new to the market, the current market is not saturated. There is still room for projects or business models that promote reduce waste generation, reuse, recycling methods, regeneration or composting activities which are easy to engage in for the consumers.
Education is always a key enabler for paradigm shifts. This is also the case for circular economy and value creation and delivery can be obtained through educational methods. In order for an education program or education facility to work at the desired capacity, various stakeholders have to be engaged and work together towards the same goal.
Although job creation is part of the economic sector, for social dimension the job balance can be an attribute. Putting it together with circular economy, society can be a direct beneficiary from circular jobs. Thus, the net job balance on circular economy is the number of circular jobs minus the linear jobs which can capture value though their economic generation.

5.3 Environment

The novelty of a business in the competition with other businesses can rely on the decarbonization levels. If a business comes with a model which generates low quantities of emissions, offers clean technologies and lean technologies, it will have a market advantage for the consumers, as reduction of CO_2 emissions are very looked into at the moment. Global warming news have reached many consumers in our current times, and if the proposed product shows CO_2 reductions for instance, there will be a higher chance for consumer engagement.
Value creation and delivery can consist of alliances for increasing recycling, reverse logistic, repurpose and reuse with stakeholders being fully engaged. Furthermore, there can be collaborations set for food waste combat such as in the case of Food Banks, for biomass production and consume, areas for intervention on bio-economy.
The value captured for the environment sector lies on the materials used. Primary raw materials (mass of waste recovered and reintroduced into its own production cycle) and secondary raw materials (mass of waste recovered and reintroduced into another production cycle) can enhance the value of the business through energy efficiency, energy savings or low energy consumption.

5.4 Innovation

Normally, innovation is regarded as value proposition as innovative technologies adopted or developed by a business set the company on the market with a different advantage with the competitors. From the start, integrating technologies that use lower amounts of resources, change the amount of carbon emissions, are clean and lean offers an advantage in favor so that consumers are more willing to choose the circular company. Also, value capture can be both, quantitative and qualitative, thus using nature as inspiration (biomimicry for instance) in product design or strategy can lead to an increased value captured by the firm. However, as a point to be considered for further development, a business can thrive better if the is an indicator for assessing the value creation and delivery. How value is created through innovation is a crucial

aspect which is not accounted for at the moment in the current evaluation grid. Such an indicator can boost pathway thinking for the life of the product/service. It can be built up on the existing knowledge, along with partners and collaborators for in-depth value delivery to the market.

5.5 Further discussion and limitations

As with all research, this current study has its limitations which should be considered while interpreting the results but creates room for discussion in further research. It is highly important that the indicators in the evaluation criteria shall be taken together and not individually. In the case of the evolution of one certain indicator, the overall business does not always mean that is heading towards circular economy. As an example, if one business is more efficient in using raw materials, however the overall product cannot be recycled, reused or recovered, the negative impact is more detrimental to the environment. As a result, the overall circularity of a business model should be assessed as the sum of the circular state of each indicator [20]. This holistic approach which is often lacking and can lead to circular economy implementation that is not sustainable.

However, in other case studies the social indicators showed issues in their assessment as companies had difficulties in providing data or the data was uncertain [20, 21]. Moreover, researchers also identified social indicators as a gap as they are not well-integrated into the concept of circular economy. The imposed issues with having under-developed social criteria are that most of the positive impacts of circularity are visible in the social element, such as creating jobs, changes in thinking or others [20].

Another debatable aspect is that Kirchherr, Reike & Hekket [2] have found in their study that although the 4R "reduce, reuse, recycle and recovery" is the official EU policy framework for CE, at European level the policy is orientated towards promoting recycling, and the rest of the Rs are not equally supported. However, a sole focus on recycling does not imply circularity. One reasoning is that practitioners show little engagement in supporting "reduction" as it is the opposite of businesses objective of growth. This gap between theory and practice might hinder the development of inclusive circular model that accounts equally for each of the three parts of the triple bottom line.

A research gap that still poses problems is that often in literature the consumers' perspective on circular economy is not fully considered – "Little is known about consumers' willingness to participate in [a CE]" [22]. The consumer is the principal facilitator for a circular business model to have the desired effect in terms of the choice for the business model strategy. Only one out of five definitions consider the consumer as a second facilitator of circular economy, thus the possibility of adopting models more focused on the supply aspect of a business creates risks in terms of circular economy application and objectives [2, 23]. This negligence may reflect misdirection in the proposed value, value creation and delivery and value capture in business models.

Circular economy presents the potential to reach ahead of the current sustainable development objectives. Yet, a clear distinction between the conceptual ideals of circular economy and the subverted ones should be always considered[24]. If not framed adequately, circular economy will bring only incremental improvements at best, while not delivering the fundamental shift in paradigm that it promises at the business market level. However, if these points of discussion are taken along with the considerations touched upon in the indicator discussion parts, the advancement towards circular economy will be enhanced and the indicators under question can provide a comprehensive, replicable and applicable evaluation grid, useful for different business models which are easy to use.

6. CONCLUSION

This research has been conducted in order to widen the use of circular economy indicators proposed by Lakatos 2019 in her master's thesis and assess them through the value lens of circular business models. A comprehensive set of indicators for circular economy can

accurately determine the point of circular economy on the market at the measured time. In relation to the business value added, the indicators can enhance value proposition, value creation and delivery and value capture. As so, businesses who integrate circular economy into their strategies can offer a product or service which will occupy a niche on the market, competitive, attractive for the consumers, with sustained value and which generates revenue from internal and external sources and at the same time close material loops.

Apart from the triple bottom line (economic, social and environment), the current research is adding innovation as a new, but highly important section for circular business models. Innovation, at its core being value proposition, sets the company ahead of its competitors on the market, integrating novel technologies, efficiency in terms of materials and energy, carbon emission reductions and providing overall alternatives to the consumers.

However further research is needed in terms of consumer needs as circular economy does not directly address the consumers' needs and desires. And if not taken with cautiousness and assessed with comprehensive indicators, circular business models can provide only slight improvements and not the whole paradigm shift promised.

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ANNEX 1 - EVALUATION GRID USED IN LAKATOS 2019

CRITERIA FOR EVALUATING CIRCULARITY IN ACTION / PROJECT / BUSINESS / STRATEGY (0 least implication and 5 high implication)					
	Economic (0-5) (Lakatos-ONU, 2018; EMF-IN, 2015)	Social (0-5) (Lakatos-ONU, 2018; EMF-IN, 2015)	Environment (0-5) (Lakatos-ONU, 2018; EMF-IN, 2015)	Innovation (0-5) (Lakatos-ONU, 2018; EMF-IN, 2015)	Scale (0-5)
Description of the indicator	**1.**Growth of the economic value of Life Cycle Thinking (Industrial Recycling; Re-design of Products and services; Industrial ecology)	**7.**Net job balance on circular economy (Circular jobs minus linear jobs)	**10.**The degree of decarbonization (Low emissions; Clean technologies & Lean technologies)	**16.**Low resource consumption disruptive innovation	
	2.Increasing the economic value of the life cycle taking in consideration (Durable, Repairable, Easy disassembly product, Recyclable, Compostable, Non-toxic) Performance economy an Industrial ecology	**8.**Project for promotion and responsibility with focus on Waste generation, Recycling, Regeneration, Reduction, Reuse Remanufacturing and Composting of waste	**11.**Primary raw material: mass of waste recovered and reintroduced into its own production cycle (Regeneration, Reduce & Recirculate)	**17.**Low carbon disruptive innovation	
	3.Implementing "green procurement"	**9.**Education action on the circular economy including relevant stakeholders too'	**12.**Secondary raw material: mass of waste recovered and reintroduced into another production cycle (Industrial Symbiosis, Recirculate, Recycling & Up-cycling)	**18.**Clean disruptive technologies	
	4.Remanufacturing, second hand products, from goods possess to services (Sharing economy)		**13.**Increasing Recycling, Reduce & Recycling reverse logistic and avoid Waste generation by Repurpose & Re-use	**19.**Lean disruptive technologies	
	5.Incorporate six principles of Blue Economy (1. use of local resources / proximity; 2. Efficiency in activities 3. Surrounding nature is imitated by a systemic approach. 4.		**14.**Food waste, Biomass and Bio-based products as areas for intervention on Bio-economy	**20.**Imitating or being inspired by nature's designs to develop environmentally	

	Optimizing and generating "multiple cash flows" 5. Have to satisfy "all basic needs" 6. It requires an innovative culture to create change.)			sustainable innovations by Biomimicry	
	6.Bio-based products with focus on bio-economy		**15.**Energy Efficiency (Amount of energy recovered; Energy savings; Low energy consumption)		

Grilă de evaluare a indicatorilor economiei circulare pentru modele de afaceri circulare: o analiză bazată pe valoarea afacerilor

Rezumat: *Starea implementării economiei circulare în modelele de afaceri prezintă încă lacune în literatură și lasă loc pentru discuții. Progresul către economia circulară ar trebui să recunoască modelele de afaceri ca facilitatori pentru atingerea obiectivelor, cu multe oportunități de dezvoltare a pieței. Și întrucât nicio tranziție nu poate avea loc dacă nu există o listă cuprinzătoare de indicatori care examinează starea actuală a circularității, cercetarea actuală discută indicatorii propuși de Lakatos 2019 conform valorilor de bază ale afacerilor - propunerea de valoare, crearea și livrarea de valoare și capturarea valorii. Ca o secțiune suplimentară, inovația a fost utilizată individual și nu a fost integrată în linia de bază triplă, ca mediu de dezvoltare- inovația este în centrul modelelor de afaceri, deoarece poate oferi un plasament unic pentru consumatori.*

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