NEW BUSINESS MODELS FOR CIRCULAR ECONOMY

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Abstract: For implementing circular economy, it is crucial to complement technological innovation by developing new circular business models. Therefore, the EU-funded Horizon2020 project sustainablySMART, aiming at more resource efficient product lifecycles of smart mobile electronic products, addresses new business models for mobile ICT products, such as smartphones and tablets. Closing the materials loop in this sector includes durability, repair, re-use and remanufacturing design strategies as well as new automatic re-/de-manufacturing processes for improving resource efficiency and enhancing product lifetime. Circular economy approaches change the structure of value creation, namely of value chains, systems and constellations. Transformation from linear to circular business models needs the assessment of this value creation structure: New actors, value creating activities, resources as well as links and interdependencies between them have to be considered. Focus is on how to create new business models for circular economy.

1. INTRODUCTION: NEW CIRCULAR BUSINESS MODELS FOR GREEN ELECTRONIC PRODUCTS

Circular economy approaches are an effective tool to lower natural resources consumption, decrease negative environmental impact of production, securing supply of strategic raw materials as well as for better re-integrating the industrial subsystem into ecosphere [1,2,3,4]. Mobile ICT (information and communication technology) products, such as smartphones and tablets, cause significant environmental impact but having a product life of few years only. Closing the materials loop in this sector includes durability, repair, re-use and remanufacturing design strategies as well as new automatic re-/de-manufacturing processes for improving resource efficiency and enhancing product lifetime.

It is essential to complement technological innovation by developing new circular business models to foster practical implementation: Technology has to be embedded into organisational measures which assure circular flows of products, components and materials. Business models and technology are informing and shaping each other, it is thus important to analyse both separately and then, to bring them back into context within an analytic framework. This contribution outlines how the business model perspective complements the circular economy by assessing how the single building blocks of business models are aligned in a strategic fit and enable economically functioning implementation.

Circular economy business models are moreover supported on European policy making level, they are addressed by several directives, e.g. for waste electrical and electronic equipment, waste in general or ecodesign. [5,6,7] and the so-called 'Circular Economy Package' [8]. It bundles relevant legislative directives and initiatives with respect to close the materials loop.

This paper argues first that circular economy approaches add new activities, actors and resources to value chains, systems and constellations. When adopting new circular business models, the structure of value creation changes. This is the main challenge of business model innovation which has to embed this changed structure into the building blocks of business models and complementary value propositions. The approach of the sustainablySMART ('Sustainable Smart Mobile Devices Lifecycles through Advanced Re-design,

Reliability, and Re-use and Remanufacturing Technologies') project for generating new business models is outlined and examples for created business models are provided.

2. CIRCULAR ECONOMY APPROACHES RESHAPE VALUE CREATION

Circular economy approaches aim to increase overall materials efficiency. They are applied as strategy to mitigate the environmental impact of product manufacturing. For technical materials that is specifically recycling, refurbishment, remanufacturing, and re-use concepts that close the materials loop at products' end-of-life. Additionally, worn out products repair or durable designed products may prolong use phase. Closing the materials loop increases materials efficiency, by creating additional use phases for products, components or materials over the industrial cycle. Figure 1 displays concepts which constitute the circular economy for technical materials and assigns single technological approaches of the sustainablySMART project to them.

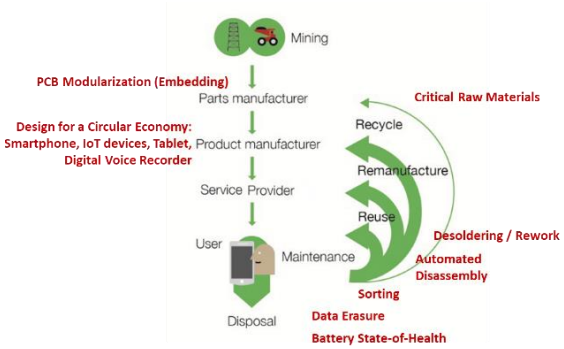

Figure 1: circular economy and technological approaches sustainablySMART project

Circular economy approaches for recycling, re-use and remanufacturing involve additional activities which are added to the value creation process of products or materials. Figure 2 provides an exemplary overview of activities which are typical in the value creation for these loop closing approaches.

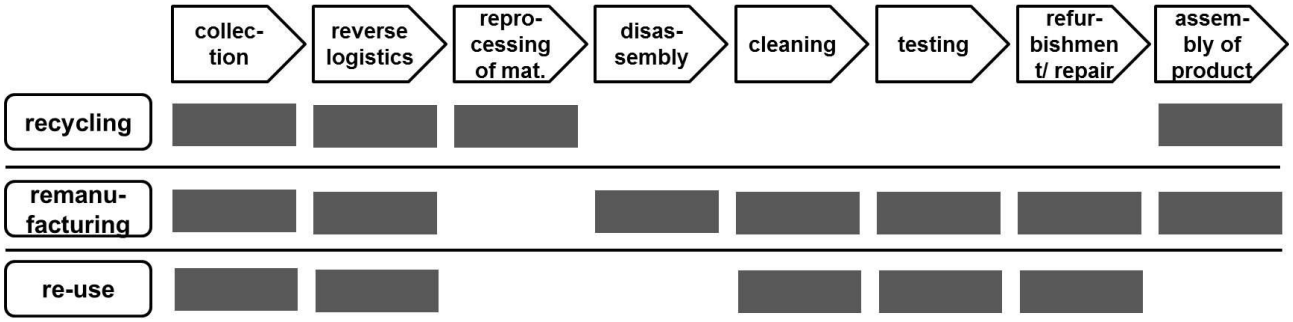

Figure 2: schematic sequence of process steps for recycling, remanufacturing and re-use approaches [9]

Note that single additional steps such as collection, reverse logistics or remarketing will require new actors in the supply chain which need specific (firm-internal) resources to perform these activities. Thereby the structure of value creation is likely at least to be extended, respectively gradually or radically changed.

3. RENEWAL OF BUSINESS MODELS

The business model as a concept is used as tool for analysis, planning and communication of corporate activities [10,11]. It assesses on an architectural level the business logic of companies and value creation networks [12]. There is at present no commonly shared understanding in science and literature what exactly defines a business model, but definitions share a number of common features. Zahn outlines the term as follows:

"The business model determines how a company creates or destroys value. Its renewal is thereby the tool to unlock new opportunities of value creation. […] Its goal is to find out which are the customer expectations and the key positions in the value creation system, which of those positions have to be secured and how which buildings blocks have to be combined to form a superior business model." [13, translated]

Main points from this definition are that the business model as a concept is

- centred on value creation and
- is formed by single building blocks.

Moreover, business models are not focussed on single companies but on ecosystems, including network partners and relevant stakeholders. Thereby the business model reveals the combination of production factors which should be used to implement the corporate strategy and the role of the involved actors [14]. A business model has to serve several functions [15]:

- articulate a value proposition

- identify target market segments for creating revenues and profit
- define the structure of value creation and considers complementary resources for securing the position in the value chain
- provide estimates on cost structure and profit opportunities basing on the value proposition and position in the value chain
- describe the position of the company in the value creation network, considering partners, complementors and competitors

Business models are a tactical layer, mediating between superordinate corporate strategy and implementation in business processes, shifting the focus on customer benefits. Starting point for creating and delivering value is the definition of the value proposition: it describes how a bundle of products or services creates value for a specific customer group. The value proposition addresses the benefit customers can expect from an offer [16,17]. Customer benefit is created by a product or a service solving a 'problem' of the customer or getting a 'job' done [18]. Business models do not only focus on value creation in a single firm (value chain) but in networks, also crossing the boundaries of a focal company and resulting in value systems or value constellations [19]. The structure of value creation clarifies how value creating activities including their intermediate results (firm-internal and -external) are interlinked for delivering the value proposition. Adaptions to existing business models then can change the structure of value creation. Table 1 provides an overview on different patterns of value creation.[20,21,22]

Pattern	Boundaries	Scope	Characteristics
Value chain	Single company/ business unit	Linear	Value added; primary and supporting firm-internal processes; of less relevance for circular business models
Value system	Company networks, supply chains	Linear	Still focus on linear added value but also consideration of horizontal (within the supply chain of an industry, up- or downstream) or vertical (with value chains of another industry) links between single value chains of companies; more complex structures of value creation
Value constellation	Company networks, business ecosystem	Parallel, multi-directional	Multi-directional value creation by transactions crossing company boundaries and their interdependencies; identify potential links for value creation between network actors in the business model ecosystem; customers can be included as actors contributing to the value creation process (e.g. as source of used products, co-creation); most complex structure of value creation

Table 1: characteristics of patterns of value creation [21,22,23,24]

As outlined in Chapter 2, circular economy approaches extend and reconfigure value creation processes by adding additional activities and actors to the business model ecosystem. This may add complexity to business models but also can be a source for business model innovation. For designing appropriate, well-functioning business models, the patterns of value creation have to be addressed, since they are especially important to circular economy approaches like recycling, re-use and remanufacturing. Business models need to be extended for collection, reverse logistics, recycling and refurbishment steps for closing the loop. This can reshape or destroy existing patterns of value creation or dominant business models. Business model innovation transcends product or process innovation. It addresses the way how a company establishes its business, respectively the rules and logic of doing business, such as closing the materials loop [18].

Main implication for the implementation of circular economy business models is that the structure of value creation reflects the configuration of a business model: Depending on the manifold patterns of value creation an optimized business model can be defined, different options and scenarios for business models compared or an existing business models can be adapted for circular economy. Newness and innovation of circular business models then are rooted in changed patterns of value creation – this means new value creating activities, actors, links and resources- or fundamental new value propositions. Consequently, circular economy approaches require business model innovation for implementing circular economy approaches into practice [3].

4. THE BUSINESS MODEL INNOVATION APPROACH OF THE SUSTAINABLYSMART PROJECT

sustainablySMART aimed from scratch to simultaneously develop technology and business models to assure exploitation of projects results. We raised project-internal awareness that choices in the technology development are reflected in design choices of the business models and vice versa. This was also complemented by life cycle assessment of environmental impact not only on product level but also for business models -if appropriate- for evaluate ecological footprint.

For designing new business models in an iterative process, we compiled a methodology which includes the key building blocks of most widespread business model concepts (e.g. 'the business model canvas' [25], 'business models as activity systems' [19], 'the integrated business model concept' [21], 'building blocks of a business model'[26])

The mission of this approach was to clarify, describe and analyse specific potential business models.

We followed a structured approach of how, where and why value added does unfold. We assessed the following pillars respectively steps:

1. 'Value proposition': What does your customer appreciate you for?
2. 'Value creation': Which activities create the value? Which resources or capabilities are particularly needed? Which actors and partners are actively involved?
3. 'Value capture': How do you turn the value into revenues and cash flows? So, how do you make the business model pay out? Which assets and protection rights are available and required beyond the technology itself?

Figure 3 provides an overview of the approach for designing new circular business models in sustainablySMART.

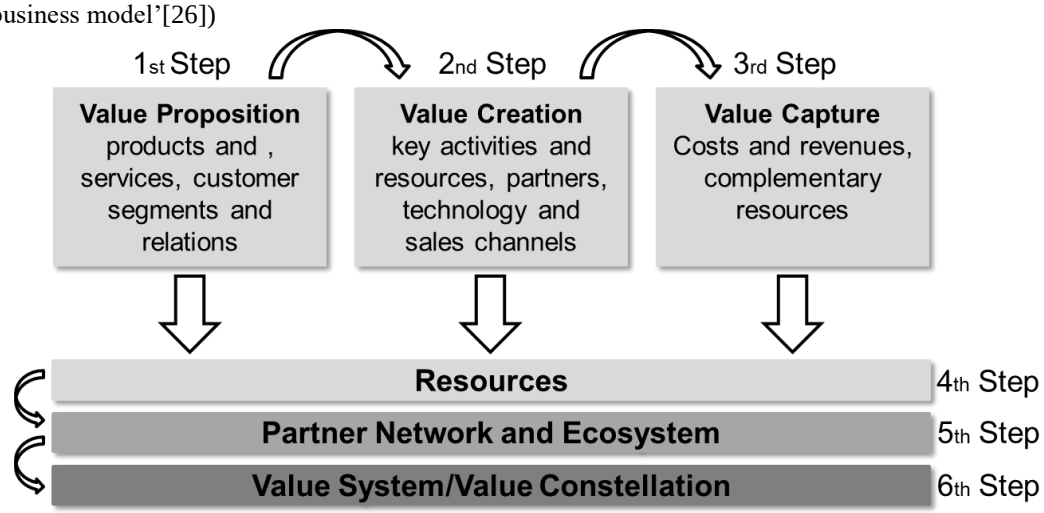

Figure 3:approach for creating new circular business models in sustainablySMART

sustainablySMART scoped on business models for the whole ecosystem of circular, smart electronic devices. This included innovative process technology for sorting, disassembly and advanced material recycling, as well as new D4R products, take-back systems and remarketing of used modules/components. Goal was to assess single business models in nine case studies which could work as stand-alone business in the current market but also can benefit from direct linkages between each other. Thereby a bigger picture of a circular electronics ecosystem becomes clearer spanning the whole lifecycle of smart mobile electronic products. This finally was completed by financial calculations in business plans and assessment of scenarios for each case study. Calculations serve as foundation for decision-making of management if a business model can be implemented in a profitable way. Figure 4 shows the business model case studies' allocation in the product lifecycle.

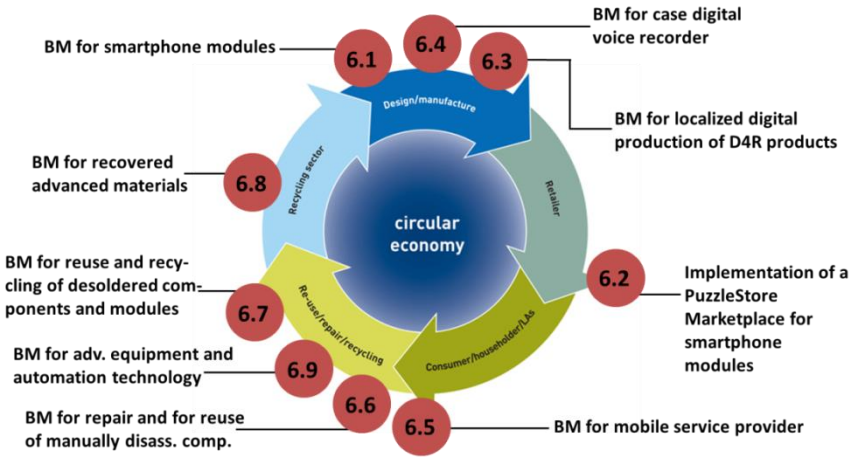

Figure 4:business model case studies of sustainablySMART in the product lifecycle

5. CONCLUSIONS

The project sustainablySMART complemented technological innovation with the exploration of new circular economy business models. We focus on the structure how value is created in company networks and ecosystems. Circular business models can require the addition of new activities actors and resources, interdependent how linear value creation is reconfigured to value systems or constellations. Business models (business model concepts) are a managerial tool depicting this business ecosystem and used for complexity handling, in particular if a prolongation of the use phase of products implies facing competition with possible future competitors, longer time horizons and insecurities which prevent precise market or technology forecasts and planning. This paper outlined the approach for developing new circular business for mobile electronic products to foster sustainable product life cycles.

6. REFERENCES

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7. ACKNOWLEDGEMENTS

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