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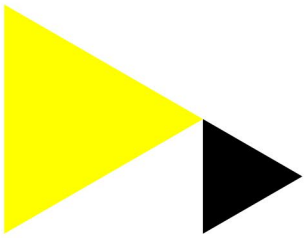

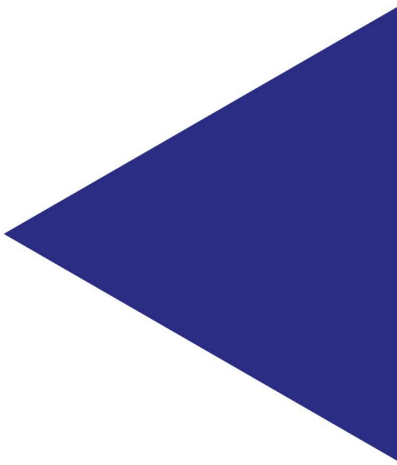

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Unravelling Repurposing

A taxonomy for a promising circular business model strategy

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Extended Abstract

Introduction

This abstract addresses a gap in academic literature with regard to a classification of repurposing as a business model strategy by unravelling the repurposing concept and providing insight in the main characteristics of repurpose as a business model strategy.

Theoretical background

In the transition towards a circular economy finding new uses for discarded products and materials is gaining increased attention in practice and research, which is one of nine circularity strategies within the product chain and referred to as 're-purpose' by Dutch national strategic advisory boards RLI and PBL (Potting, Hekkert, Worrell, & Hanemeijer, 2017).

According to a circular economy conceptualization study by Reike, Vermeulen & Witjes (2018), repurpose is used to a lesser extent than other circularity strategies. Various academic studies refer to repurpose as a strategy which uses a discarded product or its parts in a new product with a different function (Sieffert, Huygen & Daudon, 2014; Potting et al, 2017; Kirchherr, Reike & Hekkert, 2017). Whereas this definition still leaves some room for technical product modifications and

intentional design for multiple lifecycles, alternative definitions exist among scholars. For example, Sihvonen & Ritola (2015) leave no room for product modifications and specifically refer to repurposing as "using the same product for new purposes without any adjustment" (p. 641) and Bauer, Brissaud & Zwolinski (2017) specifically refer to repurposing as an end-of-life strategy. Furthermore, academic literature also refers to the same concept with alternative terms, including 'rethink', 'fashion upgrading', 'part re-use' (Reike et al., 2018), and 'upcycling' (Braungart, McDonough & Bollinger, 2007; Wilson, 2016; Kyungeun Sun, 2015), terms that are also used in practice.

Repurposing has been proposed as a possible strategy for sustainability (Sieffert et al., 2014) and especially gained attention in design literature and becoming popular among industrial design and artists (Reike et al., 2018), mainly because of its creative potential in the gap between reuse and recycling (Mills, 2012). Various contributions have been made by scholars with regard to repurposing of specific product types, for example with regard to specific cases like wind blades (Leahy, 2019; Bank, Arias, Yazdanbakhsh, Gentry, Al-Haddad, Chen, & Morrow, 2018), electronics (Zink et al., 2014; Ortiz et al., 2010) and do-it-yourself repurposing (Wilson, 2016), or in relation to design processes in textile (Han et al., 2017) and civil engineering education (Sieffert et al., 2014).

In sustainable business model literature, several scholars made important contributions in relation to business model strategies for a circular economy, for example the categories of slowing and closing loops by Bocken, de Pauw and van Grinten (2016) and the six business model patterns based on major reverse cycles in closed loop supply chains by Lüdeke-Freund, Gold and Bocken (2018). Bocken, de Pauw and van Grinten (2016) distinguish two business model strategies for cyclic use of products and materials, which are based on 'slowing' and 'closing' material loops. We consider repurposing as a 'closing loop' business model strategy with a focus on extending value where value is captured by turning otherwise 'wasted' resources into new forms of value.

Lüdeke-Freund, Gold and Bocken (2018) propose six major business model patterns based on major reverse cycles in closed loop supply chains and associate the 'cascading and repurposing' pattern particularly to local Industrial Symbioses relationships and biological cycles. Although some examples of technical nutrient and product cycles are mentioned in relation to the cascading and repurposing pattern - i.e. clothing and EV-batteries - technical nutrient cycles are primarily addressed

in any of the four other circular business model patterns (i.e. repair & maintenance, reuse & redistribute, refurbish & remanufacture, recycling).

Although some academic contributions recognise repurposing as an important business model strategy, attention for repurposing in academic research is still lacking behind (Lüdeke-Freund et al., 2018). This abstract addresses this gap by unravelling the repurposing concept and providing detailed insight in the characteristics of repurpose as a business model strategy.

Method

Our unit of analysis in this research is repurpose as a business model strategy and our classification approach is based on clustering empirically collected characteristics and variables, hence we develop a taxonomy (Bailey, 1994, p. 6; Rich, 1992). For this study we conducted 11 semi-structured interviews with experts from research and practice until a convergence of views was accomplished (Huberman & Miles, 1994) and collected 100+ cases examples from literature, interviews and by web search.

Starting from a general classification of factors and characteristics of the repurpose business models strategy based on a preliminary literature study, the 100+ cases were listed in a database with the following variables:

- Origin (Sector, Product/function, Country of use, Producer (if known), Uniqueness of origin, Availability (once / intermittent / continuous), Number of availability)
- Characterisation (Materials/parts, Production technologies, Product Characteristics , Uniformity)
- Critical factors (Unicity, Functional value, Design, Non-uniformity, Discontinuity, (A-)synchronicy, Rebound-effect)
- Typology
- Application (Sector, Product/function, Producer, Country, When/since)
- Characterisation (Preparation, Production technology, Other processes, Materials added, Product varieties, Uniformity)
- Business model aspects (Value proposition, Choice option, Distribution, Revenue model, Price, Number of repurposed items)
- Impact (Economic, Environmental, Social, Rebound effect)

- Sources/more information (Website, Pictures, Other, Similar examples, Other applications of same waste stream, Similar repurpose examples of other waste streams)

Based on the interviews, using a pattern-matching logic for explanation building (Eisenhardt & Graebner, 2007; Yin, 2017), we first identified key characteristics of repurposing and derived a definition for the repurpose business model strategy. Next, we used a multiple case study method (Yin, 2017) building on the 100+ cases of repurposing we found. Based on a cross-case analysis we developed a concept taxonomy for repurposing, that was further validated and improved in two work-shops with experts from practice.

Findings

The results of this research relate to the identification of key characteristics of re-purposing, leading to a number of variables and a domain of repurpose. Based on the interviews we have identified a number of key characteristics of repurposing, entailing:

- Change of context, function or purpose
- Enhancement or extension of value, lifecycle, lifespan, function or personal attachment
- Remaining material integrity, visible origin and emotional value
- Avoiding damaging material and large distances

Based on the interviews we define repurpose as: *"a business model strategy that applies a discarded product or its components for a function, goal or context other than its originally intended value proposition, and in doing so retaining value that was added by various production processes and adding new value"*.

Based on the cross-case analysis of 100+ case studies we also propose a taxonomy for repurposing, consisting of three main categories: Recontextualise, Reshape and Regenerate, and four related categories (see Figure 1).

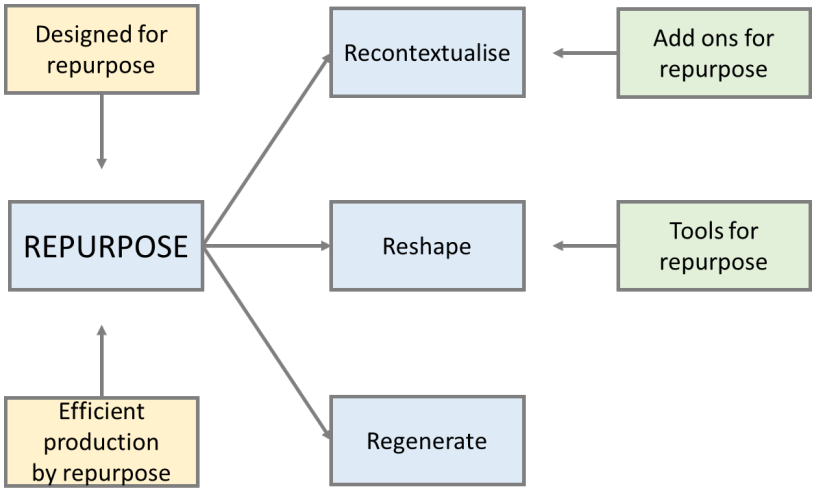

Figure 1. Three main categories for repurposing and four related categories.

The three main categories – Recontextualise, Reshape and Regenerate - each entail new value propositions with decreasing degrees of value retention. In Recontextualise the discarded product is used without physical modifications in a new context, however with a new value proposition which is closely related to its original usage. A car battery, for example, may no longer be able to fulfil its original function properly, but is with minor alterations usable in a less demanding context such as electricity storage in buildings. In Reshape, the product or its components undergo minor physical modifications and are used for a new application inspired by the emotional value related to the unique origin of the product, the original form or appearance of the product or component, and/or the functionality or the properties the product or component offers. An example that uses a combination of these characteristics is a tray made of the national railway timetables, using the colour and material properties as well as the emotional value related to the iconic timetables. In Regenerate the product or its components undergo relatively significant physical modifications, but specific functional and visual properties of components or materials are used for the production of higher-value products. Other than with recycling, with Regenerate the material of the discarded product of component is still recognizable, for example colourful flip flops produced from waste rubber found on African beaches each being unique and appealing to a sustainability-minded target audience.

Additional to the three main categories, we found four categories which are related to the concept of repurposing. Add-ons are products that facilitate recontextualising of discarded products (for example a cap that makes a spray bottle out

of a soda bottle), whereas tools for reshaping facilitate the making of a new product out of a discarded on (for example a kit to make guitar picks out of credit cards). Among the case studies we also found products that were especially designed for next-life repurpose, as well as repurposing of production waste leading to more efficient production.

Contribution and discussion

With this research we contribute to the sustainable business model and circular economy literature by providing a profound insight in the repurposing concept and a taxonomy for repurpose as a circular business model strategy. The taxonomy shows the broad scope of the repurposing concept by distinguishing between three main categories, i.e. Recontextualise, Reshape and Regenerate, with an increasing level of adjustment of the original product or product part. The main category Recontextualise reflects the definition of repurpose by Sihvonen and Ritola (2015) with no or minor adjustments to the product. The main categories Reshape and Regenerate reflect the creative potential of design to fill the gap between reuse and recycling (e.g. Reike et al., 2018; Mills, 2012) and provide promising possibilities to retain value that was added in the production process.

This taxonomy provides a differentiation of the cascading and repurposing business model pattern as identified by Lüdeke-Freund et al. (2019), addressing how this pattern may also be used for technical nutrient cycles. This taxonomy may be used as a framework for further research, for example to study the business models related to each category and to accompanying circular design strategies by employing more comprehensive case studies. Moreover, the taxonomy can be used to compare the economic, environmental and social impact of different repurpose categories, hence providing a refinement of current frameworks for circularity strategies for closing material loops.

Keywords

Circular economy; circular business model; business modelling; repurposing; business model strategy.

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