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Exploring the challenges for circular business implementation in manufacturing companies: An empirical investigation of a pay-per-use service provider

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ABSTRACT

The shift to a circular economy (CE) is associated with the need to implement innovative business models, but the adoption of circular business strategies in the industry has been limited. In fact, manufacturing companies face a range of challenges when transitioning toward such strategies, yet these challenges are rarely discussed in practice. This paper investigates the challenges faced by a manufacturing firm when implementing a circular business model and the solutions adopted to overcome them. A case-based research design was adopted in this study. The main challenges for circular business implementation faced by companies were identified in the literature and applied as lenses for examining the transition to a new circular business strategy in the company under analysis. Data analysis involved working with the data from the ground up to identify solutions for overcoming the challenges. The main findings reveal that changes needed for implementing a circular business model are achieved by integrating and engaging multiple organizational functions, each of which is complementary and mutually supportive. The involvement and collaboration of multiple stakeholders play an important role in circular business model implementation and operation. Moreover, the implementation of such models should consider specific contextual aspects of the business in question, i.e., alignment between external conditions and the business model should occur. A deeper understanding of the development of other types of circular business models in distinct contexts, and the capabilities necessary to develop and implement them, is recommended for further research.

1. Introduction

The concept of circular economy (CE) has been proposed as a promising economic avenue for addressing current environmental and socio-economic issues and creating a more sustainable society (Witjes and Lozano, 2016). In a CE, production is circular, i.e., raw materials and products re-enter the environment or are reused in successive production cycles (Ruggieri et al., 2016). As such, the CE system can be seen as environmentally and economically regenerative (Lieder and Rashid, 2016).

Although the CE concept has become widespread, it has rarely been discussed in the business and sustainability literature (Murray et al., 2015). In fact, the adoption of CE around the world is still in its infancy, especially at the micro-level, mainly focusing on recycling rather than reuse (Ghisellini et al., 2016). Implementing practices aligned with CE

concerns can transform the way companies do business, especially in the manufacturing sector (De los Rios and Charnley, 2016). The shift to a CE is associated with the need to implement innovative business models (Ruggieri et al., 2016), yet the adoption of such models in the industry has thus far been limited (Linder and Williander, 2017; Witjes and Lozano, 2016).

The integration of CE concerns into business has many benefits but also creates challenges when implementing CE at the micro-level (Rizos et al., 2016), which requires multiple and simultaneous changes in various subsystems (van Buren et al., 2016). The development of business models in manufacturing companies that fit CE concerns involves rethinking many issues, such as seeking new partnerships that permit collaborative business models (Lieder and Rashid, 2016), different capabilities, inter-firm collaboration, and leadership skills (Fischer and Pascucci, 2017; Weissbrod and Bocken, 2017). Although

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Table 1
External and internal factors that may affect circular business model implementation.

Challenges/factors that impact CE implementation	Reference
Firm's structure (management systems, long-term investments), contextual factors (government regulations, uncertainty regarding the marketplace ¹), and cultural factors (leadership issues, risk aversion)	Liu and Bai (2014)
Adoption of specific technologies (e.g., recycling technologies), legal barriers (e.g., complexity of regulations), difficulties defining the business strategy, mindset change	Roos (2014)
Customer irrationality (some customers might prefer ownership of a product even if temporary usage is more economical), conflict of interest within companies, misaligned profit-share along the supply chain, and geographic dispersion	Planing (2015)
Societal factors (stakeholder relations/inter-firm collaboration), regulatory factors (laws, subsidies, taxation), services and infrastructure, products and technology	Fischer and Pascucci (2017), Scheepens et al. (2016)
Lack of capital, administrative burden (new practices can be considered complex and entail more complex and costly management and planning processes), company environmental culture, lack of legislation, information, technical and technological know-how, and support from the demand and supply network	Rizos et al. (2016)
Professional barriers (knowledge development, dissemination, and innovation), social and people-related barriers (consumer acceptance), economic barriers (lack of investment power), institutional barriers (current practices)	van Buren et al. (2016)
Customer-specific restrictions (only certain types of customers are suitable for remanufactured products), technological expertise requirements, return flow, product categories (some types of products may not be suitable for remanufacturing), risk of cannibalization, ² fashion vulnerability, ³ tied up capital, ⁴ operational risk, lack of supporting regulation, and partnership restrictions ⁵	Linder and Williander (2017)

Notes (Liu and Bai, 2014; Linder and Williander, 2017).

¹ Some companies might be uncertain about how efforts to change to a circular business would be rewarded by the market, which is a contextual barrier to its implementation.

² This occurs when new and longer-lasting products reduce sales of older products.

³ The introduction of a circular business may lead the company to become incapable of responding to fashion changes.

⁴ In some circular businesses, for instance, when the offer involves leasing/renting rather than selling, the financial risk is transferred from the customer to the producer. Long-term contracts might be used, but may reduce the attractiveness of the offer to certain types of customers.

⁵ There might be considerable challenges associated with creating the required understanding and incentives for key partners.

some recent studies have explored internal and external factors affecting the adaptation of business models to CE principles (e.g., De los Rios and Charnley, 2016; Lewandowski, 2016; Weissbrod and Bocken, 2017), there has been little empirical debate about how firms view and develop the CE (Liu and Bai, 2014), nor has extant research explored alignments between changes taken toward circular business models and the internal and external factors affecting their adoption (Lewandowski, 2016).

Empirical research is required on the contributions of sustainable business models to CE (Witjes and Lozano, 2016). Thus, this paper explores the challenges confronted by manufacturing companies when implementing circular business strategies. The development of new business models aligned with CE concerns by manufacturing companies is critical (Lieder and Rashid, 2016), so a better understanding of the challenges for CE implementation is needed (Rizos et al., 2016).

The circular business explored in this paper is focused on offering functionality (in a renting scheme) instead of products, i.e., it uses a product-service system (PSS) business model strategy to slow resource loops. A PSS can be defined as a mix of tangible products and intangibles services designed and combined to jointly fulfill customer needs (Tukker, 2004). It is relevant to understand the effects of circular business and consumption models that involve the sale of a service or its leasing, refurbishment, and remanufacturing (Ghisellini et al., 2016) because the shift to a PSS provides the basis for a company to better contribute to CE (Witjes and Lozano, 2016).

Additionally, more empirical analysis of CE implementation in emerging economies is needed because the concept of CE is newer for developing countries (Goyal et al., 2016). Moreover, CE implementation in different regions may differ (Guo et al., 2017). Nevertheless, extant studies have focused mostly on CE implementation in China (e.g., Liu and Bai, 2014; Wu et al., 2014). However, the CE in China seems to follow a very different pattern than elsewhere (Ghisellini et al., 2016). Thus, the company and business model under analysis are located in another emerging economy: Brazil. Like other developing countries, Brazil has experienced economic expansion in recent decades and is consequently consuming more natural resources (Wu et al., 2017). For this reason, research should be performed on developing business models that advance both sustainability and the capabilities necessary for achieving it in emerging markets (Amui et al., 2017).

The remainder of this paper is structured as follows. Section 2 draws

on the CE literature to identify the challenges to implementing circular business models as reported in past research as well as the methods used to gather and analyze relevant data. Section 3 discusses the analytical findings concerning the challenges faced by the company under investigation in transitioning toward a new circular business. In Section 4, conclusions are drawn about the usefulness and implications of this study, as well as its limitations and recommendations for future research.

2. Materials and methods

2.1. Dealing with circular business features

CE principles are introduced either top-down (policymakers take the lead in implementing actions) or bottom-up (organizational innovation) (Ruggieri et al., 2016). From the bottom-up, transitioning to a CE represents a radical change that requires new ways of thinking and doing business (Bocken et al., 2016).

A business model can be defined as a representation of the primary core logic of a firm and the strategic choices made to create and capture value within a value network (Shafer et al., 2005). According to Richardson (2008), the major components of a business model are (i) value proposition, (ii) value creation, and (iii) value capture. According to Linder and Williander (2017), a circular business model can be defined as a business strategy in which the conceptual logic for value creation is based on utilizing the residual economic value of products post-use in the production of new offerings. Bocken et al. (2016) proposed key business model strategies that support both slowing and closing resource loops. On the one hand, business model strategies for slowing resource loops are focused on extending product life and reuse through business model innovation. On the other, business models for closing resource loops involve capturing value from what would otherwise be considered “waste” in a linear business. The implementation of any of these new business strategies, however, requires a company to make a range of internal changes, as discussed below.

2.2. Challenges to CE transition at the micro-level

Organizational innovation is necessary for circular business model implementation (Lewandowski, 2016), which should start with

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