

CIRCULAR BUILDING AND NEW BUSINESS MODELS: WHAT OPPORTUNITY FOR THE CONTRACTORS?

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Social and political forces are advocating the need to shift towards circular economy, defined as a restorative and regenerative economic system where resources are retained and reused and which should replace the current linear economy of take, make and dispose. This is a radical change for the construction sector which has for a long time considered the management of waste as not been part of the tasks of the industry. Demolishing and recycling activities, usually considered as low value work, now received a renewed attention and construction companies are slowly developing new business propositions to include the reuse of waste. Building on the ongoing discussion on green business models, following Teece, we define business model as a 'model' which represents the organisational and financial 'architecture' of a business and includes implicit assumptions about customers, their needs, and the behaviour of revenues, costs, and competitors. Instead of focusing on innovation as an internal process, we understand this development as a dynamic process stretching outside company boundaries. Building on a longitudinal study of construction companies (2017-2020) active in the southwest part of Sweden, we propose to give an insight in how these companies are engaged in developing new business propositions focusing on circular economy, how these propositions have emerged and how they could be transformed in new businesses. The empirical material draws on a qualitative study of 11 companies gathering interviews with 35 practitioners, five sites visits and three observations of meetings and workshop. Our contribution aims at informing how the companies, investing in the dynamic processes of business models, can support innovation in the construction industry and participate to the development of circular economy but also to document what are the main challenges they face in doing so.

Keywords: business model, circular economy, construction and demolition waste

INTRODUCTION

The recent social and political focus on circular economy is pressing the construction industry to rethink its work process and use of material. In particular, the activities related to the management of Construction and Demolition Waste (CDW) are under scrutiny. To improve the circularity of building material, the life cycle of various products and material is documented to facilitate and encourage the choice of sustainable solutions, and many models are developed to optimise the supply chain and logistic processes. Likewise, demolishing and recycling activities, usually

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considered as low value work, have received a renewed attention and some contractors are now developing competences to include these activities in their portfolio. The European Commission has launched successive initiatives, its first circular economy action plan in 2015, updated in 2020 includes focus areas for construction promoting circular principles throughout the lifecycle of buildings (EC, 2020); the last taxonomy report (EC 2020) identifies four targets to prioritise its economic investment: new buildings, renovation, individual measures and professional services and acquisition and ownerships.

Moving attention from material and technical flows to the creation of a new market, the EU policy identifies businesses and consumers as key actors to drive the transition process and suggests that the additional cost generated by the transition to circular for new constructions, renovations and acquisitions should be supported by the mechanism of the newly created market. "These additional costs can be counterbalanced over time through the expected energy savings and the wider benefits (on health, comfort, lower volume of energy consumption and reduced energy bills, etc.) associated with high-performing buildings" (EC 2020). However, whereas the potential of these new business opportunities has been forecasted by numerous researchers, in practice, it seems so far difficult to transform this potential into profit for the company and most of the construction and property professionals are still struggling to apply genuine circular thinking to their business services and products (Jones and Comfort, 2018). One of the tools to integrate new opportunity and develop new business propositions is the use of business models.

The ultimate purpose of these business models is to increase companies' financial benefit and positioning on the market. These models serve to map the actual core aspects of an organisation and to define possibilities for future developments, in particular the green business models should help to include circular thinking in new business propositions (Lüdeke-Freund *et al.*, 2019).

In this paper, we propose to give an insight how these new business models are taking shape building on the activities of a case company and interviews with 10 other companies operating in the region of Gothenburg. We build on the concept of sustainable business models (SBM) to describe, organise and analyse the processes which have driven toward these changes. The model enables us to decompose the new business models in different components and observe how these components are shaped and organised through time to create the new propositions.

To do so we draw on the material gathered in an ongoing five-year PhD project with public and private actors engaged in CDW as well as managers of the companies which have developed business models targeting CDW. We gather their concrete considerations, choices and actions when developing solutions including the circular economy principles. The overall purpose of the paper is to inform about the dynamics and processes which shape the creation of new business models and consequently innovation in the construction sector. While the scope of research on waste management within construction is including the contribution of study of the supply chain, existing work practices, business approach to projects, and technologies to reduce generation of waste, innovative approach to business development is rarely been addressed (Pekuri *et al.*, 2015, Abuzeinab *et al.*, 2018, Berg *et al.*, 2019, Buser and Carlsson, 2020).

Business Models

The basic assumption of business model is that enterprises can organise and conduct business practice, and that they can create and capture value in doing so. BMs can take many forms, mobilising different components and configurations (see see Saebi and Foss 2015, for a review), but most of the authors agree on a common definition: business models focus on how a company defines a value proposition to address specific customer segments and organise itself and its networks to reach the benefits associated to this defined proposition.

Teece (2010) characterises a BM as a strategic tool “defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit” (p:172). BM describes the organisational and financial ‘architecture’ of a business and includes implicit assumptions about customers, their needs, and the behaviour of revenues, costs and competitors (ibidem). To be operational it should be sufficiently differentiated to meet customers' needs, difficult to replicate and should lead to competitive advantage (Teece 2010). The use of BM often brings organisational changes for a company however, these may not be limited to the company but request to include a larger group of actors such as company’s customers, key stakeholders, and shareholders. (Zott *et al.*, 2011). Common features of Business encompass the dimension below:

Table 1: Dimensions of business Model (Lüdeke-Freund *et al.*, 2018)

Major dimensions	Subcategories
Value proposition	Products, services
Value delivery	Target customers, value delivery process
Value creation	Partners and stakeholders, value creation process
Value capture	Revenues, cost

Value proposition describes the benefits that customers can expect from the company products and services. Value delivery defines the audience of the product or service and how the later are delivered to the customers. Value creation entails the necessary partners to develop the proposition and the process to produce it. Value capture assesses the revenues and costs of the propositions. Building on these dimensions to describe BM is in line with major frameworks such as Osterwalder and Pigneur's “business model canvas” (2009) and widely accepted theoretical definitions (Teece 2010, Lüdeke-Freund *et al.*, 2019). As pointed out by to Baden Fuller and Mangematin (2015) many firms run portfolios of business models: large companies typically have diversified exploiting competencies in different ways across multiple customer groups. This results in different divisions capitalizing on common capabilities to sell products or services one way in one market, and in a different way in another market. The authors underline the lack of information regarding the merits of running these portfolios, and how companies have developed these business models across time and space (2015). They advocate for studying the processes by which managers construct and reconstruct the business models that frame their decisions about their businesses (Demil and Lecocq 2015, Baden Fuller and Mangematin 2015).

Green Business Models

The attention to sustainability and more recently for circularity has stimulated the development of green business models striving for associating the short-term financial interest of companies to maintain or increase economic prosperity with the longer-term focus of social, environmental and economic sustainability (Schaltegger *et al.*,

2015). However, the incorporation of circular thinking aiming at "decoupling economic activity from the consumption of finite resources and designing waste out of the system" (Ellen MacArthur foundation, 2013) involves a radical paradigmatic change.

This requires a complete reverse of the companies' focus, who thanks to "generations of engineers, operations managers, and business administrators," have concentrate their efforts so far to optimize forward supply chains that conduct resources and goods "from cradle to grave" (Lüdeke-Freund *et al.*, 2019). The authors argue that the companies' fundamental challenge is to rethink their supply chains and use of material and transform the way they create and deliver value (Ibidem page 36). Kirchherr *et al.*, (2017) identify 114 definitions of circular economy and Lüdeke-Freund *et al.* (2019) estimate to 4,445,280 theoretically possible combinations of design options to create circular economy business models.

The shared objective of these countless possibilities is nevertheless to offer a strategic tool to companies seeking to integrate sustainability values and goals in their business. We choose here to build on the categorisation of Bocken *et al.*, (2014) who identify eight sustainable business model archetypes to integrate circular concerns in business purpose and support innovative practices. They aim a categorizing and explaining BM for sustainability providing mechanisms to assist the development of sustainable BM and examples for business to de-risk the green BM innovation process, and finally to contribute to define a clearer research agenda for BM for sustainability (Bocken *et al.*, 2014). The eight archetypes developed are:

- Maximise material and energy efficiency
- Create value from 'waste'
- Substitute with renewables and natural processes
- Deliver functionality, rather than ownership
- Adopt a stewardship role
- Encourage sufficiency
- Re-purpose the business for society/environment
- Develop scale-up solutions

METHODOLOGY

The present article builds on the findings of an ongoing five-year PhD (2018-2023) project focusing on the adaptation of contractors to the flux of new regulations regarding the handling of waste (Andersson, 2021). Following the sector development during the last three years, the frame of the project has moved from sustainability to circularity demands and from the handling of waste on site to more strategic considerations including the creation of new business propositions. The frame of understanding for the present paper draws on a selective literature review drawing on BMs and green BMs theory focusing on the particularities of the construction sector.

The qualitative study consists of a mixed-methods and employs an interpretive approach to discuss the empirical material (Bryman and Bell 2011). This enables us to gain insights to the specific contexts through quotes, observations, and thick description. The paper builds on a case study of the regional division of one of the biggest contractors in Sweden gathering interviews with 13 project, production and site managers and their environmental manager complemented by visits of three building sites, and observations of two start up meetings where the contractor

introduced a new waste management concept to its sub-contractors. The case study is supplemented with 17 interviews with practitioners including six demolition companies, two environmental managers of two of the larger contractors in Sweden, one large contractor subsidiary and an architect in the Gothenburg region as well as the participation to two workshops and three seminars on the topic of circularity and waste management gathering practitioners of the sector. An overview of the interviewees is presented above in Table 1. The semi-structured interviews enable us to gather the participants experiences and opinions regarding the implementation of circularity principles and practices. The interviews were recorded and transcribed. These sessions were mainly documented with notes and pictures.

Table 2 - Interviewees' overview

Company	Interviews	Interviewees	Positions
1 of the biggest contractors	10	13	Project-, production, site-, manager
3 of the biggest contractors	3	3	Environmental manager
Demolitions small - medium contractors	6	10	Project-, production -site manager
	1	1	Sustainability manager
Large contractor - subsidiary	1	2	Business development manager,
Recycling contractor	2	3	Business developer manager
Architect	1	1	Environmental manager
Total	24	33	

The document study is based on numerous national and European governmental reports, professional guidelines, certification standards, legal frame and companies' websites. As this study is exploratory, we have followed a rather iterative process between the interviews, observations and the literature (Dubois and Gadde 2002). The material has been organised and analysed according to the emerging themes in a matrix crossing the conventional dimensions of BM and the eight archetypes developed by Bocken *et al.*, (2014).

FINDINGS

Value Proposition

The strategies of the three larger contractors in Sweden regarding products development are quite similar. If the following practices are far from being standardised at the level of the project, the companies are nevertheless engaged into experiments to integrate circularity. They have created a handful of pilot projects to demonstrate the feasibility of building out of recycle components like the Epic building in Malmö. They organise stockage of dismantled material such as doors windows for future reuse. They also propose milieu certifications and the use of sustainable material for their new projects. All these propositions which do not necessitate new heavy investments should hopefully answer the need of interested customers, but mostly so far serve as marketing tools.

Our case company have tried to develop new services to customers focusing on the management of waste but without much success. In 2015 they created a subsidiary proposing to collect and handle all types of construction waste for both professional and private customers. However, the scope of these activities is now reduced to the management of excavated masses, asphalt, concrete and soil. If the lack of readiness of the market was flagged as explanation for the downsizing, the numbers of existing competitors and a decrease of turnover for the company are more likely to account for

the decision. In 2016, the company introduced an open digital platform aiming at optimising handling of stone, soil and other secondary fillers at construction sites. The service proposed was the organisation of transport of material between workplaces across projects instead of driving it to landfill. Though having expended to Finland and Norway and counting 16 000 users, the platform was closed after three years of exploitation: “the market was not ready to engage in such initiatives” (company press release). Despite the project being awarded prizes for its contribution to sustainability, the lack of profit and external investments and the decision of the company to re-focus on their core activities drove it to an end.

Value Delivery

The target customers are so far mostly public actors such as municipality, administration or university who have specific interest, and funding to push forward the development of circularity but also the responsibility to build according to the coming national regulations. However, pilot projects of circular buildings can also be the results of the contractor's own initiative aiming at selling or renting the facilities to private actors after the completion of the project. In this case, they target "green customers" sensitive to the sustainable, innovative and fashionable aspects of the construction. But as the production of circular solutions is said to be clearly more expensive than the conventional one, the projects managers interviewed avoid including circular features in their design for private clients unless it is explicitly requested. Even though, they witness architects offering the choice between several options including some elements of circularity to their clients such as reuse of doors or windows or upcycling of material and furniture. But according to the project managers, the handling of waste during the project is never a key argument or decision factors for signing a contract. But they do recognise that customers are becoming more attentive to the issue.

Our interviewees rely on green certification of building to provide green value to their customers. Still, they also admit that one can reach the higher level of various milieu certifications without paying much attention to waste and circularity as the milieu standards focus mainly on the energy spent or saved to produce and operate a building. And this even if they are aware of the coming request of delivering life cycle analysis for public procurement. They also noticed that circularity may not "always be sustainable in construction".

If they see the transfer of material surplus from one project to another as coincidental, they value the possibility to reuse their own material such as huts, fences, or formwork timbers from one building site to another. Though it does not seem to be a practice they intend to advertise for their customers as it contributes to increase the profit margin of the project.

Value Creation

The development of circular solutions requires the collaboration of a large network of actors for the contractors. The relation to suppliers is expected to transform from a one-way consumers relation to a partnership. For example, our case company is engaged in a renovation project to test a basic process for dismantling and returning windows for circular recycling in collaboration with the product manufacturer and the tenant owner association. The contractor is responsible for the return process in the project and ensures efficient dismantling and return of the used windows. Thereafter, the manufacturer takes over and separates out the types of materials to ensure the recycling of, for example, metals, plastics and glass... Similarly, carpet, floor or

insulation providers propose to take back surplus and even used products, creating a long-term partnership with not only the contractors at the time of the production but also the company responsible of the operation of the building. The few demonstration projects of circular building also draw on a large network of actors to provide not only the material but also the existing, and to be created, competences to design and manage such productions. If this type of pilot projects is not expected to deliver revenues, it nevertheless challenges the traditional tasks and risk divisions between suppliers and contractor and open to new kind of contractual relations. A less risky form of contribution to value creation is the centralisation of material purchase, which enables the company to exercise pressure on their suppliers thanks to the large quantities they order.

The three big contractors are engaged in network of interest with suppliers, products manufacturers, research institutes, and some of their competitors to identify which material would be worth investing in to reduce resources consumption. Led by research institutes these studies aim at assessing the potential of recycling and reuse of material such as plastic, pipe, steel, aluminium or gyps... with sometimes unexpected results like when researchers had experimentally identified the possibility of reusing concrete, providing they could build an oven the size of a warehouse. Our case company has also joined a network of Swedish large companies outside of the construction sector whose task is to lobby for circularity and drive technological development, consumer behaviour and policy forward in four pillars of the circular economy: circular design, sustainable consumption, increased access to and utilization of recycled materials, and circular value chains. So far, the network has concentrated its efforts primarily on the value chains of plastics, textiles and building materials.

However, the interviewees still identified challenges such as lack of trust, loyalty, and transparency between the partners. Since most of companies in the sector tend to choose their partners not only on their competences, but also on their low-price offering. Moreover, they identify the construction unreliable flow of waste, the lack of practical solutions and the juridical issues regarding the quality of recycled material as barriers to be singularly lowered before the type of partnership mentioned above can be implemented as business solutions.

Moreover, the rare initiatives taken towards new value creation are seldom reaching the large majority of projects, which are still following linear work processes. The project managers though sensitive to the issue feel disconnected from the experiences described above.

Value Capture

Here we start with the costs as the section on revenues will unfortunately be very short. The notable challenge of these construction companies regarding the management of waste is said to be its high cost, especially the one of demolition waste. The cost variables identified are transportation cost, treatment cost, planning cost, operational cost (sorting on site, quality control of the material), etc. Since, most of the projects of these construction companies focus essentially on cost-driven business models, which builds on minimizing costs as much as possible by utilizing low price value propositions, extensive outsourcing and maximum automation for their projects, it limits drastically their involvement in circularity. Moreover, their collaboration with demolishing and recycling companies is well functioning and the benefit of handling waste already fairly distributed.

But even if we assume that the sector can contribute to produce enough waste to be integrated in the circular loop and contribute to the production of new buildings, our interviewees are still pessimist regarding the potential of CE BM within the actual juridical and economic context. Here, they outlined the challenges related to the low revenue flow of waste, the cost of recycling, the undervalued recycled or upcycled products, and an almost inexistent market for the final product. As summarised by one of the project managers, "why buying something for a higher price to get a lower quality".

However, there is a small niche market for circularity carried by environmentally engaged parts of the public sector and individuals who are ready to invest in such solutions even at a higher cost. Besides, the notion of value should not only be understood in economic terms. Value driven companies are less concerned with the cost implications of a particular business model design, and instead focus on value creation contributing with other benefits to the company such as branding and social recognition. One of the other companies interviewed explained that they hide the higher cost of circular projects by spreading it around in other conventional projects or by adding new services to the buildings (cafeteria, reception desk, etc.) that they know their clients are ready to pay for. Another solution to integrate the benefit of circular economy would be to swap short term value creation which benefits only to the company and its shareholders to long term value creation which should contribute to benefit of all stakeholders. However so far, the environmental managers of the three largest contractors in Sweden have not been able to convince their companies to invest in long term value creation.

DISCUSSION

If we compare the result of our case study with the list of BM archetypes provided by Bocken *et al.*, (2014), the company is only targeting three of the eight proposals: maximise material and energy efficiency; create value from waste and adopt a stewardship role. They have invested in the maximisation of material for new built, energy efficiency of the production and operation of buildings and optimise the existing practices. The growing interest for green certifications is a sign that the value propositions including sustainable principles are answering a market demand. This trend has already contributed to more integrated design and construction approaches, with a positive impact on the performance of buildings. However, as pointed out by Aho (2013) it does not imply that these new standards participate to the transformation of business model that the circular thinking requires. Similarly, the few show cases of circular building demonstrate the feasibility of such construction but are not so far from generating any substantial revenue. The company is struggling, as do their competitors to create value from waste.

Whereas contractors have invested in some forms of stockage of waste material for reuse, they have not yet succeeded in identifying or creating a market for it. The value propositions still mainly rely on economic revenues and do not yet include long term social benefices and circular principles. There is no tentative to decouple economic activity from the consumption of finite resources (Ellen MacArthur 2015). They timidly attempt to rethink the flow of material within the supply chain by putting pressure on their suppliers and by investigating pilot projects to test material (Lüdeke-Freund *et al.*, 2019). But they do not yet dare to challenge the different roles of the members of the chain. Prolonging the previous work of its Cooperate Social Responsibility activities, the company case adopts partially a stewardship role by

publicly and proactively engaging in different networks and with different stakeholders to advocate for the development of circular principles or by encouraging the use of milieu certified material in their projects. In doing so they contribute to ensure long-term health and well-being for both employees, customers, and the society at large and expect the customers to pay for this contribution (Bocken *et al.*, 2014).

Then again this does not signify that they are able to detach their revenues stream from the classical model of production. We identify a gap between the environmental managers, embedding the efforts towards sustainability and the projects managers who anchor their practice in a business-as-usual understanding, lacking tools, and methods to engage in new proposals (Andersson, 2021). Rather than the market and the demands of hypothetical customers, it seems that it is their own organisation who is not yet ready. So, whereas Lüdeke- Freund *et al.*, (2019) identified a large amount of value creation process options in their literature review, our contractors' companies are still struggling to develop a few solutions enabling them to create revenues.

CONCLUSIONS

This preliminary analysis of new circular business models in the some of the Swedish construction sector is enabling us to trace the development of some new business proposals. It is clear from the actors interviewed that the pressure on the sector to improve sustainable and circular economy efficiency has been the prime driver for the development of new values propositions and value creations. However, these new business models are still under developments. The EC distant promise to be able to counterbalance additional costs over time through the expected energy savings and the wider benefits (on health, comfort, lower volume of energy consumption and reduced energy bills, etc.) associated to the implementation of circular principles does not seem to be a sufficiently convincing opportunity for our contractors to radically transform their actual mode of production and force the implementation of these necessary changes within their organisation. Instead, they engage cautiously in incremental changes and peripheral initiatives. A closer look at how these initiatives take place and translate or not within organisations and their networks would certainly help to understand and determine why the opportunities for contractors to invest in CBM are not yet realised.

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