PLATFORMS OF SECOND-HAND BUILDING MATERIAL: A HUB IN THE CIRCULAR ECONOMY OR FANTASIES OF ENTREPRENEURS?

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All around the western world "platforms" for capture and redistribution of second-hand building materials are emerging, tapping into a rhetoric of circular economy. A development crucial for an acceleration of climate change mitigation. Adopting a combination of institutional theory and product platform concepts from a mass customisation discourse, we study some of the building material platforms present in Europe within an explorative abductive framework. Empirically we use interviews, internet screening and document analysis in a 3-year longitudinal fashion. The results show that so far, none of these platforms is reaching the volumes, commercialisation and documentation of recovered material matching the EU ambitions of recycling, such as stated in the European taxonomy for sustainable financing. The platforms are struggling to implement circularity facing institutional challenges such as, collaboration, supply chain, distribution of roles, transfer of liability, financing structure, and forms of ownership. Attempts to build platforms without a physical flow of materials have run into limitations. As has also small start-ups, a set up that does not sit well with the requirement of circular flows. On the other hand, alliances with institutional players - demolishers, logistics companies, re- or upcycling companies- with integrated digital support- seem to support their development.

Keywords: circularity; platforms; Europe

INTRODUCTION

Circulating materials in the build environment is a central climate mitigation approach. Circular building includes reducing waste, increasing recycling, flexibility, adaptability, disassembly, and diligent deconstruction (Ellen Macarthur, 2019). Especially thanks to the effect of the European New Green Deal-s focus on circularity, actors are mobilising themselves all over Europe to respond to the expected demand for recovered building materials (EU, 2023). Anticipating that the new regulation would create a market for such materials. However, many other dimensions need to be in place before a circular market start aggregating and accelerating. Despite numerous demonstration examples of circular building projects, there is still far to EU suggestion of 70% recycling (EU, 2023). Here the focus is on one aspect of a circular

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market, namely that of platforms providing links between demand and supply of second-hand materials. The "European Circular Economy Stakeholder Platform" (ECESP, 2021) defines platforms in the following way:

> "Platforms are where actors from different disciplines and backgrounds can engage, collaborate, exchange ideas and services, and create synergies. Circular platforms can offer multiple services including awareness and knowledge sharing, promoting tools and best practices, matchmaking, marketplaces for material exchange, and databases for public procurement".

This very broad inclusive definition is here understood as a constructive framing for an exploratory study of platforms that has established themselves, not only as a marketplace for material exchange, but also including other activities. We set out to explore some of the platform solutions within an explorative inductive framework and collect and compare ten platforms in seven EU countries and UK, focusing on a set of dimensions which is inductively derived from earlier studies. Our main research questions are:

-What features characterise circular building platforms, in terms of legal form, size, activities and organisation?

And as entrepreneurial engagement appears to be thoroughgoing:

-Is the engagement in circular platforms just another playground for entrepreneurs?

Our theoretical framing to answer these questions is a combination of institutional theory (Lawrence *et al.,* 2009) and product platform concepts from a mass customisation discourse (Gawer, 2009).

As theoretical part of our abduction we choose a combination of institutional theory and product platform concepts from a mass customisation discourse

The latter question hinges upon a tendency to fashionalise any important societal issue to accommodate it into governmental innovation policies and societal legitimisation and celebration (Green, 2011). The support of start-ups and entrepreneur indeed being such a trend. But the urgency of climate mitigation (IPCC 2023) is too important to risk fashionalisation, and it should not only mean acceleration of growth of volumes of recovered building materials, but also acceleration of accompanying services, knowledge production and network relations. An understanding clearly flagged by active platforms.

\Indeed, circularity is one of several sustainability trends that occurs in parallel in many geographical places - and there is a tendency that the same experiences are learned repeatedly in different contexts. Wainwright (2020) for example provides very parallel new experiences with partially circular building projects recently realised in Belgium, Denmark, France, Netherlands and UK. The contribution of this piece lies in commencing conceptualising important (crucial) dimensions of platforms for exchange of second-hand building material. As a perspective, national and international structures of multiple platforms should also be included as singular platforms are not likely to be able to meet the complex need of circularity, including its volumes and its combined local/global aspects.

METHOD

To answer the research questions an interpretive sociomaterial approach is adopted (Orlikowski and Scott 2008, Suddaby 2006). The present piece is part of a larger research effort on circularity in construction. The interpretive socio-material approach offers a succinct appreciation of the combined social and technical aspects of circular building as well as platforms. But even if the overall approach is abductive for further research (Dubois and Gadde, 2001), this piece stays mostly with an inductive stance, empirically appreciating concrete platforms and their possible characteristics.

Inspired by grounded theory (Suddaby, 2006), constructs that characterised circular platforms are identified using early experiences from the Swedish platform "Återbruk Väst" (Reuse West, Andersson *et al.,* 2021). And inductively interpreting and learning from other emerging platforms in Sweden and Denmark. Some constructs mobilised are clearly taken directly from the context of Återbruk Väst, but others are added for better coverage of present and emergent issues.

Selection of platforms
Several rounds of search were carried out. From the summer of 2020, presence in the public communication on circular building initially help identify Swedish and Danish platform for study.

Three consecutive times the "European Circular Economy Stakeholder Platform (europa.eu, ECESP)" was consulted to select platform candidates. This occurred in the spring of 2021, autumn 2022 and spring 2023. The ECESP database contains 180 entries for platforms in EU. 23 of these are focused on construction.

Out of these a closer screening, looking for material market activity, volume of recycled material and resourceful organisation showed that 10 platforms should be examined further. However, it is and was very clear that the European stakeholder platform represent but a grip of the tail of the elephant of circular platforms. Illustrative of this limitation and curiously a publication from ECESP (2021) provided five further platform suggestions from Italy (Resign). Germany (Restado/Concular) and Netherlands, which were not registered in their own database. Finally, an earlier search for platforms in Belgium lead to looking further into Rotors work with the platform Opalis and the UK platform SalvoWEB (through the work of Bougrain and Doutreleau, 2022).

From the ECESP platform was finally selected

- Circular Berlin
- Baukarussell
- Luxembourg Wood Cluster
- Neue Effizienz gemeinnützige GmbH

From a Danish context was selected Greendozer, among roughly ten possible emerging platforms.

It was decided to focus in on those platforms that involves a material flow. Several pure network and communication platforms, such as the Madaster (NL), "Cirkelstad" (NL) and "Recyklujme stavby! - Let's recycle buildings" (CZ) was disregarded due to their lack of focus on contributing to the material flow. As it will derive below, we did end up with several "nonmaterial" platforms. These was also examples of platforms that claims they are digital but also have storage facilities and engage in the physical flow. The consolidated sample looks like this:

Table 1: The sample of circular platforms

Name	Country
Rotor/Opalis	Belgium
Salvoweb	United Kingdom
GreenDozer	Denmark
Circular Berlin	Germany
Neue Effizienz gemeinnützige GmbH	Germany
Restado/Concular	Germany
Luxembourg Wood Cluster	Luxembourg
BauKarussell	Austria
Resign	Italy
Werflink	Netherlands

Despite the relatively rigorous and long-term search for platforms this method for collecting examples should be understood as a convenience sample (Bryman and Bell, 2011). It is thought of as explorative, and no representative criteria are employed.

Framework of Understanding

Using an interpretive sociomaterial approach is appropriate to respond to the research aims (Orlikowski and Scott, 2008, Suddaby, 2006) and which is also used in construction management (Buser and Carlsson, 2017). We here operate in an abductive manner interaction between theoretical concept and bottom-up concepts. As theoretical part of our abduction we choose a combination of institutional theory and product platform concepts from a mass customisation discourse.

Institutional work (Lawrence *et al.,* 2009) and institutional field (Zietsma *et al.,* 2017), offers a conceptualisation of social interaction in and around phenomena like platforms where micro and meso aspects intersect. Previous studies of fields using institutional theory have established that qualitative longitudinal case studies with multiple types of empirical material are suitable (Zietsma *et al.,* 2017). And that the approach applies to studying mature as well as emerging new fields (Zietsma *et al.,* 2017).

While platforms' ability to develop market and economy in general are broadly recognised among economists (Cutolo and Kenney, 2021, EUP, 2021, Gawer, 2009, Gawer and Phillips, 2013), circular platforms and circular building platforms are far less developed and studied (Koch and Polesie, 2020). Moreover, a possible megastructure transcending the single platform and connecting many platforms and servicing different segments of a future circular building market is far less present let alone conceptualised or studied. Adding to this much platforms studies within economy appear to assume that the laws of supply and demand are unchangeable foundations of a platform-based economy, whereas to better understand circular platforms in the building sector a market creation dynamic approach is needed to understand the formation of platforms as processual and well as socially creating new laws of the market (Callon, 2016). We propose to think of these new types of markets as characterised by resource economics (Conrad and Roleau, 2020, Feldman and

Worline 2011), where limited material resources and revaluation of used materials emerges as integrated into the exchange of materials and goods.

The bottom-up generation of concepts are inspired by grounded theory (Suddaby, 2006) invites the researcher to collect recurring phenomena in a field and synthesize them into “constructs". Here constructs that characterised circular platforms are identified below using early experience from the Danish and Swedish platforms, in particular “Återbruk Väst” (Reuse West) from 2019 and 2021 (Andersson *et al.,* 2021). Some constructs mobilised are clearly taken directly from the context of Återbruk Väst, but others are added for better coverage of present and emergent issues.

Andersson *et al.,* (2021) worked with their platform for a longer period and enjoyed public innovation funding in a period. Two times a questionnaire was distributed to the attached stakeholder, by the platform organisation. The stakeholders pointed to the issues listed below as important for the further development of the platform.

Deriving from Andersson *et al.,* (2021) the most important characteristics are: Attitudes, knowledge, time and resources, market (demand, supply, players), warranties /quality, storage and logistics, costs/gains, tools and methods, a public regulation. In the present study it is not possible to look at attitudes (and culture) as the empirical material to a high degree comes from the platforms, which is also a bias in the other dimensions. Adding to the Återbruk Väst dimensions it is interesting to look at the Business model of the platform, what funding it relies on and which are the investors.

Moreover, where are the platform places at a public- private axis (from fully private to public private partnerships (PPP), to a pure public set up). This is summarised in the criteria “legal status”. Qualifying the logistics dimension, it can be important for emission reasons to know about transport distances and geographic scope covered, which can be covered by the logistics dimension (Bougrain and Doutreleau, 2022). With a view to accelerating the climate change mitigation it would be important to know whether there is a growth in volume of material and/or turnover over the years. This gives the resulting set of criteria - constructs- for understanding circular platforms:

- Legal status
- Knowledge
- Time and Resources
- Market (demand, supply, players)
- Warranties / Quality
- Storage and logistics
- Costs/Gains
- Tools and methods
- Public regulation
- Growth/acceleration

It is acknowledged that several issues have been disregarded adopting this framework. Such as participation in larger constellations of platforms and the form of technical digital database. The latter is for example discussed in a World Business Council for Sustainable Development report (WBCSD, 2021) using Madaster as example.

ANALYSIS

In the table below is entered the platforms analysed, their legal status, their main customer (if possible) and the size of their organisation. Then follows the analysis of the 10 dimensions of the framework of understanding.

Table 2: The characteristics of the circular platforms

	Legal	Customers	Organisation	Material exchange
Rotor/Opalis	Non-profit	Micro Businesses	<10	Yes
Salvoweb	Private	Micro Businesses	<10	Yes
GreenDozer	Private	Large Companies	<10	Yes
Circular Berlin	Public	Mixed	<10	No
Neue Effizienz gemeinnützige GmbH	Shareholder company	Mixed	20-25	No
Restsdo/Concular	Private	Businesses	<10	Yes
Luxembourg Wood Cluster	Non-profit	Mixed	<10	No
BauKarussell	Social	Mixed	<10	Yes
Resign	Private	Mixed	<10	Yes
Werflink	Private	Businesses	<10	Yes

Legal status

The sample is varied in legal status, and most are of entrepreneurial character. Many prices their materials and base their turnover on that. But this business segment is also combined with doing demolitions, consulting about demolition and/or sharing transport or machinery capacity. Note that a fully owned public shareholder company is part of the sample (Neue Effizienz). By being owned by a public utility company it is possible for this company to price recycled material and create a turnover for its activity Another remarkable variant is BauKarusell, which under the label "Social Urban Mining" are drawing on labour market subsidies to unemployed, offering demolition work and other services and at a time taking social sustainability into its business model. Finally, Werflink combines trading of second-hand material with construction equipment (vehicles, machines, scaffolding etc). There are remarkable differences between the companies participating in the network around a platform. Roto/Oralis and Salvoweb has a network almost completely dominated by microenterprises. Whereas Greendozer and Återbruk Väst has a clear core of very large companies concentrates in a small geographic area (Aarhus resp. Gothenburg).

Knowledge

Developing and communicating knowledge about aspect of circularity in the construction sector is often communicated as a secondary activity to that of trading materials. Many platforms at a time share the events and other activities they have been part of, while also providing access to a database of materials and a physical storage location, giving the impression that knowledge is maybe more important than understood/assumed even by themselves. The knowledge production offers an important way in which value propositions can be changed. Salvoweb combines their business of second-hand building materials with trade of antiques, which constitutes another more specialised type of knowledge.

Time and Resources

As mentioned, most of the platforms have small internal organisations. They are therefore dependent on networking effects for example with large clients, architects, consulting engineers or the like. Conversely lack of resources to handle the extracting of material, recycling, quality assurance etc. by these other stakeholders in the platform network risk becoming a barrier for growth of the platform. Rotor for example is serving many micro companies, many of them trading only one or two types of material, which levers resource demands by Rotor as overall cross material services must be carried out by them.

Market (demand, supply, players)
Most of the markets appear to emerge out of local context, for example large cities such as Bruxelles (Rotor), Wuppertal (Neue Effizienz), Amsterdam (Werflink). Often aided by local authorities procuring circularity, a commencing manifestation of demand from some stakeholders and supply from other players appear to be three recurrent dynamics. For most of the platforms the demand of circularity in the EU regulation for sustainable finance - also known as the EU taxonomy (EUC 2023), is an important reference point. Salvoweb is, even if UK is the main market, also impacted through their activities in the Republic of Ireland.

Warranties / Quality
The issue of quality and assurance appear relatively clearly to still be an unsolved issue (Bougrain and Doutreleau, 2022). "Återbruk Väst" (Andersson *et al.,* 2021) experience very little functional deficiencies, and a bit more esthetic deficiencies (a distinction the platform makes), but nevertheless their stakeholders ask for improved warranty.

Storage and logistics
Storage places are organised in different ways. Several of the platforms have relatively restricted storage place and therefor count on partnerships with other stakeholders that can provide this (Greendozer's partnerships with among others the demolisher P Olesen is an example). Oralis and Salvoweb has a network of microenterprises mostly trading one or two materials and with average storage place at 3000 square meters (Bougrain and Doutreleau, 2022).

Salvowebs customers/suppliers averagely travel less than 50 km to participate. Rotor's customers have in average 50-100 km distance to the platform.

Some platforms communicate, that they are aware of the emission issue related to long transports of the secondhand material. However, only Restado/Concular claim they have calculated the emission and work on reducing it as part of their business.

Costs/Gains
The turnover of most platforms is limited. Where most platforms attempt to create a value proposition where doing something for the climate is weighed against costs of extraction etc. of second-hand material, BauKarussell directly attempts to reduce costs by introducing lower paid personell, which then again represent a social effort.

Tools and methods
The adoption of LCA and EPD tools appear to be limited to a few of the platforms., Given their entrepreneurial status it is likely that they hope for other actors in the circularity network will eventually take care of these resource demanding calculations.

Public regulation
The waste regulation and the sustainable finance regulation comes from two different parts of the EU system, which also for the platform is a challenge. Local, regional and national action plans for circularity are in place but have different emphasis.

Greendozer in Denmark must count on EU regulation as the Danish government at present focus on sustainable building with LCA regulation, leaving circularity aside.

Growth/acceleration

It has not been possible to find documentation for economic development of most of the platforms. However, the understanding of needed acceleration, appear to be just that: An understanding, not a practice. So, acceleration is still to come. There are even examples of platforms with expectations of decline. Rotor/Oralis have negative expectations for the future on the Belgium building market (Bougrain and Doutreleau, 2022). Judged from the Danish and Swedish context, there are many more regional and local platforms, so it's a limitation in the present study to rely on a European level network of platforms (ECESP, 2021). There are probably quite a lot more platforms active than those registered by ECESP. And there need to be, to serve the acceleration of the transition.

DISCUSSION

The analysis does not give a clear indication of a single superior legal model. There are mostly modest business models in operation, with start-up and entrepreneurial character. Many of the platforms' entrepreneurial character appear to help them staying afloat. There is an ethos of playground for fiery souls to them. Some have been able to raise public innovation funding, which enable them not only to survive, but also to distribute knowledge and support networking. Public funding thus helps overcoming early barriers in the emerging process of increased circularity. It is rare to see private platforms networking with the municipality recycling stations (Andersson and Buser 2022), even if the EU directives on waste place more emphasis on these units. Outside of this analysis, some might see the Dutch Madaster as a winning concept.

However, its likely with the growth of circular flows that Madaster lack of connection to the upcoming local flows will be a growing concern for Madaster and introduce partnership and other measures to keep in touch with the value flows. The flipside of learning on circularity rather than inventing the wheel locally, is that the same iconic examples get mentioned again and again (Wainwright, 2020), thus contributing to a feeling of growth in circularity in building, which however masks the intensive repetition in professional communities of the same examples repeatedly. The presently proposed circularity strategies in society at large (and not necessarily by the investigated platforms) are in mutual contradiction: For example, if it's recognised that securing buildings a longer lifetime is a central circularity approach. Then buildings where each component is only a purchased service (BCaaS, Rau in Wainwright 2021) is not without tension to this. if the "take back" contract allows the component provider to indeed take back a component at any time. It derives from this bottom-up analysis that it is a present difficult to see an emerging European institution of platforms with similarities among them.

It can be claimed that the various submarkets are in an early stage of institutionalisation, with the platforms as proto-institutions, institutions to come. It should be noted that a rather homogenous institutional pressure in the form of EU legislations could in the future lead to a formation of more homogenous institutions and that we would then witness a form of closure of the present variation of platform features. But this is yet to come. The implication for the national industries is that apart from Restado/Concular in Germany, most countries have lived with a diversity that risks being in contradiction to volume and acceleration.

CONCLUSIONS

This piece set out to explore what characterise circular building platforms, and came to study legal form, size, activities and organisation. Moreover, a worry of fashionalisation led us to question whether the engagement in circular platforms constituted just another playground for entrepreneurs, risking compromising the necessary efforts as fashions and entrepreneurial playing tends to change focus constantly. It was indeed observed that many of the platforms had entrepreneurial character with small organisations willing to take large risks. Nevertheless, this appears to help them staying alive while Europe experience a prolonged transition to circular buildings. Very little joint activities are observed that make ready an accelerated and substantial transition afloat.

Adopting an overall abductive research design, but mostly inductive, our qualitative-driven study encompassed interviews, internet screening and document analysis. The analysis involved looking at the platforms legal status, knowledge production, time and resources, the market development, quality, storage and logistics, costs and gains, tools and methods, public regulation and possible growth/acceleration A side result, as the analysis did not enter digitalisation, is that, so far attempts to build platforms without a physical flow of materials is likely to run into limitations and lack of institutionalisation. Yet, alliances with other institutional players - demolishers, logistic, re- or upcycling companies- as well as a more integrated digital infrastructure seem to mitigate this weakness. Finally, we see less institutionalisation or field emergence of platforms despite the rather uniform institutional pressure for EU policy and legislation.

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