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BUSINESS MODELS OF DIGITAL MARKETPLACES FOR ENABLING CIRCULARITY IN CONSTRUCTION

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ABSTRACT: The shift towards circularity in the construction industry (CI) is imperative, yet the lack of economic viability discourages stakeholders from adopting circular practices. Establishing a market for second-hand products and/ or materials can turn this around. A mature market requires streamlined communication between stakeholders, access to information about product composition, identification of potential customers, and the fair market value of recovered products. Digital marketplaces (DMPs) offer a promising solution by connecting geographically dispersed stakeholders and enhancing the economic appeal of circular economy strategies. Nevertheless, their uptake in the CI remains limited due to issues such as insufficient listings, high storage costs, unreliable product information, and uncertain availability. Additionally, product variability extracted from the built environment contributes to market segmentation, necessitating customized business models (BMs). This study investigates the influence of the extracted products from the built environment on DMP business models. A two-stage methodology was applied: (i) Analyzing the BMs of existing DMPs utilizing Business Model Canvas (BMC); and (ii) Mapping product inventory to business subsections of DMPs through interaction analysis. In total, 23 DMPs across five industries were analyzed and aggregated into 31 business subsections. Synergies between the 21 subsections and 12 product categories from the built environment were then explored. The findings suggest that BMCs' characteristics vary across industries underscoring the notion that diverse CI offerings make certain subsections align better with specific product categories. However, current DMPs in the CI have yet to implement tailored BMs that account for these differences. The developed interaction matrix offers valuable guidance for existing and new DMPs to refine their BMs and enhance their competitive positioning.

1. INTRODUCTION

The construction sector is a major consumer of natural resources, accounting for nearly half of global raw material usage. It is also a significant contributor to landfills, with construction, renovation, and demolition waste representing more than 30% of the total solid waste (Luga et al. 2025; Mollaei et al. 2023). The construction industry follows a linear economy model (i.e., take-make-dispose), leading to resource depletion and unsustainable production cycles (Yang et al. 2024). In contrast, the circular economy (CE) offers a regenerative alternative, prioritizing waste reduction, material reuse, and extended product lifecycles (Hossain et al. 2020). The transition from a linear to a circular economy is imperative but will bring about radical changes in the construction industry (Allam and Nik-Bakht 2023b).

Recently, efforts have been made in Europe and North America through guidelines, standards, policies, by-laws, and ordinances to promote circularity in construction (Allam and Nik-Bakht 2024). However, in practice, the shift towards circularity in construction faces significant challenges, primarily due to economic viability concerns and insufficient stakeholder communication (Allam and Nik-Bakht 2023a). Economic viability remains a major barrier for industry players, as implementing circular economy strategies often

requires high initial investments, long payback periods, and uncertain financial returns. Additionally, these strategies are difficult to integrate into existing business models, discouraging widespread adoption. Yet, demonstrating this financial viability is crucial for transitioning traditional business models to circular economy business models, as it provides the necessary justification for investment and strategic realignment (Guerra et al. 2021; Kanzari et al. 2022).

Beyond financial concerns, ineffective communication and collaboration between stakeholders, including contractors, suppliers, policymakers, and clients, pose significant barriers to the adoption of circular economy practices in construction (Banihashemi et al. 2024). Here, communication refers primarily to the exchange of business-related information, such as the spatial availability of materials, transaction and transportation logistics, rather than technical information about the materials. Separately, the information gap related to the technical and factual characteristics of the recovered products at the end-of-life (EoL) phase appears to be a key root cause of the lack of economic viability and stakeholders' collaboration. At the EoL, it is often unclear which products have reuse potential, who the potential customers are, and what the fair market value of these products is. To address this gap, there is a dire need for financial mechanisms that enhance the profitability of adopting circular economy strategies and structured communication frameworks that foster collaboration across the construction value chain. Digital marketplaces/platforms (DMPs) offer a promising solution by facilitating interaction among geographically dispersed stakeholders, as they widen the scope of industrial symbiosis processes and enable collaboration beyond local constraints (Silva et al. 2022). In doing so, they can improve resource efficiency, reduce costs, and establish transparent value networks that support circular economy business models. Their ability to connect stakeholders in a timely manner, streamline transactions, and provide data-driven insights positions them as a vital tool in overcoming the economic and communication barriers currently impeding circular economy adoption in construction.

Despite the potential benefits of DMPs, their use remains limited due to supply and demand challenges. On the supply side, the major hurdle lies in insufficient listings, driven by a lack of detailed product information, storage costs, and uncertainty regarding the timing of sales (Çetin et al. 2022). On the demand side, negative perceptions of second-hand products hinder sales in DMPs. This social stigma is often justified by unreliable information regarding the physical condition, quality, durability, remaining service life, and temporal availability of products. This skepticism stems from the absence of standardization in information, such as product data sheets, and uncertainties surrounding warranties for any resulting issues (Byers et al. 2024; Edwards 2021). These challenges coupled with the fact that these platforms remain fragmented, operating at small-regional scales that are yet to be expanded to reach a wider audience have collectively stunted the growth of DMPs (Wuyts et al. 2023). The construction industry is renowned for its complexity and uniqueness; even a single-family home contains a vast array of materials and components sourced from various manufacturers. As a result, when a facility reaches its EoL and undergoes deconstruction, each material and/ or product follows a distinct pathway, leading to diverse destinies. This variability creates different market segments, necessitating the customization of business models for DMPs. Therefore, there is a dire need to propose business models for DMPs that are tailored to the specific characteristics of the recovered materials and products. This paper aims to investigate the influence of the type of deconstructed products and/ or materials from the built environment on the business model of DMPs.

2. METHODOLOGY

A two-stage research methodology, as shown in Figure 1, was adopted to explore how the type of deconstructed materials and products from the built environment influence the business models of DMPs. In the first stage, the business models of existing DMPs were investigated. This process involved three key steps: (i) conducting an informal Google search using the keywords "reuse digital marketplaces", "reuse online marketplaces", and "circular economy digital marketplaces" as a search query while limiting the location to Europe, USA, and Canada"; (ii) reviewing the websites and social media accounts of the identified DMPs; and (iii) analyzing each DMP's business model using Osterwalder's BMC (Osterwalder and Pigneur 2010). Osterwalder's BMC consists of nine blocks (sections): customer segments, value

propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure, as listed in Table *1*. A systematic approach was taken to complete each section by answering specific questions. For instance, under the "value propositions" section, questions such as "why do customers pay for the product?", "what value do they get?", "what needs are being satisfied?" and "How does this value proposition stand out from what competitors compose?" were addressed. Osterwalder's BMC is widely used as a strategic tool to systematically analyze and compare business models, providing insights into how companies create, deliver, and capture value. Its comprehensiveness and ease of interpretation make it a popular framework across various industries for adapting and developing industry-specific business models (Jayakodi et al. 2024). Given that the DMPs studied span multiple sectors, the traditional BMC was adopted to ensure consistency and comparability.

Stage 1- BMC Analysis

Step 1: DMPs Identification
Google Search
Keywords: "reuse digital marketplaces", "reuse online marketplaces", and "circular economy digital marketplaces"
Filtered by geography: EU, USA, and Canada

Step 2: DMPs Screening
Focus: "Does the DMP sell recovered products or materials"
Diversity: "Does the DMP offer multiple product categories or specialize in a single type"

Relevant — No → Exclude; Yes →

Step 3: Data Collection
Sources: Official websites, startup financial databases, and social media platforms
Extraction: Business model characteristics

Step 4: BMC Analysis
Analyze and map the extracted DMP characteristics onto Osterwalder's Business Model Canvas

Stage 2A - Morphological Analysis

Step 1: Business Subsection Aggregation
Using a bottom-up approach, regroup the identified characteristics of each section based on similarities into business subsections.

Step 2: Morphological Analysis
Aggregate business subsections into morphological fields to visualize the BMC characteristics across DMPs

Stage 2B - Interaction Analysis

Step 3: Filter Business Subsections
Criteria 1: Is the subsection general in nature?
Criteria 2: Is the subsection invalid if the DMP acts solely as a facilitator?

Yes → Exclude; No →

Step 4: Inventory Identification
Analyze UniFormat 2010 and existing DMP listings to identify potential inventories
(Resulted in 12 key product categories)

Step 5: Mapping Interaction Matrix
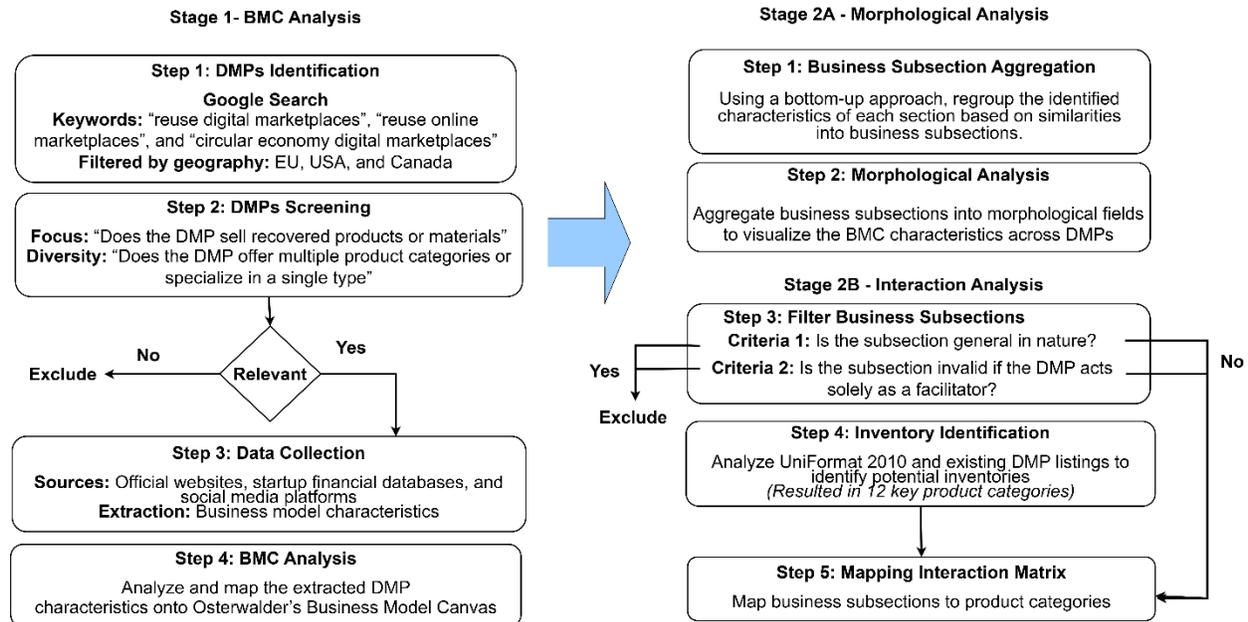Map business subsections to product categories

Figure 1: High-Level Methodology

In the second stage, synergies between the identified DMPs' BMCs and potential products and/or materials from the built environment were explored through a series of brainstorming sessions conducted by the authors. This process involved three main steps: First, using a bottom-up approach, the main characteristics of each section were aggregated into subsections. Second, the identified sub-sections and their characteristics were integrated using a morphological approach; this step was essential to present the 'Gestalt' of the identified BMC (i.e., to visualize the full picture of the business models). This approach was proposed by Möller et al. (2022) for designing business model taxonomies. Third, a list of potential inventories (i.e., products and materials) coming out from deconstruction projects was identified through an analysis of the UniFormat 2010 classification system and existing DMPs in the construction industry. Finally, a matrix was constructed by mapping the main characteristics of the BMCs to the potential inventory. Constructing such a matrix of principles, functionalities, or factors from two initiatives supporting the Architectural, Engineering, and Construction (AEC) industry is a proven method for exploring interactions between those initiatives (Allam and Nik-Bakht 2024; Marzouk et al. 2019; Sacks et al. 2010).

3. RESULTS AND DISCUSSION

The results are divided into two subsections: (i) morphological analysis; and (ii) interaction analysis. The former outlines the business models of DMPs, while the latter explores the synergies between products and/or materials from the built environment and the various sections and subsections of the business models.

Table 1: The blocks (sections) of the Osterwalder's BMC and their focus areas

Section	Focus Areas
Customer Segments	Who are the most important users of the marketplace, and how is the offering tailored to each segment?
Value Proposition	What value does the marketplace deliver to its users—such as buyers, sellers, or both—and potentially to broader stakeholders like society and the environment?
Channels	Primary touchpoints through which users access and interact with the marketplace
Customer Relationships	Types of relationships established with users throughout their journey (before, during, and after a transaction), including community engagement
Revenue Streams	Sources of revenue for each customer segment and the structure of payments
Key Resources	Essential resources required to operate, scale, and support the platform, including those related to channels and customer service
Key Activities	Core activities to deliver the value proposition, manage and maintain the platform, and grow the user base
Key partners	External parties and service providers the marketplace relies on for efficient operations
Cost structure	Major fixed and variable costs involved in delivering the value proposition and maintaining strategic functions

3.1   Morphological analysis

The initial search resulted in the identification of 42 DMPs specializing in selling second-hand products across eight industries: construction, plastics, fashion, batteries, consumer electronics, furniture, classified advertising, and general (covering multiple industries); and one that sells virgin materials for construction. The focus of this research was on DMPs either within the construction industry or can be related to products from the built environment, considering factors such as size, material use, or product diversity. This led to narrowing down the list to 23 DMPs, including 16 in construction, three in classified advertising, one in furniture, one in virgin construction materials, and two categorized as general, covering multiple industries. For these 23 DMPs, key business information was extracted using the BMC framework, as outlined in the methodology section. In the initial stage, specific characteristics of each DMP were collected for each business section and then aggregated. These characteristics were further sub-grouped based on similarities, resulting in a total of 31 subsections. This categorization of identified characteristics itself established the morphological fields, as shown in Table *2*, which illustrates the sections, subsections, and features of DMPs studied. For example, under "Customer Segments", all recorded users of the selected DMPs were categorized into two subsections: "Individuals" and "Businesses". Similarly, for "Value Proposition", the benefits or unique propositions claimed by DMPs were grouped into six subsections: Consumer, Financial, Technical, Environmental, Market, and Pricing. This procedure was consistently applied across the remaining business sections.

Analyzing the morphological fields, presented in Table *2*, helps draw key conclusions and identify necessary innovations to propose a robust business model. Percentages within each section are proportioned to 100%, indicating the relative frequency of each characteristic within that business section among the 23 DMPs studied. This enables a direct comparison of the prominence of characteristics inside each business subsection and section. This structure helps identify patterns of convergence, where DMP practices align, and divergence, where DMPs adopt varying approaches across the same business sub-sections.

Table 2: Business model canvas of DMPs

Section	Subsection (SS)	Characteristic				
Customer Segments	Individuals	Homeowners (9%)	DIY Enthusiasts (13%)	Renovators (5%)	Retailers (24%)	
	Businesses	Contractors (26%)	Marketplaces (2%)	Waste Processing Facilities (7%)	Architects (8%)	Manufacturers (6%)
Value Proposition	Consumer	Reliability (3%)	Quality Products (11%)	Verified Participants (6%) (SS 3B)	Easy-to-Use Platform (10%)	
	Financial	Budget-Friendly Listings (6%)	Cash Rewards (1%)	Material Warranties (1%)		
	Environmental	Reduced Waste (14%)	Increased Reuse (9%)	Carbon Emission Reductions (7%)		
	Technical	Consultation & Technical Support (7%)	Curated Product Data Recording Sheets (4%)			
	Market	Expanded Geographical Access (20%)				
	Pricing	Fixed (1%)	Auction-Based (1%)	Negotiation (1%)		
Channels	Operational Roles	Facilitator (10%)	Intermediary (6%)	Reseller (4%)	Information Aggregator (2%)	
	Logistic Partnerships	Pick-up (1%)	Delivery (10%)	Buyer/ Seller Arrangement (1%)		
	Interaction	Physical (8)	Online (15%)			
	Shopping	Physical (9%)	Online - Web platform (25%)	Online - Mobile Apps (4%)		
Customer Relationships	Support-Oriented	Self-Service (1%)	Automated Service (1%)	Personal Assistance (1%)		
	Engagement-Oriented	Community Partnerships (1%)	Guides & Resources for Reuse (1%)			
Revenue Stream	Transaction-Based	Transaction and Commission (18%)	Managed Inventory (20%)			
	Recurring	Subscription and Membership (18%)				
	Service-based	Consultation (11%)	Training (2%)			
	Funding and Grants	Government (10%)	Investor Equity (10%)			
	Marketing	Advertisement (10%)	Product Promotion (1%)			
Key Resources	Digital	Digital Platform (41%)	Data Analytics Tool (5%)	Database of Service Providers (9%)		
	Physical	Warehouse (14%)				
	Human	Customer Service Staff (17%)	Skilled and Experienced Workforce/Team (14%)			
Key Activities	Operational	Digital Platform Maintenance (24%)	Networking and Partnerships (10%)			
	Customer-Centric	Customer Support (26%)	Customer Engagement (12%)	Education and Outreach (7%)		
	Strategic or Analytical	Marketplace Data Analytics (9%)	Sourcing of Managed Inventory (12%)			
Key Partners	Financial Partners	Payment Partners (11%)	Financial Institutions (11%)			
	Operational	Logistics Partners (26%)	Deconstruction Service Providers (14%)	Contractors and Facility Managers (7%)	Salvage Suppliers (5%)	
	Environmental & Quality Assurance	Testing Service Providers (3%)	Environmental Organizations (12%)	Educational institutions (11%)		
Cost Structure	Fixed Cost	Platform Development & Maintenance (23%)	Staffing Costs (15%)	Operational Costs (14%)		
	Variable Cost	Marketing & Promotion (29%)	Logistics and Material (1%)			
	Strategic Cost	Customer Support Services (9%)	Research Activities (9%)			

For example, under the "Market" subsection of "Value Proposition," all the analyzed DMPs emphasize expanded geographical access for selling or sourcing recovered products. Similarly, in the "Recurring" subsection of "Revenue Stream", the subscription and membership model is the common approach adopted by the DMPs. In contrast, under the "Pricing" subsection of the "Value Proposition", variability can be observed, with different types of pricing mechanisms offered by DMPs, namely: Fixed, Auction-based, and Negotiation-based pricing systems. Likewise, the "Customer Segments" section highlights how DMPs serve both individuals and businesses, supporting peer-to-peer (P2P), business-to-business (B2B), or hybrid models. This segmentation reflects the diverse customer base that DMPs cater to, ranging from

contractors and demolition firms supplying salvaged materials to architects, designers, and homeowners seeking sustainable building solutions.

Further analysis also reveals interdependencies between characteristics across multiple business subsections. For example, if the "Value Proposition" under the "Technical" subsection emphasizes consultation and technical support, it logically aligns with revenue generation from consultation or training fees under the "Service-based" subsection. Similarly, if the technical benefits offered emphasize curated product data recording sheets, it follows that the DMP's key resources should include skilled and experienced workforce, and its "Strategic Costs" may involve research activities (which also depend on guides & resources for reuse). Likewise, if a DMP fosters customer relationships through engagement-oriented community partnerships, it logically links to "Key Activities" such as education and outreach and "Operational activities" like networking and partnerships.

These examples show that the decisions made in one business model subsection often influence other sections (a pattern also observed during interaction matrix development and analysis). While only select interdependencies are outlined here, Table *2* offers broader opportunities for readers to observe additional patterns of interdependencies among the characteristics of DMPs, and in turn across different business subsections, reflecting the diversity of business practices. Overall, the morphological analysis highlights both recurring (i.e. similar) business practices and diverging characteristics among digital marketplaces for reusable products and materials. These insights informed the development of the interaction matrix, detailed in section 3.2, and for proposing customized business models aimed at enhancing the DMPs competitiveness, accelerating their adoption, and thus supporting the reuse of products and materials.

3.2   Interaction analysis

An investigation of DMPs across multiple industries revealed that the construction industry is unique in terms of the diversity of products it offers. While DMPs in other industries offer homogenous products, such as plastic recyclates or reusable items such as furniture or electronics, irrespective of the time they were produced, the construction industry is marked with products of varying specifications and evolving regulations. These factors make some products non-reusable in the present while limiting demand to only those products or materials users are confident of reuse.

To develop a BMC tailored to the construction industry, that benefits both new as well as existing platforms to better position themselves for success, the sub-sections from morphological analysis were mapped to construction industry product categories using an interaction matrix, as shown in Table 3. The rows of the interaction matrix represent the sections and sub-sections of BMC, which were reduced from 31 to 21. The omitted sub-dimensions were excluded for two main reasons. First, some, such as environmental value, human resources, operational activities, fixed costs, and variable costs, are general in nature and essential regardless of the products sold. Second, others, such as service-based revenue, funding & grants, and physical resources, i.e. a warehouse, were excluded based on the postulation that a DMP solely provides a platform for facilitating connections between sellers and buyers, without offering any consulting services or maintaining its own inventory. Beyond those identified in morphological analysis, a new subsection, "Listing for service requisition by owners for salvagers", has been introduced in the interaction matrix to account for situations where some owners prefer to contract deconstruction services to providers for free or for a nominal fee in exchange for relinquishing ownership of the recovered materials.

Additionally, for some retained business subsections, multiple characteristics were evaluated separately when they were considered significant for alignment with product categories. Specifically, under the "Consumer" subsection, characteristics including quality products and verified participants were assessed individually; similarly, under the "Digital" subsection, data analytics tool and database of service providers were evaluated separately. In contrast, other subsections, such as "Financial" and "Operational," were represented by a single key characteristic in the matrix, budget-friendly listings and logistics partners, respectively. This does not imply that other characteristics are less important; rather, they are either inherent to the subsection (e.g., digital platform under the "Digital" subsection), outside the scope of the DMP definition (e.g., consultation and technical support under "Technical Value Proposition" subsection),

or may not yet be viable within the construction industry, where DMPs are still at a nascent stage (e.g., cash rewards under the "Financial" subsection).

The columns present construction industry products that should be or are likely to be listed on DMPs to maximize consumer reach and enable increased reuse. The identified products were categorized based on function into structural wood, architectural wood products, wood sheathing architectural finishing other than wood, mechanical, plumbing, and electrical; while certain high-demand and easily reusable materials such as furniture, doors and windows, stone, brick, and ornamental & hardware products are illustrated separately.

Each cell of the interaction matrix is assigned an index number to indicate a synergy between a product category and a business model subsection. A value of "1" indicates total alignment between a product and a business subsection. If no alignment exists, the cell remains empty. In most business subsections, alignment was assessed for the subsection as a whole. However, certain subsections, specifically "Pricing", "Operational Roles", and "Shopping Channels" contain distinct characteristics that differ significantly in business practice. Therefore, it was necessary to assess alignment at the level of these characteristics rather than the subsection as a whole. Within the "Pricing" subsection, fixed pricing, negotiation-based pricing, and auction-based pricing represent fundamentally different mechanisms, each requiring separate consideration in the interaction matrix. In "Operational Roles", a DMP can act either as a facilitator between buyers and sellers or as an intermediary assisting buyers with custom orders, depending on the product category. Similarly, in "Shopping Channels", a DMP can either provide an online-only channel for easily reusable such as stone or allow physical access for categories requiring inspection for defects or reuse suitability, such as architectural finishing and windows.

Table 3: Interaction matrix of product categories vs. business sub-sections

Section	Subsection (SS)	Inventory Product Categories											
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Customer Segments	Individuals		1		1			1	1	1	1	1	1
	Businesses	1	1	1	1	1	1	1	1	1	1	1	1
Value Proposition	Consumer (*Quality Products)*	1		1		1	1						
	Consumer (Verified Participants)	1	1	1	1	1	1	1	1	1	1	1	1
	Service requisition for salvagers	1	1	1	1	1	1				1	1	
	Financial (*Budget-Friendly Listings)*	1	1		1	1	1						1
	Technical	1	1	1	1	1	1	1	1	1	1	1	1
	Market	1		1		1	1						
	Pricing	2,3	2,3	2,3	2,3	3	2,3	2,3	2,3, 4	2,4	2,4	2,4	2,3, 4
Channels	Operational Roles	5,6	5,6	5,6	5	5,6	5	5	5	5	5	5	5
	Logistic Partnerships	1	1	1	1	1	1	1	1	1	1	1	1
	Shopping	8	7,8	8	7,8	7,8	8	8	7,8	7,8	8	8	8
Customer Relationships	Support-Oriented	1		1	1	1	1						
	Engagement-Oriented	1	1	1	1						1	1	
Revenue Stream	Transaction-based	1	1	1	1	1							
	Recurring							1	1	1	1	1	1	1
	Marketing	1	1	1	1	1			1				1

Key Resources	Digital (Data Analytics Tool)	1	1	1	1	1	1	1	1	1	1	1	1
	Digital (Database of Service Providers)	1	1	1		1					1	1	
Key Activities	Strategic or Analytical	1	1	1	1	1	1	1	1	1	1	1	1
Key Partners	Operational (Deconstruction Service Providers)	1	1	1	1	1	1	1					
	Environmental & Quality Assurance	1		1	1	1	1						
Cost Structure	Strategic Cost	1	1	1		1							

Legend:
P1 – Structural wood; **P2** - Architectural wood products; **P3** - Wood sheathing; **P4** - Architectural finishings other than wood; **P5** – Mechanical; **P6** – Plumbing; **P7** – Electrical; **P8** – Furniture; **P9** - Doors and windows, **P10** -Stone; **P11** – Brick; and **P12** - Ornamental & hardware products.

1 – Total Alignment; **2** - Fixed pricing; **3** – Negotiation; **4** – Auction-based pricing; **5** – Facilitator; **6** – Intermediary; **7** – Physical access; **8** – Online access only

The interaction matrix reveals that certain sub-sections, highlighted in grey in Table 3, apply to all products. These sub-sections include customer segment (businesses), consumer value (verified marketplace participants), technical documentation (curated product data recording sheets), logistic partnerships (providing doorstep delivery services), and digital resources (a data analytics tool offering insights on listing prices, real-time buying price, and turnover times). For sub-sections that align with only specific products, key influencing parameters include the existence of an established market, quality requirements, turnover time, original use of a product, probable trade volume, and ease of disassembly. Products requiring quality testing, such as structural wood, may be restricted from individual listings and instead may be allowed by businesses following quality testing.

Turnover time and an established market influence the alignment of cost benefits, geographical access, and revenue generation streams. For example, a DMP can do away with listing fees for low-turnover-time products to attract more listings and diversify offerings. Similarly, revenue streams could also vary, with slow-moving products generating revenue upon transaction completion, whereas fast-moving products require membership or subscriptions. Promotional packages could also be offered to users to get their products more visibility, particularly for slow-moving products. Pricing mechanisms are influenced by demand and trade volume. High-demand products may have fixed or auction-based pricing, whereas low-turnover time products or bulk-trade listings should allow for negotiation.

Additionally, it was observed that some sub-dimensions influence others. For instance, operational roles (a DMP acting solely as a facilitator, providing a passive platform that enables transactions between buyers and sellers, or as a mediator, taking an active role in managing negotiations, handling logistics, and supporting transactions, or both) and support-oriented relationships (distinguishing between a self-service model, where buyers and sellers manage all activities independently, and a personal assistance model offering tailored services such as fulfilling custom orders, product matchmaking, and technical support) are shaped by product turnover time, the existence of an established market, and trade volume. These sub-dimensions, in turn, affect the alignment of operational partnerships with deconstruction service providers, and strategic cost allocation. Similarly, consumer value and quality testing impact the need for the DMP to have partnerships with environmental & quality assurance service providers.

4. RECOMMENDATIONS FOR DMPS

The interaction matrix highlights that a single BMC does not fit universally across industries, and within the construction industry, the variability lies in the products themselves. This variation suggests that certain sub-sections of BMC align better with specific product categories than others. Sub-sections that align with all product categories enhance brand reputation and foster trust in the DMP, as well as among marketplace participants. Since lack of trust is a major challenge for existing DMPs, both new and established platforms should prioritize the elements that are in alignment with all product categories in their operations to improve consumer value and relationships.

To boost adoption, DMPs could employ a tiered revenue model based on product demand and turnover time, balancing greater market penetration with steady revenue generation. Additionally, DMPs in the construction industry could offer cost incentives to encourage sellers who consistently follow quality standards and provide accurate or near-accurate product information, for promoting the reuse of construction materials. Beyond connecting sellers and buyers, DMPs should enable owners to list requisitions for salvagers to handle product disassembly and removal of unwanted materials at no cost in exchange for ownership of products, or vice versa. The ease of disassembly plays a vital role in influencing this sub-section, as doors, windows, and ornamental products can be removed by individuals, while other products require professional services.

Apart from the above, the DMPs can further adopt best practices from others, such as partnering with building insurance providers to offer warranties for reused products and materials, or aggregating listings from other marketplaces within the same country. Establishing affiliate programs with other DMPs can also generate revenue-sharing opportunities when successful transactions occur. Since DMPs in the construction industry are still in their infancy and no proven, time-tested business model that guarantees success has been established, it is imperative that marketplaces continuously innovate and explore alternate BMC sub-sections to remain competitive.

5. CONCLUSION

This study investigates DMPs in the material and product reuse space of five sectors, focusing on understanding their business models. Most importantly, it identifies the alignment of business model sub-sections (i.e. attributes) with the construction industry's diverse product categories. To this end, findings indicate that the corresponding characteristics of business model subsections vary significantly, underpinning the wide-ranging devices DMPs employ to maintain competitive advantage. Through the interaction matrix, this study underscores the concord and discord between product categories and business subsections. However, the current DMPs in the construction industry do not implement tailored business models for specific product categories. In pursuit of this, the analysis of synergies provides valuable guidance for both existing and new DMPs to refine their BMs and better position themselves for success. Although, theoretically, implementing these synergies can enhance the situation of DMPs in the construction industry, their widespread adoption and profitability warrant more research. Accordingly, DMPs need to develop a deeper understanding of the needs of stakeholders within the construction industry and experiment with proven strategies from other industries.

This study has two limitations. First, the majority of identified DMPs operate within a single country or a limited geographic region, particularly in the construction industry. While this local focus aligns with CE principles, from a business perspective, the potential expansion of DMP operations beyond national boundaries, particularly in regions where countries are geographically smaller and closely situated such as in Europe, could introduce new challenges and opportunities that were not considered in this study. Second, the interaction matrix was developed based on iterative brainstorming sessions conducted among the authors, rather than a formal focus group. Although the authors collectively possess interdisciplinary expertise in circular construction, business model innovation, and digital technologies, external validation remains necessary. Future studies should incorporate expert focus groups and obtain feedback from industry stakeholders to strengthen the robustness and applicability of the findings.

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