RESISTANCE TO MATERIAL SUSTAINABILITY IN CONSTRUCTION ORGANISATIONS: AN INSTITUTIONAL PERSPECTIVE

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INTRODUCTION

The construction sector is a massive consumer of virgin material resources worldwide, contributing to 40% of material-related greenhouse gas emissions (United Nations Environmental Programme, 2021). On the other hand, many countries report that construction and demolition wastes form their biggest solid waste stream of approximately around 35%. The data highlights the negative environmental impact caused by the linear nature of the construction industry; thus, advancing material efficiency and promoting circularity is an essential agenda in the sustainability transition of the construction sector. Material efficiency is defined as "using less new materials to achieve the same goals" (Allwood et al., 2012). Material efficiency in construction could be achieved through several strategies spanning different phases in the life cycle of buildings and the built environment. They include design optimization to reduce consumption of raw materials, design for disassembly, incorporating flexibility into building design for increased and adaptive functionality, switching from energy-intensive building materials and technologies to those of low embodied carbon and environmental impact, deploying deconstruction and reuse of materials and components, utilization of recycled materials, etc. These strategies help reduce material flow, fostering circularity and thus contributing to the sustainability transition of the construction sector.

SUSTAINABLE CONSTRUCTION AND ITS BARRIERS

While material sustainability or material efficiency is one of the components encompassed within the broader agenda of sustainable construction, some of the other significant components include energy efficiency, water management, waste management, and indoor environmental quality. Despite the understanding of the adverse environmental impacts of the construction sector and the advancements in tools and technologies for sustainable construction, the construction industry has been notably slow to adopt the different components

of sustainable construction, including material sustainability (Akadiri, 2015, Chan, 2018, Nyugen 2023).

Various challenges surround the uptake of sustainable construction, and a systematic literature review has been conducted to understand the barriers and challenges to sustainable building in different geographical contexts. The review unveils that more than technological challenges or financial constraints, the dominant factors that are resisting the transition towards sustainable construction are those such as management or co-ordination challenges at the project level, supply chain dependency issues at the field level, and the social barriers such as environmental consciousness, awareness, acceptance etc.

The systematic literature review highlights two major research gaps in understanding sustainability transition in the construction sector. First, while studies highlight a resistance that prevails across the construction industry that constrains the adoption of sustainable construction, there is scarce understanding of why and how the resistance occurs. In other words, there is a lack of understanding of the underlying causes and pathways contributing to the industry's resistance to sustainable construction. Second, the majority of the studies look at solutions or strategies to promote a sustainable built environment from a project-level perspective or a policy-level perspective. Although organizations are the key enablers in implementing sustainable construction (Glass & Dainty, 2011), only a few studies consider an organizational perspective to sustainable construction.

ORGANIZATIONAL RESISTANCE TO CHANGE

While organizations such as Interface Inc. and Bendigo have successfully developed exceptional sustainable business cases by leveraging various structural and cultural changes in their businesses (Stubbs & Cocklins, 2008), many organizations irrespective of their domains face challenges and resistance when they attempt sustainability implementation. The resistance arises because these organizations are embedded within a broader institutional and social context. Thus, institutional theory, that attends to the more resilient aspects of social structure, considering the process of how rules, norms, and routines are created, adopted, and diffused over time and space (Scott, 2005). Institutional theory is a framework for understanding how institutions influence the behaviour and actions of individuals or organisations (Scott, 2014) thus providing a powerful theoretical lens to understand the resistance.

Institutions are formal and informal rules of the game (North, 1990), comprised of regulative, normative, and cultural-cognitive elements (Scott, 2013) that structure social interactions and govern existing ways of working. As the major impediments to sustainable construction are deep-rooted industrial practices, significant changes in these structures and practices would be required for higher-scale adoption of sustainable building technologies and construction practices. Effective change interventions require a thorough understanding of the *'embedded institutions'*, including the traditions, norms, customs, beliefs, and cognitive routines behind existing practices and behaviours. Also, understanding the nature of the *'institutional environment',* which includes the existing political, legal, and economic system (Williamson, 2000), is significant in capturing the resistance prevailing within the construction field in the sustainability attempts. Thus, this paper aims to answer the following research question:

"How do the embedded institutions and the institutional environment inhibit organizations from progressing towards material sustainability in construction?"

RESEARCH SETTING AND METHODOLOGY

Grey literature, including government reports, technical reports, white papers, and open-source videos, forms an important source of up-to-date and comprehensive data. Due to the widespread interest and nationally determined contributions (NDCs), sustainable development has been openly debated and discussed in online forums. Thus, in this paper, we utilize open-source online video recordings of panel discussions and roundtable discussions, which form an emerging source of qualitative data (Mazanderani et al., 2013; Chandrasekar et al., 2024) comprising the viewpoints of expert stakeholders. Overcoming geographical bias of information, ease of availability, and early and open information are advantages of utilizing this data (Webb, 2017).

The search string framed using the keywords “sustainable OR green AND construction OR building AND challenges OR barriers AND round table OR panel discussion” was used on the Google search engine and retrieved several sources. Since the term sustainable construction or green buildings unfolds discussion on several components such as energy efficiency, water efficiency, material efficiency, health and well-being, the contents of the video recordings were carefully examined and filtered based on their relevance to the problem, which is to study material sustainability. Also, a subjective assessment was necessary to assess the credibility of

the data sources, leading to the exclusion of some sources of information. The preliminary findings discussed in this extended abstract are based on seven videos, listed in Appendix 1, which account for a total recording of 8 hours and 28 minutes. Transcripts of the video recordings have been prepared and coded manually using open coding. The codes are analysed using thematic analysis with embedded institutions and institutional environment as the broad themes.

PRELIMINARY FINDINGS

Organisational roles towards material sustainability

The data analysis provides an overview of the proposed or desired roles that key categories of organizational stakeholders within the construction sector need to play in achieving material sustainability. At the field level, material manufacturers play a significant role as they are substantial consumers of virgin raw materials, open up the material flow cycle, and have the potential to determine whether the material flow is linear or circular within the field. Some of their material sustainability strategies include developing lightweight solutions, effective end-of-life recovery solutions, and replacing virgin raw materials with recycled materials. At the project level, client organizations play an influential role in material sustainability by embedding the elements into the design briefs and contracts. The data analysis highlights multiple instances where collaboration between engineering firms, architectural firms, and builder and contractor organizations is proposed as an essential process change for effective design and implementation of material sustainability strategies across design, construction, life extension, and deconstruction stages.

Significance of embedded institutions and institutional environment: Some examples

Although organizations in the construction field have significant roles to play in the sustainability transition, the data presents several arguments where embedded institutions, such as the organization's sustainability interest, perception or beliefs, and institutional environment, such as tax mechanisms resist organisations attempts towards material sustainability. Figure 1 illustrates one such instance where clients believe or suspect that recycled materials are not durable, which leads to a risk aversion attitude, causing the behaviour to avoid using recycled materials in their projects. Stakeholder behaviours such as these directly affect the reuse and recycled products demand, supply, and pricing mechanisms. Figure 2 illustrates that since recycling materials or components in a construction project is more labour intensive, an

institutional environment where the labour tax is comparatively higher than material tax or absence of landfilling tax does not provide adequate support for reuse or recycling of building materials. Figure 3 illustrates that the value of existing materials in a building are unrealized by the stakeholders, and thus they do not document or keep track of the information about them, leading to reduced opportunities to reuse the materials at the end-of-life of buildings.

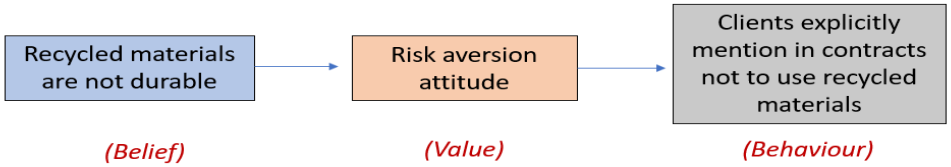

Figure 1: An instance of embedded institutions resisting material efficiency

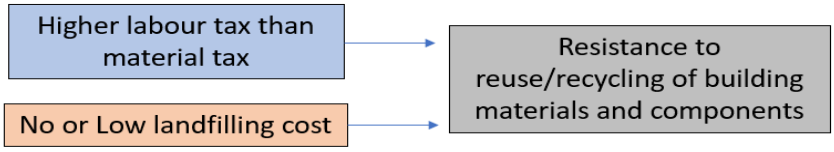

Figure 2: An instance of institutional environment resisting material efficiency

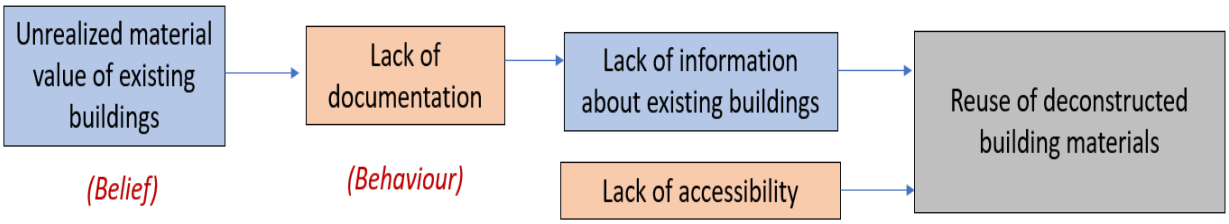

Figure 3: Embedded institutions and institutional environment resisting material efficiency

As indicated in the above figures (Fig. 1 to Fig. 3), there may be multiple sources of path dependency for a strategy, denoting higher resistance to change. Understanding the different resistance pathways and the embedded institutions within them is highly significant, as they represent the second most effective points to intervene within a system, with the most effective being the power to transcend these paradigms (Meadows, 1997).

Table 1: Embedded institutions and institutional environment resisting material sustainability

Organizational stakeholder	Technologies, strategies and process changes towards achieving material sustainability	How institutions resist material sustainability?	
		Embedded institutions (Traditions, norms, values, customs, beliefs, mental models, expectations or prevailing culture)	Institutional environment (Formal institutions consciously designed by humans and their interactions)
Manufacturers	Light weight & low environmental impact solutions	Risk aversion attitude of clients/contractors	Delay in codes and standards publication, Immature supply chain
	Effective after-life recycling & reuse	Stakeholders' perception that recycled materials are not durable	Higher labour tax than material tax
Clients	Embedding material sustainability and circularity elements into design briefs and contracts	Lack of client's sustainability interest and awareness	Lack of accepted and tangible circularity metrics and indicators
	Prevent landfilling of building materials and components	Unrealized material value of building assets	Unavailable documentation of building information, land filling is cost-free, land fill tax is less than cost of hand-over to recycling
Engineering, Architectural & Contractor organizations	Incorporating adaptability/flexibility into building design	--	Linear design process
	'Collaborative design and demolition process'– to enable effective sustainability implementation	--	Linear design process, lack of deconstruction specialists
	Increasing the functionality of existing buildings	Functional considerations are dominating- structural aspects are not examined before demolition	Lack of involvement of engineers in demolition decision

Table 1, derived from thematic data analysis, maps the resistance faced by stakeholder organizations due to the embedded institutions and the nature of the institutional environment, in relation to the desired roles of each organization in the transition towards material sustainability. Although the table is only an indicative summary of the data gathered and analysed thus far, designing interventions at the level of each embedded institution and creating supportive structural changes in the institutional environment could potentially drive sustainability transformation within the organsations and in the institutional field in which they are embedded. The insights obtained from the study imply that institutions are deeply integrated with any organisational changes or transformation relating to sustainability implementation. As the existing institutional environment hinder the attempts, analysing these elements would help us understand the trajectories that influence the current sustainability practices and future sustainability behaviour within an organization or an institutional field.

CONCLUSION & FUTURE WORK

Material strategies and the reduction of embodied carbon in buildings have massive potential to reduce carbon emissions in the construction sector (Hertwich et al., 2020). However, they

are in a comparatively primitive phase among the other strategies, such as reducing energy demand or decarbonizing the power supply of the built environment. The abstract contributes to an enhanced understanding of the resistance faced by the organisational stakeholders while working towards material sustainability, and highlights that the resistance pathways are created both from elements within the organisations and from the institutional field in which the organisations is embedded. As the research question addressed in this extended abstract is a part of the broader research problem, comprehensive validation of the findings is limited at this stage, though it will be addressed as the research progresses. The future work plan is to gather preliminary data representing key organizational stakeholders in the construction sector and to explore the complex interdependencies between the institutions and stakeholders to capture the resistance pathways for the transition towards material sustainability. The pathways would contribute to identifying and strategizing agendas for sustainable construction that can effectively leverage the potential of organizations to achieve material sustainability in construction.

APPENDIX 1

Source 1: Sustainability Challenges for the UK Construction Sector
Source 2: Sustainability in the built environment
Source 3: Circular economy panel discussion
Source 4: Panel Discussion: Construction and sustainability
Source 5: Moving the Construction Needle Towards Sustainability and a Circular Economy
Source 6: Sustainability and Circular Economy in Construction
Source 7: Sustainability Circular Economy in Construction

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