

FACILITATING NET-ZERO TARGET IN THE BUILDING SECTOR THROUGH ONLINE TRANSACTION PLATFORMS: FEEDBACK FROM INDUSTRIAL PRACTITIONERS

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In recent years, the increasing demand for reducing building energy consumption in support of sustainable development and achieving net-zero goals has created opportunities for trading low-carbon technologies and solutions in the building sector. Traditional transaction is still being commonly used now in building industry, and digital transaction platforms have not yet been popularly adopted, although they have been used in many areas of people's life, such as retail and publishing. It is still not clear how the building sector perceives and can utilise digital transaction platforms to facilitate the net-zero process. To address this issue, fifteen industrial practitioners, including nine suppliers and six buyers, were interviewed in this study and four types of changes that platforms could bring were identified along with nineteen influencing factors. The results indicated that integrating transaction platforms in the conservative building sector is challenging due to the uncertainty of performance and the high knowledge barrier of low-carbon products and services. The study helps to better understand how to promote the transition of the building sector from the traditional transaction method to digital online method.

Keywords: built environment; sustainability; platform; net-zero; factors

INTRODUCTION

To mitigate global climate change, the Paris Agreement has committed 164 countries to decarbonise (UNFCCC. Secretariat, 2021), and a net-zero goal has been set to limit the carbon emissions from human activities to protect our environment (UN, 2020). As a primary source of greenhouse gas emissions (Joensuu *et al.*, 2020), the building sector plays a vital role in this process (Martiskainen and Kivimaa, 2018). To contribute to this 2050 net-zero target, the UK government has started to put homes, workplaces, schools, and hospitals at the centre of the green economic recovery (HM Government, 2021). This process, however, relies significantly on the adoption of low-carbon technologies, such as smart façade, heat pumps, energy-efficient appliances etc. (IEA, 2021). Although there are many low-carbon technologies and solutions (LCTSS) available in the market, the potential buyers appeared to have

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limited willingness to adopt these new technologies, given the inherent feature of the industry (Dubois and Gadde, 2002). Therefore, the application of LCTSs remains lagging.

As a loosely coupled system, the building sector involves a complex network, which needs collaborations from various aspects, such as actors, actor activities, and resources (Dubois and Gadde, 2002). This inherent feature facilitates mutations and novel solutions but forestalls the spread of innovations over the whole system (Weick, 1976). Consequently, the building sector has been widely denounced of failing to uptake new techniques, such as 'industrialisation' of manufacturing processes (Li and Yang, 2017, Gann, 1996) that help improve the performance of other industries. The reason for this could be the management techniques not been transferred according to the building sector's inherent complexity context (Dubois and Gadde, 2002, Gidado, 1996).

Digital transaction platforms act as intermediaries to facilitate direct exchanges and transactions of products, service, and information between different parties (Bonina *et al.*, 2021). According to Perren and Kozinets (2018), transaction platforms have the capability of intermediation and consociality, which means they hold an intermediary role and facilitates certain level of social interactions between practitioners.

Nowadays, the DTPs have disrupted the traditional interaction mode of many industries (e.g., retail, travel, and publishing) (Cusumano *et al.*, 2020). In the building sector, the integration of Digital Transaction Platforms (DTPs) is still at the emerging stage, and currently there is still no matured aggregated DTP in this industry. In traditional building sector, linear businesses are supported by regulative and habitual practice, and the value generated from this process was created by the providers and then was passed to the buyers through the transaction process (Sarja *et al.*, 2021). In contrast, subjected to network effect, the value of DTPs is positively related to the number of total available users and functions (De Reuver *et al.*, 2018). However, it is still vague in how interactions change in DTP environment and what factors may affect this process. There is, therefore, an urgent need to explore how DTPs can fit the inherent features of building sector practices.

To fill this gap, this study has explored how DTPs interrupt and reform the interactions between the participants of low-carbon technologies/solutions (LCTS) transactions. The study was carried out by interviewing relevant practitioners in the building section, from both provider side and buyer side. This study aims to provide insights into the way of the building sector adopting new LCTS, considering its inherent complexity and uncertainties. The results will help to overcome the barriers of adopting LCTS to accelerate the process of digitalisation in this specific industry for sustainable development.

DTP and LCTS

DTPs have been used in many business areas, such as retail and publishing, to create awareness and facilitate novel and more effective interactions between diverse parties (Kahn *et al.*, 2018, Gawer and Cusumano, 2014). This has been enhanced further during the pandemic period, when people were forced to stay at home and separate with others (Jena *et al.*, 2020). By aggregating useful information in one place, DTPs help to reduce information asymmetry, which has been recognised as a major barrier of adopting LCTSs (Gillingham and Sweeney, 2012).

As an emerging part in the building sector, the implication of LCTS faces not only the inherent conservatism and pragmatism of the industry, but also the problem of how to

be known and accepted as innovations. According to the Roger's Diffusion of Innovations theory (Brook, 2018, Rogers, 2010), the pioneering users play a significant role in promoting the innovation to other potential users. On the other hand, awareness creation also plays an important role because people will not purchase a product/service if they are not aware of or do not understand its functions. This becomes even more important for industries with high knowledge barrier, such as LCTs. With the ability of gathering useful information, DTPs therefore, have the potential of helping overcome the information and knowledge gap between providers and buyers, especially from the buyers, who may not know the technologies very well (Rabhi and Pal, 2019). In this sense, DTPs could facilitate introduction and application process of LCTs.

METHOD

In this study, in-depth interviews were conducted with in total fifteen interviewees (six buyers and nine providers). Given the expertise of interviewees and the complexity of the issue, it is anticipated that fifteen interviewees could potentially offer valuable insights as phased discovery. The interviews consisted of two parts, with the first part collecting basic information about the interviewees (e.g., job position), and the second part exploring their experience and opinions towards the application of transaction platforms in the building sector. The interviews were conducted in a semi-structured manner, with specific questions aiming at gathering relevant information for the study, with improvised and adjusted follow-up questions according to the answers from each interviewee. These follow-up questions allow extra flexibility compared to rigid structured interviews, encouraging interviewees to give their unique verbal expression (Kallio *et al.*, 2016).

The data collected were then analysed by thematic analysis (Creswell, 2017), using Microsoft Excel. The thematic analysis began with a careful reading of the interview transcripts to establish familiarity with the data. From this reading, initial codes were generated by identifying significant recurring patterns and ideas. These initial codes were then organised into potential themes. To ensure the reliability of findings, the analysis adopted a systematic process constantly comparing codes and themes across the dataset. In the end, four themes were identified, followed by nineteen factors. All participants of this study possess solid expertise and experience in this industry, thereby providing sufficient power in information (Malterud *et al.*, 2015).

FINDINGS

Based on the interview results, the changes DTPs could bring to this specific industry were classified into four themes: creating new transaction opportunities, time, cost saving, reducing information asymmetry, accelerating knowledge and information sharing, establishing trust-based environment. To elaborate further, by aggregating useful information and counterparties in the one place, DTPs can increase the number of successful transactions. In addition, DTPs provides integrated and efficient communication channel with the help of internet and communication technologies (ICT), which is ascendant compared to traditional work mode in cost-sensitive building sector. Furthermore, DTPs facilitate the exchange of knowledge and experiences. This process involves documenting and discussing authentic case studies, practical experiences, and data. Consequently, not only are knowledge and experiences accumulated, but also trust is fostered among participants, as emphasized by industry practitioners in interviews. And then, unique factors influencing the changes were identified, as shown in table 1.

According to the involved parties (i.e., providers, buyers, and platform) in a digital transaction application for low-carbon technologies/solutions, this study identified five types of interactions between them, as shown in Figure 1. They are 1) providers-buyers, 2) providers-platform, 3) buyers-platform, 4) providers-providers, and 5) buyers-buyers. As this study considered DTPs as one single intermediary that facilitates the transactions between two parties, the interactions inside the DTP were not concerned.

Figure 1: Five types of interactions between DTP, providers, and potential buyers

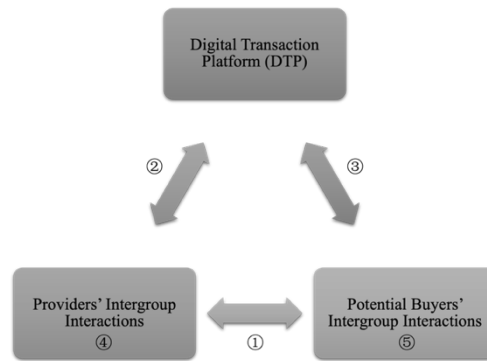


Table 1: Influential factors in facilitating transactions of LCTSs

Factors	Interactions	Change Themes
Extending S-B network	Providers - Buyers	Creating new transaction opportunities Time, cost saving Reducing information asymmetry Accelerating knowledge and information sharing Establishing trust-based environment
Fostering trust-based relationship		
Maintaining good relationship		
Creating harmonious communication atmosphere		
Enabling efficient contacts		
Enabling higher customization		
Aggregated information about market needs	Providers	
Two-way visibility	-	
New opportunities from platform's existing customers	Platform	
Creating firm value		
Information's high aggregation level	Buyers	
Education towards deeper acknowledgements to LCTSs	-	
Regularly update	Platform	
Uniformity of information		
Help finding cooperation opportunities	Providers	
Extending interfirm network	- Providers	
Case study sharing	Buyers	
Facilitating spread of eWoM	- Buyers	
Time and cost saving		

Interactions between Providers and Buyers

As the interaction mode accounting for the largest proportion, DTPs help facilitate transactions by extending the provider-buyer network. The provider-buyer interaction mainly concerns with the scope and depth, as well as the trust issue involved. Among all the providers being interviewed, around 60% are start-ups, and they emphasized on importance of increasing awareness. A major reason for them to join the DTP is to obtain convincing backup from the platform through well-established quality control process. Moreover, the innovative feature of LCTSs makes it difficult for potential buyers to actively approach the technologies/solutions they are targeting for. It is, therefore, necessary for providers to obtain better exposure, suggesting “This kind of solution is something that nobody thinks they need and until you've had a conversation with them”.

In addition, the industry practitioners also face the problem of dislocation of connections. In other words, providers need “getting talk to the right person at the right position”. By creating a unique and professional environment for interaction, DTPs can foster efficient contacts. According to the answers by the interviewees, it seems like the current main approach adopted by providers are LinkedIn, industrial events etc. About 20% of the providers also highlighted the importance of social media marketing and communication. After an intense work on contacting potential buyers, the reply rate only ranged between 1% and 20%. Using the DTP environment, however, providers are able to make direct contact to the “right person”, if the potential buyers also use the platform.

In the process of provider-buyer interaction, 70% of the buyers stated that most current LCTSs in the market do not fit the market’s need, they say,

“There’s a lot of people out there spending lots of money... developing things which no one wants”.

By providing a more efficiency interaction tunnel, the potential buyers can engage earlier and deeper, facilitating customisation and make the LCTSs closer to demand. Given that as a loosely coupled system, most of the innovations are project-based and cannot be applied in another case directly. The early and deep communication between providers and buyers are particularly important in facilitating customisation and therefore increasing the success rate of matchmaking. However, it is noteworthy that the aforementioned activities are predicated upon the fundamental principle of trust.

Trust plays an important role in transactions, especially in the building sector. The interviewees refer to the concept using different words, including but not limited to “credibility”, “believe”, and “trust”. Trust requires collaborative work and interaction from various parties. In the transaction of LCTSs, sixty percent of the potential buyers shows concern about the promotion information provided by the providers, including standard alignments, and said only “real building data” is credible. Other potential buyers consider adhering to standards (e.g., ESG and BREEAM) credible. They suggest:

"Somebody to be able to assess those products... that has to be an application process potentially to assess the claims that people will be making. So if you say that my product reduces carbon emissions by 80% percent on a on a building, we need to be able to test that."

At most of the circumstances, when it comes to choosing an appropriate LCTS, potential buyers tend to adopt the advice or experience of existing buyers facing

similar challenges who they have cooperative relationship with, "It would be really helpful to know which other organisations they have implemented this technology with... it (talking to peers) gives us sort of reassurance that we are not missing anything."

Interactions between Providers and Platform

Upon discussing about the interacting with the platform, providers frequently mentioned a significant limitation in the traditional mode of selection, whereby they are unable to effectively discern customer preferences until potential buyers make proactive contact and communication. In contrast, the platform offers a distinct advantage by providing browsing habits, such as extended periods of time spent on specific pages within the platform environment, thereby allowing providers to gain insights into potential buyer preferences.

"So having an understanding of if someone viewed it, what they viewed...if we were to go into our website and take a look at the analytics, we can see what pages they've looked at, where they've looked at it, how long they've looked at it... (if) no one goes on to it, why would we put the time and effort into to update it and if we knew that people were looking at it, of course we would be hot on keeping that absolutely as up to date as possible."

With two-way-visibility, it is possible to establish a virtuous cycle where providers maintain their platform image with increased diligence, resulting in the platform becoming more appealing to potential buyers due to the abundance of information it offers. This situation leads to active attitudes of both buyers and providers.

In addition, within a platform containing a significant amount of aggregated information, engaging with the platform can facilitate providers in identifying their own unique positioning, leading to the development of a more compelling value proposition for their company.

"Before engaging in platforms, all I thought was selling... and then I thought about is building connections and deploy my product in as many places as possible."

Interactions between Buyers and Platform

In the interaction between potential buyers and DTP. The buyers No.1 focus is the aggregation level of the DTP. By aggregating as much information as possible, DTPs help in reducing information asymmetry. Potential buyers in building sector show great expectation to visiting a DTP with high aggregation level as it contributes to time and money saving in search new innovations across the industry:

"The Internet platform that I would use is a kind of aggregation platform... have lots of different sources of energy data, some from the suppliers... and we have a web platform where all of that is aggregated, and we can look at."

Nowadays, there is still huge information asymmetry between providers and buyers. The information source come mainly comes from connection introductions and through industrial events (e.g., The UK Construction Week). These efforts are made to ensure that no information is missed out. Therefore, it is important for DTPs to keep constant update of information.

"You almost need... go compare these websites... all the other websites to get the up-to-date information."

In this base, all the potential buyers investigated expressed the expectation for an DTP with high aggregation level:

"I need an integrated platform that can provide all information needed."

On the other hand, due to the immaturity of the industry, there is no existing unified standard for presenting and introducing LCTs. The uniformity of information enables comparability between similar kind of innovations and contributing to the most suitable decision-making.

"We wouldn't buy through these platforms necessarily, but we would use them to compare the environmental performance...The key is to make sure the information...is transparent and comparable."

Providers' Intergroup Interactions

Numerous providers have emphasized the significance of peer communication. Despite the advancements in information and communication technology (ICT), providers remain largely isolated. Presently, the primary means of communication between providers is at industrial events, which function similarly to DTPs and assemble diverse stakeholders in the same location and time. Through interfirm communication, the primary aim for providers is to identify opportunities for cooperation among various entities.

"I had a chance to speak to some of them, and that was the first time...there's very little sort of (opportunities to communicate). We're all part of the same partnership apart from one other brand within the partnership that I can think of. None of them are direct competitors for us. And so my first thought is there must be overlaps where we can help each other."

Despite that, the providers also concern about learning the latest knowledge of advertising and business expansion.

Buyer' Intergroup Interactions

The buyer-buyer interaction is like that of the provider-providers. Sharing experiences among buyers, particularly those belonging to large companies, presents a greater challenge due to the safeguarding of their own commercial interests. In the selection process, around 90% of the potential buyers highlighted the importance of "trial" before final decision-making. Currently, there is a dearth of appropriate and reliable platforms to incentivise the exchange of experiences among buyers on a significant scale.

"For me it would be really helpful to know which other organisations they have implemented this technology with...What has been the actual feedback from those organisations and well, actual savings they have...From the technology developer, a lot of time they are very focused on showing the success rather than actually show how the technology has worked...But there isn't really a place where you can go right now and say: OK, I can see that these colleagues in these five organisation...So perhaps it deserves A conversation."

During this process, extensive communication can aid in disseminating electronic word-of-mouth (e-WOM) and simultaneously conducting a screening process, thereby elevating the lesser-known providers to the forefront. This will also facilitate the conservation of time, energy, and financial resources for the buyers during the selection process.

DISCUSSIONS

In general, both providers and potential buyers exhibit a cautious yet inquisitive attitude toward integration of digital transaction platforms (DTPs) in their traditional workflow. Notably, providers, who are typically small and medium-sized enterprises (SMEs), express a fervent inclination towards DTPs, citing its potential to enhance their visibility and communication with potential buyers. Conversely, potential buyers

tend to be more sceptical regarding the reliability of DTPs and the providers participating, aligning with the cautious and conservative culture that characterises the building sector. During the interviews, all potential buyers indicated that they are regularly contacted by numerous providers each day and will put limited time and effort to screen them. On one hand, the amount of reaching is too large to be went through one by one. In general, understanding towards DTP is not widespread in this industry, for some of the practitioners, although have joined the platform, they do not fully comprehend the purpose of joining. On the other hand, despite the large amount of LCTSs in the market, a substantial number of these innovations lack diversity, which lead to disappointment on the market and less interest in exploring. Therefore, education towards the nature of DTP is as important as that of the significance of LCTSs.

When queried about their willingness to participate in a new DTP, the potential buyers conveyed a sense of dissension. Approximately fifty percent of the participants indicated that despite their previous suboptimal experiences, they would still consider joining to “keep up with the market”. Conversely, the remaining participants expressed apathy towards the prospect. This lack of interest could be attributed to the nature of the buyer, as relatively disengaged buyers are typically affiliated with large organisations or enterprises that possess established suppliers, customers, and hold a relatively conservative attitude towards innovation, which conforms to the traditional characteristics of the building sector.

As a cost first industry, the practitioners tend to remain conservative, and trust comes with time and money consuming trials and real experiences. Therefore, the pragmatism of the industry could be one of the one of the most significant barriers hampering the adoption of DTPs. Future research may quantify how industry pragmatism affect the functioning of DTPs. The pace of low-carbon transformation in the building sector is slow. In this situation, the ability of creating an interaction environment with more rapport and facilitate the sharing and accumulation of knowledge and experiences could be one of the most outstanding contributions of integration of DTP, which could reduce both time and monetary cost of trial process thus making trading more efficient and credible to the potential buyers. This process could be contributed to the unique network effect of DTP.

In summary, the findings reveal a cautious yet inquisitive attitude among the stakeholders. Providers, primarily SMEs, are eager to leverage DTPs to enhance their visibility, while potential buyers are more sceptical about their reliability. The study identified four themes of changes DTPs could bring to facilitate the introduction and application process of LCTSs, as well as the unique factors in this process. Trust emerges as a key factor in facilitating transactions, particularly in the building sector. The findings suggest that DTPs can effectively extend the depth and breadth of communication between provider and buyer sides, reduce information asymmetry, and create opportunities for cooperation and customisation. However, the importance of education on the nature and benefits of DTPs is highlighted, as well as the need to build trust and share experiences among the industry practitioners to enable a more efficient and reliable adoption of low-carbon technologies.

CONCLUSIONS

The present research endeavours to comprehend the efficacy of incorporating DTPs to enable the building sector to achieve the net-zero emissions target. Through interviews with both providers and potential buyers, this inquiry elucidates the

conventional transaction mode of LCTSs and identifies four themes' DTPs can help with to facilitate the transactions of LCTS along with the influencing factors. Based upon which, this study identifies the critical factors that can facilitate the transaction of LCTS. The research outcomes offer insights into the integration of DTPs and suggest prospects for extending these findings to adopt novel technologies in the building sector.

The limitation of this study could be contributed to the sample size of interview, future work should extend the sample size to enrich and validate current findings. Additionally, all interviewees in this study are business participants, restricted by a business-to-business (B2B) working pattern. To broaden the study's scope, future research could explore other business modes (e.g., B2C).

REFERENCES

- Bonina, C, Koskinen, K, Eaton, B and Gawer, A (2021) Digital platforms for development: Foundations and research agenda, *Information Systems Journal*, **31**(6), 869-902.
- Creswell, J W and Creswell, J D (2017) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, London: Sage publications.
- Cusumano, M A, Gawer, A and Yoffie, D B (2019) 3.4 platform versus non-platform company performance: Some exploratory data analysis, 1995-2015, *Software Business, Platforms, and Ecosystems: Fundamentals of Software Production Research*, **171**.
- Cusumano, M A, Yoffie, D B and Gawer, A (2020) The future of platforms, *Mit Sloan Management Review*, **61**, 46-54.
- de Reuver, M, C Sørensen and C R Basole, The digital platform: A research agenda, *Journal of Information Technology in Construction*, **33**, 124-135.
- Dubois, A and Gadde, L-E (2002) The construction industry as a loosely coupled system: Implications for productivity and innovation, *Construction Management and Economics*, **20**, 621-631.
- Gann, D M (1996) Construction as a manufacturing process? Similarities and differences between industrialised housing and car production in Japan, *Construction Management and Economics*, **14**, 437-450.
- Gawer, A and Cusumano, M A (2014) Industry platforms and ecosystem innovation, *Journal of Product Innovation Management*, **31**, 417-433.
- Gidado, K (1996) Project complexity: The focal point of construction production planning, *Construction Management and Economics*, **14**, 213-225.
- Gillingham, K and Sweeney, J (2012) Barriers to implementing low-carbon technologies, *Climate Change Economics*, **3**, 1250019.
- HM Government (2021) *Net Zero Strategy: Build Back Greener*, Available from: <https://www.gov.uk/government/publications/net-zero-strategy> [Accessed 26 July 2023].
- IEA (2021) *Net Zero by 2050, A Roadmap for the Global Energy Sector*, Paris: International Energy Agency.
- Jena, S, Prajapat, S and Madaan, R (2020) Role of online platform in creating awareness during COVID-19, *SSRN*, 3637378.

- Brook, J R, Setton, E M., Seed, E, Shooshtari, M and Doiron, D (2018) The Canadian Urban Environmental Health Research Consortium - A protocol for building a national environmental exposure data platform for integrated analyses of urban form and health, *BMC Public Health*, **18**(1), 1-15.
- Joensuu, T, Edelman, H and Saari, A (2020) Circular economy practices in the built environment, *Journal of Cleaner Production*, **276**.
- Kahn, B E, Inman, J J and Verhoef, P C (2018) Introduction to special issue: Consumer response to the evolving retailing landscape, *Journal of the Association for Consumer Research*, **3**, 255-259.
- Kallio, H, Pietilä, A M, Johnson, M and Kangasniemi, M (2016) Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide, *Journal of Advanced Nursing*, **72**, 2954-2965.
- Li, J and Yang, H (2017) Published A research on development of construction industrialisation based on BIM technology under the background of industry 4.0, *In: MATEC Web of Conferences*, 2017 EDP Sciences, 02046.
- Malterud, K, Siersma, V D and Guassora, A D (2015) Sample size in qualitative interview studies: Guided by information power, *Qualitative Health Research*, **1**, 8.
- Martiskainen, M and Kivimaa, P (2018) Creating innovative zero carbon homes in the United Kingdom - intermediaries and champions in building projects, *Environmental Innovation and Societal Transitions*, **142**, 15-31.
- Perren, R and R.V Kozinets, Lateral exchange markets: How social platforms operate in a networked economy, *Journal of Marketing*, **82**, 20-36.
- Rabhi, A and Pal, P (2019) Japan-India technology matchmaking platform: Approach to promote Japanese low carbon technologies in Indian industries, *Journal of Resources, Energy and Development*, **16**, 9-18.
- Rogers, E M (2010) *Diffusion of Innovations*, New York: Simon and Schuster.
- Sarja, M, Onkila, T and Mäkelä, M (2021) A systematic literature review of the transition to the circular economy in business organisations: Obstacles, catalysts and ambivalences, *Journal of Cleaner Production*, **286**, 125492.
- UN (2020) The race to zero emissions and why the world depends on it, Available from: <https://news.un.org/en/story/2020/12/1078612> [Accessed 14 February 2022].
- UNFCCC Secretariat (2021) Nationally determined contributions under the Paris agreement Synthesis report by the secretariat.
- Weick, K E (1976) Educational organisations as loosely coupled systems, *Administrative Science Quarterly*, **21**(1), 1-19.