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Systematic Review

Analysis of One-Stop-Shop Models for Housing Retrofit: A Systematic Review

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Abstract

Housing retrofit plays a pivotal role in achieving sustainability goals. The fragmented nature of the retrofit industry has been identified as a barrier to driving retrofit at scale. The study aims to analyse how to strategically improve the concept of the one-stop-shop model to drive housing retrofit at scale with the help of existing literature. The concept of a one-stop-shop model provides all the retrofit services with a single contact to the client. A systematic literature review approach was used. Only peer-reviewed journal articles, book chapters and conference articles published from 2016 to 2025 in English were selected. There are 12 shortlisted journal and conference proceedings articles critically evaluated under three themes: delivery method, ownership structure and level of responsibility. The findings highlight the different characteristics of the one-stop-shop model under these themes. Considering the existing case studies, starting a one-stop shop under a hybrid delivery method and a medium level of responsibility is recommended for retrofit at scale. The ownership structure shall be context-specific. Limitations could be given as the researcher bias and the missed articles in databases not considered for this review. Further research is suggested on how the characteristics of a one-stop shop can be customised, considering the context-specific resources and purposes.

Keywords: energy efficiency; housing; integrated solutions; one-stop shop; retrofit at scale

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1. Introduction

1.1. Retrofit at Scale

The government of the United Kingdom is legally required to achieve net zero emissions by 2050 [1]. As far as the total emissions of the UK are concerned, 19.76% come from the existing housing stock [2]. The UK housing stock is considered to be one of the oldest and leakiest in all of Europe [3–5]. Retrofitting of the existing housing stock can be considered as an answer to this problem [6]. Considering the nearly 30 million housing stock in the UK [4,7], it is a critical challenge to retrofit all the existing housing stock by 2050. In addition, the purpose of housing retrofit is not just decarbonisation. The literature suggests the benefits of retrofitting, such as improving health, comfort, safety, occupant well-being, asset durability, aesthetics and fuel poverty [3,6,8].

While the importance of housing retrofit is validated, the existing fragmented nature of the retrofit industry has become a key constraint in moving retrofit forward [9,10]. Various parties to retrofit play their own role. Generally, one installer only installs a single measure. As there was no whole-house approach that would have considered the overall consistency of the retrofit measures, this has caused unintended consequences

in the past [8,11]. However, by identifying these issues and as a response to the "Each Home Counts" report in 2016 [12], the PAS 2035 specification was introduced, removing the bottlenecks of industry fragmentation to a certain level [11].

The concept of a one-stop-shop (OSS) model for housing retrofit has been identified by many studies as a potential solution for removing the constraints of the traditional fragmented retrofit industry [13,14]. The one-stop-shop model gives a single interface to the customer, eliminating the requirement for homeowners to manage various building professionals and parties. The one-stop-shop model is believed to be the forerunner of retrofitting [15].

1.2. Barriers to Retrofit

Regarding the housing retrofit decision barriers, Bertoldi et al. (2021) identify three categories: economic, informational and decision-making [16]. While endorsing these three categories, Biere-Arenas et al. (2021) identify two further categories under regulatory and split interests topics [17]. Bagaini et al. (2022) discuss barriers under four topics: institutional, economic, social and market [18]. Market, sociological, technical and financial barriers are suggested by Lucas et al. (2023) [19]. Financial, legal, social and technical barriers are discussed by Elgendy et al. (2024) [20]. Biere-Arenas and Marmolejo-Duarte (2023) also identify barriers under informational, economic, behavioural and regulatory categories [21].

Table 1 summarises the most important barriers under five key topics. The literature discusses an exhaustive number of barriers related to housing retrofit. Considering the focus of this study to retrofit at scale, the above-selected barriers for retrofit were synthesised. There are financial and economic barriers to retrofitting, which are key barriers identified in the literature. They include the high initial cost of the retrofit, longer payback periods and split interests between the landlords and tenants. The informational barriers related to housing retrofit are lack of awareness about the retrofit process/benefits and unintended consequences. Informational asymmetry, or not transferring the right information to the right parties, is suggested as a key barrier by various researchers [16–18,21].

Table 1. Barriers to housing retrofit.

	Category	Barriers
1	Economic	High initial cost of retrofit and longer payback. Split interests between tenants and landlords.
2	Informational	Lack of awareness about the retrofit process and benefits. Uncertainty of the benefits and unintended consequences. Informational asymmetry.
3	Regulatory	Inconsistencies in policies. Complex administrative procedures.
4	Behavioural	Resistance to change. Social influence. Lack of trust in the retrofit.
5	Technical	Disruption to the residents. Lack of skills to deliver retrofit at scale. Market fragmentation.

Regulatory barriers include all the institutional, legal and regulatory challenges impeding the promotion of housing retrofit. Some of the government policies themselves demotivate the promotion of housing retrofit due to various reasons, for example, the price disparity between natural gas and electricity [22]. Government policies are inadequate to

deliver retrofit at scale [21]. In general, there are policy and regulatory challenges related to the complexities and inconsistencies.

Bertoldi et al. (2021) talk about cognitive burden, loss aversion or status quo challenges in decision-making related to behavioural barriers [16]. Due to the conflict of interest, the homeowners do not believe that the contractors are working in the best interest of the homeowners, which has become a key challenge [23]. Some researchers have investigated the behavioural aspects of housing retrofit, which leads to the conclusion that the retrofit decision-making by the homeowners is not straightforward and challenging to understand [24–26]. For example, the decision-making behaviour of the homeowner is influenced by several cognitive biases, which are highly difficult to predict.

Apart from these barriers, there are several technical barriers. Most of these technical barriers are reported to have been addressed as there are successful case studies [27,28]. Still, more challenges are observed in the retrofit industry. When a building is retrofitted, a house is already occupied, unlike building new houses. In this case, it is quite difficult to eliminate disruption to the residents' daily routine during the retrofit. Alternative accommodation can be expensive, and homeowners may hesitate to accept it. Another reason is the lack of skills. The lack of skills is emphasised by Elgendy et al. (2024) [20] and Mainali et al. (2021) [23]. Market fragmentation is not directly a technical issue. However, market fragmentation causes unintended consequences and uncertainties in the retrofit journey of the homeowner [10,18,19].

1.3. One-Stop Shops in Housing Retrofit

BPIE (2021) identifies the one-stop-shop model for retrofit as "TurnKey Retrofit" [29]. This centrally coordinated stakeholder engagement model is becoming popular in the European context and has also reached the United Kingdom [10]. A one-stop shop (OSS) is a digital or physical point of contact. The clients can find all the information and services about their housing retrofits in this single point of contact [13,15].

This one-stop-shop model approach is identified as a productive method to drive sustainable housing retrofit. The homeowner is managed by the OSS throughout the lifecycle of the retrofit process to ensure the agreed-upon outcomes are delivered. Further, the retrofit coordinator is supposed to handle the other stakeholders collaboratively to deliver the agreed-upon outcomes [13,30]. This one-stop-shop model shares the features of the construction management procurement route as explained by Brook (2004) [31]. In the construction management procurement route, there is a single construction manager who reports to the client. The construction manager coordinates with the contractors and designers to deliver the project on behalf of the client. Figures 1 and 2 show the ideas of existing fragmented model and one-stop-shop model for housing retrofit.

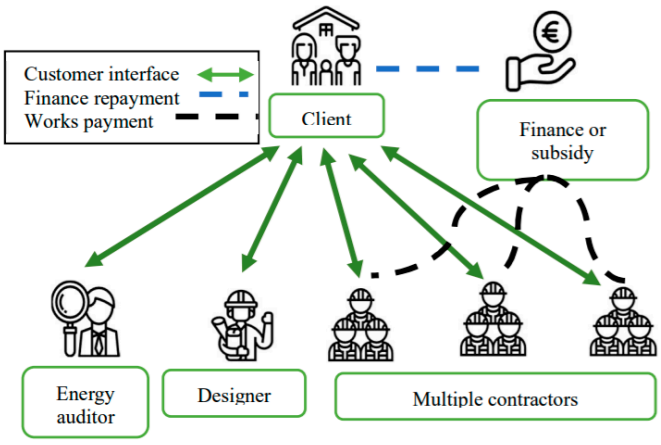

Figure 1. Existing fragmented model [15].

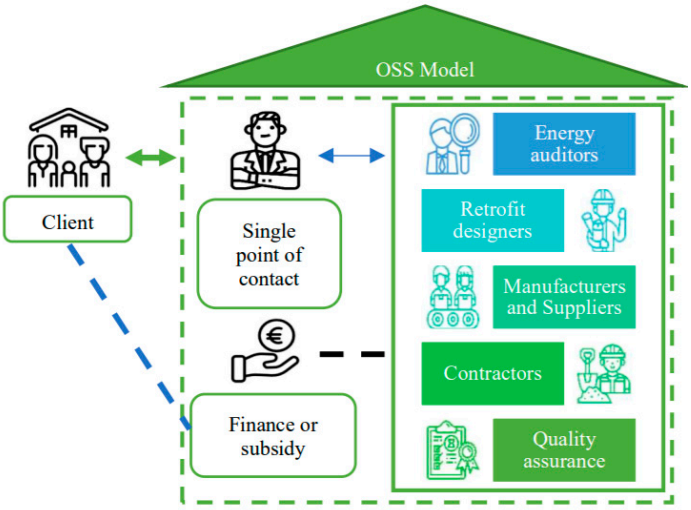

Figure 2. One-stop-shop model [15].

It is suggested that the one-stop shops are ideal to provide information and decision-making support for overcoming homeowners' personal barriers. Further, they can reduce the transaction cost barriers for homeowners when installing energy retrofit measures. Some one-stop shops would provide continuous support throughout the retrofit in managing such projects. There are barriers to launching these one-stop shops due to reasons such as high initial costs or uncertainties of energy savings. The trustworthiness of the one-stop shops and inconsistencies of information are other challenges [32]. Bjørneboe et al. (2017) point out the benefits of reducing uncertainty about the retrofit to the homeowner [33]. Further, a one-stop shop shall create awareness, allowing the homeowner to make an informed choice about retrofit measures. The main drawback is the extensive time consumption since it needs a comprehensive assessment of the property and time to coordinate various traders and installers.

Bertoldi et al. (2021) have emphasised the potential of one-stop shops to address market fragmentation issues, increase awareness, offer integrated solutions for retrofit and help homeowners throughout the retrofit journey [16]. The high cost of running a one-stop shop has discouraged the adoption of the model despite its benefits over time and hassle for the homeowner. Considering the risks and costs incurred by a private entity to operate a one-stop shop, the model does not seem to be appealing to investors [17]. A one-stop shop can serve as a guiding resource for homeowners from the outset of their decision-making journey, providing them with a secure shortcut that streamlines the process and inspires more extensive renovation decisions [34]. Agreeing with the other literature, Hill and Duffy (2022) validate the potential of a one-stop-shop retrofit model to give a single interface to the homeowner [35].

As far as the existing one-stop shops are concerned, three types of one-stop shops can be identified. Mainly, there are physical one-stop shops and online one-stop shops. Both physical and online one-stop shops can play a key role in the delivery of housing retrofit [35–37]. Sequeira and Gouveia (2022) argue that online one-stop shops are unlikely to answer the challenges of housing retrofit by themselves due to the limitations associated with online platforms [37]. This has been validated by Ebrahimigharehbaghi (2022) [32]. Physical one-stop shops have challenges such as high initial costs, a lack of skills or inconsistencies of information. Online one-stop shops have problems such as a lack of social interactions, poor digital literacy, limited accuracy and functionality.

According to an evaluation conducted about the existing digital tools (similar to one-stop shops), Seddiki et al. (2021) state that the poor functionality of the existing tools is not sufficient to make an impact [38]. As an answer to the limitations associated with

physical and online one-stop-shop solutions, the literature also suggests hybrid models. In these hybrid models, there are humans involved with the one-stop shop to reach out to the stakeholders. These interactions are facilitated by digital platforms [32,37]. The services of the one-stop shop are automated according to the requirements, fully, partly or not at all. For example, the retrofit assessment needs to be fully delivered by a retrofit assessor. Awareness programs can be delivered fully automated and online. The resident engagement and understanding requirements can be done remotely using digital platforms.

As far as the literature is concerned, there is a significant scope of literature on the topic of the one-stop shop for housing retrofit. However, the direction of the growing one-stop-shop model and its applicability in different geographical contexts are not clear. Further, there are no role models of one-stop shops observed anywhere. By considering the general literature suggestions, the study aims to analyse how to strategically improve the concept of the one-stop-shop model to drive housing retrofit at scale with the help of existing literature.

2. Materials and Methods

2.1. Search Strategy, Inclusion Criteria and Scope

This study used a systematic literature review research methodology. According to Pahlevan-Sharif et al. (2019) [39], the systematic literature review is a way of reducing the bias involved with qualitative research. As the systematic reviews are conducted in a step-by-step process, which is consistent and not subjective to the researcher's worldview, the findings are rather objective [39]. For the purpose of this study, the PRISMA 2020 statement has been referred to as a standard [40]. Further, the methodologies adopted by Mendis et al. (2023) and Bobrova et al. (2022) were referred to as guidance [26,41].

Once the keywords were identified as one-stop shop and retrofit, the search string was developed using Boolean logic. The same search string was used in the four databases selected for the article search.

"(TITLE-ABS-KEY (one AND stop AND shop) AND TITLE-ABS-KEY (retrofit) AND PUBYEAR > 2016 AND PUBYEAR < 2025"

Only the articles published during the past ten years were selected. For the literature search, four popular databases were used: Scopus, Web of Science, ProQuest and Elsevier. The searches were carried out on 25 February 2025. Only peer-reviewed, published journal and conference articles in the English language were selected. Book chapters were included, although they were not shortlisted for the final selected articles. All other articles were excluded.

2.2. Selection of Studies

Figure 3 shows the selection of studies for the systematic review. The study selection was carried out according to the PRISMA Statement 2020 [40]. There were 654 articles identified first according to the given keywords (Scopus—12, Web of Science—12, ProQuest—145 and Elsevier—485). After removing duplicates, initial screening of the title/abstract/keywords, article retrieving and assessing for eligibility, the final 12 articles were included in the study. The articles were initially screened by the corresponding author, and the selected articles were independently validated by the co-authors. No automation tools were used.

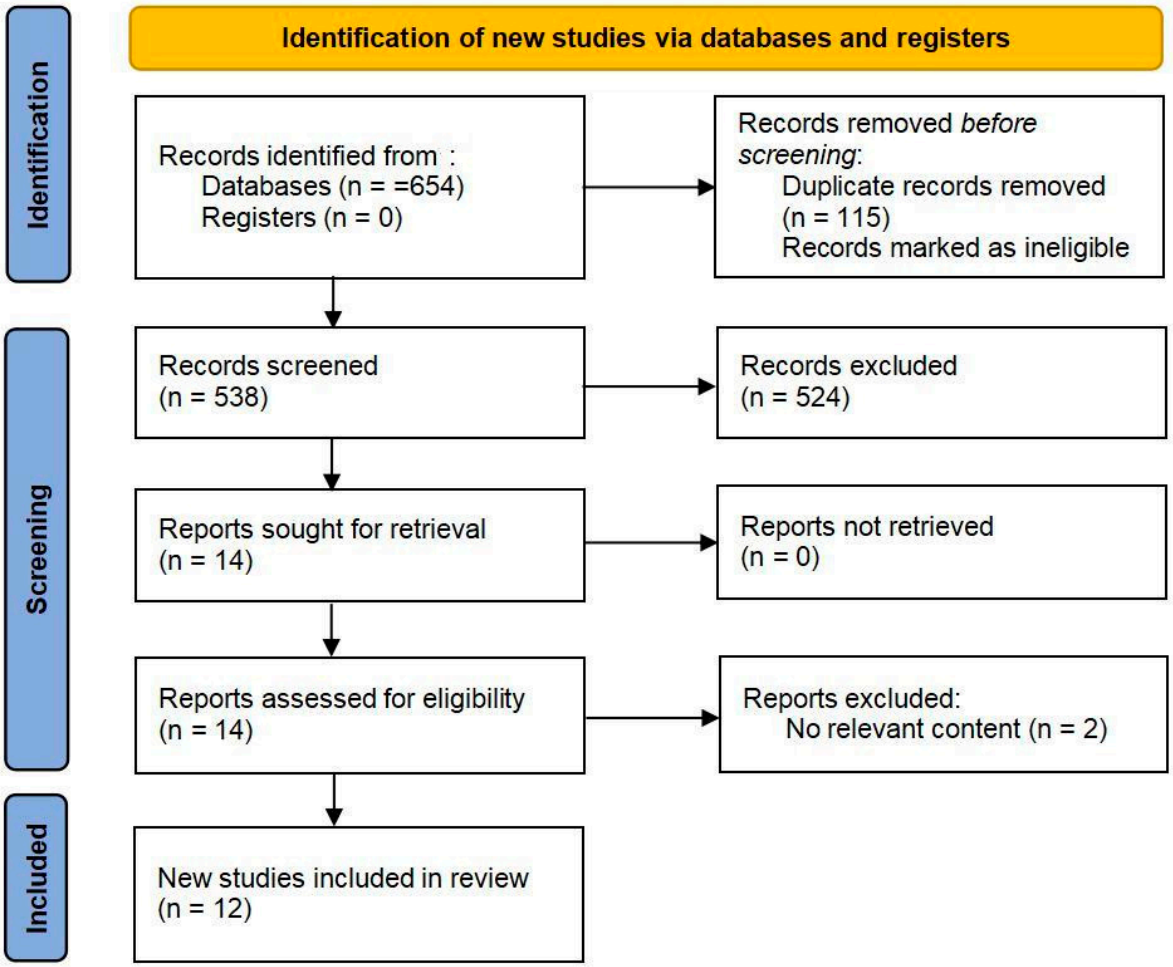

Figure 3. Study selection.

The corresponding author first reviewed all included articles for the data required for the analysis using keywords and their synonyms. A table was prepared to include the data under three themes: level of responsibility, ownership structure and delivery method. The co-authors independently reviewed and validated the data analysis using the table and the selected articles. No automation tools were used.

2.3. Data Items

Table 2 shows the selected articles included for the study. These 12 articles were used to collect data for the study, and they were thematically analysed under the three themes: level of responsibility, ownership structure and delivery method.

A qualitative thematic analysis was used to decide which studies were eligible for each synthesis. The findings were tabulated under the respective themes and given in the Section 3. These tables show the data under each theme, supported by the respective references of the articles included. The risk of bias due to missing results in the synthesis (arising from reporting biases) is considered to be low due to the qualitative nature of the data. Further, the data analysis is discussed with the support of related academic and grey literature in the discussion to minimise the bias.

Table 2. List of articles included in the study.

	Title	Authors	Year	Article Type	Source/Journal	Reference
1	Business models for residential retrofit in the UK: A critical assessment of five key archetypes	Donal Brown	2018	Journal article	*Energy Efficiency*	[10]
2	Swedish House Owners' Intentions Towards Renovations: Is there a Market for One-Stop-Shop?	Georgios Pardalis, Krushna Mahapatra, Giangiacomo Bravo and Brijesh Mainali	2019	Journal article	*Buildings*	[42]
3	The role of one-stop shops in energy renovation—A comparative analysis of OSSs cases in Europe	Paolo Bertoldi, Benigna Boza-Kiss, Nives Della Valle and Marina Economidou	2021	Journal article	*Energy & Buildings*	[16]
4	Strategies for the deep renovation market of detached houses	Brijesh Mainali, Krushna Mahapatra and Georgios Pardalis	2021	Journal article	*Renewable and Sustainable Energy Reviews*	[23]
5	To be or not to be: The organisational conditions for launching one-stop-shops for energy related renovations	Georgios Pardalis, Madis Talmar and Duygu Keskin	2021	Journal article	*Energy Policy*	[43]
6	One-Stop-Shops for Energy Renovation of Dwellings in Europe—Approach to the Factors That Determine Success and Future Lines of Action	Rolando Biere-Arenas, Silvia Spairani-Berrio, Yolanda Spairani-Berrio and Carlos Marmolejo-Duarte	2021	Journal article	*Sustainability*	[17]
7	Boosting energy home renovation through innovative business models: ONE-STOP-SHOP solutions assessment	Annamaria Bagaini, Edoardo Croci and Tania Molteni	2022	Journal article	*Journal of Cleaner Production*	[18]
8	A Sequential Multi-Staged Approach for Developing Digital One-Stop Shops to Support Energy Renovations of Residential Buildings	Miguel Macias Sequeira and João Pedro Gouveia	2022	Journal article	*Energies*	[37]
9	One Stop Shops on Housing Energy Retrofit. European Cases, and Its Recent Implementation in Spain	Rolando Biere-Arenas and Carlos Marmolejo-Duarte	2023	Conference paper	*Sustainability in Energy and Buildings*	[21]
10	European market structure for integrated home renovation support service: Scope and comparison of the different kinds of one-stop shops	Estay Lucas, Peperstraete Marthe, Ginestet Stephane, Oms-Multon Claire and Bonhomme Marion	2023	Journal article	*AIMS Energy*	[19]
11	Energy efficiency practices: A case study analysis of innovative business models in buildings	Sergio Copiello, Edda Donati and Pietro Bonifaci	2024	Journal article	*Energy & Buildings*	[44]
12	Integrated home renovation services as a means to boost energy renovations for homeowner associations: A comparative analysis of service providers' business models	Ragy Elgendy, Erwin Mlecnik, Henk Visscher and Queena Qian	2024	Journal article	*Energy & Buildings*	[20]

3. Results

3.1. Level of Responsibility

The first theme identified in the one-stop-shop categories was the level of responsibility of the one-stop shop. According to the literature, several one-stop shops were found at different responsibility levels. They could be segregated into three categories: low, medium and high-responsibility one-stop shops. Table 3 shows the details related to the level of responsibility theme.

Table 3. Level of responsibility.

	Description	References
Low	One-stop shops with low responsibility regarding their delivery of services.	[10,18,19,21,37]
Medium	One-stop shops, which have a medium level of responsibility over their services.	[10,17–19,21,44]
High	One-stop shops with a higher level of responsibility for their services.	[10,16,18,19,21,44]

Low responsibility: These one-stop shops provide minimal engagement in the retrofit process. Their roles are typically limited to providing information and referrals. They also provide awareness to the stakeholders, such as the contractors and the homeowners [18]. Brown (2018) identifies these low-responsibility one-stop-shop models as "Market Intermediation Models" [10]. These models are good for the homeowners who seek initial guidance for the retrofit works but lack the depth of delivering retrofit at scale [19]. Most of the one-stop shops at this level of responsibility are online one-stop shops [37].

Medium responsibility: There are one-stop shops with medium levels of responsibility over the retrofit process. They provide better engagement than the low-responsibility models by providing project management services apart from the awareness and referrals provided by the low-responsibility models. Key decisions are still taken by the clients, and the one-stop shop does not take any responsibility for the performance other than the guarantees and warranties of the respective suppliers and contractors. Bagaini et al. (2022) argue that one-stop shops operated at this level have a high potential to reduce institutional and market barriers [18]. Brown (2018) identifies these models as "One-stop shops" [10]. The one-stop shops at this level can fit in the middle between low and high-responsibility models, provide a satisfactory level of impact and help drive retrofit services to a considerable level. Biere-Arenas et al. (2021) argue that the most successful one-stop shops are all-inclusive ones, corresponding to the middle range of responsibilities [17]. Endorsing the same, nearly 50% of the one-stop shops in Europe have fallen into this category [21].

High responsibility: The third type of one-stop shops, according to the level of responsibility, takes the highest level of responsibility in their services. They manage the process from initial awareness-making to project completion, as well as taking responsibility for the performance. According to Brown (2018), two business models fall into this category [10]. One is to guarantee the energy performance of the retrofitted house, and the other is to guarantee the payment to the lender who financed the retrofit project. Bertoldi et al. (2021) emphasise the importance of one-stop shops of this nature to deliver retrofit at scale as they provide a high level of stakeholder trust [16]. These one-stop shops not only streamline the retrofit process but are also helpful in achieving mass-scale retrofit goals [21]. Bagaini et al. (2022) suggest that these models focus more on funding and low risk in terms of one-stop shop delivery [18]. Copiello et al. (2024) state two types of high responsibility

one-stop-shop models [44]. They share the common characteristic of repayment through the guaranteed energy savings.

3.2. Ownership

The second theme identified in the one-stop shops was the ownership structure. Mainly, there were government or government-related one-stop shops. They have different characteristics compared with the others. Further, there were one-stop shops directly operated by the contractors. Apart from the government and the contractors, others operate one-stop shops, for example, energy companies, NGOs or co-operatives. Some of the one-stop shops were funded by the government, irrespective of the fact that they were operated by institutions other than the government. There were hybrid one-stop shops operated by the government and another parties. They were also considered under the "Other" category. Table 4 shows the details related to the ownership theme.

Table 4. Ownership of the one-stop shop.

	Description	References
Government	One-stop shops, funded and operated by government-related institutions.	[16–20]
Contractor	One-stop shops, operated by retrofit contractors.	[16–20,42,43]
Other	One-stop shops, operated independently by other stakeholders such as NGOs or energy companies.	[10,16,18,19,21]

Government: There are one-stop shops owned and operated by governments or government-related institutions. The important aspects of these government one-stop shops are that they are often funded by public money and do not charge fees for their services. The objectives are broadly inclined to drive national decarbonisation goals as well as other social and economic goals, such as fuel poverty. There are limitations as these one-stop shops may focus only on delivering government grants but are unavailable to all householders. Bertoldi et al. (2021) suggest that these one-stop shops focus on climate change or energy-related purposes, including broader societal objectives and national agendas [16]. Lucas et al. (2023) highlight that government-related one-stop shops receive support from government entities and that their objectives are often driven by climate-related, social or energy resource management goals [19]. Biere-Arenas et al. (2021) show that most of the one-stop shops are public in their study and suggest that this may be due to the high costs of implementation and operation of OSSs, which are not financially feasible for other organisations [17]. Biere-Arenas and Marmolejo-Duarte (2023) found that nearly 90% of the one-stop shops in their analysis have received government funding for the operation, and nearly 50% of them are direct initiatives of the government [21].

Contractors: In contrast, there are contractor-driven one-stop shops. These one-stop shops are established by the contractors or parties in the supply chain to drive their businesses. They expect to bridge the demand created for integrated retrofit services by homeowners due to the existing fragmented nature of the retrofit supply chains. Due to private ownership, their services may or may not be free, and there can be trust issues due to conflict of interests or "Moral hazard" of the contractors [18]. According to Pardalis et al. (2019), these one-stop shops should highlight cost efficiency, energy efficiency and quality of work as key selling points to attract clients [45]. Pardalis et al. (2021) reviewed the organisational conditions of one-stop shops, mainly focusing on the contractor [43]. They highlight the importance of reducing transaction costs in one-stop-shop delivery.

Other: Apart from these public or private one-stop shops, there can be other types of one-stop shops operated by different stakeholders. For example, energy companies in Europe are reported to operate one-stop shops to drive housing retrofit under ESCO models [10,16]. Further, there are NGOs or professional organisations running one-stop shops. These one-stop shops may charge a fee to cover their costs. Bagaini et al. (2022) have discussed the ownership of one-stop shops under public, private and other ownerships [18]. Elgendy et al. (2024) discuss both public and private one-stop-shop business models [20]. Public one-stop shops prioritise broader societal purposes, while private entities prioritise operational aspects and financial stability. Accordingly, they propose hybrid one-stop shops of public and private partnerships.

3.3. Delivery Method

The delivery method of the one-stop shop was identified as a key aspect in the success of retrofit services. Mainly, there are physical one-stop shops and online one-stop shops. Due to the unique advantages of both physical and online one-stop shops, the concept of hybrid one-stop shop is observed to be growing. The review was conducted under these three categories: physical, online and hybrid. Table 5 shows the details related to the delivery method.

Table 5. Delivery method of the one-stop-shop.

	Description	References
Physical	One-stop shops with a physical presence in a location where people can call over and meet professionals.	[16,19,37]
Online	One-stop shops without a physical presence but functioning online.	[10,16,19,37,42]
Hybrid	One-stop shops, which have both a physical location and an online presence.	[17,18,37]

Physical: In the physical delivery model, there is a place where the service providers are located and the clients can visit. There are face-to-face interactions between the parties taking place in these locations. From one point of view, these physical one-stop shops provide better interactions and trust. They can facilitate a better understanding of the homeowners' needs. Physical one-stop shops can foster a friendly environment, which can attract homeowners better and more effectively. Similarly, they are reported to have better customer satisfaction, which will help to provide tailored and immediate feedback [16]. Physical one-stop shops can effectively provide consumer awareness and community engagement, going beyond just providing retrofit services but with a broader scope related to energy efficiency and retrofitting [19].

Online: The online method of one-stop delivery uses digital platforms to deliver one-stop shop services for housing retrofit. This method of service delivery has gained popularity due to the lower costs, convenience and consistency. There are concerns related to inclusivity as the technical availability and capacity of the homeowners matter. Bertoldi et al. (2021) recommend online or web-based one-stop shops as an alternative to physical one-stop shops to provide awareness about the retrofit process and their benefits as well as to monitor and evaluate the client satisfaction of already retrofitted houses [46]. There are concerns raised by researchers about online one-stop-shop delivery methods due to the low scope of services offered by existing ones, which are not sufficient enough to address the barriers of the most households in related to housing retrofit [37].

Hybrid: The hybrid model of one-stop-shop delivery has combined both the features of physical and online models, focusing on a more flexible approach to service delivery. Although the characteristics of different hybrid models can differ from one another, these models shall have both a physical location and an online presence. Another possibility is to deliver some services online and some services in person. Bagaini et al. (2022) point out the potential of a hybrid OSS model to complement the advantages of both physical and online models while accommodating different types of client requirements [18]. Although Sequeira and Gouveia (2022) have tested an online one-stop shop, they recommend complementing online one-stop shops with physical ones to have the best productivity [37].

4. Discussion

4.1. Responsibility Levels of One-Stop Shops

Considering the responsibility levels of one-stop shops for housing retrofit, the articles have stated a range of one-stop-shop models scaling from information hubs to managed energy services agreements (MESAs). For easy comprehension, they were segregated into three categories: low, medium and high-responsibility models. According to Bagaini et al. (2022), most government one-stop shops operate with low responsibility, focusing on information sharing and raising awareness [18]. There are medium-responsibility-level one-stop shops operated by the government, but they rarely operate at higher levels of responsibility. Most of the medium-level-responsibility one-stop shops are private. Sequeira and Gouveia (2022) have proposed an online one-stop-shop model at a low responsibility level for homeowners who are already motivated to retrofit their houses [37]. They suggest that these digital models can efficiently provide information and collaboration for the stakeholders.

Brown (2018) argues that most low-responsibility one-stop shops are information hubs and places for information exchange [10]. They are operated at a limited scope and often struggle to make an impact. Looking at the basic and non-tailored information disseminated by these information-only one-stop shops, homeowners may not be satisfactorily impressed with the idea of retrofitting their houses [47]. Due to the limited and standardised scope, it is suggested that low-responsibility one-stop shops could be easily delivered online.

Medium-level responsibility one-stop shops are equipped with the resources and services to help clients. They can offer both strategic advice and support through the retrofit delivery process. The functionality of the one-stop shops for housing retrofit is expected at least at this level. If they failed to deliver their promises in delivering the required level of services and collaboration, it could undermine the reputation of the one-stop shops [10].

High-responsibility one-stop shops can be found under the business models of ESCO (energy service companies) and MESA (managed energy services agreements). Apart from the collaboration and project management of the medium-level one-stop shops, these models provide guarantees of energy savings and loan repayments. These models can address the structural challenges of energy-efficiency retrofits [48]. Energy savings certainty is vital to attract homeowners for the retrofit process, and repayment guarantees are essential to attract lenders to retrofit financing. Engagement of the residents and the interest of the lenders are both key criteria of success to retrofit at scale. The challenges of these models can be given by the requirement for significant human and financial investments to set up and run these models with a higher level of operational excellence [49].

4.2. Ownership of One-Stop Shops

The ownership of the one-stop shops was also considered as a criterion for categorising one-stop shops in housing retrofit. The data collection found that there are government

one-stop shops and government-funded one-stop shops. Further, several one-stop shops are owned and operated by contractors as a part of integrated service delivery. There are 24 one-stop shops registered in Ireland under the Sustainable Energy Authority of Ireland as of 2024 [50].

Due to the availability of funding, public one-stop shops are more affordable and can be helpful to low-income householders [51]. Further, they have more power and authority. They can get support from a broader range of stakeholders and influence through policies and regulatory tools. However, the efficient operation of the model can sometimes be challenging due to the reliance on public funding and leadership. These entities often operate on national agendas without considering the interests of the homeowners [22].

It can be expected that the private one-stop shops operate on competitive grounds, aiming for gains through maximising sales. Unlike public entities, they are not able to use policy tools but promotions through marketing and operational excellence. It is argued that private one-stop shops offer tailor-made and customer-focused services to meet market demands. Accordingly, they are expected to be adaptive and responsive to client requirements. Although the private-owned one-stop shops have these advantages, the profit-oriented nature of their objectives can compromise service quality and the best interest of the clients due to their revenue generation targets.

There are other ownership structures of one-stop shops that may have a broader range of objectives, such as community service and/or revenue generation. They can be operated by a range of stakeholders, such as public–private partnerships or non-profit organisations. They may operate deviating from a primary revenue generation purpose, contributing to housing retrofit at scale [51]. Researchers recommend that these independent one-stop shops avoid the clients' hesitations toward contractors and government bodies. Homeowners may believe that the contractors do not work in their best interest and that the government bodies work on their agendas. Non-government and independent one-stop shops are recommended to overcome these challenges [32].

4.3. Delivery Methods of One-Stop Shops

Selected articles have identified the delivery methods of one-stop shops under three categories: physical, online and hybrid. Most of their findings and arguments related to these delivery methods are supported by the literature outside the data collection. One of the key problems with the physical one-stop shops is the geographical limitations and operating hours as they may not fit into the availability and convenience of the clients [52]. Place-based physical one-stop shops for housing retrofit are recommended despite these limitations due to their potential to collaborate with housing retrofit stakeholders at the community level [53].

In contrast, online delivery models of one-stop shops can leverage the technological infrastructure to deliver better services where the physical ones struggle. They are observed to have better efficiency and flexibility, helping to deliver one-stop-shop services despite geographical or time constraints [35]. Another advantage of online delivery methods is the lower operating costs. The low or no-cost delivery of energy retrofit programs was highlighted in the literature to engage residents better [54].

The establishment and maintenance of physical one-stop shops are expensive and resource-intensive [55]. In response to the challenges of physical and online one-stop shops, hybrid one-stop shops are proposed. They are observed to support clients with physical interactions for complex requirements and online interactions for simple requirements. This can be endorsed under the Cynefin framework of problem analysis [56]. In the Cynefin framework, there are simple problems where the cause and effect are known and rules are clear. These problems can be easily automated and delivered online. There are complicated

problems where there are known multiple answers, but the best one is not known. The expert input (ideally, human experts) is required to solve them.

These types of problems can be delivered through physical delivery methods in one-stop shops with the help of human experts. A recent article proposes the potential of a hybrid one-stop shop for housing retrofit in the UK. There is an online interface aimed at a non-technical audience (retrofit clients). A retrofit champion (a non-technical person) is proposed to deliver the retrofit services through physical interactions for people without computer literacy, using the same interface [57]. This hybrid delivery method has addressed most of the problems related to physical or online delivery methods.

4.4. Recommendations for Retrofit at Scale

The challenges of housing retrofit were categorised into five topics in this study: economic, informational, regulatory, behavioural and technical. Since these challenges have different consistency levels in different contexts, there will not be any "one-size-fits-all" one-stop-shop solution. It can be generally recommended that the best one-stop-shop model be chosen according to the specific challenges prevalent in the context. In this study, the main characteristics of a one-stop shop were identified according to their level of responsibility, ownership structure and delivery method.

In terms of one-stop shops, the literature has recommended hybrid one-stop shops over the physical and online models. Both physical and online one-stop shops have their limitations and potential. It will be more efficient and productive to go for a hybrid method of service delivery to leverage the potential of these two models. The promoter will have to decide which services to deliver online and which services to deliver physically. Another aspect is the segregation of services according to the type of client. For example, older and less tech-savvy clients will benefit from physical one-stop shops. Online one-stop shops can be better in terms of awareness-making and initial engagement with the stakeholders, including the homeowners. Figure 4 shows the proposed classification for the one-stop shops.

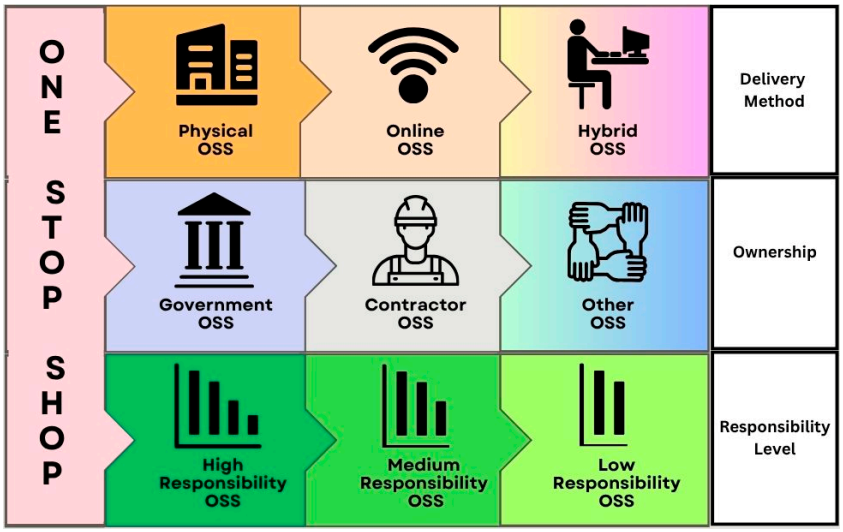

Figure 4. One-stop-shop classification.

When it comes to the ownership, several potential delivery partners can be identified. Government and contractors are the most prominent parties identified in the literature. Funding is a key requirement for the operation of one-stop shops. Government one-stop shops can seek public funding, and contractor one-stop shops can generate revenue through sales, which will support the capital and operational costs of one-stop shops. Apart from

them, non-profit organisations, cooperatives and energy companies are also reported as high-potential promoters. There is a question of how to finance the entity. Either they will have to seek government funding, which would be the easiest method; otherwise, they will have to use an alternative business model to manage the cost of implementation and operation.

The level of responsibility of the one-stop shop is an important aspect in the design of one-stop shops for housing retrofit at scale. The literature has reiterated that the basic one-stop shops are only suitable for awareness-making and simple stakeholder collaboration [38]. A comparison of online retrofit tools in the UK (similar to OSSs) has revealed that they have not been able to make a satisfactory impact due to their lower level of responsibility [57]. There are issues with these entities due to the negative effects of homeowner frustration. Although low-responsibility one-stop shops can be helpful to a certain level, medium-responsibility one-stop shops are recommended, which provide all-inclusive services to homeowners. The idea of the one-stop shop is not only to provide information but to take the client through the retrofit process from start to end with seamless collaboration and integration. It would be better if the entity could be established to provide energy-savings guarantees and repayment guarantees, such as in the ESCO model one-stop shop called "OCTAVE" in France [17]. However, the cost can be expensive. There are existing standards and best practices to improve the quality of retrofit and ensure there are no unintended consequences. For example, PAS 2035 specification and certification schemes such as Passivhaus Enerphit have already addressed this requirement. Accordingly, even a medium level of responsibility would be sufficient to give a head start for retrofit at scale. The level of responsibility can be increased gradually, subject to the availability of resources.

It will be important to look at the interplay among these variables when structuring a one-stop-shop solution for housing retrofit. A physical one-stop shop may be delivered by the government, while it will not be financially feasible for a contractor or an entity without any financial assistance. Physical one-stop shops were reported to be expensive to set up and operate. Further, a physical or hybrid one-stop shop needs to be with at least a medium level of responsibility due to the high level of investment. A low-responsibility physical one-stop shop can be a waste of money due to low impact. Accordingly, most of the online one-stop shops are operated under a low-responsibility model. Concerning the ownership and the responsibility level of one-stop shops, a socialistic government may take a high level of responsibility for the OSS services, while a mainly capitalistic government (such as the UK) shall choose to have a medium or low-responsibility model.

4.5. Limitations and Implications of the Results

Although the study was conducted thoughtfully and with attention to detail, there can be limitations. One limitation can be identified as the number of included studies in the study. Since the study has considered only four popular databases, there may be relevant studies that are not indexed by these databases. Further, the qualitative nature of the study may have caused researcher bias in this study. In order to address these limitations, the data analysis was reviewed by all authors independently, and the results were discussed with the help of further academic and grey literature. The research findings are expected to help develop better retrofit at scale strategies due to the elaborative interpretation of the one-stop-shop concept for housing retrofit according to their level of responsibility, ownership structure and delivery method. The policy makers, contractors or any promoter of retrofit one-stop shops will benefit from this study due to the synthesis of the existing literature. Further empirical research is recommended to identify the specific characteristics of one-stop shops in different contexts according to their performance.

5. Conclusions

Retrofitting the housing stock is a key requirement, not only to achieve the climate change goals but also to make houses more comfortable, healthier, cheaper to operate and safer to live in. Although there are technologies to support this transition, several challenges have been observed in the housing retrofit industry. For this reason, housing retrofit is not moving forward at scale. The one-stop-shop model has become a key buzzword in the housing retrofit industry due to the perceived potential to address most of its challenges. This study was conducted as a systematic literature review to understand the current position of one-stop shop delivery, looking at different characteristics.

The study found that the characteristics of one-stop shops can be broadly segregated into three themes according to their level of responsibility, ownership structure and delivery method. Since different contexts have different characteristics and objectives, it is difficult to recommend one key strategy for one-stop shops. Instead, the study recommends hybrid delivery methods and medium-level responsibility models for retrofit at scale. The ownership structure depends on the promoter. Although some researchers recommend hybrid models of joint ownership between the government and private sector, this study expects to leave it to the promoters to decide it according to their purposes. The literature with regard to the retrofit one-stop-shop concept is still growing. The shortlisted twelve articles were helpful in identifying three themes. However, there can be further themes to analyse that would be helpful for promoters to design better one-stop shops for retrofit. For example, the level of information or coverage (neighbourhood level, local or national).

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