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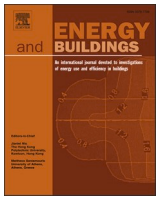

From blueprint to reality: An ex-ante and ex-post evaluation of one-stop shops for building renovation

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ABSTRACT

One-stop-shop (OSS) business models offering integrated renovation services, making renovation more affordable and feasible, are a requirement of European Union policies aiming in energy efficiency in buildings. The present paper offers an ex-ante (pre-implementation) and ex-post (post-implementation) evaluation of 37 OSS business models currently operating in the EU renovation market. The evaluation was performed using eight indicators that evaluate key factors in a business model followed by interviews with representatives of each of the examined OSSs. Findings indicate meticulous design and execution, with alignment between pre- and post-implementation evaluations, albeit with a lack of rigorous competitor analysis. While OSSs generally delivered expected value propositions, some struggled with clear communication and initial market assumptions, emphasizing the need for customer-centric strategies and adaptability to market dynamics for sustained success. The study also provides suggestions for future OSS development, which include comprehensive competitor analysis, enhanced communication strategies, and strategic partnerships to ensure long-term sustainability and success.

1. Introduction

In the European Union (EU), buildings represent almost 42 % of final energy consumption and 36 % of carbon dioxide emissions [1]. Approximately 75 % of existing residential buildings in the EU are energy inefficient, with a similar percentage projected to remain in use by 2050 [2]. As high as 97 % of EU buildings need upgrades by 2050 to meet climate neutrality goals [3]. Current energy crises and growing energy poverty highlight the need for large-scale building renovations [4,5].

The annual weighted renovation rate in the EU is notably low, barely reaching 1 % [6]. Specifically, for deep energy renovations, achieving reductions of at least 60 %, the rate drops to 0.2 % [5]. To address this, the European Renovation Wave aims to double the annual renovation rate by 2030, with targets of 3 % by 2035 and 4 % by 2040 [1].

Building renovation can yield multiple benefits on social, environmental, and economic levels [5,7]. Key drivers for energy renovations include reduced operating costs, improved indoor living environments, environmental concerns, and enhanced aesthetics [8,9]. However, homeowners face various barriers, such as financial, social/behavioral, and information barriers [10–15]. Renovations involve complexities and diverse actors engaged in different activities [16,17]. The fragmented value chain sees micro-, small-, and medium-sized construction companies promoting individual solutions and delivering renovation work piecemeal [11,18].

The low engagement of property owners in energy renovations can be attributed to their primary focus on technical and financial aspects, often fraught with significant decision-making barriers [19]. Additionally, the lack of easily accessible incentives and financing mechanisms poses a major hurdle [20], despite the availability of such incentives in many EU regions [21]. Property owners also lack the necessary knowledge to make informed decisions regarding energy renovations [20], necessitating extensive research, interaction with renovation professionals, and coordination of efforts, while bearing all associated risks and responsibilities [16,22]. Moreover, renovation providers, crucial influencers of property owners' decisions, often lack sufficient knowledge and exhibit limited interest in offering integrated solutions [15,23].

Incumbent approaches have failed to accelerate the pace of energy renovations, prompting the need for integrated solutions in the market. One such solution is the one-stop-shop (OSS) business model, facilitating comprehensive energy renovation packages by coordinating actors in

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the renovation value chain [18]. OSS aims to provide transparent, accessible tools to help property owners navigate energy efficiency renovations, while encouraging innovation among suppliers [24]. The EU Member States have been urged to facilitate access to OSS since the revision of the Energy Performance of Buildings Directive in 2021 [25]. Recognizing OSSs as essential for breaking barriers to renovation, the regulation targets all actors involved in building renovations, including homeowners and various economic entities [25].

Implementing organizations of OSSs vary and can include governments, energy agencies, ESCOs, consultants, and cooperatives [26]. These OSSs differ in their level of involvement in the renovation process [26]. While the number of operating OSSs is challenging to determine due to similar integrated renovation services not identifying as OSS, numerous studies explore the role of OSSs in national contexts and their design and implementation conditions [15,27–32]. However, there are gaps in understanding OSS costs, functions, and impacts on the energy renovation market in the EU [33–35]. Notably, few studies address these gaps, with one examining costs and functions [26] and another exploring how OSSs could accelerate renovation pace in Europe [36].

This article aims to enhance understanding of the implementation of currently operating OSSs in the EU renovation market by combining ex-ante and ex-post evaluations. The ex-ante assessment is based on an adaptation of the eight indicators scale proposed by Mateu and March-Chorda [37], evaluating key factors in a business model. The ex-post evaluation reflects on the actual implementation of these factors in the market. Integrating these evaluation methods provides stakeholders and policymakers with improved insights into OSSs' influence within the renovation market. It also highlights challenges OSSs face, aiding in their streamlined advancement and the formulation of effective supportive policies.

2. Reviewing one-stop-shop business model and business models assessment approaches

2.1. Overview of one-stop-shop for building renovation

The role of OSSs in advancing comprehensive energy renovation services is widely recognized. The European Commission actively encourages Member States to establish OSS platforms at local or regional levels to foster economies of scale and engage various stakeholders, including SMEs, financial institutions, and energy agencies [38]. Directive 2018/844/EU amends Directive 2010/31/EU concerning the energy performance of buildings (EPBD), emphasizing the importance of transparent and accessible advisory tools like OSS platforms [25,39]. This legislative step specifically addresses OSS platforms, contrasting previous directives that primarily promoted general advisory services through conventional mechanisms [39].

The OSS business model streamlines integrated building renovations by consolidating all required services in one place, providing property owners with a single point of contact, reliable advice, and project management assistance [26,35]. This model bridges the gap between fragmented supply-side renovations and demand [40], with authors highlighting its potential to accelerate deep renovation adoption, broaden customer bases, simplify access to financing, and foster local economic development through collaborations among stakeholders [13,24,40]. However, most available information on OSSs is based on project reports detailing case studies, with limited studies exploring conditions for OSS development or service delivery in Europe [15,24,41].

The one-stop shop (OSS) business model can take various forms, including virtual, physical, or a combination of both [42,43]. Its structure often varies depending on local conditions, involved parties, target customer segments, available resources, and services provided [15,40,44,45]. Cicmanova et al. [44] categorized OSS models into four types (facilitation, coordination, all-inclusive, or ESCO-type) based on the extent of support and liability assumed for the renovation's outcome. Additionally, OSS models are classified based on governance structures [24,26,40,46,47].

Despite recognized benefits for the demand side and potential business opportunities, supply-side actors, especially renovation SMEs, are hesitant to offer OSS models due to perceived barriers in local markets or high customer acquisition costs [41,42,48,49]. Existing OSS initiatives face challenges such as low customer demand, changing customer needs, operational constraints, and reliance on public funding without adequate contingency measures [16,26,29,50].

Existing OSSs in the European renovation market primarily focus on different types of residential buildings, with a notable emphasis on single-family houses. To accelerate building renovations and meet European Renovation Wave targets [5], innovative business models like OSS require further development, testing, and replication with support from policy, business, and research [34,35]. Thus, assessing the development and application of existing OSS initiatives in the market is essential for gaining knowledge to enhance the OSS business model in both research and practical market applications.

2.2. Evaluation of business models

Business model evaluation entails analyzing and understanding the performance of a business model design [51]. It enables informed decision-making aligned with business strategy [52] and offers insights into improving projected performance through adjustments [53]. Performance involves technical and business aspects, influenced by factors like feasibility, viability, robustness, scalability, and replicability [54]. In building renovations, viability is crucial for expansion and duplication, while feasibility and robustness are also essential [55,56].

Research emphasizes the importance of business model evaluation for success [57], with metrics and key performance indicators supporting evaluation [58–61]. While metrics describe performance and structure decision-making, evaluation methods are needed. Reviews like Tesch and Brillinger [62] on digital business model designs and Schoormann et al. [63] and Süβ et al. [64] on sustainability offer insights. Mateu and Escribá-Esteve [65] highlighted the ex-ante evaluation method by Mateu and March-Chorda [37] as noteworthy in their review of business model evaluation.

2.3. Ex-ante and ex-post evaluation methods for business models

Ex-post evaluation of a business model occurs after implementation, recording outcomes to assess success or address issues [66,67]. It evaluates actual performance and provides a comprehensive overview when implemented long-term [68]. Conversely, ex-ante evaluation assesses theoretical models before implementation, predicting outcomes [37]. While initially proposed by few scholars, ex-ante evaluation has gained popularity recently [37,65,67,69–73].

Predicted outcomes from ex-ante evaluation serve as a benchmark for comparison with actual outcomes ex-post [74]. Combining both evaluations provides stakeholders with comprehensive information, closing the business model cycle [75] and advising policymakers throughout the policy-making cycle [76].

3. Methodology

This study employs a qualitative multiple case study approach [77] to assess the implementation of the OSS business model in the residential buildings' renovation market. It was conducted in two phases to capture a distinct view of the OSS business model during the design phase (expectations) and after its market implementation (realized outcomes). This phased approach allowed us to assess both the anticipated impact and actual performance of the model over time.

In the first phase (*ex-ante*, conducted between Spring 2018 and Spring 2021), a scoping study was first conducted to identify relevant OSS case studies. Following this, we gathered data from OSS

representatives through desktop research, structured interviews, and informal discussions, based on predefined criteria [78,79], to assess their initial expectations and perceived feasibility of the model during its design phase. This *ex-ante* evaluation captured representatives' projections, potential success factors, and anticipated challenges prior to full implementation. During this phase, OSS representatives evaluated their business model blueprints using a 5-point rating scale across eight indicators, adapted from Mateu and March-Chorda's method [37]. This structured evaluation formed the basis of the *ex-ante* assessment, reflecting initial expectations about the model before market exposure.

In the second phase (*ex-post*, conducted in autumn 2022), after the OSS model had been implemented in the market, we conducted an *ex-post* assessment through an online questionnaire administered to the same OSS representatives. This questionnaire used the same eight indicators and a 5-point rating scale [80], allowing a direct comparison between initial expectations and realized outcomes. A follow-up interview session validated the questionnaire responses and provided deeper insights into practical challenges and successes experienced during implementation.

The two-phase structure isolates initial perceptions from implementation outcomes, minimizing the influence of market experience on *ex-ante* assessments. Additionally, we utilized multiple data sources—including documents, reports, research articles, and direct quotes from OSS representatives—to strengthen rigor and mitigate biases, ensuring a comprehensive view of the OSS model's design and real-world performance. This approach, with clearly defined *ex-ante* and *ex-post* stages, captures the evolution from initial expectations during the design phase to post-implementation outcomes, offering valuable insights into the OSS model's effectiveness and highlighting potential areas for refinement.

Following consultation with relevant ethics committee, it was determined that a formal ethical review was not required for this study. However, all participants were fully informed about the study's purpose and the intended use of the data. Informed consent was obtained from all participants prior to their involvement in the interviews and questionnaire, ensuring they understood the purpose and could withdraw at any time. No personal identifiers were disclosed, and participant anonymity was protected by only listing company names in the appendix. The study adhered to ethical standards throughout the data collection process, ensuring participants could withdraw at any point without consequences. Additionally, all data was handled confidentially and securely, preserving participant privacy and maintaining research integrity.

3.1. Case studies selection

In the initial data collection phase, we identified 104 OSSs across Europe by reviewing existing literature, documents, and conducting web searches related to integrated renovation services. Additionally, we encountered 23 cases of integrated renovation services through web searches, but they were not included in this study as they did not self-identify as OSSs. Among the initially identified 104 OSSs, prior research [24] indicated that four were no longer in operation, and our investigation found that an additional six OSSs had ceased operations. This left us with a final pool of 94 OSSs. These 94 OSSs, spanning 20 European countries, underwent further selection based on specific criteria. In addition to criteria applied in previous studies [24,26,47], we excluded OSS cases still in development or testing phases, as they could not provide sufficient information for ex-post evaluation. Additionally, one OSS case lacked sufficient data, having only recently commenced operations in mid-2022. This resulted in a final selection of 37 OSS cases operating in eleven different European countries (see Fig. 1 for geographic distribution). These 37 OSSs responded to the questionnaire and participated in an interview. For detailed case information, please refer to the accompanying study's Appendix I. Additional details regarding governance structure and service providers for selected OSSs can be found in Table 1, and Figs. 2 and 3.

Following the typology of OSS business models by Cicmanova et al. [44], the facilitation model aims to increase homeowner awareness

Fig. 1. Operating OSSs identified across Europe up to 2022 (own data).

Table 1
Categorization of OSSs participating in this study based on their type and governance.

Type	Public-driven	Private-driven
Coordination	BM3, BM5, BM6, BM7, BM15, BM16, BM17, BM21, BM24, BM26, BM31	BM8, BM19, BM20, BM35
Facilitation	BM2, BM11, BM14, BM18, BM33, BM37	BM10, BM22
All-inclusive		BM4, BM9, BM23, BM29, BM34, BM36
ESCO-type	BM27, BM32	
Mixed type	BM1, BM28	BM12, BM13, BM25, BM30

about energy renovation benefits, offering general information on measures and suggesting potential suppliers. In the coordination model, the OSS provider supplies information and manages supply-side actors, but homeowners contract directly with them, absolving the OSS provider of renovation work risks. In the all-inclusive model, the OSS provider takes full responsibility for the renovation but doesn't guarantee energy savings in contracts. The ESCO model is akin to the all-inclusive, with guaranteed energy savings. Additionally, some providers deliver their service using a mix of facilitation and coordination types. Information regarding the type of OSSs examined in this study can be found in Fig. 4.

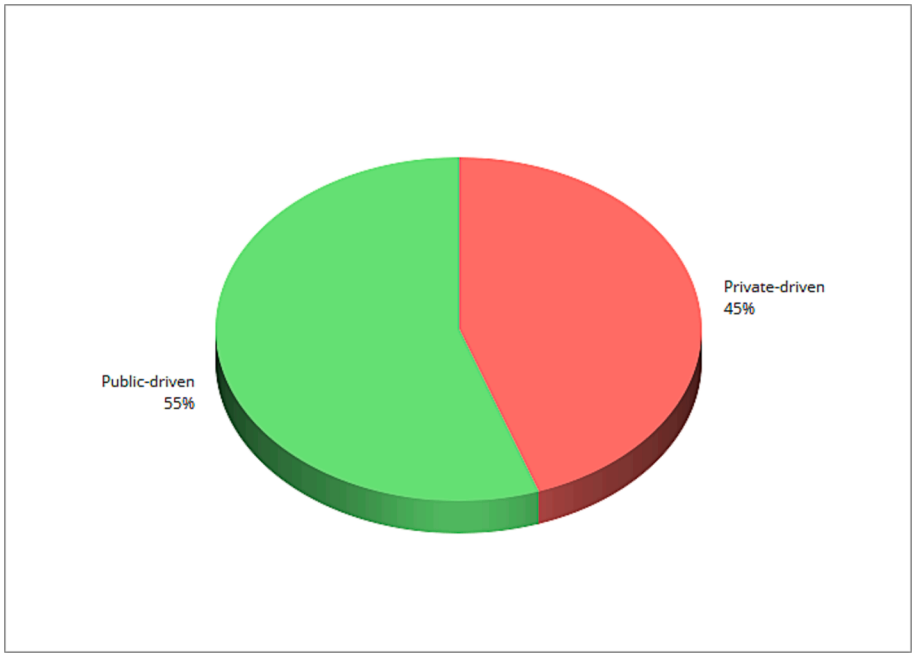

Fig. 2. Governance structure of identified operating OSSs across Europe (own data).

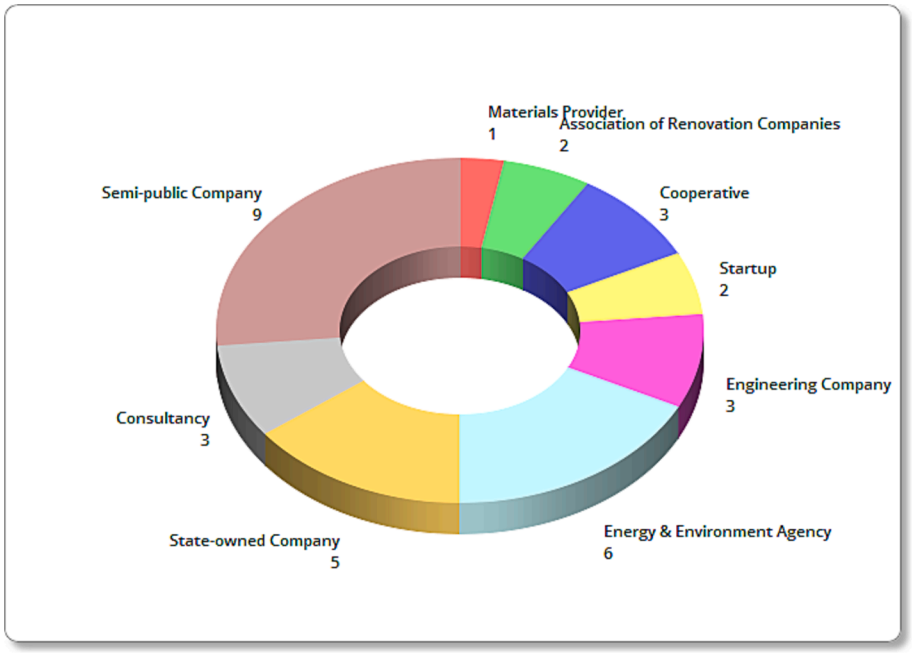

Fig. 3. Operating OSSs across Europe per provider of service (own data).

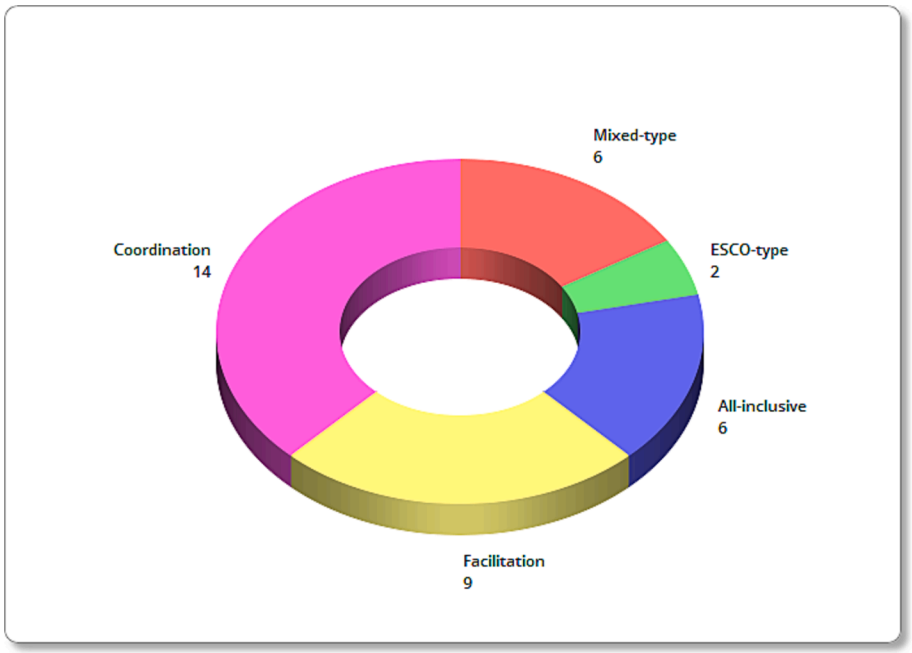

Fig. 4. Operating OSSs (market implemented) across Europe per type (own data).

3.2. Ex-ante evaluation

For the ex-ante evaluation of chosen OSSs, we applied Mateu and March-Chorda's [37] method. It involves eight indicators assessing crucial aspects of a business model, outlined in Table 2, as mentioned earlier.

Each of the eight indicators was accompanied by a question for the OSSs to answer using a 5-point scale. Each value (1 to 5) was defined by specific descriptions. Table 3 displays the generic formulation of questions posed to the examined OSSs, along with the description of each value for the associated 5-point rating scales.

3.3. Ex-post evaluation

Conducting an ex-post evaluation of a business model is crucial for organizational learning, offering insights from experiences and outcomes [61]. This process also highlights how businesses adapt their models to market conditions, ensuring adaptability and competitiveness.

In this study, the ex-post evaluation of selected OSSs occurred in two stages. Initially, a questionnaire was sent to OSS representatives, focusing on eight key factors corresponding to indicators in Table 1. The questionnaire, designed to assess eight key factors in a business model, utilized a 5-point scale for responses. Its aim was to enable OSSs to self-evaluate their models in actual market application, providing valuable performance insights. Table 4 outlines the questionnaire questions, along with the description of each value for the associated 5-point rating scale.

Table 2
The eight indicators for Mateu and March-Chorda's ex-ante business model evaluation method.

1.	Value creation condition
2.	Complete value proposition condition
3.	The sufficient size of market condition
4.	The access to potential customer condition
5.	Predisposition to make efforts condition
6.	Affordable costs condition
7.	Superiority over competitors' condition
8.	Entry barriers existence condition

In the second phase of the ex-post evaluation, follow-up interviews were conducted with OSS representatives. These interviews aimed to validate questionnaire responses and provide deeper insights into how their business models were applied in the market. Questions from the initial questionnaire formed the basis of the open-ended interviews, ensuring consistency and facilitating richer insights. Representatives had the opportunity to elaborate on indicators and share experiences.

Initially, both ex-ante and ex-post evaluations assessed OSS business models by averaging performance across eight indicators, each equally weighted. Detailed outcomes are in Appendix II. Subsequently, an intuitive assessment was conducted for a more nuanced evaluation, leveraging both objective data and subjective expertise [37]. This approach aims for effective result interpretation by combining both types of assessment. Mateu and March-Chorda [37] explored the correlation between their eight-indicator evaluation and an intuitive assessment, estimating the latter through a linear combination of scores across the indicators.

The intuitive assessment was performed by calculating the following formula:

$$Ei = \sum_{j} pjEij$$

Where:

E_i is the intuitive assessment of the OSS model i.

P_j is the weight assigned to indicator j in the linear combination (j takes values between 1 and 8).

E_{ij} is the rating of the OSS model i by the survey respondent for indicator j (numbers between 1 and 5 as showed in Table 4 for each of the models).

The weights employed in this study, outlined in Table 5, mirror an intuitive assessment methodology introduced by Mateu and March-Chorda [37]. To evaluate each OSS model, we multiplied the score of each indicator (Eij) by its corresponding weight (Pj), summing these weighted scores to generate an overall assessment. This structured approach ensures that the evaluation accurately reflects the model's performance, or characteristics based on the eight indicators, considering their unique contributions in a standardized manner.

Table 3
Questions for ex-ante business model evaluation method. (adapted from Mateu and March-Chorda [37]).

Questions	Rating Scale Description 1	2	3	4	5
1. How would the value proposition bring utility to the customer? To what extent?	The new business model will not add significant value or differentiation compared to existing options	The new business model might potentially add value or differentiation compared to existing options, but yet not a substantial ones.	The new business model will neither add significant value nor differentiation compared to existing options	The new business model will add notable value or differentiation compared to existing options	The new business model will add important advantages for the potential customer, including significant savings in effort and money, and significant energy savings, compared to existing options
2. Are all the necessary complements already available? If not, can we obtain those complements or develop them conveniently and at a reasonable price?	The business model required legal development and competence acquisition which required a very big investment for the entrepreneur and reflected on the price of the service	The business model required legal development and competence acquisition which required a considerable investment for the entrepreneur and obviously reflected on the price of the service	The business model required legal development and acquisition of competence from the broader market at a cost that has not reflected significantly the price of the service	The business model has not required legal development and missing competence has been acquired within the entrepreneur's network at a cost that has not affected the price of the service	The business model has not required legal development and all the necessary competence was in house. The price of the service has not been affected
3. How large is the market in terms of both customer volume and purchasing power?	The market is only local, with customers interested to invest in single energy efficiency measures, and with low purchasing power	The market is not only local, but limited in size, with customers interesetd to invest in specific energy efficiency measures, and with low purchasing power	The market is satisfactory in size, but with customers who are not interested to invest in holistic integrated renovation solutions nor have big purchasing power	The market is not massive, but attractive enough, because of the ability of customers to invest in holistic integrated renovation solutions	The market is massive, with a high volume of potential customers willing to invest in holistic integrated renovation solutions
4. How difficult will it be to explain the benefits of the value proposition to the potential customers?	The business model entails a radical change in the way energy efficiency renovations are offered. The value for the customer though is not obvious	The service that the OSS offers focuses a lot on the technical details. The value for the customer is too difficult to comprehent	The value that the service the OSS offers to the customer is relatively obvious to understand but not clear enough in terms of money saving and improvement of energy performance	The value that the service the OSS offers to the customer is obvious enough to understand both in terms of money saving and improvement of energy performance	The value that the service the OSS offers to the customer is very obvious and does not require any kind of additional explanation
5. Would the potential customers be ready to pay the price and make the effort the new business model requires?	Potential customers are very reluctant to pay for the kind of service the OSS offers	From the potential customers pool, some may be willing to pay for the kind of service the OSS offers, while others may have reservations but it's not a pervasive problem	There is a mix of potential customers, where some are very reluctant to pay for the kind of service the OSS offers, and others who are willing but indecisive	From the potential customers, some are very reluctant to pay for the kind of service the OSS offers, while others are hesitant or not fully convinced from the pricing	Potential customers are ready to pay for the service the OSS offers
6. Will it be costly for us to offer the value proposition? or, on the contrary, will it give us an attractive margin?	The business model does not include mechanisms that can reduce the unit costs, like economies of scale or network effects	The business model includes some basic strategies that lead to limited attempts to leverage mechanisms that can reduce the unit costs, like economies of scale or network effects	The business model includes some effective mechanisms that can reduce the unit costs. There are efforts to capitalize on economies of scale or network effects, but they can be improved	The business model includes robust mechanisms that can reduce the unit costs. It leverages economies of scale or network effects with relative success	Minimal costs, highly attractive margin
7. Are there many alternative value propositions competing for the same customers? How valuable are those alternative options? How strong are those competitors?	There are several strong competitors with business models that are similar of better than our OSS	There are several strong competitors with better market presence, but the business model of our OSS shows a relative differentiation	There are several strong competitors with better market presence, but the business model of our OSS shows a significant differentiation	Our OSS can compete with other actors in the market with a definite relative superiority	There are competitors in the market, but the business model of our OSS is clearly superior to theirs
8. Does the new Business Model provide a mechanism to hold the imitators at bay?	The business model of our OSS is very easy to replicate	The business model of our OSS is easy to replicate and can only be protected by how customer relationships are formulated	The business model of our OSS is hard to replicate because it requires an important volume of investment	The business model of our OSS is protected by network effects that help the first mover	The business model of our OSS requires resources and capabilities which are hard to obtain for competitors

4. Findings

Table 6 displays the average scores of the analyzed OSS business models across eight key indicators ex-ante and ex-post, using equal weights for indicators, along with averages of intuitive assessments employing varying weights. Additionally, a *t*-test was conducted to assess the significance of differences between ex-ante and ex-post scores, indicating changes in OSS business models over time. Results are categorized by OSS type (coordination, facilitation, all-inclusive, ESCO-type, and mixed type) and governance structure (private or public-driven).

Table 4
Questions for ex-post business model evaluation.

Questions	Rating Scale Description 1	2	3	4	5
1. How would you evaluate the value proposition of the service you delivered to your customers?	The value proposition added no significant value for the customer compared to existing solutions in the market	The value proposition gave to the customer slight advantages compared to existing solutions in the market	The value proposition gave to the customer perceptible advantages compared to existing solutions in the market	The value proposition gave to the customer important advantages compared to existing solutions in the market	The value proposition gave to the customer important advantages compared to existing
2a. How would you assess the necessity for complementary elements within your business model?	There was great necessity for complementary elements that required significant additional investment	There was a considerable necessity for complementary elements, that required a considerable investment	There was a moderate necessity for complementary elements, that required moderate investment	There was a low necessity for complementary elements, that required low investment	There was minimal necessity for complementary elements. There was need for additional investment
2b. If there was a need for complements, how these complements affected the final price of your service?	Complementary elements had little to no effect on the final price of the service	Complementary elements brought some adjustments on the final price of the service	Complementary elements brought a noticeable influence on the final price of the service	Complementary elements brought a significant change on the final price of the service	Complementary elements brought a profound impact on the final price of the service
3a. Have you reached the local market, or your service was delivered to mass market?	The service primarily targeted the local market with minimal efforts directed towards reaching the mass market	There were efforts for some outreach to the mass market, but the primary focus was on the local market	There was a balance between targeting the local market and reaching out to the mass market	The service made significant strides in penetrating the mass market, while still maintaining a presence in the local market	The service established itself in the mass market
3b. What was the volume of the market you reached with your service?	The service has only reached a small segment of the market	The service has achieved some level of penetration into the market, reaching a moderate segment of potential customers	The service has reached a significant portion of the market, with widespread adoption and recognition among its target audience	The service has successfully penetrated a large portion of the market	The service has reached a large volume of the market, establishing itself as a dominant player
3c. How would characterize the financial capacity of your customers (income group)?	The majority of customers belong to lower income groups	A significant portion of the customers fall into lower to middle income groups	The customer base consists primarily of middle-income group customers	The customer base consists of moderate-high- and high-income group customers	The customer base consists of customers from all income groups
4. How challenging was it for you to effectively convey your value proposition to potential customers in a clear and understandable manner?	It was extremely challenging to effectively convey the value proposition to potential customers in a clear and understandable manner	It was very challenging to effectively convey the value proposition to potential customers in a clear and understandable manner, requiring efforts to overcome barriers	It required moderate effort to effectively communicate the value proposition to potential customers	There were some minor difficulties in conveying the value proposition to potential customers	It was relatively easy to convey the value proposition to potential customers in a clear and understandable manner
5. Were potential customers willing to pay the price for your service?	Potential customers were unwilling to pay the price for the service	Potential customers expressed hesitation or reluctance to pay the price for the service	Potential customers were neither strongly willing nor strongly unwilling to pay the price for the service	A significant portion of potential customers showed willingness to pay the price for the service	Potential customers were willing to pay the price for the service
6. Did providing your value proposition incur significant costs, and did it yield an attractive profit margin?	High costs with low profit margin	Moderate costs with moderate profit margin	Moderate costs with attractive profit margin	Low costs with high profit margin	Minimal costs with highly attractive margin
7a. How would you rate your service in comparison to available alternatives in the market?	The service is significantly worse that available alternatives in the market	The service is slightly worse than available alternatives in the market	The service is on par with available alternatives in the market	The service is slightly better than available alternatives in the market	The service is significantly better than available alternatives in the market
7b. How would you evaluate the alternative value propositions that compete for the same customer segment as you?	The alternative value propositions are significantly worse than ours	The alternative value propositions are slightly worse than ours	The alternative value propositions are on par with ours	The alternative value propositions are slightly better than ours	The alternative value propositions are significantly better than ours
8. How easy is it for others to replicate your business model?	Very easy to replicate	Moderately easy to replicate	Neutral	Moderately difficult to replicate	Very difficult to replicate

For a detailed analysis of scores for each examined OSS business model, please refer to Appendix II. These eight indicators offer a succinct yet comprehensive evaluation of business models, providing valuable insights by assessing diverse and pertinent criteria.

The follow-up interviews with representatives of the examined OSS business models offered crucial insights into real-world implementation challenges. These discussions provided a platform for representatives to elaborate on indicators and share their experiences. The findings from these interviews are summarized below, organized into sections corresponding to each question in Table 4 and its respective indicator (referencing Table 2 for context).

Value creation indicator (question 1)

The interviewed OSS representatives strongly believed in the substantial advantages their business models offered to customers, emphasizing streamlined renovation planning and energy-saving opportunities. They portrayed their services as reasonably priced and

Table 5
Weights assigned to each of the eight indicators to emulate intuitive assessment of a model through a linear combination, as determined by Mateu and March-Chorda [37].

Indicator	Weight
1. Value creation	0.33
2. Complete value proposition	0.04
3. Sufficient size of the market	0.25
4. Access to the potential customer	0.10
5. Willingness to make an effort	0.05
6. Affordable costs	0.05
7. Superiority over competitors	0.12
8. Entry barriers existence	0.10

Table 6
Average scores obtained by the examined OSS models during ex-ante and ex-post assessment.

OSS Type and Governance Structure	Ex-ante Avg.	Intuitive	Ex-post Avg.	Intuitive	p-value (*t*-test)
Coordination OSS					
Whole lot	2.90	3.05	2.85	3.167	0.0718
Public-driven	2.88	3.05	2.80	3.146	0.1809
Private driven	2.91	3.04	2.99	3.225	0.2719
Facilitation OSS					
Whole lot	3.034	3.16	2.903	3.106	0.8349
Public-driven	3.003	3.13	2.882	3.012	0.6428
Private driven	3.065	3.195	2.965	3.39	0.6379
All-inclusive OSS					
Whole lot	3.168	3.298	2.973	3.228	0.4076
Public-driven	–	–	–	–	–
Private driven	3.168	3.298	2.973	3.228	0.4076
ESCO-type					
Whole lot	3.44	3.64	2.96	3.375	0.2753
Public-driven	3.44	3.64	2.96	3.375	0.2753
Private driven	–	–	–	–	–
Mixed type					
Whole lot	3.00	3.09	2.9	2.995	0.7767
Public-driven	3.07	3.20	3.14	3.03	0.8612
Private driven	2.92	2.98	2.66	2.96	0.9272

providing excellent value. However, while they claimed competitor analysis, further analysis in this aspect was lacking. Their assertions were based on positive customer feedback, with less emphasis on negative reviews in their value proposition assessment. Negative feedback was deemed less significant. Additionally, many OSSs, particularly privately driven ones, assessed service value primarily based on completed projects and corresponding fees. Data on customers opting out of renovation was presented discreetly to protect the OSSs' reputation, with some categorizing opt-outs as projected rather than actual sales, potentially masking true performance.

Complete value proposition indicator (question 2)

Insights from interviews with OSS representatives revealed a common trend: all examined OSSs made additional investments post-launch in the market. Public-driven OSSs primarily focused on acquiring expertise through collaborations, with costs not affecting final service prices. Private-driven OSSs, on the other hand, invested in s upplementary services to enhance value and customer appeal, such as economic estimations or redesign services. These "extra" services were often integrated into their business models or absorbed additional costs, occasionally leading to a slight increase in the final price.

Sufficient size of market indicator (question 3)

Discussions with OSS representatives shed light on their target market and customers' financial capabilities. Some OSSs conducted thorough market analyses and piloted offerings with specific customer segments to gather feedback and iterate. Interestingly, their target market wasn't homeowners seeking complete renovations but those interested in tailored energy-efficient measures within their financial means. Adoption of these measures varied, with OSSs aiming to cater to homeowners across income brackets. Initially, some OSSs targeted homeowners capable of investing in comprehensive solutions, but market experience revealed a limited scope. Shifting focus to homeowners willing to invest in specific measures proved more practical. Certain private OSSs initially targeted high-income homeowners for holistic solutions but realized only a fraction were ready for such investments. Homeowners often preferred adopting measures gradually. Prioritizing the broader market, regardless of financial capacity, enabled more access to services and ensured operational sustainability for most OSSs, regardless of project volume.

Access to potential customers indicator (question 4)

The majority of OSS representatives acknowledged the difficulty in effectively communicating their value proposition to potential customers. Despite their proposition seeming straightforward, technical jargon often obscured it, making comprehension challenging for customers. Simplifying complex concepts was met with skepticism, as customers tended to be cautious. Additionally, homeowners were generally unfamiliar with OSSs and often expected larger companies to oversee the entire process. Established companies in the renovation market already emphasized energy efficiency, posing challenges for OSSs to differentiate effectively. Some representatives observed that OSSs might not convey their value proposition adequately through online platforms, hindering potential customers' ability to navigate information and pique their curiosity.

Predisposition to make efforts indicator (question 5)

Regarding customer willingness to pay for services, two distinct clusters emerged among the examined OSSs:

- **Public-driven OSSs:** These OSSs reported that their customers were generally prepared to pay for the services they provided.
- **Private-driven OSSs:** Customer willingness to pay varied within this cluster. While customers were relatively open to paying for services, they often required persuasion regarding the value and ability of the services to meet their specific needs. Private OSSs emphasized high standards for quality and personalization to enhance service appeal. However, they faced competition from established market players with well-known brands, making customer persuasion challenging. Demographics also played a role, with younger customers more willing to pay but also more price-sensitive, while older customers were more willing but less numerous.

Affordable costs indicator (question 6)

When discussing costs incurred by OSSs in delivering value propositions, companies mainly cited minimal or negligible expenses related to creating, marketing, or training activities. Their focus centered on costs associated with delivering the value proposition. Some mentioned opportunity costs, particularly among coordination and all-inclusive OSS types, such as reallocating resources to promote the new proposition. Overall, there was a prevailing sense that standard costs for delivering OSS services, including management, administrative, and IT-related expenses, were not significant enough to impact final service prices. Consequently, these costs did not raise concerns among OSSs.

Superiority over competitors indicator (question 7)

The majority of OSS representatives expressed confidence in the significant differentiation of their business models compared to existing ones in their markets. They believed their services surpassed competitors', primarily due to additional value-added services such as design and renovation planning, project management, access to contractors, premium materials, warranties, and ongoing support. However, some facilitation or coordination OSSs acknowledged relative differentiation but were unsure if it conferred an advantage over competitors.

When characterizing alternative value propositions in their markets, opinions were divided. Generally, competitors' propositions were not considered stronger, but certain elements gave them an edge. Reputation, cultivated brand, and existing customer relationships were

significant challenges for smaller OSSs to overcome. Larger OSSs found it challenging to convince customers of their customer-oriented approach, with competitors perceived as better addressing individual needs. Additionally, existing competitors benefited from network effects, posing barriers to OSS expansion efforts.

Entry barriers existence indicator (question 8)

All examined OSS business models shared the belief that their structure is relatively easy to replicate but highlighted various factors potential new entrants should consider. These include local regulations, market demand, and available resources, with a thorough assessment of the local context and regulatory environment crucial before entering the market. For instance, some regions may have established programs and incentives supporting energy renovations and OSSs, while others may pose challenges for market entry.

Availability of resources, both financial and human, is another critical consideration. One-stop-shops for energy renovations require a range of expertise, from financing and marketing to energy assessments and project management. Developing these capabilities may require partnerships or investments in staff training. Many privately-owned OSSs emphasized the importance of building relationships with customers as a powerful marketing tool, engaging local communities and creating a multiplying effect for their business.

While OSSs adeptly identified and evaluated potential customer accessibility, they encountered challenges in effectively communicating their value proposition in terms of cost savings and energy performance improvement. Some OSSs initially assumed this communication would be unclear but discovered otherwise upon market implementation. This underscores the importance of continually reassessing assumptions and adapting strategies based on real-world feedback, leading to successful communication and alignment with customer needs.

5. Discussion

The stability of ex-ante and ex-post evaluation scores of examined OSS business models, grouped by type and governance structure, indicates that these models performed as planned under real market conditions. Initial forecasts aligned with reality, reflecting reasonable assumptions about target markets and customer behavior. Close alignment between pre- and post-implementation evaluations suggests meticulously designed and effectively executed business models yielding intended outcomes. Upon individual examination, notable differences emerge in evaluation results across the eight indicators.

Specifically, regarding the first indicator on value creation, business models generally delivered expected value propositions, with some making minor adjustments to enhance value compared to competitors. Reliance on positive customer feedback and tendency to overlook negative reviews raise questions about analysis comprehensiveness. Moreover, the lack of rigorous competitor analysis among most OSSs suggests a potential blind spot in understanding the competitive landscape, impacting their ability to differentiate effectively.

Regarding the second indicator, which addresses the complete value position condition, private-driven OSS models, especially those categorized as facilitation, all-inclusive, and mixed-type, faced challenges regarding legal development and competency acquisition. Implementation revealed these factors influenced service pricing, necessitating adjustments to ensure accessibility. Despite challenges, OSSs' willingness to invest post-launch demonstrates commitment to enhancing value and appeal. Balancing investments with competitive pricing and profit margins is crucial. Integration of s upplementary services without extra charges reflects strategic decisions aimed at enriching customer experience, potentially impacting profitability.

Regarding the third indicator, which addresses the sufficient size of the market condition, most examined OSS models conducted accurate market assessments. This enabled effective capture of planned market share and satisfactory adaptation to market dynamics over time. However, certain facilitation OSSs faced unexpected challenges during market implementation. Initial assumptions about their target market were inaccurate, leading to misjudgment of customer needs. Consequently, they needed to adapt closely to customer preferences, impacting business model performance compared to projections. Despite setbacks, false assessments provided valuable insights, facilitating necessary adjustments to enhance ability to meet customer needs and navigate market dynamics. Shifting focus from high-income homeowners to a broader audience seeking tailored energy-efficient solutions underscores a pragmatic approach to market penetration and sustainability. Prioritizing accessibility and affordability aim to expand reach and mitigate dependence on niche segments.

The results of both ex-ante and ex-post evaluations for the fourth indicator, focusing on access to potential customers, reveal that examined OSSs successfully identified and evaluated accessibility of their potential customer base. However, despite the clear inherent value proposition, many struggle to articulate tangible benefits such as money savings and energy performance improvement. Interestingly, some coordination OSSs initially anticipated challenges in communicating this value proposition but found success upon market application, resonating with their target audience. This underscores the importance of clarity and accessibility in messaging. The gap between technical expertise and customer comprehension highlights a critical communication gap OSSs must address to foster trust and engagement. Moreover, differentiation from established market players underscores the importance of targeted marketing strategies tailored to customer needs and preferences.

Regarding the fifth indicator, assessing the predisposition to make efforts condition, evaluation results indicate that most examined OSS models encounter challenges related to customer behavior and perceptions. Varying levels of willingness among customers to pay for OSS services reflect the complexity of value perception and the importance of personalized offerings. While publicly driven OSSs enjoy higher acceptance of their pricing models, private-driven OSSs face additional challenges in convincing customers of their value proposition. Emphasis on quality, personalization, and brand differentiation underscores the competitive landscape OSSs navigate and the imperative to cultivate customer trust and loyalty. Moreover, examined OSSs show an inability to articulate the advantages of using OSS services, contributing to customer reluctance and indecision. Hesitancy to buy an OSS service for renovation may reflect broader issues of trust regarding reliability and support provided by OSSs. Customers may perceive OSSs as less reliable or supportive compared to traditional offerings, leading to skepticism about the value proposition. Concerns about additional costs or uncertainties surrounding pricing models may also contribute to customer reluctance, as they fear unexpected expenses or lack clarity about total renovation costs offered by an OSS.

The results of both the ex-ante and ex-post evaluations of OSS business models related to the sixth indicator, which assesses the affordable costs condition, indicate several key findings. Firstly, the business models have effectively integrated mechanisms that enabled them to reduce unit costs efficiently. Many of these models successfully capitalized on economies of scale or network effects, leveraging these factors to drive down costs. Moreover, the strategies devised to achieve cost reduction goals were implemented as intended, yielding outcomes that aligned closely with initial projections. This indicates a high level of consistency and effectiveness in execution. Furthermore, resources such as time, capital, and manpower were utilized efficiently to pursue cost reduction objectives without compromising on quality or performance standards. However, the sustainability of these models hinges on maintaining a delicate balance between cost optimization and service quality. This underscores the importance of resource optimization in achieving affordability without sacrificing value. While the business models demonstrate effectiveness in reducing unit costs, there remains room for improvement. Efforts to further capitalize on economies of scale or network effects could be intensified to unlock additional cost-saving opportunities and optimize overall affordability.

The analysis of the seventh indicator (superiority over competitors'

Table 7
Summary of the insights from the OSS business models' evaluations.

Indicator	Key findings	Noteworthy results in relation to OSS type
1. Value creation	OSS business models generally delivered the expected value to customers Minor adjustments enhanced the value proposition, making it more notable compared to existing competition Tendency to focus on positive feedback and overlooked negative reviews Lack of rigorous competitor analysis result in lack of understanding the competitive landscape	*Private OSS* evaluated the value of their service solely on projects they deliver and not on those opted out
2. Complete value proposition	Private OSS faced challenges concerning legal aspects and competency acquisition necessary for delivering their value propositions Adjustments in these business models were required to maintain accessible pricing without becoming prohibitive A commitment to enhancing service value and customer appeal was evident through investments in additional services post-launch, though this required balancing with profitability concerns	*Public OSS* primarily focused on gaining expertise through partnerships, which did not affect service pricing *Private OSS* enhanced their services' value and appeal by offering supplementary services absorbing these costs to avoid raising prices, but sometimes increased price anyway *Facilitation, all-inclusive and mixed type* faced challenges regarding the legal development of their businesses and acquiring necessary competencies to deliver their value proposition
3. Sufficient market size	OSS models generally conducted accurate market assessments, Some faced challenges due to inaccurate initial assumptions about their target market The false assessment provided valuable insights, enhancing their ability to meet customer needs and navigate market dynamics effectively	Certain *private OSSs* initially aimed their services at high-income homeowners, but discovered that few wanted to make such large investments *Facilitation OSS* encountered difficulties in market size assessment and communication of their value proposition
4. Access to potential customers	OSSs successfully identified and evaluated the accessibility of their potential customer base Initial challenges for some OSSs in communicating their value proposition in terms of tangible benefits (e.g. money savings, energy efficiency) Upon implementation, they managed to effectively communicate these benefits, Need for clarity in messaging to bridge the gap between technical expertise and customer comprehension	*Coordination OSS* assumed significant challenges in explaining the benefits to potential customers, which than proved wrong
5. Predisposition to make efforts	Challenges related to customer behavior and perceptions varied among OSS models Publicly driven OSSs had higher acceptance of their pricing models, while private-driven OSSs faced more challenges in convincing customers of their value Inability to articulate the advantages of OSS services contributed to customer reluctance and indecision, reflecting broader issues of trust Concerns about additional costs or uncertainties surrounding pricing models contributed to customer reluctance	*Public OSSs'* customers were prepared to pay for services In the *private OSS* the willingness to pay fluctuated
6. Affordable costs	OSS business models effectively integrated mechanisms to reduce unit costs, leveraging economies of scale or network effects to lower prices Strategies for cost reduction were implemented as planned, aligning with initial projections The sustainability of these models depended on balancing cost optimization with service quality Successful in reducing costs, but still potential for further cost savings and overall affordability optimization	*Coordination and All-inclusive* OSS mentioned opportunity costs, such as reallocating resources within the organization to promote the new value proposition.
7. Superiority over competitors	OSSs demonstrated significant differentiation from competitors, identifying and capitalizing on competitive advantages to establish Have unique value propositions or features attracting customers Alignment between ex-ante and ex-post evaluations suggest stability in the OSSs' competitive position over time	*Facilitation and coordination* struggled with differentiation from competitors
8. Entry barriers existence	OSSs experienced a shift when applied in real market conditions Despite the apparent low entry barriers due to the ease of replicating OSS models, strategic differentiation and market positioning became essential Contextual factors such as regulatory environment, market demand, and resource availability significantly influenced market entry feasibility Efforts included building strong branding, enhancing the customer experience, incorporating further network effects, and forming strategic partnerships Targeted niche markets to provide unique value to underserved segments, demonstrating adaptability and a proactive approach in navigating market challenges Maintaining operational excellence was crucial throughout	*Coordination OSS* faced issues with entry barriers due to easy replicability

condition) shows that the examined OSSs exhibit clear differentiation from competitors. Despite competitors having better market presence, these OSSs offer unique features that attract customers. They have successfully identified and leveraged competitive advantages, establishing a strong market position. The stability between ex-ante and ex-post evaluations highlights the effectiveness of their strategies. Regarding the eighth indicator (entry barriers existence condition), the analysis indicates that while OSS models are easily replicable, strategic differentiation and market positioning are crucial. Although entry barriers seem low, factors like regulatory environment, market demand, and resource availability influence market entry feasibility. To sustain themselves, OSSs focused on building strong branding, enhancing customer experience, incorporating network effects, and forming strategic partnerships. Maintaining operational excellence was essential, and some OSSs targeted niche markets to provide unique value. Overall, the findings underscore the OSSs' adaptability and proactive market strategies.

Table 7 offers a concise overview of the key findings and noteworthy results from the evaluation of the examined OSS business models, summarizing insights for each OSS type.

6. Conclusions

This paper provides ex-ante and ex-post evaluations of one-stop-shop (OSS) business models for energy renovations in the EU, using an adapted version of the eight-indicator scale by Mateu and March-Chorda [37]. This scale evaluates eight key factors in a business model. The evaluations were complemented by open-ended interviews with representatives of the OSSs to gain deeper market insights and validate questionnaire responses. This approach highlighted the challenges faced by OSSs when transitioning from planning to market implementation and identified areas for future consideration.

The evaluations revealed meticulous design and effective execution of the OSS business models, with close alignment between pre- and post-implementation assessments. This indicates that initial forecasts were realistic, with reasonable assumptions about target markets and customer behavior. However, many OSSs lacked rigorous competitor analysis, potentially affecting their differentiation. While they generally met expected value propositions, reliance on positive customer feedback suggests a need for more comprehensive analysis. Additionally, some OSSs struggled to clearly communicate their value proposition to potential customers, underscoring the importance of effective communication strategies tailored to customer needs.

Accurate market assessments were common, but some OSSs faced challenges due to inaccurate initial assumptions about their target market, necessitating adaptation to customer preferences and market dynamics for sustained success. Cost efficiency was achieved without compromising quality, but maintaining this balance is crucial for long-term sustainability. OSSs demonstrated clear differentiation from competitors by offering unique value propositions or features. Sustaining differentiation through branding, customer experience enhancement, and strategic partnerships is essential. Although entry barriers may seem low, strategic differentiation and market adaptability are vital for success amidst competition.

In summary, future developments for OSSs in energy renovations should focus on understanding and adapting to customer needs, conducting comprehensive competitor analysis for effective differentiation, and enhancing communication strategies to clearly articulate value propositions. Balancing cost efficiency with service quality, proactively identifying niche markets, and developing strategic partnerships are crucial for long-term sustainability and success in the OSS market landscape.

CRediT authorship contribution statement

Georgios Pardalis: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Krushna Mahapatra:** Writing – review & editing, Writing – original draft, Investigation. **Jenny Palm:** Writing – review & editing, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1

Appendix I. – List of OSS case studies

Code	Name	Geographical coverage	Type of OSS	Governance structure	OSS provider	Active since
BM 1	KredEx	Estonia	Facilitation & Coordination	PD[1]	Governmental Organization	2009-operational
BM 2	Ekubirojs	Latvia	Facilitation	PD	State-owned company	2017-operational
BM 3	Arena Tejo	Portugal (Portalegre region)	Coordination	PD	Energy agency	n/a-operational
BM 4	Klimatfastigheter Småland AB	Sweden (southeast regions)	All-inclusive	PrD[2]	Startup	2019-operational
BM 5	Hauskunft	Austria (Vienna)	Coordination	PD	PPP[3]	n/a-operational
BM 6	SuperHomes	Ireland (Tipperary County)	Coordination	PD	Energy agency	2016-operational
BM 7	Opengela	Spain (Bilbao)	Coordination	PD	Governmental organization	2020-operational
BM 8	ReformANERR (SiRE)	Spain (Bilbao)	Coordination	PrD	Renovation companies' association	2015-operational
BM 9	SHG Bauteam Hamburg	Germany (Hamburg)	All-inclusive	PrD	Renovation company	2017-operational
BM 10	Energieheld	Germany	Facilitation	PrD	Engineering company	2012-operational
BM 11	Berliner Energieagentur GmbH	Germany (Berlin)	Facilitation	PD	PPP	n/a-operational
BM 12	Innovation City Management GmbH (ICM)	Germany (Bottrop)	Facilitation & Coordination	PrD	Consultancy	n/a-operational
BM 13	Sustain Solution	Denmark (Copenhagen)	Coordination & All-inclusive	PrD	Consultancy	2015-operational
BM 14	BedreBolig	Denmark	Facilitation	PD	Energy agency	2013-operational
BM 15	RenoWatt	Belgium (Wallon region)	Coordination	PD	PPP	2014-operational
BM 16	Dubo (former Huisdokter)	Belgium (Limburg)	Coordination	PD	PPP	2005-operational
BM 17	Vlaams Energiebedrijf (VEB)	Belgium (Flanders)	Coordination	PD	PPP	2015-operational

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Code	Name	Geographical coverage	Type of OSS	Governance structure	OSS provider	Active since
BM 18	HomeGrade	Belgium (Brussels)	Facilitation	PD	Semi-public company	2019-operational
BM 19	Fluvius (BENOveren)	Belgium	Coordination	PrD	PPP	n/a-operational
BM 20	Stroomversnelling (former Energiesprong)	Netherlands	Coordination	PrD	PPP	2013-operational
BM 21	Reinmarkt	Netherlands	Coordination	PD	PPP	2014-operational
BM 22	Slim Wonen in Leeuwarden	Netherlands	Facilitation	PrD	Association of companies	2013-operational
BM 23	Huizenaanpak	Netherlands	All-inclusive	PrD	Cooperative	2014-operational
BM 24	De Woonpas	Netherlands	Coordination	PD	PPP	2017-operational
BM 25	WoonWijzerWinkel	Netherlands (Rotterdam)	Facilitation & Coordination	PrD	Materials provider	n/a-operational
BM 26	Espace Info Energie	France	Facilitation	PD	Region-owned company	n/a-operational
BM 27	SEM Ile-de-France Energie	France	ESCO-type	PD	Cooperative	2013-operational
BM 28	CoachCopro	France	Facilitation & Coordination	PD	Environmental agency	2013-operational
BM 29	Operene	France	All-inclusive	PrD	Engineering company	2014-operational
BM 30	HEERO (former Mon carnet)	France	Facilitation & Coordination	PrD	Startup	2015-operational
BM 31	Hauts-de-France Pass Renovation	France	Coordination	PD	Cooperative	2014-operational
BM 32	Oktave	France	ESCO-type	PD	Semi-public company	2016-operational
BM 33	Tighean Innse Gall	UK (Western Isles)	Facilitation	PD	Energy agency	n/a-operational
BM 34	RetrofitWorks	UK	All-inclusive	PrD	Cooperative	2015-operational
BM 35	Renovation Underwriting	UK	Coordination	PrD	Insurance company	2020-operating
BM 36	Ecofurb	UK (London)	All-inclusive	PrD	Cooperative	2020-operating
BM 37	Alienergy	UK (Argyll Lomond & the Islands)	Facilitation	PD	Energy agency	2009-operational

[1]Public-driven.
[2]Private-driven.
[3]Private-Public Partnership.

Appendix I. I – Analytical ex-ante and ex-post evaluations of the examined OSS business models

Ex-ante Evaluation

	1	2	3	4	5	6	7	8	Avg.	Int.
BM 1	4	3	3	3	3	3	3	2	3	3.13
BM 2	3	3	3	3	3	5	4	2	3.25	3.38
BM 3	4	3	2	3	2	3	3	2	2.75	2.88
BM 4	4	4	3	4	4	4	3	4	3.75	3.88
BM 5	3	3	4	3	3	3	3	2	3	3.13
BM 6	4	4	3	5	5	5	5	2	4.13	4.26
BM 7	3	3	3	3	3	3	2	2	2.75	2.88
BM 8	4	4	2	3	3	3	3	2	3	3.13
BM 9	4	5	3	3	3	4	4	2	3.5	3.63
BM 10	3	5	4	3	4	5	5	2	3.88	4.01
BM 11	2	3	3	3	2	1	3	2	2.38	2.51
BM 12	3	3	2	3	3	1	3	2	2.5	2.63
BM 13	4	4	4	3	3	4	4	2	3.5	3.63
BM 14	4	4	4	3	4	4	4	2	3.63	3.76
BM 15	3	3	3	3	3	2	2	2	2.63	2.76
BM 16	3	3	2	3	2	2	2	2	2.38	2.51
BM 17	3	3	3	3	2	2	2	2	2.5	2.63
BM 18	3	3	3	3	3	2	2	2	2.63	2.76
BM 19	3	3	3	3	2	2	4	2	2.75	2.88
BM 20	5	4	3	5	4	4	3	4	4	4.13
BM 21	3	4	3	3	3	3	2	2	2.88	3.01
BM 22	2	3	2	3	2	2	2	2	2.25	2.38

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	1	2	3	4	5	6	7	8	Avg.	Int.
BM 23	3	3	3	3	2	3	2	2	2.63	2.76
BM 24	3	3	2	3	3	3	2	2	2.63	2.76
BM 25	3	3	2	3	2	2	2	2	2.38	2.51
BM 26	4	3	3	3	2	2	3	2	2.75	2.88
BM 27	4	4	4	2	3	5	4	2	3.5	3.76
BM 28	4	3	3	3	3	4	3	2	3.13	3.26
BM 29	4	4	3	2	4	4	3	2	3.25	3.38
BM 30	4	4	3	2	3	3	3	2	3	3.13
BM 31	4	3	4	2	3	4	4	2	3.25	3.38
BM 32	4	5	3	2	3	4	4	2	3.38	3.51
BM 33	3	5	2	3	3	4	3	2	3.13	3.26
BM 34	4	4	3	3	3	2	3	2	3	3.13
BM 35	2	4	2	1	3	1	1	1	1.88	2.01
BM 36	4	3	3	3	2	3	3	2	2.88	3.01
BM 37	3	3	3	3	4	3	3	2	3	3.13
	3.43	**3.54**	**2.92**	**2.95**	**2.95**	**3.08**	**3**	**2.08**	**2.99**	**3.13**

Ex-post evaluation

	1	2a	2b	2	3a	3b	3c	3	4	5	6	7a	7b	7	8	Avg.	Int.
BM1	3	2	1	1.5	4	3	5	4	3	4	4	4	2	3	1	3.14	2.22
BM2	4	1	1	1	5	2	5	4	3	3	4	3	4	3.5	1	2.86	2.21
BM3	3	2	2	2	2	1	4	2.3	3	3	4	2	3	2.5	1	2.67	2.5
BM4	4	3	2	2.5	2	2	3	2.3	3	4	4	3	2	2.5	2	3.4	3.2
BM5	3	2	2	2	3	3	5	3.7	3	4	4	3	2	2.5	1	2.83	3.1
BM6	5	1	1	1	4	4	5	4.3	4	5	5	5	1	3	2	3.57	4.23
BM7	3	2	2	2	3	3	5	3.7	3	3	4	3	2	2.5	1	2.67	3.05
BM8	4	2	2	2	4	3	3	3.3	3	4	4	4	3	3.5	2	3.17	3.55
BM9	5	3	2	2.5	3	3	5	3.7	3	4	4	4	3	3.5	1	3.4	3.9
BM10	5	3	2	2.5	3	2	5	3.3	4	2	3	4	2	3	3	3.33	3.9
BM11	3	2	1	1.5	3	2	5	3.3	2	3	4	3	4	3.5	1	2.6	2.95
BM12	3	2	1	1.5	3	2	5	3.3	3	3	3	3	4	3.5	1	2.6	3
BM13	4	2	1	1.5	3	2	5	3.3	3	3	3	3	3	3	1	2.83	3.27
BM14	3	2	2	2	4	3	5	4	3	4	3	4	2	3	2	3	3.28
BM15	3	2	1	1.5	3	3	5	3.7	2	3	3	3	3	3	1	2.5	2.94
BM16	3	3	1	2	3	3	5	3.7	3	3	4	2	3	2.5	1	2.67	3.05
BM17	3	2	1	1.5	4	3	5	4	3	3	4	2	3	2.5	1	3	3.1
BM18	3	2	1	1.5	3	3	5	3.7	3	3	4	3	3	3	1	2.83	3.09
BM19	2	2	1	1.5	3	3	5	3.7	3	3	4	3	3	3	1	2.67	2.76
BM20	5	2	2	2	4	4	3	3.7	4	4	4	5	3	4	2	3.57	4.14
BM21	3	3	2	2.5	3	1	5	3	2	3	3	3	4	3.5	1	2.5	2.86
BM22	3	2	1	1.5	3	2	5	3.3	3	3	3	2	3	2.5	1	2.6	2.88
BM23	4	2	1	1.5	2	2	5	3	3	3	4	2	3	2.5	1	3	3.18
BM24	3	2	1	1.5	2	2	5	3	3	3	4	2	3	2.5	1	2.83	2.85
BM25	2	2	1	1.5	2	2	5	3	2	3	4	2	3	2.5	1	2.5	2.42
BM26	3	1	1	1	2	2	5	3	2	3	4	3	4	3.5	1	2.43	2.85
BM27	4	2	1	1.5	4	3	5	4	2	4	4	3	2	2.5	1	3.17	3.38
BM28	5	1	1	1	4	3	5	4	3	3	4	3	2	2.5	2	3.14	3.84
BM29	4	3	1	2	4	3	4	3.7	2	2	3	3	2	2.5	2	2.5	3.28
BM30	4	3	1	2	3	3	3	3	2	2	4	3	2	2.5	2	2.71	3.15
BM31	5	1	1	1	5	4	5	4.7	3	4	5	4	2	3	1	3.14	4.08
BM32	4	1	1	1	4	3	5	4	2	3	4	4	2	3	1	2.75	3.37
BM33	4	2	1	1.5	3	3	5	3.7	3	3	4	3	2	2.5	1	3	3.36
BM34	3	3	2	2.5	3	3	3	3	4	3	3	3	2	2.5	1	2.83	2.94
BM35	2	2	3	2.5	2	1	5	2.7	2	2	5	1	5	3	1	2.55	2.45
BM36	3	3	1	2	3	3	3	3	3	3	4	3	2	2.5	1	2.71	2.87
BM37	4	2	1	1.5	1	3	5	3	3	3	4	3	2	2.5	1	3	3.18
	3.54	2.08	1.35	**1.72**	3.14	2.62	4.62	**3.46**	**2.84**	**3.19**	**3.84**	3.05	2.07	**2.88**	**1.27**	**3.14**	**3.15**

Data availability

Data will be made available on request.

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