The Building Business Network (B-Biz): Addressing Gaps in the High-Performance Building Technology Market, Especially for Underserved Customers

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ABSTRACT

Increased market intelligence and business model innovation is needed to build contractor confidence in high-performance building technologies in order to increase the speed and scale of adoption to meet the U.S. Department of Energy's building stock decarbonization goals. Although there have been important innovations in energy efficiency, affordability, and decarbonization of building technologies, consumers are not purchasing these technologies at the necessary speed and scale partially due to a gap in institutional understanding around barriers contractors face in providing and servicing these technologies. Small businesses in this market must mitigate risk around high-performance building technologies, limiting their opportunities in the market and impacting the rate of adoption. The Building Business Network (B-Biz) aims to provide high-performance building technology solutions to underserved customers by collaborating with local small businesses that provide and service high-performance building technologies in communities with the lowest rates of adoption. This research explores the current market, the importance of business models, and the opportunity to utilize small businesses to address market gaps in underserved communities.

Background

Utilizing high-performance building technologies is important to meet energy decarbonization and efficiency goals. It is estimated that nearly 281 million additional decarbonization measures might need to be implemented in buildings by 2030, and around 1.1 billion additional measures by 2050, to achieve U.S. climate goals (ICF 2023). However, the perceived market risks of energy efficiency are often greater than the potential benefits for building owners (McCabe 2011). High-performance building technology delivers a higher level of energy efficiency performance, occupant health, or greenhouse gas reduction than what is required by regulation or as compared to other existing technologies in the industry (GSA 2018). Although there have been important innovations in energy efficiency, affordability, and decarbonization of building technologies, the adoption of these new technologies is limited by misalignments in the market.

Customers who are underserved in the high-performance building technology market may not have access to these technologies even if they could benefit from them. Many existing incentives that aim to promote efficient buildings miss low-income households who may not be able to take advantage of these programs, often due to a lack of resources. In residential buildings, choosing a higher-efficiency product generally includes extra costs and considerable payoff periods, which can be inaccessible for these homeowners. In commercial or larger-scale buildings, field validations or testing of new technologies less commonly occurs in buildings in underserved areas or in older, smaller buildings. By conducting field validations in underserved

communities, both building owners and occupants in these communities can benefit from exposure to these new technologies (Dombrovski, McIntyre and Jimenez 2023).

Business models, which describes an organization's value, have the potential to influence entire value chains by connecting multiple actors, mediating production and consumption, and supporting the introduction of new technologies into the marketplace. Innovative business models are a source of competitive advantage in designing or modifying a system of activities. New business models can be designed to address barriers that obstruct technology adoption, include more stakeholders in the market, promote drivers of technology dissemination, and explore strategies being used to address these challenges (Pardo-Bosch, Cervera, and Ysa 2019). Novel business models contribute to sustainable development by serving and developing products for underserved customers. Although providing value to underserved customers can be a key challenge for businesses, examples exist internationally and domestically demonstrating how business innovation can serve these unique customer groups (Hossain 2021).

The U.S. Department of Energy (DOE) Building Technologies Office (BTO) and the National Renewable Energy Laboratory (NREL) have supported efforts toward increased adoption of new building technologies through past and current programs and initiatives. BTO's mission is to develop, demonstrate, and accelerate the adoption of cost-effective building technologies, techniques, tools, and services. By leveraging innovative research and development of technology validation tools, information sharing, and utilization of regulatory authority, BTO can enable high-performing, energy-efficient, and flexible residential and commercial buildings in both the new and existing building markets (BTO 2019). The new B-Biz program will both complement existing offerings and explore opportunities with small businesses to design and demonstrate replicable business model solutions to address barriers in the market and improve the speed and scale of high-performance technology adoption in underserved markets.

The High-Performance Building Technology Market

Markets can be a physical or virtual space where stakeholders facilitate the exchange of goods and services, including the market for high-performance building technology, in which products and services are exchanged (Kenton 2023). The high-performance building technology market is comprised of companies that deliver a higher level of performance, occupant health, or greenhouse gas reduction than what is required by regulation or as compared to other similar technology (GSA 2018). To increase integration of this technology in the market, stakeholders must first identify ways to address market barriers and reduce risks that have inhibited widescale uptake (BTO 2019). This section describes current stakeholders and prominent barriers to adoption in the high-performance building technology market.

Stakeholders

There are many different types of stakeholders involved within the process of building upgrades; they can be generally categorized as demand-side actors, supply-side actors, facilitators, and financers.

Demand-side actors are those who purchase (customers) or use (end users) high-performance technologies in residential, commercial, municipal, industrial, or other types of buildings. Customers are individuals, organizations, or government entities who purchase the products or services. They need to understand the benefits and value proposition of the high-

performance technology to make a decision that best meets their needs (USAID, n.d.). Customers may be different for different scales of buildings, such as homeowners for residential buildings or facility managers for larger-scale buildings. End users (or consumers) may not be the direct purchasers but are users of the product. End users may be customers, but not all customers are end users. End users include renters, tenants, occupants, and visitors of a building. For demand-side actors who are underserved, it may be more difficult to participate in the market due to barriers related to affordability, incentive, or access (Hossain 2021).

Supply-side actors, such as contractors, are skilled laborers and technical professionals who install products, provide services, and integrate new practices into the market. For voluntary market-based programs, contractors must also be able to effectively sell and communicate the benefits of the technology to customers in order to convince them to participate (USAID, n.d.). The term "contractor" can be used in this market to indicate a variety of different services including installation, sales, financing, and operations and maintenance (O&M).

Facilitators are stakeholders that promote and support high-performance technology adoption to supply-side actors, demand-side actors, or both. Facilitators are key stakeholders and market participants who could help drive the development, implementation, and success of any policy or program. Key facilitators may include government, policymakers, regulators, building performance professionals, community-based organizations, utilities, or other organizations that can reduce risk and aid customers, including in underserved communities.

Financial institutions can finance projects and programs in ways that complement policy frameworks, program designs, and project plans (USAID, n.d.). Financial institutions in this market include banks, credit unions, community development financial institutions (CDFI), government lenders, specialized lenders, energy service companies, and others. Financial institutions may play an important role in implementation and risk reduction.

Barriers

Stakeholders may face several different types of barriers during the building upgrade process. Barriers that may confront stakeholders interested in providing, servicing or adopting high-performance building technology products or services are described below:

Barriers related to financing:

- High initial cost of upgrades or systems may be intimidating or unaffordable; even with incentives, additional administrative reporting can add cost (Zhao and Pan 2022)
- Uncertainty of financial gains or predicted savings due to lack of credible information about the inefficiency of their buildings and the benefits of upgrades (Tzani et al. 2022)
- Lack of or inadequate investment capital for major upgrades, impacting all scales of customers from homeowners to facility managers (Meijer et al. 2019)
- Risk adverseness toward investment or new technology, including reluctance to finance energy improvements by using long-term loans or a preference to pay for improvements with savings or short-term, no-cost financing (Meijer et al. 2019)

Barriers related to incentives and policy:

- No or insufficient incentives for owners or developers to implement energy efficiency initiatives (MacDonald et al. 2020)

- Inconsistent energy efficiency standards, incentives, and regulations across state markets can cause confusion for stakeholders who work across various markets (Scott 2013)
- Split incentives that disincentivize owners from pursuing upgrades if they do not occupy the building or directly benefit from the upgrade (Regional Energy Efficiency Organizations 2016)
- Unclear or insufficient incentives for new technology that may limit new market players facing high market competition from incumbent players (Meijer et al. 2019)
- Lack of explicit energy efficiency targets that may reduce the focus on strategic planning for energy efficiency, even if lumped with other more general targets (Penny 2020)

Barriers related to stakeholder needs:

- Complexity of high-performance technologies may be resource consuming or a complete deterrent from using new technology (Dadzie et al. 2018)
- Lack of collaboration or communication between demand-side actors impacts knowledge sharing, informed decision-making, and product referrals (Zedan and Miller 2017)
- Lack of consumer focus or limited attention to end users, including consideration for how to get technologies to end users based on their interests, understanding, and behaviors (Meijer et al. 2019)
- Limited resources for end users to make informed decisions (Meijer et al. 2019)
- Limited time and motivation from end users to learn about new technologies, even when resources are provided (Meijer et al. 2019)
- Information that is not in easily understandable language or terminology for the average user to make quick decisions (Davis and Metcalf 2014)
- The "energy efficiency gap," generally referring to the paradox that better information does not necessarily lead to better choices (Linares and Labandeira 2010)
- The "rebound effect" phenomenon, where improving energy efficiency may lead to less energy savings than expected due to a change in energy use (Gillingham, Rapson, and Wagner 2014)
- Impacts of political orientation influence both support for energy efficiency policy and the decision to purchase an energy-efficient product (Dietz, Leshko, and McCright 2013).
- Concern with aesthetic appearance, which may impact how attractive these technologies are to customers, regardless of energy saving potential (Meijer et al. 2019)

Barriers related to building planning:

- Gaps in holistic building planning, which can reduce the benefits customer receive around savings, efficiency, and reliability (Ala-Juusela and Tuerk 2022)
- Short-term instead of long-term planning, which can put building owners at risk for extra expenses or other complications in their building system (Meijer et al. 2019)
- Reactive versus proactive building maintenance strategies, limiting more cost-effective and proactive maintenance approaches (Ahern, O'Sullivan, and Bruton 2022)
- Space constraints to install new on-site technologies or capacity that can reduce opportunities for buildings of all scale (Meijer et al. 2019)
- Geographical conditions, climate zones, and location density, which may all influence technology choices and performance (Pokorska-Silva, Nowoświat, and Gać 2021)

- Ongoing supply chain issues, amplified during the pandemic, causing production delays, pressuring sales volumes, and leading to higher costs (Fitch Ratings 2021)

Barriers related to workforce:

- Lack of skilled workforce for new technological advancements as well as small applicant pools and lack of industry-specific skills (DOE 2022)
- Investment to recruit and hire qualified personnel, such as technical staff, which may be competitive as well as time- and resource-consuming (Meijer et al. 2019)
- New technology that may require building professionals to develop additional skills and knowledge (Srivastava, Awojobi, and Amann 2020)
- Bottlenecks in the market if the workforce is unable to expand at the same pace as the increased demand for new products or services (Goldman et al. 2010)

Barriers related to O&M:

- Limitations to data quality, such as lack of usable data or fragmented data in buildings, which can limit the ability to effectively carry out energy modeling (Morewood 2023)
- Doubt around economic effectiveness because of the measurement and verification (M&V) practices currently used (Tzani et al. 2022)
- Lack of metering may impact understanding of benefits if savings or incentive payments are calculated based on metered energy consumption (Tzani et al. 2022)
- Addressing unique O&M issues for new building features may require new or more complex procedures by experienced staff (DOE 2022)
- Issues with warranties, navigating terms, and product replacements (Cort et al. 2022)
- Technical incompatibilities due to the condition of the building may make it difficult to implement new technologies or cause unexpected challenges (MLTechSoft 2023)
- Under-documentation on legacy systems may make it difficult to understand how to integrate legacy systems with modern systems or platforms (MLTechSoft 2023)
- Deferred maintenance or backlog maintenance can impact performance and function if repairs are not made when needed (Yasin et al 2019)

Utilizing Building Business Models

Generally, a business model defines how organizations create, deliver, and capture value. A business model can be described through nine basic building blocks to demonstrate their value (Osterwalder and Pigneur 2010):

Table 1. Nine basic building blocks of a business model

	Building block	Description
1	Customer segments	An organization serves one or several customer segments.
2	Value propositions	An organization seeks to solve customer problems and satisfy customer needs with value propositions.
3	Channels	Value propositions are delivered to customers through communication, distribution, and sales channels.

4	Customer relationships	Customer relationships are established and maintained with each customer segment.
5	Revenue streams	Revenue streams result from value propositions successfully offered to customers.
6	Key resources	Key resources are the assets required to offer and deliver the previously described elements.
7	Key activities	Key activities are performed using key resources.
8	Key partnerships	Some activities are outsourced, and some resources are acquired outside the enterprise.
9	Cost structure	The business model elements result in the cost structure.

Source: Adapted from Osterwalder and Pigneur (2010)

These building blocks, referred to as the business model canvas, inform the full business plan by first defining the key elements. The building blocks in Table 1 cover the four main areas of a business: the customers, the offer, the company infrastructure, and the financial viability. This framework is beneficial to define the entire ecosystem of activities and the actors participating, including the interactions between components. For instance, a business model canvas can demonstrate how a model accounts for costs, risks, and benefits related to economic, environmental, and social factors (Pardo-Bosch, Cervera, and Ysa 2019).

There are many types of business models for high-performance building technologies that each utilize unique methods to create, deliver, and capture value for these technologies. High-performance building technologies may include efficient windows, heat pumps, or ENERGY STAR® appliances. For many of these technologies, the value proposition is that new high-performance products or services outperform their predecessor in efficiency standards and pave the path for greater savings in the long run. However, due to a gap between available technologies, high up-front costs, current business models, and consumer behavior, the full potential of these technologies in the market has not been realized (Khanam and Daim 2021).

The following table summarizes some of the most common, current business model approaches for high-performance building technology.

Table 2. Business model approaches for high-performance building technology

Business model	Value proposition	Typical customers*
Leasing technology	Avoided investment costs, stable price, long-term management	I, C, R
Life cycle contracting	Holistic approach, one point of contact	I, C, M
Community-based business models	Lower cost, community-informed decisions, optimize infrastructure via sharing of assets	R
Public-private partnership	Outsource risks of energy efficiency improvement, long-term relationship	M
Energy-as-a-service	Reduce costs, improve operational quality, increase sustainability, risk management	I, C
Concierge service (i.e., one-stop shop)	One point of contact for the customer, long-term management, decision-making assistance	I, C, R
Energy saving performance contracting (ESPC) through	Outsource risks of energy efficiency improvement, one point of contact, performance-based model	C, M

an energy service company (ESCO)		
Enterprise energy management	Optimize energy demand and supply, more holistic view of energy system, data-driven decision-making	I, C, M
Aggregator services	Simplicity of one platform, identify cost savings, data-driven decision-making, convenience	I, C, R
Pay-per-X models	Only pay for use or outcome, eliminate management/ownership responsibilities	I, C
On-Bill financing	Repayment through monthly utility bill, good for leased spaces	C, R
Energy service agreement	No up-front capital cost, third-party financing, performance-based model	I, C, R, M
Property assessed clean energy (PACE)	Repayments through property tax bill, lien remains with property even upon sale	C
Retail sales	No intermediary, retail staff may be able to provide no-cost guidance	C, R

* I = industrial customers, C = commercial customers, R = residential customers, M = municipal customers.

Source: NREL

Differentiators in Business Model

Although many of the business model approaches in Table 2 have demonstrated success in the high-performance building technology market, these business models may be impacted by differentiators in the market like building type, vintage, ownership, management, and location, among others. These differentiators are especially prominent in underserved communities whose buildings are often older and smaller than those in more affluent communities (Dombrovski, McIntyre and Jimenez 2023). This section describes how differentiators may impact current business model effectiveness, especially in an underserved context.

Residential, commercial, industrial, and municipal building owners and operators will likely have different overarching goals, policy constraints, consumption patterns, and electricity rates or energy prices, among other variations. These factors may lead to differences in business model approaches because not all opportunities are available to all building types, therefore making options for each building type unique.

Building vintage (i.e., new versus existing buildings) may impact the level of energy-efficient design, performance goals, readiness for new technologies, and energy code compliance among other variations. New buildings can be designed to be more energy efficient through whole-building system design approaches to meet performance goals. In an existing building, an energy assessment or energy audit will evaluate the building's current energy use and determine opportunities to reduce overall energy consumption and costs as well as increase occupant comfort and health. Then, building upgrades may be adopted one at a time or sequenced, which can vary in cost, time, and resource demands. Additionally, low-income residents and occupants of commercial buildings in underserved communities tend to live in and occupy buildings that are older and less efficient (Dombrovski, McIntyre and Jimenez 2023. These factors may lead to differences in business model approaches because not all buildings will be immediately ready for

or capable of certain upgrades, which may limit both the number of available customers and the access to these services for customers in existing homes.

Building ownership (i.e., owned versus rental) impacts available incentives for building upgrades and who will receive the benefits of the upgrade, and determines who the decision maker is. Rental properties face additional challenges with retrofitting, often referred to as split incentives, a term which refers to the financial disconnect between owners and tenants when it comes to investments in, and benefits of, energy improvements (Regional Energy Efficiency Organizations 2016). This disparity is amplified for historically underserved communities where there are gaps in homeownership and housing stability along the lines of race, ethnicity, or geography (Fannie Mae 2023). Additionally, the structure of building management impacts who the decision maker is around technology adoption. Homeowners and building owners who occupy their own buildings have the benefit of managing their own buildings and enjoy decision-making power around high-performance upgrades. However, for renters or building owners who do not occupy or manage their own buildings, there may be an on-site contact such as a leasing manager or facility manager who is responsible for these decisions, even if they are not an end user (Dombrovski, McIntyre and Jimenez 2023). These factors may lead to differences in business model approaches. If the occupant is a renter, they may not be able to make decisions regarding building upgrades and the owner may not be motivated to make upgrades for a building they are not currently occupying or using as a source of income.

Affordable housing in underserved communities presents additional barriers for building occupants who may be interested in the benefits of more efficient upgrades. These can include lack of capital, decision-making power, or other requirements to finance and adopt high-performance technology. For example, manufactured homes are one of the largest sources of unsubsidized affordable housing in the United States. They are extremely energy intensive and generally have much larger thermal energy use intensities, but are difficult to retrofit compared to homes on permanent locations (Reyna et al. 2022). Among the many benefits of retrofitting low-income and affordable housing, there are hidden hazards and challenges. Upgrades need to be implemented thoughtfully to avoid unintended risks, but limited access to expertise and financial resources makes it more difficult for owners of these buildings to retrofit them (Walsh 2021). Affordable and low-income housing occupants may be left out of business models due to their complexity, reducing the options for these customers to access high-performance building technology and receive various benefits.

Location density (i.e., rural versus urban) can account for some differences in energy consumption caused by a variety of factors ranging from household characteristics, socioeconomic dynamics, and environmental conditions. On average, rural homes are 30% larger than urban homes, and they are typically detached houses, which means that they are more exposed to weather conditions and do not benefit from radiant heat from adjacent buildings. On the other hand, rural houses are typically newer, compared to urban houses (Muratori 2013). However, rural areas may not have access to contractor networks or skilled labor that may be more readily able to serve urban areas. These factors may lead to differences in business model approaches because both rural and urban buildings have distinct needs based on their region and the markets able to serve them, often leading to variations in available upgrade options.

The Value of Business Model Innovation

More effective business models establish better conditions for both the investors and the end users. Publications on business model innovation in the context of “green buildings” have

increased significantly from 1998 to 2020, especially since 2011 (Zhao and Pan 2022). Ultimately, business models are about creating value for companies, customers, and society (Osterwalder and Pigneur 2010). Both theoretical frameworks and case studies can support innovation to increase value; however, it is necessary to have empirical evidence to support increased value in these proposed models (Nosratabadi et al. 2019). Value can be evaluated through a variety of ways such as exploring value propositions, value delivery, value capture, value creation, and value testing. A business model has the potential to influence entire value chains if used as a competitive advantage in designing or modifying a system of activities, and has great potential to promote sustainable innovations (Zhao and Pan 2022; Munaro et al. 2021).

In the high-performance building technology market, business models can capture environmental, societal, and economic benefits to demonstrate sustainable innovation. Designing a more sustainable business model often involves designing a user-centered value proposition through an iterative process in which potential customers or users are engaged in the design. For example, business models certified as Benefit Corporations or 'B Corps' participate in a voluntary evaluation that measures a company's social and environmental performance against an impact assessment. B Corps illustrate how social and environmental concerns are embedded in their mission and purpose to create positive impact for their stakeholders, which is affected by their value propositions. Close integration with customers improves consumers' acceptance, risk perception, and confidence in decentralized approaches. In this way, the definition of value can be expanded to include value for both companies and society within their business model. Specifically, entrepreneurs may engage in user-centered approaches to change industry norms, social beliefs, and cultural-cognitive barriers in a value proposition (Nosratabadi et al. 2019).

Opportunities for Small Businesses Engaging Underserved Communities in the High-Performance Building Technology Market

Small businesses are especially well positioned for business model innovation in this market. Because small businesses generally have direct impacts in the community they serve, small businesses may be able to adopt and advance identified areas of innovation and further promote accelerated market growth.

First, small businesses can become local service providers and utilize networks to be trusted messengers to provide dependable service, consistent delivery, and reliable communications to the communities they serve (Schirber and Ojczyk 2016). Similarly, partnerships between different groups can support varying interests, mitigate complexities, and promote investment in efficiency (McCabe 2011). Referral networks can enforce this messaging and reduce burden around customer acquisition. This is also an opportunity for small businesses to grow by introducing new products and services for existing customers. For local service providers, expanding into energy-upgrade services can generate additional revenue, but it can also address seasonality for employees who face reduced hours or layoffs during the winter months. Having a portfolio of services that can be undertaken year-round would be helpful in retaining quality employees (Schirber and Ojczyk 2016). With more offerings, the customer-business relationship can grow by transitioning from a single sell-purchase transaction to a long-term customer relationship. Companies that have more holistic products and services, ranging from building to O&M, often value customer relationships, customer loyalty, and sustainable products and services to improve user-based functionality and customer-oriented services (Zhao and Pan 2022). If each actor increases the value of their product or service, it can benefit the rest of the actors along the value chain (Pardo-Bosch, Cervera, and Ysa 2019).

Second, small businesses can improve their customer acquisition strategy. This starts with an effective sales and marketing strategy, which is important to both maximize opportunities for local businesses and to engage customers. As a best practice in sales and marketing, persistence and consistency of messaging may provide more opportunities to raise awareness among customers, consider new technology and ask questions (Schirber and Ojczyk 2016). To forge common understanding and shared objectives, language can be broadened to incorporate financial and energy metrics in a way that is more easily understandable for customers; for example, converting cost per kilowatt-hour to cost per square foot (McCabe 2011). During the sales process, effective organizations promote benefits of the upgrades instead of just the aspects of the technology. Technology may not be an enticing investment, but customers may be more drawn to benefits such as whole-house energy efficiency, reduced energy consumption, improved home performance, home durability, environmental benefits, and better occupant health and comfort among others (Khanam and Daim 2021). However, if businesses are making their desired profit with an existing business model providing or servicing non-high-performance products, it may be difficult to change behavior or incentivize a change. Therefore, designing business models for unique needs, investment objectives, access to capital, property type, business norms, culture, or stakeholder interests for different types of customers can help shape the value proposition of each sale (Usher 2022).

Third, an organization may improve its internal business strategy to encompass the customer relationship from customer acquisition to decommission, depending on the services or products provided. Organizations can leverage tools such as energy audits and sequencing strategies to reduce the risk of upgrades (ACEEE, n.d.). Initial testing, like an energy audit, can document the existing conditions to inform and guide work scopes, budget, and opportunities to sequence upgrades for additional benefits or efficiencies (Schirber and Ojczyk 2016). In the residential and commercial sectors, energy audits evaluate building as a whole and are therefore an avenue for maximizing energy savings. In the industrial sector, audits are often comprehensive but may focus on specific energy-intensive processes (ACEEE, n.d.). After an energy audit, sequencing upgrades may mitigate unintended consequences, like extra expenses, in the building's system (Schirber and Ojczyk 2016).

To demonstrate benefits of these products and services, one may utilize certifications like the LEED certification, DOE Zero Energy Ready Home program, ENERGY STAR, or National Green Building Standard. These certifications are an easy way to demonstrate legitimacy of upgrades and may add a premium to a property (Gabe et al. 2023). Similarly for contractors with professional designations, these certifications often demonstrate credibility, higher quality of work, better service levels, and increased reliability. Customers may trust that services by contractors with professional designations are worth paying a higher price for (Usher 2022).

Finally, business practices do not end at the point of sale; after a purchase, the ease of installation O&M is crucial to receiving the full benefits of the upgrade. The most efficient measure will be ineffective if it is not installed or operated correctly. O&M can be an important service for small businesses to make sure the customer receives the expected benefits which can impact the customer's satisfaction with their investment (Srivastava, Awojobi, and Amann 2020). In the O&M process, organizations may also leverage M&V data to measure success and verify the intended benefits of a product or service by demonstrating performance. Energy efficiency programs can be an effective way to scale up products and services in the buildings sector with an M&V component. These programs may have incentives to reduce adoption barriers, improve resources for customers, and sometimes reduce risk as part of the program

design. Those interested in assessing energy savings, resiliency improvements, emission reductions, and other benefits can compare data with targets—such as codes and standards—as well as pre-implementation studies, to evaluate effectiveness and inform potential adjustments and improvements if possible (Cox 2016). These codes and standards can be used as an easy or starting target for M&V.

All of these business practices contribute to the reputation of the organization. Reputation has been identified as one of the most important indicators that a company is committed to protecting its customers' interests and can reduce the perceived risk to the consumer. Some important influences that impact reputation include personality traits of contractors, company culture, social media presence, supplier relations, number of projects, service area, and any certifications (Usher 2022). For instance, online platforms including social media or comparison websites like Angi (formally Angie's List) can be utilized to connect to customers, get up-to-date information, and share photos as testimonies for referrals (Schirber and Ojczyk 2016).

The Goal of the Building Business Network (B-Biz)

Innovative business models help facilitate the diffusion of sustainable innovation in the high-performance building technology market. This approach is still relatively understudied but gaining momentum, especially over the last decade. Although various innovative business models have been tested, the types of successful business models that are being adopted and their key characteristics are still vague (Zhao and Pan 2022). However, this research details some of the ways that business model innovation can be used to address barriers to adoption.

This current landscape will inform the opportunities for a new program, the DOE Building Business Network (B-Biz). B-Biz is a network that collaborates with local small businesses in communities with the lowest rates of high-performance building technology adoption by demonstrating innovative and replicable business model solutions to address barriers in the market and improve the speed and scale of high-performance technology adoption. Program development for B-Biz will incorporate the findings of this report as well as interviews with current market stakeholders to design and implement a program that can address the current market gaps. Through a network interested in demonstrating innovative business models for high-performance building technology, B-Biz aims to accelerate market transformation.

B-Biz participants will identify, demonstrate, evaluate, and document successful business models for high-performance building technology. In each round of B-Biz, a cohort of businesses will work on their own projects as well as collaborate with NREL researchers, market stakeholders, and the other B-Biz cohort participants to develop and execute projects in their community. B-Biz will conduct a case study of the program in the summer of 2024 and intends to launch the full program in the fall of 2024.

Conclusion

There is room for growth in the high-performance building technology market using business model innovation to explore and address current market barriers. More effective business models establish better conditions for both the investors and the end users. Specifically, small businesses have opportunities for impact as trusted local messengers and important stakeholders for underserved markets. Therefore, the new B-Biz program collaborates with local small businesses who provide or service high-performance building technologies in communities with the lowest rates of adoption. By collaboratively designing and demonstrating innovative

business model solutions with the small business participants and industry partners, B-Biz aims to address barriers in the market and improve the speed and scale of technology adoption.

Based on this research from published literature, a conference working session, industry perspectives, and over 40 interviews with market stakeholders, the case for utilizing small businesses to address market gaps in underserved communities was identified as an opportunity to increase the adoption of high-performance building technologies. As small businesses generally have a direct impact on the community they serve, they present an opportunity to adopt and advance identified areas of innovation and further promote accelerated market growth. B-Biz, launching in 2024, aims to benefit underserved communities and empower business owners to have confidence in their network to sell and service these technologies.

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