Computer Science and Interdisciplinary Research Journal
Volume 2, Issue 2, 2025. ISSN: 3033-1218, DOI: 10.70862/CSIR.2025.0202-14

Model for Building a PropTech Ecosystem Through a Network of e-Platforms and Software Service Integration

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Abstract – The present article examines the conceptualization of a model for building a digital business ecosystem through design and implementation of an e-platforms' network that integrates software services within PropTech Bulgaria as an international organization. "Business Model Archetypes" as a conceptual framework is being applied to the real business case of PropTech Bulgaria, thus clearly showcasing how different business models (BM) correspond to respective e-platforms starting from the basic BMs like product, service, and commerce; developing into combined BM forms such as subscription, marketplace, and brokerage. The system architecture is implemented through a modular approach, led by the understanding that strategies, knowledge, and technologies change over time. As a natural consequence, transaction points change as well. Having a modular structure presupposes a bigger number of transaction points. Currently, there is no communication among separate modules through data transfer. The study advances a practically applicable model for developing a resilient international PropTech ecosystem, i.e., the most complex business model archetype.

Keywords – e-platform, business model, proptech, digital ecosystem, software architecture.

DOI: https://doi.org/10.70862/CSIR.2025.0202-14

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Received: 26 June 2025.
Revised: 25 August 2025.
Accepted: 9 September 2025.
Published: 9 September 2025.

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1. Introduction

In the last decade, software platforms have been established as a strategic instrument for elaborating scalable business models. Progressed by the ever expanding need to connect services, users, and partners globally, e-platforms assume an increasingly central role in structuring business ecosystems. The present article addresses the issue of applying an ecosystem building model via the design and implementation on a modular principle of an e-platforms' network through integrating software services at PropTech Bulgaria. The core business activities of PropTech Bulgaria feature the international business development of PropTech innovations, i.e., innovations in the Construction industry and the Real Estate sector, inclusive of Smart Cities, Smart Buildings, Smart Homes, urban planning innovations, and ESG technological solutions required by the EU Taxonomy legislation enforced in 2021. The study focuses on building an operational international PropTech ecosystem driven by a modular architectural approach, multi-sided business models, and technologically mediated interactions. Both the theoretical foundations of e-platforms and their practical manifestations in the activities of PropTech Bulgaria are explored.

2. Theoretical Context and Relevance of the Problem

The development of e-platforms as a primary software expression of business ecosystems is interlinked with a radical change in comprehending the value of technologies and their application. In the contemporary digital economy, e-platforms such as Amazon, Airbnb, Alibaba, and the alike not only

support commerce or services but design and set the stage for a holistic environment to entertain interaction among multiple stakeholders. All these platforms expose an exponential effect being "multisided platforms," as defined by Zhao et al. [1]. Junic Kim [2] describes such platforms as economic platforms, or intermediary platforms, as these are characterized by multiple individual players/stakeholders who mutually benefit from staying in a common network. Kim [2] underscores one peculiarity of such platforms, namely, the platform owner incurs costs to serve multiple participant groups and collects revenue from various stakeholders involved in the platform. In this particular aspect, Eisenmann et al. [3] further explain that the platform business model fundamentally differs from the linear business model of conventional businesses. In the latter case a company pays suppliers for raw materials and receives money from customers for a finished product/service; customers and suppliers are clearly defined and identifiable. However, this is not the case with platforms: different participants can simultaneously be suppliers and customers to other participants, and the platform owner merely facilitates, maintains, and regulates the network to enable more transactions.

New economic dependencies are being formed in such an environment, the exchange of value is accelerated, and resilient networks of intertwined services are being constructed. The concept of platforms as "an interface of a business ecosystem" [4] implies a new paradigm which formulates the platform not limited to just a technical product, but extended to a means intended to structure the interaction among participants within a specific market or industry. As Cusumano [5] concludes, "Who wins and who loses these competitions is not simply a matter of who has the best technology or the first product. It is often who has the best platform strategy and the best ecosystem to back it up.” We can hitherto highlight that the presence of a business ecosystem backing up a platform is integral to the success of the platform. According to Moore [6], there is yet another dimension that impacts the platform strategy success, namely the life-cycle stage the respective company is in, duly reflected in its value proposition. He accentuates that the functionalities (i.e., the type) of a platform change in accordance with life-cycle stage. Therefore, the Business Model Archetypes tool as applied to PropTech Bulgaria’s case, outlines in Figure 1 the trajectory of this movement/development of the company's web platforms. Further, Table 1 below projects this movement over the years.

Being the author of the business ecosystem concept, Moore [6] defines it in 1993 as a loosely connected business community incorporating various levels of organizations (industry players, associations, government organizations, etc.), which share a common goal, and aim at achieving mutual development in a strive to cope with the fluctuating business environment. A strong business ecosystem is the backbone of any successfully operating platform.

The business ecosystem is perceived as a means of offering that shapes the way participants operate and facilitates their joint development [6]. This approach is further supported by the research of Parker, Van Alstyne, and Choudary [7], who focuses on the inherent platform feature to generate new economic opportunities. Iansiti and Levien [4] state that nowadays competition among businesses is waged at ecosystem rather than company level. This factor is the driving force behind PropTech Bulgaria's unwavering strategy to build the most complex business model archetype, namely business ecosystem.

The presence of the so-called network effect is of prime importance, as it determines that the platform value accumulates with the number of active participants [8]. The network effect is also defined as economies of scope on the demand side [2], meaning 'the value of a product or service is in function to the number of people using it' [2]. Hence, it is of uttermost importance for a platform to be purpose-built in a way as to encourage participation, interaction, and collaboration in a purposeful manner, recognizing the diverse ways to achieve a network effect to directly pivot on the level of strength of separate stakeholders. The degree of strength is reckoned as to decide on the precise structure of the platform. Eisenmann et al. [3] define factors such as subsidizing the right group of participants, avoiding price wars through platform differentiation, and being particularly cautious of larger rivals coming from unfamiliar industries who may offer the platform's service as part of their larger service packages, thus becoming more attractive to the potential clients of the platform.

PropTech Bulgaria’s e-platform seeproptech.eu is established to be an "interface for business ecosystem interaction," but it does not imply co-creation of products; nor does it imply the inclusion of as many stakeholders as possible, given that it provides limited and closed access. At the same time, the e-platform of PropTech Bulgaria also presupposes that a network effect, a typical characteristic of technological platforms, should be amplified. Refer to point 5 below on our synopsis how PropTech Bulgaria's platform is technologically structured to optimize and maximize the network effect.

Baldwin & Woodard [9] assert that platforms exist in a number of different settings: within an organization as product lines; among companies as multi-product systems; or as multi-sided markets

where different types of participants interact through a common infrastructure. From the standpoint of PropTech, a rapidly developing sector at the intersection of digital technologies and the construction industry, platforms should be fitted for bringing together numerous stakeholders: technology startups, construction companies, construction investors, property developers, municipal and state institutions, universities, venture capital funds and other external funding organizations, national PropTech associations, international PropTech organizations, as well as diverse clients outside the construction industry such as banks, energy distribution companies, water and sewage firms, manufacturing businesses, etc. Such a wide range of stakeholders calls for a new type of communication platform which, unlike e-commerce platforms, is not solely transaction-oriented but prioritizes information exchange, strategic collaboration, community building and engagement, as well as social bonding. Despite the growing interest in platform business models, scientific research related to closed communication platforms like the one of PropTech Bulgaria remains limited. Jacobides, Cennamo, and Gawer [10] view such a deficiency as a critical challenge throughout the process of constructing resilient digital ecosystems. A substantial gap in the scientific conceptualization of business models in such platforms is observed, exacerbated by the lack of research on determining appropriate business and software architecture and methodology; and evaluating the network effect in the absence of open access.

3. Objective, Research Approach, and Conceptual Model

The purpose of this research is to practically apply and illustrate how PropTech Bulgaria has been construing the organization's business ecosystem on the grounds of the Business Models Archetypes instrument of Cabage [11]. Showcasing the process of actual application, we exemplify how the design and implementation of a network of e-platforms is being steadily directed within PropTech Bulgaria. This real business case aims at proving the rationale behind consolidating and structuring different business models in a mutually amplifying way, thus building up to an ecosystem, the most complex business model. The approach is firmly grounded on the paradigm that a successful ecosystem cannot emerge spontaneously, unless one mandatory prerequisite has been put to effect, namely, there is a pre-established stable foundation of separate operational business models, each technologically implemented through an e-platform. At PropTech Bulgaria we observe a logical and sequential upgrade starting from basic through combined business models, thus setting the stage for building an integral ecosystem.

3.1. Conceptual Model for Ecosystem Building through a Network of E-Platforms

The conceptual instrument includes three levels of business models, graded by their degree of complexity and integration. Figure 1 exhibits the explicit application of the Business Models Archetypes of Cabage [11] to the online presence and e-platforms of PropTech Bulgaria, thus illustrating the fact that the company has systematically and steadily been enhancing the digitalization of its services/products for more than 9 years to the date of our research, in order to prepare for establishing an ecosystem. Table 1 below tracks the development of all websites and e-platforms via a time continuum, starting from 2016 till now (August 2025).

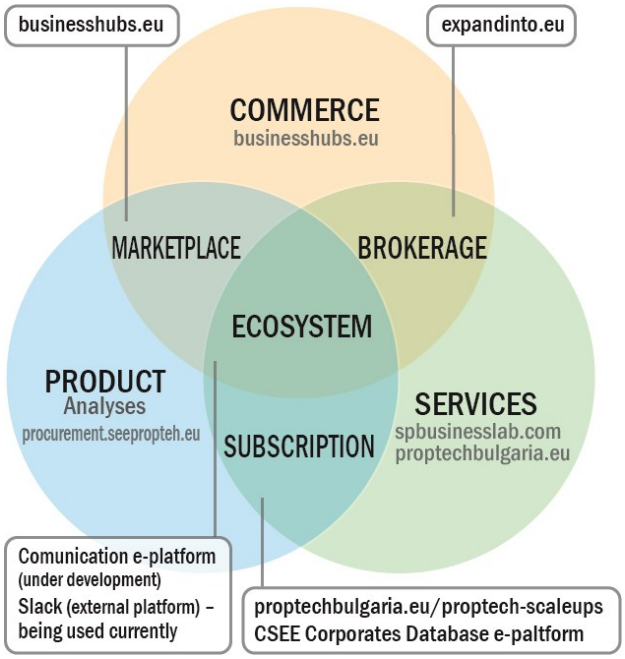


Figure 1. Conceptual Model of PropTech Bulgaria.

3.2. Basic business models of PropTech Bulgaria

Basic business models of PropTech Bulgaria and corresponding e-platforms are as follows:

- **Product Business Model:** offering international analyses and reports – procurement.seeproptech.eu (the platform is built up and is active);
- **Service Business Model**: consultancy activities, mentoring entrepreneurs and senior managers in strategic business development - spbusinesslab.com, proptechbulgaria.eu (websites are built up and are active);
- **Commerce Business Model**: online sale of products and services – businesshubs.eu (e-commerce platform is built up and is active).

3.3. Combined Business Models and Platforms

Subscription Business Model (Product + Service): access to consultations and analyses through annual membership in the association – prexcelerate.eu, proptechbulgaria.eu/ proptech-scaleups (websites are built up and are active). CSEE Corporates Database, the newest e-platform of PropTech Bulgaria, also has a Subscription business model – seecorporatedatabase.seeproptech.eu (analytical platform for corporate decision-making – built up and active).

Marketplace Business Model (Product + Commerce): offering services in a closed external network (Slack) and future public integration of Slack groups (external platform); upcoming implementation of access.seeproptech.eu (communication platform under development).

Brokerage/Intermediation Business Model (Service + Commerce): international business development services applying commission payments - expandinto.eu (website is built and active).

3.4. Ecosystem Level – Integration Platform

Communication Platform: central hub for coordination, collaboration, and resource exchange among participants from different countries – acess.seeproptech.eu (under development).

E-platform CSEE Corporates Database consists of a large database of construction investors from Central-Southeast Europe; built-up functionalities for categorization, search, and results visualization, thus digitizing the management decision-making processes required at strategizing for international expansion to other countries - seecorporatedatabase.seeproptech.eu (the analytical platform for managerial decision-making is built up and active).

This network of e-platforms is invented to not only support various business interactions but to generate a network effect which amplifies the value of both the platforms, and the entire ecosystem. The transition from single, self-sufficient solutions to an integrated environment emanates from the strategic transformation of PropTech Bulgaria's digital presence towards resilient and scalable international development.

4. Platform Architecture and Software Implementation

Building a network of e-platforms within PropTech Bulgaria requires a carefully designed architecture that ensures both the autonomy of each individual platform and the technological connectivity of all platforms within a common ecosystem. The goal is to achieve a modular, scalable, and integrable system capable of supporting various business models and dynamically adapting to the needs of participants.

4.1. Architectural Model and Integration Layers

The enhancement of websites and e-platforms of PropTech Bulgaria is grounded on a marketing approach. That is, the technological profile of a given web site or e-platform is entirely structured based on the products/services offered to the respective client categories.

Table 1 tracks down the development of all websites and e-platforms of PropTech Bulgaria along a time continuum which covers a period of over 9 calendar years, starting from 2016 till now (August 2025). It also presents the type of each website/e-platform based on Chaffey's classification [12] in addition to showcasing how PropTech Bulgaria elevates its online presence and digitalization of services.

Table 1. Development of PropTech Bulgaria's online presence and OVP (online value proposition) from flagship websites to e-business platforms.

Website Launch year	Web site Type	Web site Domain
2016 - 2018	Flagship web sites	spbusinesslab.com *(active)* impactventures.today *(deactivated)*
Upgraded to		
2019 - 2020	Brand-building web sites as well as Service-oriented web sites [12]	prexcelerate.eu *(active)* proptechbulgaria.eu *(active)*
Upgraded to		
2020	E-commerce web site, as well as communication e-platform of a social network type (social network or community building) [12]	businesshubs.eu *(active)*
2021	Seeproptech.eu as a brand-building & service-oriented web site – (1st level), but with the potential to be upgraded to e-business e-platform (2nd level). The 2nd level has already been launched in 2024 - 'Procurement' functionalities and further expanded in July 2025 – 'CSEE Corporates Database'.	seeproptech.eu *(active)* Till 07.2024 г. this web site is limited to brand-building & service-oriented one.
2022	Expandinto.eu as a brand-building и service-oriented web site [12]	expandinto.eu *(active)*

Upgraded to		
2022 - 2024	E-platform which digitizes business processes (e-business web site and platform) [12]	seeproptech.eu *(active)* Following 07.2024 г. it has become an e-business web site as 'Procurement' functionalities were launched. procurement.seeproptech.eu *(active)*
Upgraded to		
2025	2 out of 3 more modules are under development. These are additional to seeproptech.eu, thus making this e-business platform an accomplished ecosystem. The 1st module is the analytical e-platform 'CSEE Corporates Database', which was launched and has been fully operational since 15 June 2025. seecorporatedatabase.seeproptech.eu *(active)*	

Base Layer – Functional Modules. Each website (e-platform) represents an independent functional module implementing a specific business model which is depicted in Figure 1. These modules operate independently and apply different technologies as described in details in point 4.2. below.

Upper Layer – Collaboration and Communication Hub. This is access.seeproptech.eu e-platform, which will function as a central co-operation hub streamlining the international interactions within the ecosystem. The platform will integrate functions which enable closed internal communication, resource access, partner mediation and brokerage, and service marketplace. It is planned to be built on a closed SaaS infrastructure, with role-based access management and encapsulated communication channels (forum, chat, direct links to other platforms).

4.2. Technology Stack

Each e-platform uses a specific set of technologies simultaneously tailored to both its functionality, and the target client segments of PropTech Bulgaria:

- **spbusinesslab.com** – a flagship web site built with HTML, CSS, and JavaScript;
- **proptechbulgaria.eu** – a brand-building web site implemented with WordPress;
- **businesshubs.eu** – an e-commerce platform built on WooCommerce with integration to a plugin providing payment services in four currencies, including currency conversion, as well as a product catalogue plugin;
- **prexcelerate.eu** – a service-oriented web site created with WordPress, allowing for subscription form submissions;
- **expandinto.eu** – built with WordPress as a brokerage platform with registration forms;
- **procurement.seeproptech.eu** – an e-platform implemented as a tool for searching and filtering suppliers, with specific functionality for company classification and business inquiry management. The technical implementation uses HTML, CSS, JavaScript, and an external email service;
- **access.seeproptech.eu** – in the design phase; planned to be implemented using Spring Boot, Java, and Thymeleaf;
- **CSEE corporate database** – an e-platform built with Spring Boot, Java 17, and Thymeleaf for creating a dynamic web interface. The platform uses Spring Data JPA and MySQL for managing and accessing a corporate database, supporting CRUD operations, filtering, and searching database records. Input data validation is carried out using spring-boot-starter-validation, ensuring reliability and security during the process of company registration. RESTful APIs are integrated for external communication with other systems, and spring-boot-starter-security for controlling access to sensitive information. The visualization of statistical data uses the external library Chart.js. The platform is designed for administration, search, corporate and management analyses of construction investors and property developers in Central-Southeast European region.

4.3. Interaction among platforms

Communication among separate modules is defined through pre-established business processes that allow for:

- Automatic user redirection between web sites/e-platforms via URL logic and SSO;
- Transfer of requests from one platform to another (e.g., from consultation to commerce or vice versa);
- Shared visual elements in graphic, web, and motion design, as well as shared structures to ensure user consistency.

4.4. Closed communication platform implementation peculiarities

Access.seeproptech.eu e-platform, being a central component of the future ecosystem, demands for a specific approach:

- The system must maintain restricted access while simultaneously providing communication among participants from different countries;
- Building a flexible backend for managing dynamic content and services.

4.5. Contribution of the architectural model to digital ecosystems' implementation

The architectural model presented does not only provide a functional foundation for building a network of e-platforms. Furthermore, it displays a conceptual framework for fostering digital business ecosystems. Such a multi-faced contribution is manifested in a number of aspects:

- **Integration of different business models.** Each of the primary business models (product, service, commerce, subscription, marketplace, and brokerage) is accomplished through a separate e-platform - an approach which allows for flexible value management within the entire system.
- Though not being technologically connected, all platforms serve a **common strategic goal** and are construed on a unified modular fundamental, allowing for comprehensive value management within the ecosystem boundaries.
- **Step-by-step development of a network effect.** The model speeds up the gradual expansion of the ecosystem through a sequential integration of participants and platforms, thus installing conditions for organic growth and involvement of international partners. Given that PropTech Bulgaria's platform is of a multi-sided type, its structure is modular. Consequently, transactions between different parties are controlled by the platform owner in the most direct way. Although modularity increases competition intensity, this structure also simplifies transactions, reducing the time parties need to reach an agreement [13]. In short, modularity helps minimize the time otherwise needed by participants to conclude a transaction. Each module has a separate network effect, meaning that in each case, the subsidized side used to attract the paying side is different. For example, in the communication platform case, the subsidized side is the national PropTech associations, which hold the direct contact with the largest construction investors in their country, while the paying side is the PropTech companies that pay to use the associations' services to reach construction investors in the respective country. Hence, the more associations there are on the platform, the greater the number of countries that PropTech companies have access to.

Another characteristic of PropTech Bulgaria's platform that impacts the network effect growth is the extent of differentiation the platform has in terms of functionalities, incoming and input information, and information exchange [3]. Differentiation immediately changes the focus of competition among rival platforms from price-based to ecosystem scope-based, therefore, putting the stress on the ecosystem that serves as the backbone of the platform.

Formalizing organizational digital structure. The systematic approach to architecture formalizes the rationale behind business transformations in PropTech Bulgaria.

Potential for standardization. The architectural model exhibits the potential for developing a reference standard on which ground similar organizations can design their ecosystems on a modular, API-oriented, and communication-active infrastructure. As Eisenmann et al. [3] underline, the market for multi-sided platforms in certain sectors is likely to be dominated by only one or at most two platforms. This is precisely the case of international PropTech mediation (the sector which PropTech Bulgaria operates in). Accordingly, establishing an industry standard platform in this sector will determine the dynamics of competition.

5. Discussion, Contributions, and Target Users Outreach Analysis

The development of a network e-platform architecture within PropTech Bulgaria represents a strategic and methodological transition from relatively independent digital initiatives to a comprehensive ecosystem framework. Not only has this transition its origin in a technological transformation but it results from reorganizing business logic in a way to align with the principles of interconnectedness, integration, and collaboration. The real business case of PropTech Bulgaria clearly demonstrates how any change in an organization's business modeling promptly impacts its technological presence. A major contribution of the developed conceptual model is the formalization of the relationship among different business model types and the corresponding e-platforms, with a clear architectural and functional role for each. A decentralized structure is typical for the early stages of digital platform development, as noted by de Reuver, Sørensen, and Basole [14]. The current model demonstrates how their functions complement and build upon each other, thus amplifying the network effect and new value creation for priority stakeholders.

5.1. Effectiveness of the Integrated Model

The implementation of a network of e-platforms allows for:

- Addressing different user needs – from B2C services (in this case a company's clients are individual end-users) to multi-facet B2B

international business interactions (in this case a company's clients are other businesses);
- Ensuring a logical transition when upgrading between different business models – for example, from subscription to direct participation in a marketplace;
- Tracking and analyzing user behavior at various touchpoints;
- Supporting business processes with varying degrees of complexity and engagement – from purchasing a product to strategic partnerships.

In this context, the network structure creates synergy between the platforms which does not otherwise exist if they are used as stand-alone units.

5.2. Reaching Target Users

The analysis of online behavior and the dynamics of single platforms usage shows that:

- The upcoming platform access.seeproptech.eu has the potential to serve as a catalyst for the actual community building potential, taking advantage of the deep interaction among participants from different countries.
- The analysis of current development indicates that the architecture is suitable for progressive but simultaneous user engagement towards achieving a higher degree of integration and participation.
- The analysis of current information consumption proves that the modular structure significantly increases the speed of interaction among different participants on PropTech Bulgaria's platform, thus reducing the time needed for transactions between them or between them and PropTech Bulgaria to be completed.
- The analysis of current communication on the platform also proves that the subsidized parties in each module are correctly specified, as the unfolding of a network effect is being observed in each module.

6. Conclusion and Further Research

This study presented a conceptual model for building a business ecosystem through design and implementation of a network of e-platforms that integrate software services within PropTech Bulgaria. The approach is based on an in-depth analysis of the organization's business logic, systematic mapping of its platforms, and constructing a software architecture that allows both autonomy and connectivity between individual modules. The core of the established ecosystem comprises a hierarchy of business models, categorized by their degree of integration – from basic forms such as "Product," "Service," and "Commerce" to more complex hybrid models like "Subscription," "Marketplace," and "Brokerage." A specific e-platform is the technological embodiment of each of these business models, and supports the respective business model to play its role in achieving the strategic goal – building a resilient, international PropTech community. The network architecture is designed to provide for expansion and adaptation, based on modularity, API connectivity, and flexible communication logic. The upcoming implementation of the closed communication platform access.seeproptech.eu will introduce the last missing functionality – centralized coordination and community building. Although the system has not yet reached its full capacity, the analysis shows a high degree of readiness and steady deployment of a network effect. The conceptual model under consideration demonstrates not only how platforms can be projected and connected, but furthermore, it reveals how business models can be managed through a software architecture oriented towards value, synergy, and co-development.

As a next step in the research process, it would be very useful to apply the model of Rong et al. [15], which would further visually illustrate and explain how and why the web platforms built by PropTech Bulgaria change over time; how such a change (first dimension) translates into a change in customer segments and the company's value proposition (second dimension) given the change in the life cycle the company is in (third dimension).

Based on the current study, several important directions for development can be outlined:

- Technical completion and launch of access.seeproptech.eu with role-based access management, communication modules, and related services;
- Expansion of interfaces between platforms through SSO and unified UX elements;
- International expansion of the partner base by introducing new participants;
- Formalization of the model into an open standard that serves as a reference framework for building e-business ecosystems in similar contexts.

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