

REAL ESTATE MEETS TECHNOLOGY. THE IMPACT OF NEW TECHNOLOGIES ON THE REAL ESTATE SECTOR IN SPAIN

Llorca-Ponce, Alicia ^{a1}; and Rius-Sorolla, Gregorio ^{a2}

^aUniversitat Politècnica de València. Spain. (^{a1}allopon@omp.upv.es, ^{a2}griusoso@upv.es)

ABSTRACT: The real estate industry has traditionally been a low-tech industry. The arrival of new, more technological companies in the sector has brought about a revolution in an industry that is very conservative and not very innovative. The term *Proptech*, short for property technology, groups together new activities that include applications, platforms and, in general, technologies related to the digitalization of the real estate sector. It includes core technologies of the Industrial Revolution 4.0. such as Big Data, Artificial Intelligence, Blockchain, visualization technologies, the Internet of Things and cloud computing; technologies that are rapidly changing how the agents involved, buyers, sellers, investors, managers or tenants, operate. Due to the large number of activities and technologies involved, there needs to be some clarification about the scope of activities and technologies within *Proptech*. This paper explores the different classifications and maps of *Proptech* in Spain. The objective is to provide knowledge regarding the composition and delimitation of the *Proptech* sector in Spain and its comparison with the classifications made in other countries. To do this, an adaptation of the *Proptech* map of Spain will be made with the categorization created by Baum (2017, 2020) in which four large clusters or groups of activities are identified: Real Estate Fintech, Shared Economy, Smart Real Estate and Data Digitalization and Analytics.

KEY WORDS: *Proptech*; Real Estate Fintech; Shared Economy; Smart Real Estate.

1. INTRODUCTION

The term *Proptech* derives from the union of “property” and “technology”. It includes all products, processes and business ideas that apply the most innovative resources of information and communication technologies (Tagliaro et al., 2020).

Proptechs are those companies or startups that, using the latest technology, are able to improve and optimize the processes of investment, management, construction and

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marketing of real estate assets.¹ There needs to be some clarification about the scope of activities and technologies within *Proptech* due to the sheer number, diversity and complexity of these. The paper explores the different classifications and maps of *Proptech* in Spain with the aim of clarifying its structure and composition. After consulting several international classifications, we start from the categorization made by Baum et al. (2020) of the Saïd Business School of Oxford University, in which four clusters of activity are identified. From here, each of the categories of the Spanish *Proptech* map is identified with the clusters identified by Baum. The aim is to provide information to be able to assess the composition and evolution of *Proptech* in Spain compared to other countries.

2. CONTEXT

Proptech is defined as the mass deployment of emerging technology in the real estate sector. “PropTech is one small part of the wider digital transformation of the property industry. It describes a movement driving a mentality change within the real estate industry and its consumers regarding technology-driven innovation in data assembly, transactions, and the design of buildings and cities” (Baum and Dearsley, collected in Davenport, 2017). According to these authors, *Proptech* is, on the one hand, a name that defines all technological innovations in the real estate segment and, on the other hand, the industry itself, the business sector. It is also a collective term used to identify start-ups that offer technologically innovative products and new business models for real estate markets (Siniak et al., 2020).

The report 2023 European *Proptech*: 32 countries in numbers & UAE² by *Proptech* Bulgaria indicates that on 1st February 2023, the total number of *Proptech* companies is 9641; in Europe, the number rises to 4775 companies, and in Spain, the *Proptech* ecosystem has 554 companies, which represents a weight of 11% of the total number of European companies. According to the report, Europe accounts for 50.24% of the total number of *Proptech* companies, followed by North America with 24.69% and in third place Asia Middle East and Pacific where the proportion of companies is 13.81%.

The *Proptech* sector encompasses a variety of real estate-related businesses, from property management, through financial services, insurance, maintenance, and facilities, ranging from marketing platforms, shared use, real estate management, financial services, transactions, construction, data exchange, maintenance and facilities management services. The great diversity of activities makes the term complex and difficult to delineate. In recent years, several maps have been constructed to identify the main areas that are identified (Tagliaro et al., 2020).

Alongside *Proptech*, there are other tech sectors, such as *ConTech*, the technology sector that supports all dimensions of the building process, from design to construction. *LegalTech*, based on the use of smart contracts and facilitating transactions and especially

¹ <https://propertytechnology.es/empresas-proptech-mapa/>

² <http://proptechbulgaria.eu/2023-european-proptech-32-countries-in-numbers>

Fintech, is a combination of “financial technology”, the new technology that seeks to improve and automate the delivery and use of financial services. The term *FinTech* is conceived as the implementation of the use of new technologies and disruptive business models in the field of financial services (World Economic Forum, 2015). As noted by Baum et al. (2020), *Fintech* includes a broad spectrum of activities, including *Lending tech*, *Payments/Billing tech*, *Institutional/Capital market tech*, *Equity Crowdfunding*, *Insurtech*, and *Personal Finance*. Many of these new technologies also affect the real estate sector, in fact, many companies included in the above *Fintech* fields operate in the real estate market. Between the financial and real estate sectors, there are areas of activity in common that are called *Real Estate FinTech* (Valín, 2020).

3. PROPTECH CLASSIFICATION

After analysis of various corporate reports, it can be determined that *Proptech* is any digital innovation that affects the real estate sector, so it is a very broad concept (Valín, 2020). “The non-exhaustive list of these technologies includes home search tools, drones, virtual reality, building information modelling (BIM), data analytics tools, artificial intelligence (AI), Internet of Things (IoT) and blockchain, smart contracts, crowdfunding in real estate, financial technologies related to real estate (fintech), smart cities and regions, smart homes and sharing economy” (Siniak et al., 2020).

The literature review points to two main approaches to identifying *Proptech* areas. On the one hand, classifications are made on the basis of a deductive method and, on the other hand, the categorization of the sector following an inductive method (Tagliaro et al., 2020). According to Jacob (2004), the classification is done on the basis of predetermined guidelines or principles and through a scheme that is artificial and arbitrary, “[...] artificial because it is a tool created for the express purpose of establishing meaningful organization; and arbitrary because the criteria used to define the classes in the scheme reflect a single perspective of the domain to the exclusion of all other perspectives.” (Jacob, 2004). Categories are inferred from a creative synthetic process. Classes are derived from the literature and subsequently populated with entities (Tagliaro et al., 2020).

After reviewing the literature, the author establishes the following classification criteria: the technology used, the stages in the supply chain, the drivers of innovation and the stakeholders involved. Firstly, classifications based on technology often differentiate technology based on its state of evolution, *Proptech* 1.0, 2.0 and 3.0 (JLL, 2017; Baum, 2017). Secondly, the classification based on stages in the supply chain focuses on the types of production-related businesses by differentiating between pre-construction, construction and post-construction sectors (Maududy and Gamal, 2019). Thirdly, looking at the drivers of innovation, a distinction is made between information, transaction and management and control. We can consider three lines of action that guide *Proptech's* activities. Firstly, the possibility of accessing more information of higher quality and at a lower cost. Secondly, greater efficiency in operations by reducing time and costs and, thirdly, improving management processes such as valuations and asset

management (Baum, 2017). Another classification establishes the following drivers of innovation construction, operation, management, marketing and transaction (Maudududy and Gamal, 2019); Fourthly, if we look at stakeholders, they are grouped into capital investment activity, commercial market, building management and residential market (Shaw, 2018). On the other hand, Categorization is mainly based on types of activities or product functions. This approach has been proposed mainly by consulting companies, but also by researchers.

In Spain, Aguirre Newman created the first *Proptech* map, including 58 companies (InmoDiario, 2017). This first map identifies four categories: portals and marketplaces, P2P (peer-to-peer) technology solutions, virtual reality and collective investment or crowdfunding platforms, later expanding to 9 categories. Table 1 compares three classifications of *Proptech* in Spain based on technology. API's report *Radiografía del Proptech en España* raises the number of *Proptech* companies to 514 in 2022.

Table 1. Ranking of Proptech technologies in Spain.

Aguirre-Newman and Finnovating (a)	API (b)		Dekker (c)	
		n° companies		% companies
P2P, Peer to Peer	Peer to Peer	77	15.0%	Rental Peer to Peer
	Shared spaces	16	3.1%	
Real State Software	Software y CRM	74	14.4%	CRM, Property software
Big Data	Big Data	59	11.5%	Big data
Marketplaces	Webs and marketplaces	57	11.1%	Marketplaces
Visual Startups	Image	55	10.7%	Virtual Reality
Smartphone	Smartphone	45	8.8%	
Investment	Investment, buyers	35	6.8%	Crowdfunding
	Property management	25	4.9%	Agents & Buyers
Mortgage Financing	Mortgage	21	4.1%	Morgages
	Scoring	10	1.9%	
	Marketing	15	2.9%	Marketing
	Legal	13	2.5%	Legal
Home automation/smart homes/IoT	Smart offices	12	2.3%	Home automation
				Real Estate news
				Accelerators
				Aggregators
				Events
				Blockchain
TOTAL		514		

Source: Own elaboration based on (a) *Proptech map Aguirre-Newman and Finnovating* (b) *Radiografía del Proptech en España API* (2022) (c) <https://privacasa.eu/proptech>

The professional organisation API *Colegios y Asociación de Agentes Inmobiliarios de Cataluña* have published the best-known *Proptech* map in Spain for several years. It was published for the first time in 2020, and its latest update in July 2023 includes 580 companies, see Table 2. In this map, companies are classified according to the services they provide, differentiating those that are more directly aimed at real estate professionals. On the one hand, 352 B2B and B2B2C oriented companies are identified and categorised according to the needs of the real estate business to which they provide solutions: Agency, Product and Clients. On the other hand, another 228 B2C and C2C companies were identified. In turn, each of these categories is composed of different types of technological solutions. Figure 1 shows each category's proportion over the total number of companies in the *Proptech* map.

Table 2. Proptech companies in Spain.

	B2B y B2B2C	B2C y C2C	Total
Legal	12		12
CRM and Software	Your agency	16	81
Digital signature		9	9
Platforms		12	2
Investment		27	37
Funding	Your customers	6	25
People Rating		10	10
Household management		19	19
Image	57	11	68
Attract			31
Smart spaces		5	20
Peer to Peer	Your product	42	58
Real State Valuation		30	30
Portal		41	26
Showcase	6		6
ibuyers		7	7
Smart homes		34	34
Property manager		9	9
Big Data		23	23
Shared spaces		20	20
	352	228	580

Source: API, *Proptech Map*, July 2023.

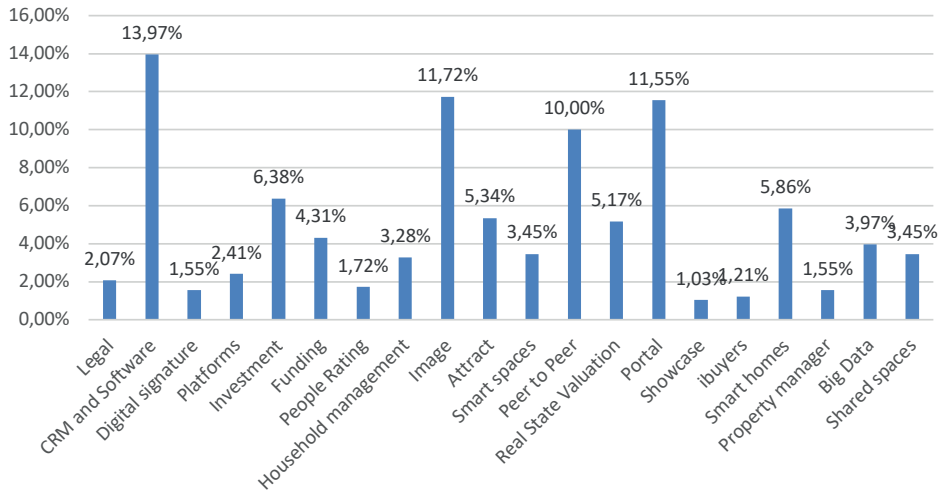


Figure 1. Share of Proptech companies in Spain by category, 2023.

Source: Own elaboration based on API (2023).

At the international level, among the different classifications analysed, the study by the University of Oxford stands out. In this classification, three drivers are identified from the point of view of innovation in the sector, known as horizontal drivers, namely information, transaction and management and control (Baun, 2017). A later report states, “The roots of PropTech lie in 5 areas or drivers: construction technology, legal technology, the shared economy movement, FinTech and exogenous technology” (Baum, 2020). Four clusters or areas of activity are established: Smart Real Estate, Real Estate Fintech, The Real Estate Shared Economy and Data Digitalization and Analytics (nuts and bolts), Baum (2020).

The Real Estate Fintech includes technology applications to facilitate transactions in real estate assets, whether real estate, real estate investment trusts, debt or equity. These are markets in which both ownership and leasing are transferred. Technologies will be geared towards improving the sector’s critical aspects of profitability and efficiency, liquidity and transparency. Baum et al. (2020) point to three aspects that influence liquidity: the time it takes for the asset to be sold, the probability of the sale occurring, and the costs associated with the transaction. On the other hand, the greater the transparency, the more information participants can access that will allow them to trade more rationally. Various technologies aim to increase this transparency in a market that has traditionally been very opaque. Real Estate Fintech includes those FinTech technologies applied to the Real Estate sector. These include *LendingTech*, which includes platforms for peer-to-peer lending and solvency analysis; *Payments/billing tech*, which includes tools to facilitate invoicing and payments; *Personal finance/wealth management*, which includes technological tools aimed at facilitating wealth management for individuals; *Blockchain/token*, a technology that uses distributed databases, without a central manager, to register

and transfer assets using distributed databases maintained by users to register and transfer digital assets; *Capital Markets tech* on Investment, Crowdfunding and *Insurtech*. In line with the innovation drivers mentioned above, Real Estate Fintech uses technologies for information and transactions (Baum, 2017, 2020).

Smart Real Estate describes technology-based platforms that facilitate real estate asset operation and management. The platforms may simply provide information, or they may directly facilitate or control building services. It uses technologies related to information management and control. Green initiatives, especially *Contech*, establish Smart Real Estate's origins. In the case of *Contech*, technologies related to prefabrication and especially Building Information Modelling (BIM) have been of significant influence.

The Shared Economy describes technology-based platforms which facilitate the use of real estate assets, land, and residential or commercial buildings. Platforms may simply provide information or facilitating transactions or effect rent- or fee-based transactions.

The fourth area of activity, Data Digitalization and Analytics, includes those technologies oriented towards data management, analysis and visualization that drive the digitalization movement. We include in this group Big Data, which provides software designed to analyse, process and extract information from extensive and complex data sets. We also include the development of technologies such as Blockchain.

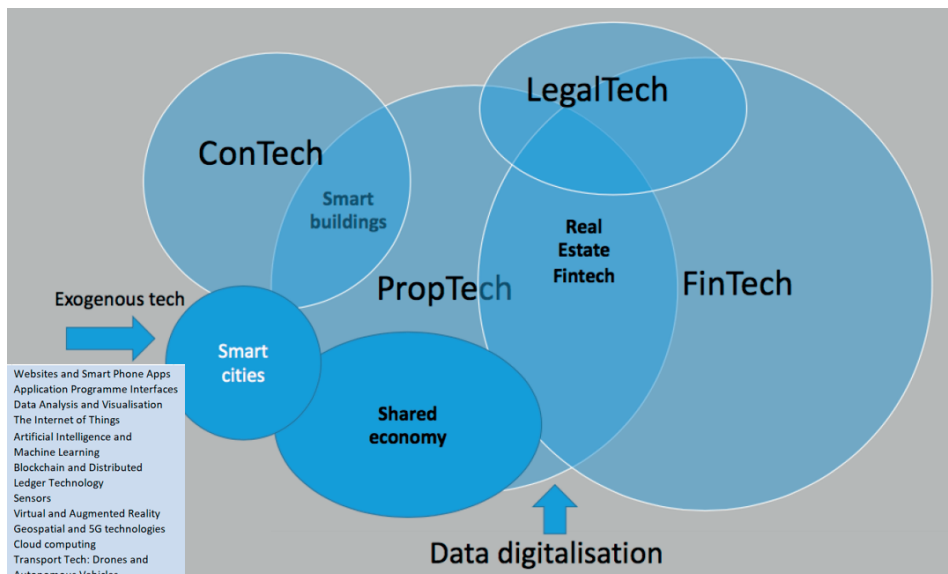


Figure 2. Branches of activity in PropTech.

Source: Baum (2020) and own elaboration.

Based on the categorisation made by Baum et al. (2020), see Figure 2, we integrate the categories of the *Proptech* map of Spain into this one, along the same lines as Tagliaro (2020) for *Proptech* in Italy. This will allow us to relate the sector’s evolution with other countries more easily.

Table 3. Proposed categories based on the classification of Baum et al. (2020).

Proposed classes Baum (2020)	Proposed categories API
Context	Context
Smart Real Estate	Smart Spaces
	Smart Homes
	Image
	Household management
	CRM & Software
Real Estate Fintech	Property manager
	ibuyers
	Platforms
	Legal
	CRM & Software
	Digital signature
	Portal
	Investment
	Funding
	People Rating
	Attract
	Image
	Showcase
	Real State Valuation
	Shared Economy
Shared spaces	
Platforms	
Data digitalization/analytics	Big Data

Source: Own elaboration.

4. CONCLUSION

Although the real estate sector has been characterized by being conservative in terms of the adoption of new technologies, recently and especially since the crisis resulting from the Covid-19 pandemic, the process of adopting technology and digitalization has accelerated significantly. Thus, *Proptech* has come to be known as the set of activities in which technology oriented towards the real estate sector is developed. The term comes from the merger of two other terms, “property” and “technology”, and has followed a terminology similar to that of other sectors such as finance with *Fintech*, insurance with

Insurtech or construction with *Contech*, among others. Although it is widely accepted what is meant by *Proptech*, there is no clear consensus on the delimitation and classification of the activities that form part of it. It is a recent and rapidly developing phenomenon. This work has aimed to clarify the composition of the sector in Spain in order to facilitate its comparison with other countries. This last task will be carried out in future works.

Although the real estate sector has been characterized as conservative in terms of adoption. In the case of Spain, after the analysis of the different existing *Proptech* maps, the API map has been analyzed in more depth as it has a more complete trajectory and information.

When consulting the different classifications of *Proptech* at the international level that appear in the literature, the one carried out by the University of Oxford by Baum (2017 and 2020) stands out, which, beyond focusing only on the type of technologies applied, is oriented towards the search for clusters of activity. As in the case of other European countries, such as Italy, the work carries out an adaptation of the Spanish *Proptech* map with the classification proposed by Baum. This adaptation will allow a more in-depth comparison of the Spanish *Proptech* map with that of other countries.

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