Technology Entrepreneurship in Real Estate Sector Development in India : PPP Model

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Abstract

The role of technology entrepreneurship and public and private partnership (PPP) have been considered important for real estate sector development in India. This study intended to find the role of public and private banks to promote and support technology entrepreneurship in India and to study the impact of residential loans, commercial loans, real estate advances, and indirect loans by public sector (SBI, PNB, Canara Bank, IDBI Bank, and Indian Bank) and private sector (HDFC Bank, ICICI Bank, Axis Bank, Yes Bank) banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India by using partial least squares structural equation modelling (PL–SEM).The banks like State Bank of India (SBI) and HDFC Bank were found to play a major role to promote and support technology entrepreneurship in India with the help of PPP model like the introduction of property festival online with private players like Snapdeal.com, MagicBricks.com with SBI and HDFCRed.com by HDFC Bank in assisting the property buyers which led to an increase in the role of public and private partnership projects (PPP) in India. Further, the partial least squares structural equation modelling was employed, which showed that there was an impact of the residential loans, commercial loans, real estate advances, and indirect loans by banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India.

Keywords : **residential lending, commercial lending, structural equation modeling, real estate, banks, loans**

JEL Classification Codes : D3, L9, L85, R31

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Public – private partnership (PPP) has been defined by Alfen (2009) as the co-operative institutional arrangements between public and private enterprises which have gained wide interest around the world. The PPP model is a new way to handle the infrastructure projects. Both the sectors have certain merits if they are combined together, and the result is good for all new products and services. These projects are long-term in nature and have contractual agreements, which reduce pressure on government budgets and increase value for money.

According to Bhirudh and Vasant (2015), the real estate sector has been largely fragmented and the scope for the real estate sector development is very wide. So, the availability of funds or rather economic availability and use of funds is desired for development. The public – private partnership (PPP) as a model is a good solution as there is a large scope of the PPP model in various areas of the real estate sector.

Telang and Kutumbale (2015) stated that in the banking sector, the public and private sector banks are also promoting and supporting technology entrepreneurship in India for real estate development. Public – private

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partnership (PPP) refers to the arrangement between the government entities and private entities for the provision of public assets or public services through investments being made or the management taken by the private sector for a specified period of time, where there is well-defined allocation of risk between the private and public entities and the private entity receives the performance-linked payments that conform to predetermined performance standards.

The public and private partnership (PPP) helps to ensure a win-win situation by improving innovation, enabling timely implementation of the projects as the risks associated with the projects are transferred to the private sector, there is allocation of public resources, and reduced costs. According to Roig and Soriano (2015), PPP help the governments to free up the resources for other public needs as this collaboration becomes successful.

Kaur and Kaur (2017) showed that entrepreneurship is the process of innovation which creates a new organization. It flourishes in those countries that give chance to the new organizations and national institutions and social norms which lead to the creation of new ventures. The role of new technology leads to new markets and transform the existing market and industry.

The role of technology in the real estate sector will help the people to find residential accommodation easily without physically visiting on-site locations of housing companies and builders. The launch of online property festivals as well as the availability of numerous property consultants have ushered the way for customers within India and outside India to sharpen up their available options (Scarlat, 2014).

According to Reddy, Rama, and Reddy (2015), the Leadership in Environment and Environment Design (LEED) is the rating system for guiding construction, operations, and maintenance of green buildings. India ranked third for the most LEED space globally. The real estate sector is growing significantly, providing the much-needed infrastructure for India's growing needs. Entrepreneurship technology is an investment in projects which involves the use of specialized individuals and also the assets which lead to creating value of a firm (Alfen, 2009).

According to Gupta and Jaiswal (2020), the banking sector is adopting innovation and technology, which is bringing a spurt in the banking options available to the corporate and retail customers. The public and private sector banks are contributing to promote and support technology entrepreneurship for the real estate sector development in India. The real estate sector has been considered as a lucrative source of investment in India as it is among the fastest growing markets in the world. Banking finance is very important for the development of the real estate sector in India. The present study attempts to ascertain the impact of residential loans, commercial loans, real estate advances, and indirect loans by public and private sector banks on the total real estate sector in India for strengthening the impact of technology entrepreneurship for future real estate development in India. Kaur and Pasricha (2019) showed that there are various problems faced by the employees in implementing the financing schemes by banks.

Various banks have been considered for the study like State Bank of India, Punjab National Bank, Canara Bank, Industrial Development Bank of India (IDBI Bank), Indian Bank, HDFC Bank, ICICI Bank, DCB Bank, Axis Bank, and Yes Bank, which provide real estate loans for development of the real estate sector in India.

Studies Conducted So Far Related to Real Estate Sector Development

Kotishwar (2018) focused on the impact of technology on select banks with respect to transactions pertaining to online digital transactions and their contribution towards business per employee of respective banks and assessed the impact of 3G/4G communication technology on select banks with respect to transactions pertaining to credit and debit cards, NEFT, RTGS, mobile phone based transactions, and ECS and their contribution towards business per employee of respective banks.

Kumar (2017) showed that housing is an essential need in each economy, and it is a fundamental pointer for the financial improvement of the nation. This study distinguished the problems faced by home loan borrowers from

the application stage to the last stage of loan repayment and examined how their socio - financial profile impacted their perceptions of the problems faced by them while availing home loans.

The economists, sociologists, and business experts have been attracted by the macro aspect of entrepreneurship, that is, social networking. Komosny, Bulin, and Ilgner (2017) showed the new source of spatial data for the real estate sector which is huge and can be trusted as the location is essential for the real estate sector development. Srinivasan (2017) identified the role of the Internet for the transformation of the real estate sector from unorganized to organized market.

Technology development has given a new way of developing the environment. Technical knowledge of business and technology is important to become a successful business entrepreneur. Giones and Brem (2017) showed that the digital transformation of technology helps in getting increased growth and advancement which leads to attracting more wealth and profitability for the firms. Digitalization and technology help in the development of the real estate sector.

Public and private partnerships (PPP) in India have emerged as the very viable and possibly sustainable mode of creating much-needed infrastructure for our country. Public and private partnerships (PPP) have been able to define the role of the public sector as a facilitator and the private sector plays the role of the financer, builder, and operator of the service or the facility given (Telang & Kutumbale, 2015). The advancement and innovation of public and private partnerships for real estate projects and new trends help to improve allocation of public resources with quantitative approach provided by the private participation (Roig & Soriano, 2015). The focus is on the problem of infrastructure and real estate to accommodate the growing migration of people to urban areas. The application of public – private partnership (PPP) is very important for the real estate sector development in India (Bhirud & Vasant, 2015). Chaturvedi and Sharma (2015) showed that the Indian real estate market is one of the fastest growing markets in the world. The role of technology entrepreneurship in the real estate sector helps in getting increased growth and development for the real estate sector in India. Reddy et al. (2015) compared the Indian real estate sector with global markets and revealed that the Indian real estate sector has higher returns as compared to the global markets. The opportunities that exist in the real estate sector will attract more global players in India, which will help the real estate industry to get mature, transparent, and improve management.

The public and private sector banks in the form of public and private sector partnership (PPP) are promoting and supporting technology entrepreneurship for real estate development in India. It has been observed that real estate developers use a variety of appraisal techniques to find the value of properties prior to purchase. According to international statistics, the real estate sector is considered as one of the most profitable businesses for the speculators in which there are financial sources and enough information about the market (Bailetti, 2012). The public – private sector partnership (PPP) of banks helps in increasing real estate sector development in India by promoting the role of technology entrepreneurship in India. The PPP (public and private partnership) refers to the cooperation between public and private partners which are dynamic and flexible according to the goals and fields of application around the globe (Alfen, 2009). Sengupta and Tipple (2007) showed that the public sector banks help in promoting technology entrepreneurship in India. They are playing a major role in the development of the housing sector and the new reforms which are launched by the government, which is a good step to solve the crisis of housing.

Role of Public and Private Sector Banks to Promote and Support Technology Entrepreneurship in India

The State Bank of India is playing a major role in supporting and promoting technological entrepreneurship in India. SBI (State Bank of India) started the “Seal the Deal Campaign” with MagicBricks.com to have an online

property festival which was the first in the industry for the SBI approved projects (State Bank of India, 2017). MagicBricks.com is a website which is owned by Bennett Coleman and Company Limited (Times Group) which provides a platform for property buyers and sellers to locate properties in India. It shows the role of public and private partnership (PPP) and technology entrepreneurship between State Bank of India (public sector) and MagicBricks.com (private sector).

SBI Home Loans has partnered for an online property festival with Snapdeal.com (private group) and it is the only e-commerce company in India to promote real estate. It also reflects the role of public and private sector partnership (PPP) and technology entrepreneurship between State Bank of India (SBI) and Snapdeal.com. SBI Home Loans also signed a memorandum of understanding with CREDAI to conduct the joint meeting/corporate social responsibility activities and build a strong bond with the builder fraternity.

SBI launched SBI Realty.com portal for the home buyers on which the information for the property developers are available online. SBI has made this portal with the help of SBI CAPS (SBI Capital Markets (investment banking)) and PropEquity (private company) which shows the role of public and private partnership (PPP) and technology entrepreneurship between SBI and PropEquity (State Bank of India, 2017).

The IDBI (Industrial Development Bank of India) Bank is playing a major role in entrepreneurship technology. It became the first public sector bank by opening its international financial sector unit (IFSC) at Gujarat International Finance Tech City (GIFT) (IDBI Bank, 2017).

The Housing Development Financial Corporation (HDFC) Bank is playing a role in promoting entrepreneurship technology with the help of HDFCRed.com, which is a digital information hub that assists potential home buyers in identifying properties and provides leads to the potential home loan customers. It provides information on over 30,000 properties spanning over 20 cities (HDFC Bank, 2017).

GRUH Finance and HDFC Realty Limited is the other initiative by HDFC Bank for promoting entrepreneurship technology in India. GRUH Finance Limited (GRUH) is the housing finance company in the affordable housing segment with the retail network of 185 offices spread across 11 states. The holding of HDFC Bank in GRUH currently stands at 58.5%.

On the other hand, the advisory company for all information related to the real estate sector is given by HDFC Realty Limited. It has presence in 19 locations across India. The service includes residential property sale and leasing of commercial premises, consultation, and valuation services, sale and purchase of land, and pricing advisory services. HDFC (Housing Development Financial Corporation) Bank collaborated with Thane City to launch One-City-One Card as a part of the Smart City Initiative.

ICICI (Industrial Credit and Investment Corporation of India) Bank launched the first mobile app – the EAZYPAY for merchants, real estate brokers that can accept multiple models for digital payments business – consumer transactions. More than 1 lakh businesses and professionals adopted 'EAZYPAY' within 4 months of its launch. Axis Bank introduced recyclers which can accept and dispense cash. The bank introduced around 1349 recyclers.

The prepaid programs for smart cities have been started by Yes Bank in Nasik and Udaipur to provide the facility of digital payments for government to citizen (G2C) services for municipal corporations. The Yes Bank also provides this facility to other cities which come under the Indian government's Smart Cities Mission. These are the major initiatives by the public and private sector banks to promote and support technology entrepreneurship in India.

Objectives of the Study

↳ To study the role of public and private sector banks to promote and support technology entrepreneurship in India.

↳ To study the impact of residential loans, commercial loans, real estate advances, and indirect loans by public and private sector banks on the total real estate sector in India for strengthening the impact of technology entrepreneurship for future real estate development in India.

Research Methodology

The research is descriptive in nature. The data were collected from research papers, annual reports of banks, and is based on secondary sources. The sample banks include public and private sector banks. The public sector banks include State Bank of India, Punjab National Bank, Canara Bank, Industrial Development Bank of India (IDBI), and Indian Bank. On the other hand, private sector banks include HDFC Bank, ICICI Bank, Axis Bank, DCB Bank, and Yes Bank which provide residential lending, commercial lending, indirect lending, and real estate advances for the development of the real estate sector and have been taken into consideration for the study.

↳ **Statistical Tools :** The measurement model and structural model assessment have been employed to study the impact of residential loans, commercial loans, real estate advances, and indirect loans by public and private sector banks on the total real estate sector in India by using the partial least square structured equation modeling.

Hypotheses

↳ **H_o (Null Hypothesis) :** There is no impact of residential loans, commercial loans, real estate advances, and indirect loans banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India.

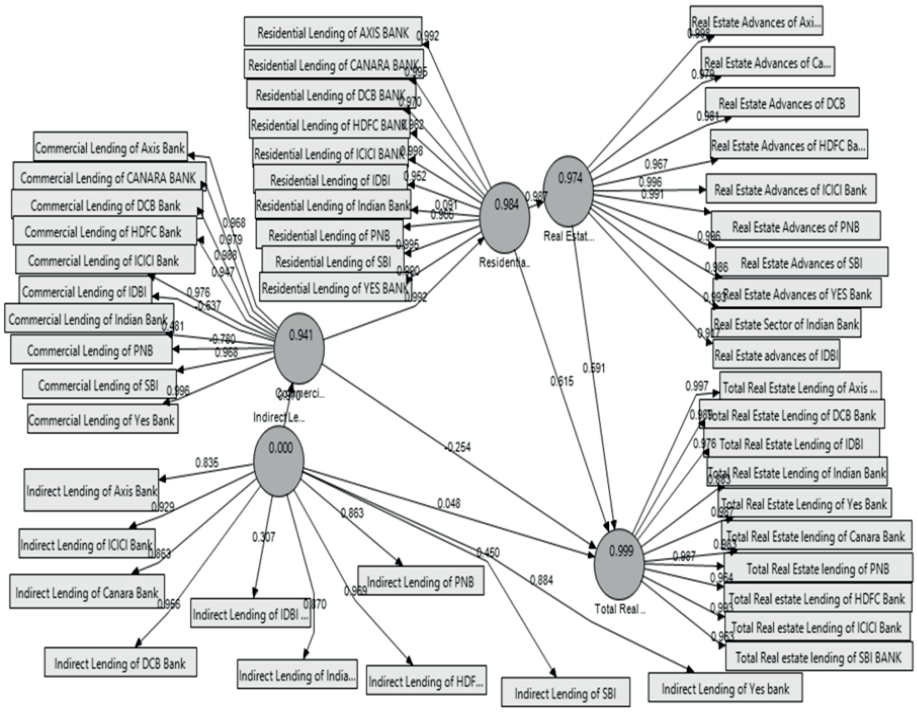
↳ **H_1 (Alternate Hypothesis) :** There is an impact of residential loans, commercial loans, real estate advances, and indirect loans by banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India.

Analysis and Results

According to Figure 1, residential lending, commercial lending, real estate advances, and indirect lending are the exogenous variables and total real estate lending is the endogenous variable. Figure 1 shows the relationship between exogenous and endogenous variables for strengthening the impact of technology entrepreneurship for future real estate development in India. As the public and private partnership (PPP) model is adopted by banks (such as association of State Bank of India and MagicBricks.com), it is essential to increase the role of PPP projects in residential lending and commercial lending for total real estate sector development which is fruitful for the real estate buyers as they require an adequate amount of finance for purchasing real estate property. For this purpose, they will also get the right information for the real estate market from the same platform. The banks help the real estate buyers by providing finance for purchasing the real estate property. On the other hand, MagicBricks.com helps in locating the properties for real estate buyers. It will increase the role of public – private partnership and technology entrepreneurship in India.

This is a great advantage to the real estate buyers as they will be able to get the finance and real estate property at one place. The real estate buyers get the advantage of transparency in dealings as the role of banks itself is involved. So that is why this model of structural equation modelling is employed to test whether there is an impact of residential, commercial lending, real estate advances, and indirect loans on total real estate sector development

Figure 1. PL– SEM Graph Showing Relationship Between Residential Loans, Commercial Loans, Real Estate Advances, and Indirect Loans on Total Real Estate Sector Development in India for Strengthening the Impact of Technology Entrepreneurship in India



in India for strengthening the technology entrepreneurship for future real estate development in India. The time period chosen for the study is from 2011 – 2018.

(1) Measurement Model Analysis : The outer model is first assessed by values of composite reliability (to assess internal consistency) and average variance extracted (AVE) (to assess convergent validity). Hair Jr., Hult, Ringle, and Sarstedt (2016) showed Cronbach's alpha of all indicators to be equally reliable. Table 1 shows that the value

Table 1. Reliablity and Validity

Variables	AVE (Average Variance Extracted)	Composite Reliability	*R* Square	Cronbach's Alpha	Communality	Redundancy
Commercial Lending	0.7893	0.9427	0.9414	0.8372	0.7893	0.7407
Indirect Lending	0.6736	0.9506	0	0.9368	0.6736	0
Real Estate Advances	0.9618	0.996	0.9741	0.9955	0.9618	0.9368
Residential Lending	0.8654	0.9833	0.984	0.9725	0.8654	0.8518
Total Real Estate Lending	0.9458	0.9943	0.9988	0.9935	0.9458	–0.5318

of the composite reliability is greater than the prescribed value of 0.70 , and the value of AVE is found to be greater than 0.50. The average variance expected (AVE) of commercial lending, indirect lending, real estate advances, residential lending, and total real estate lending is 0.7893, 0.6763, 0.9618, 0.8654, and 0.9458, respectively and all values are greater than 0.50. The Cronbach's alpha of commercial lending, indirect lending, real estate advances, residential lending, and total real estate lending is 0.8372, 0.9368, 0.9955, 0.9725, and 0.9935, respectively. All values greater than 0.70 show that the model is the perfect fit. The communality and redundancy of commercial lending, indirect lending, real estate advances, residential lending, and total real estate lending are 0.7896, 0.6736, 0.9618, 0.8654 and 0.7407,0.9368 , 08518 and –0.5318, respectively.

Table 2 demonstrates that the square root of the AVE (average variance expected) values for all the correlations are higher than the inter-construct correlations shown by Fornell and Larcker (1981), thus establishing the discriminant validity. The average variance expected helps in defining that there is the establishment of discriminant validity in the model.

Table 2. Correlations

	Commercial Lending	Indirect Lending	Real Estate Advances	Residential Lending	Total Real Estate Lending
Commercial Lending	1	0	0	0	0
Indirect Lending	0.9703	1	0	0	0
Real Estate Advances	0.9769	0.9865	1	0	0
Residential Lending	0.9919	0.986	0.9869	1	0
Total Real Estate Lending	0.9798	0.9908	0.997	0.9935	1

Table 3 shows that the individual loadings in commercial lending (0.9677, 0.9788, 0.9469, 0.9757, 0.9677, 0.9961, and 0.9677) are found to be higher than the respective cross loadings (0.811, 0.7733, 0.9297, 0.2796, 0.7847, 0.8385, 0.811, 0.7733, 0.8593, 0.9516, 0.935, 0.359, 0.7976, and 0.9267).

The individual loadings in indirect lending (0.835,0.863, 0.9557, 0.9688, 0.9286, 0.8701, 0.8627, 0.8841, and 0.9843) are found to be higher than the respective cross loadings (0.3894, 0.9323, 0.9391, 0.9142, 0.569, and 0.8403).

The individual loadings in real estate advances (0.988, 0.9788, 0.9813, 0.9673, 0.9958, 0.9912, 0.9963, 0.9858, 0.993, 0.9172) are found to be higher than the respective cross loadings (0.9857, 0.9817, 0.973, 0.8933, 0.9573, 0.4145, 0.9476, 0.9838, 0.8414, 0.9828, 0.983, 0.2886, 0.7944, 0.3634, 0.94, 0.9878, 0.9615, 0.169, 0.8924,0.9675, 0.9588, 0.9496).

The individuals loadings in residential lending (0.9919, 0.9946, 0.9702, 0.9618, 0.9984, 0.9518, 0.9657, 0.9951, 0.9904) are found to be higher than the respective cross loadings (0.9728, 0.9884, 0.9962, 0.9433, 0.9517, 0.4986, 0.9812, 0.9951, 0.8139, 0.8307, 0.9521, 0.2886, 0.7944, 0.3634, 0.901, 0.9755, 0.9566, 0.9607, 0.9861, 0.985, 0.9852, 0.9766, 0.89, 0.9608, 0.8377, 0.992, 0.9734, 0.994, 0.9472).

The individual loadings in total real estate lending (0.9965, 0.9885, 0.9755, 0.8826, 0.9867, 0.9827, 0.9873, 0.9643, 0.9926, 0.9629) are found to be higher than the respective cross loadings (0.9814, 0.9835, 0.9502, 0.4439, 0.9621, 0.8259, 0.8553, 0.9344, 0.2941, 0.8301, 0.8452, 0.4142, 0.8877, 0.99, 0.9604, 0.9215, 0.9506, 0.9658, 0.1585).

All cases of residential lending, commercial lending, real estate advances, indirect lending, and total real estate lending provide the evidence of discriminant validity. The loadings are higher than the value of 0.6 which has been prescribed by Nunnally (1979). Some indicator items from the variables have loadings less than 0.6 or even

Table 3. Cross Loadings

Variables	Commercial Lending	Indirect Lending	Real Estate Advances	Residential Lending	Total Real Estate Lending
Commercial Lending of Axis Bank	0.9677	0.9848	0.9857	0.9728	0.9814
Commercial Lending of Canara Bank	0.9788	0.9842	0.9817	0.9884	0.9863
Commercial Lending of DCB Bank	0.9879	0.9751	0.973	0.9962	0.9835
Commercial Lending of HDFC Bank	0.9469	0.929	0.8933	0.9433	0.9086
Commercial Lending of ICICI Bank	0.9757	0.9349	0.9573	0.9517	0.9502
Commercial Lending of IDBI	–0.637	–0.5446	–0.6062	–0.559	–0.5635
Commercial Lending of Indian Bank	0.4814	0.3894	0.4145	0.4986	0.4439
Commercial Lending of PNB	–0.7798	–0.7099	–0.7254	–0.7311	–0.724
Commercial Lending of SBI	0.9677	0.9451	0.9476	0.9812	0.9621
Commercial Lending of Yes Bank	0.9961	0.976	0.9838	0.9951	0.9861
Indirect Lending of Axis Bank	0.811	0.835	0.8414	0.8139	0.8259
Indirect Lending of Canara Bank	0.7733	0.863	0.8479	0.8307	0.8553
Indirect Lending of DCB Bank	0.9832	0.9557	0.9607	0.9828	0.9708
Indirect Lending of HDFC Bank	0.9807	0.9688	0.9544	0.983	0.9623
Indirect Lending of ICICI Bank	0.9297	0.9286	0.9293	0.9521	0.9344
Indirect Lending of IDBI Bank	0.2796	0.307	0.2754	0.2886	0.2941
Indirect Lending of Indian Bank	0.7847	0.8701	0.8522	0.7944	0.8301
Indirect Lending of PNB	0.8385	0.8627	0.8593	0.8295	0.8452
Indirect Lending of SBI	0.318	0.4503	0.3823	0.3634	0.4142
Indirect Lending of Yes Bank	0.8874	0.8841	0.8591	0.901	0.8877
Real Estate Advances of Axis Bank	0.976	0.9843	0.998	0.9845	0.9955
Real Estate Advances of Canara Bank	0.9625	0.9782	0.9788	0.9755	0.9793
Real Estate Advances of DCB	0.9434	0.9419	0.9813	0.9566	0.9712
Real Estate Advances of HDFC Bank	0.9577	0.9391	0.9673	0.9607	0.9604
Real Estate Advances of ICICI Bank	0.9837	0.9738	0.9958	0.9861	0.9913
Real Estate Advances of PNB	0.9625	0.9846	0.9912	0.9751	0.9917
Real Estate Advances of SBI	0.9819	0.9743	0.9963	0.985	0.9907
Real Estate Advances of YES Bank	0.9909	0.9785	0.9858	0.9852	0.9835
Real Estate Sector of Indian Bank	0.9571	0.9867	0.993	0.9766	0.991
Real Estate Advances of IDBI	0.8593	0.9323	0.9172	0.89	0.9215
Residential Lending of Axis Bank	0.9901	0.9908	0.9899	0.9919	0.9914
Residential Lending of Canara Bank	0.9905	0.9788	0.9853	0.9946	0.9888
Residential Lending of DCB Bank	0.9516	0.9391	0.94	0.9702	0.9506
Residential Lending of HDFC Bank	0.954	0.9142	0.9219	0.9618	0.9365
Residential Lending of ICICI Bank	0.9951	0.9825	0.9878	0.9984	0.9911
Residential Lending of IDBI	0.935	0.9831	0.9615	0.9518	0.9658
Residential Lending of Indian Bank	0.0359	0.0569	0.169	0.0908	0.1585
Residential Lending of PNB	0.971	0.9713	0.9691	0.9657	0.9716

Residential Lending of SBI	0.9914	0.9737	0.9755	0.9951	0.9828
Residential Lending of YES Bank	0.9763	0.9658	0.9627	0.9904	0.975
Total Real Estate Lending of Axis Bank	0.9788	0.9819	0.9921	0.9922	0.9965
Total Real Estate Lending of DCB Bank	0.9796	0.9704	0.9863	0.992	0.9885
Total Real Estate Lending of IDBI	0.9357	0.9876	0.9675	0.9608	0.9755
Total Real Estate Lending of Indian Bank	0.7976	0.8403	0.8924	0.8377	0.8826
Total Real Estate Lending of Yes Bank	0.9942	0.9795	0.9835	0.9932	0.9867
Total Real Estate Lending of Canara Bank	0.9653	0.9795	0.9801	0.9803	0.9827
Total Real Estate Lending of PNB	0.9669	0.9876	0.9882	0.9734	0.9873
Total Real Estate Lending of HDFC Bank	0.9789	0.9557	0.9588	0.9817	0.9643
Total Real Estate Lending of ICICI Bank	0.9923	0.9794	0.9936	0.994	0.9926

negative like commercial lending of IDBI Bank, commercial lending of PNB, and indirect lending of IDBI Bank, which should be dropped so that it would result in improved reliability and validity of those variables.

The loadings of residential lending are higher as compared to those of commercial lending, indirect lending which shows that banks are contributing more for the residential real estate sector to strengthen the impact of technological entrepreneurship for real estate sector development in India.

Table 4. Bootstrapping Technique

					Path Coefficients (Mean, STDEV, and *t* - values)
Variables	**Original Sample (O)**	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**Standard Error (STERR)**	***t* - Statistics (|O/STERR|)**
Commercial Lending -> Residential Lending	0.9919	0.9919	0.0002	0.0002	6501.0107
Commercial Lending -> Total Real Estate Lending	–0.254	–0.2531	0.008	0.008	31.6567
Indirect Lending -> Commercial Lending	0.9703	0.9703	0.0003	0.0003	3089.9326
Indirect Lending -> Total Real Estate Lending	0.0477	0.0482	0.0083	0.0083	5.7598
Real Estate Advances -> Total Real Estate Lending	0.5914	0.5901	0.0112	0.0112	52.6835
Residential Lending -> Real Estate Advances	0.9869	0.9869	0.0003	0.0003	3359.035
Residential Lending -> Total Real Estate Lending	0.6148	0.6147	0.0093	0.0093	66.3083

(2) Structural Model Assessment : The inner model is assessed to test the relationship between the exogenous and endogenous variables. The path coefficients are obtained by using non-parametric, bootstrapping routine technique given by Vinji, Chin, Henseler, and Wang (2010). In this, the four exogenous variables are commercial lending, indirect lending, real estate advances, and residential lending, which have the values of *R* - square ranging between 0.9414 – 0.9988, which shows sufficient accuracy of the structural model. Since the *t* - value is greater than 1.96, it reflects that the alternative hypothesis is accepted that there is an impact of residential loans, commercial loans, real estate advances, and indirect loans by banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India.

Table 4 shows the relation between residential lending, commercial lending, real estate advances, indirect lending and total real estate lending, that is, 66.30, 31.65, 52.68, 5.75, which reflects that the *t* - value is greater than 1.96 ; hence, the alternate hypothesis is accepted. Since the *t* - values of residential lending are more than that

of commercial lending, real estate advances, and indirect lending, it can be ascertained that banks are contributing more for the real estate sector development in India for strengthening the impact of technology entrepreneurship for future real estate development in India.

Table 5 shows that the value of Stone - Geisser Q square value is greater than zero, which shows the predictive relevance of the model and reveals that the alternate hypothesis (there is impact of residential loans, commercial loans, real estate advances, and indirect loans by banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India) is accepted and the null hypothesis (there is no impact of the residential loans, commercial loans, real estate advances, and indirect loans by banks on the total real estate sector development in India for strengthening the impact of technology entrepreneurship in India) is rejected. It also reflects that the structure of the model is also correct.

Table 5. Blindfolding Technique

Total	**SSO**	**SSE**	**Q Square(1 – SSE/SSO)**
Commercial Lending	80	26.9225	0.6635
Real Estate Advances	80	8.5164	0.8935
Residential Lending	80	21.9317	0.7259
Total Real Estate Lending	80	8.1303	0.8984
Case 1	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	13.8779	4.381	0.6843
Real Estate Advances	15.4906	1.7575	0.8865
Residential Lending	11.0522	5.1015	0.5384
Total Real Estate Lending	15.3486	1.6505	0.8925
Case 2	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	17.3212	4.1626	0.7597
Real Estate Advances	12.8512	1.8473	0.8563
Residential Lending	9.4163	10.8359	-0.1508
Total Real Estate Lending	8.8791	1.4985	0.8312
Case 3	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	15.1577	5.1719	0.6588
Real Estate Advances	8.8721	0.5052	0.9431
Residential Lending	14.6748	1.6995	0.8842
Total Real Estate Lending	8.3647	0.7744	0.9074
Case 4	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	11.1559	1.8249	0.8364
Real Estate Advances	8.3431	0.958	0.8852
Residential Lending	15.404	1.6637	0.892
Total Real Estate Lending	8.1978	1.1369	0.8613
Case 5	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	6.5793	1.654	0.7486
Real Estate Advances	9.5728	1.6016	0.8327
Residential Lending	13.2962	0.9392	0.9294
Total Real Estate Lending	10.7699	0.9145	0.9151
Case 6	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	9.0585	4.4469	0.5091

Real Estate Advances	10.1381	0.6578	0.9351
Residential Lending	7.6234	0.6884	0.9097
Total Real Estate Lending	14.2116	1.406	0.9011
Case 7	**SSO**	**SSE**	**1 – SSE/SSO**
Commercial Lending	6.8495	5.2812	0.229
Real Estate Advances	14.7321	1.189	0.9193
Residential Lending	8.5332	1.0036	0.8824
Total Real Estate Lending	14.2284	0.7494	0.9473

Note. The Q - square stands for criteria of predictive relevance, SSE stands for sum of squared errors, and SSO stands for sum of squares optimization.

Discussion

Partial least square structured equation modeling (PL–SEM) (bootstrapping and blindfolding technique) has been employed to study the impact of residential loans, commercial loans, real estate advances, and indirect loans by public and private sector banks on the total real estate sector in India for strengthening the impact of technology entrepreneurship for future real estate development in India. The results show that the alternative hypothesis is accepted.

As the public and private partnership (PPP) model is adopted by banks (such as association of State Bank of India and MagicBricks.com), it is essential to increase the role of PPP projects in residential lending, commercial lending for total real estate sector development, which is fruitful for the real estate buyers as they require an adequate amount of finance for purchasing real estate property, and for this purpose, they will also get the right information for the real estate market from the same platform. The banks help the real estate buyers by providing finance for purchasing the real estate property. On the other hand, MagicBricks.com helps in locating the properties for real estate buyers. It will increase the role of public – private partnership and technology entrepreneurship in India. As a result, the banks are contributing to the real estate sector development in India and are also promoting and supporting technology entrepreneurship in India. HDFC Bank's major initiatives like HDFC Realty Limited, GRUH Finance Limited show the promotion and support of technology entrepreneurship in India. From the results of structural equation modelling, it is clear that banks are contributing more for the residential real estate as compared to commercial lending, indirect lending, indirect advances, and real estate advances to promote and support technology entrepreneurship in India.

The benefits of PPP projects are :

↳ **For the Public Sector :** These help the government in raising capital, expertise, and infrastructure to render better services for the real estate sector and to provide relevant and transparent information to the real estate customers digitally.

↳ **For the Private Sector :** The private sector will get long term business opportunities and the relationship with the government of private sector becomes stronger, which will help to increase the role of technology entrepreneurship in India by doing public and private partnership projects.

Research Implications

↳ The real estate buyers should be made aware of the role of technology entrepreneurship by public and private partnerships in the real estate sector so that they will be able to get the authentic real estate information digitally.

↳ Partial least square structural equation modeling has been used, which shows that there is impact of residential loans, commercial loans, real estate advances, and indirect loans by public and private sector banks on the total real estate sector in India for strengthening the impact of technology entrepreneurship for future real estate development in India.

↳ The role of the public – private partnership (PPP) model has been increasing in India as the role of banks is to provide finance and private partners help in locating the real estate property at the same time.

Limitations of the Study and Scope for Future Research

This study is limited to an analysis of five public sector banks (State Bank of India, Punjab National Bank, Canara Bank, IDBI Bank, and Indian Bank) and five private sector banks (HDFC Bank, ICICI Bank, Axis Bank, DCB Bank, and Yes Bank) in relation to the initiatives of technology entrepreneurship in real estate sector development in India. The time period chosen for the study is from 2011 – 2018. However, the study does not consider the role of the non-banking financial companies (NBFCs), which can be further included for a more comprehensive study of technological entrepreneurship for policy implications for the betterment of the future real estate sector development in India.

Authors' Contribution

Dr. Priya Solomon conceived the idea and developed qualitative and quantitative design to undertake the empirical study. Mr. Tanu Aggarwal extracted research papers of high repute, filtered these based on keywords, and generated concepts and codes relevant to the study design. The numerical computations were done by both authors using Smart PLS 2 version.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter, or materials discussed in this manuscript.

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